Leading Light Wind

NJDEP Waterfront Development Individual Permit Application for Geotechnical & Geochemical Surveys

OCS-A-0542 Leading Light Wind

Submitted by:

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wsp

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List of Key Acronyms and Abbreviations

ASTM	American Society for Testing and Materials
DGPS	differential global positioning system
DPII	dynamically positioned, class 2
BMPs	best management practices
BOEM	Bureau of Ocean Energy Management
cm^2	square centimeter
CPT	cone penetration test
DMA	Dynamic Management Area
EMs	Environmental Monitors
ESA	Endangered Species Act
ft	feet
ft^3	cubic feet
GPS	global positioning system
HDD	horizontal directional drilling
Hmax	maximum expected wave height
IPaC	Information for Planning and Consultation
km	kilometers
m	meters
m^3	cubic meter
NHP	Natural Heritage Program
NJDEP	New Jersey Department of Environmental Protection
nm	nautical miles
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NSSP	National Shellfish Sanitation Program
NY	New York
NYSERDA	New York State Energy Research and Development Authority
PDC	project design criteria
PSOs	Protected Species Observers
QMA	Qualified Marine Archaeologist
RTK	real-time kinematic
SMA	Seasonal Management Area
USBL	ultra-short baseline
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey

Part I. Introduction

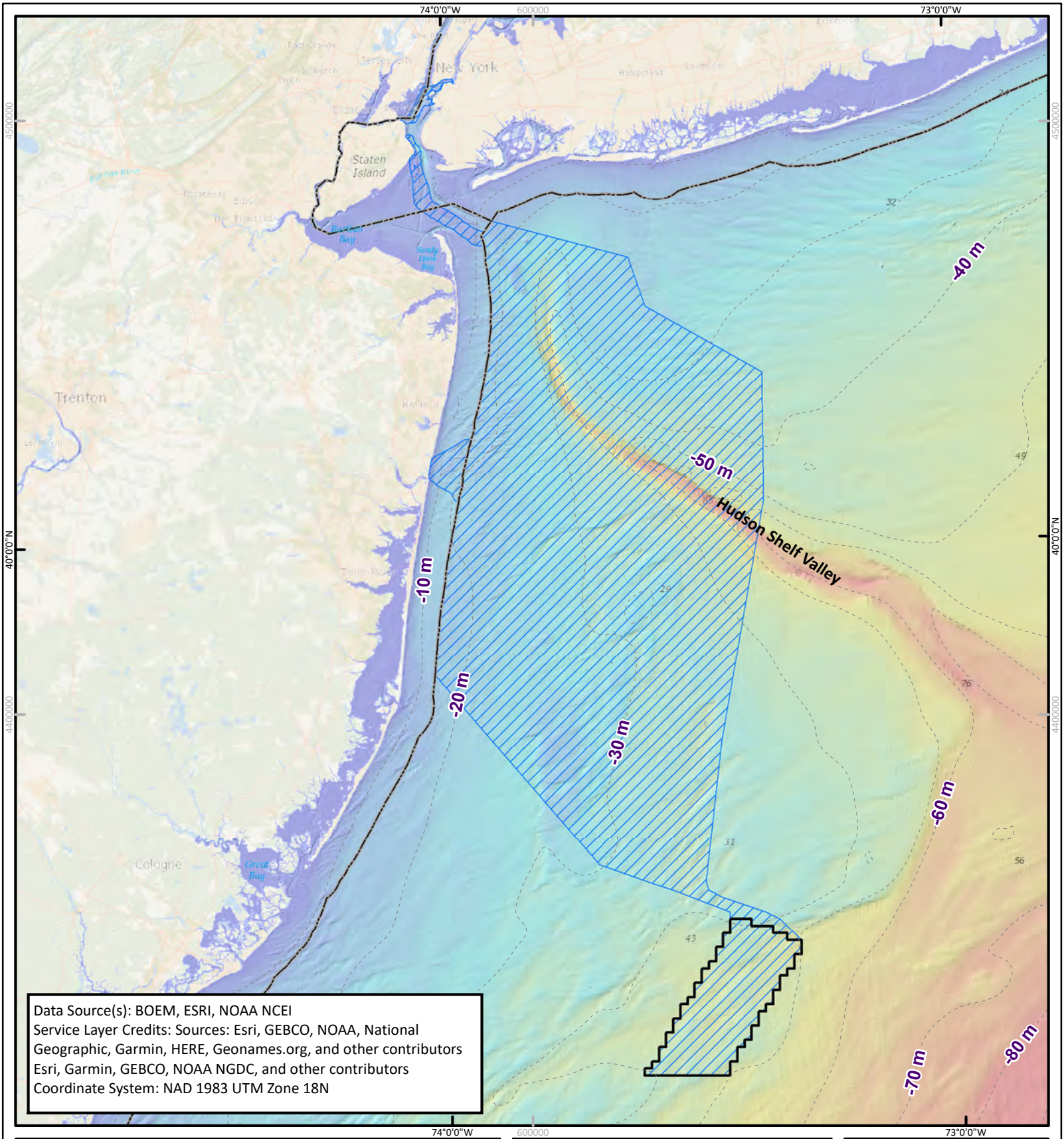
Invenergy Wind Offshore LLC (the "Applicant") executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) (40 nautical miles [nm]) east of Atlantic City and 150 km (80 nm) south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km (50+ nm) of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore. A general overview of the Survey Area including the lease area and potential export cable corridors is provided as **Figure 1**. The Survey Area is shown on U.S. Geologic Survey (USGS) topographic maps (**Figure 2**) and local roads (**Figure 3**).

The Applicant is planning to conduct geotechnical and geochemical survey program to collect data for characterization of the seafloor and subsurface conditions in the lease area and potential export cable corridors. Geotechnical surveying will be conducted in the lease area to support the planning and design of wind turbine and offshore power substation foundations, inter-array cables, and export cable(s). Geotechnical surveying will also be conducted along potential export cable corridors to support the planning and design of the export cable(s). In addition, geochemical sampling will be conducted along export cable corridors to obtain information necessary for future federal and state permit applications. The Applicant is proposing up to 65 geotechnical borings, 65 cone penetration tests (CPT), and 53 geochemical borings within New Jersey waters. The Project will result in less than 0.1 acre of disturbance to the seabed floor.

The activities will be conducted in a manner consistent with the requirements prescribed by the Bureau of Ocean Energy Management (BOEM) *Leading Light Wind's Commercial Lease OCS-A 0542, specifically Addendum C, Section 2, Site Characterization (*Lease*),* and with federal guidelines (30 CFR part 585 subpart F). The survey will be sequenced and conducted in a manner that will allow interdependent activities (e.g., geophysical data to be collected and used to perform archaeological clearance of geotechnical locations) to occur in accordance with regulatory requirements and lease stipulations.

The Applicant is seeking a Waterfront Development Individual Permit (In-Water) and Water Quality Certificate from the New Jersey Department of Environmental Protection (NJDEP) to proceed with the geotechnical and geochemical borings within the Survey Area. The Applicant obtained a Sediment Sampling and Analysis Plan (SSAP) approval from NJDEP Office of Dredging and Sediment Technology (File No. 0000-23-0002.1 DRG230002), U.S. Army Corps of Engineers, New York District Nationwide Permit (Survey Activities) Verification (File No. NAN-2023-00421-EMI) and has previously conducted benthic surveys within the proposed Survey Area with authorizations from NJDEP and the federal government.

Part II of this application describes the Project's purpose and need, location, and proposed activities. Part III includes a description of existing conditions and Part IV demonstrates compliance with the conditions outlined in the Coastal Zone Management Rules (N.J.A.C. 7:7).



Offshore Export Cable Survey Area

Lease Area OCS-A 0542

State Water Limit

Bathymetric Contour

Bathymetry (m)

0 — 90

Figure 1. Lease and Export Cable Survey Area

Invenergy FUGRO WSP

Author	William Scales
Date	9/25/2023

0 3 6 9 12 Nautical Miles

0 5 10 15 20 Kilometers

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LOCATION MAP

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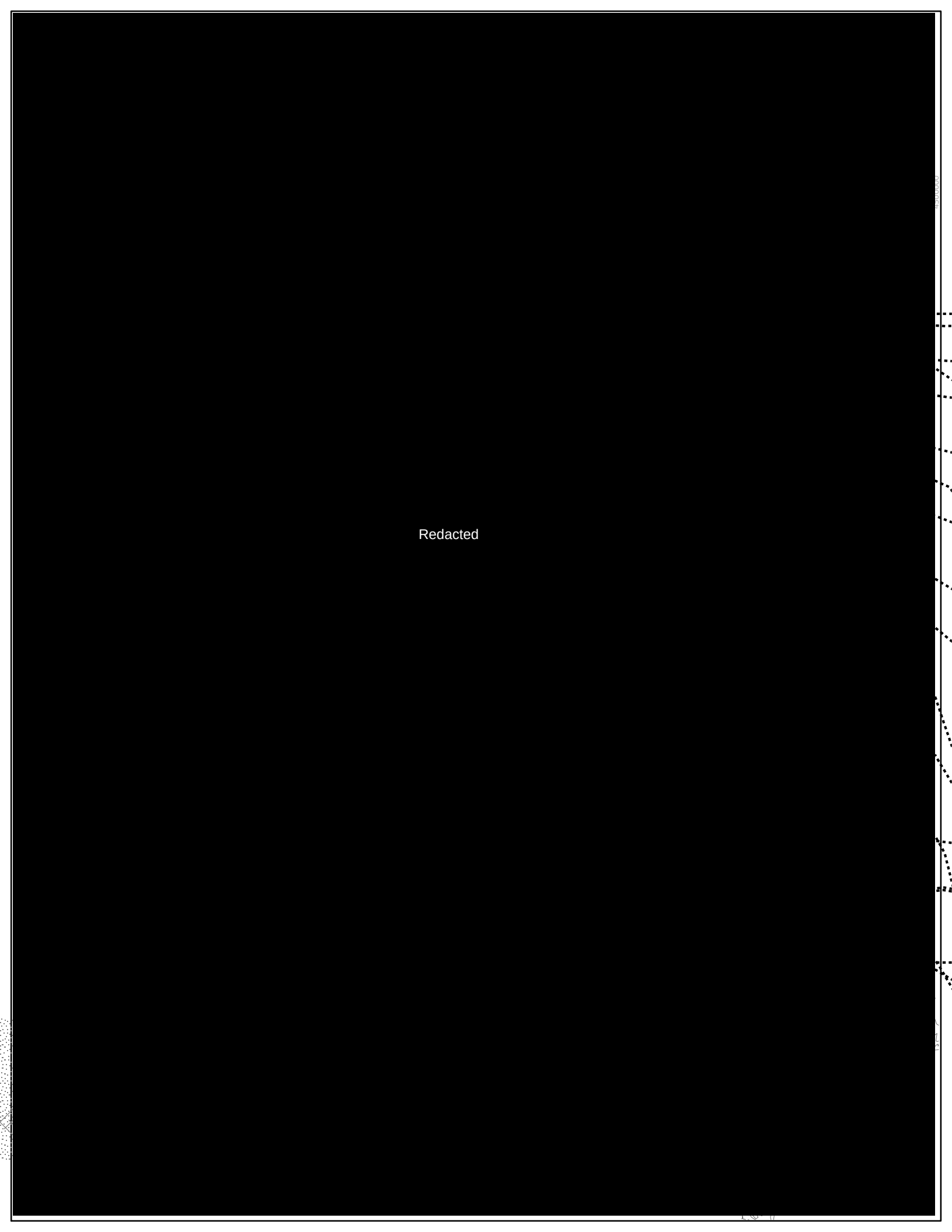
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Part II. Project Description

1.0 Project's Purpose and Need

Geotechnical surveys to support the Project's export cable route are necessary for informing the engineering of the cables as well as for optimizing siting and minimizing environmental impacts from the Project. The Applicant's planned geotechnical and geochemical investigations will support the evaluation of the following:

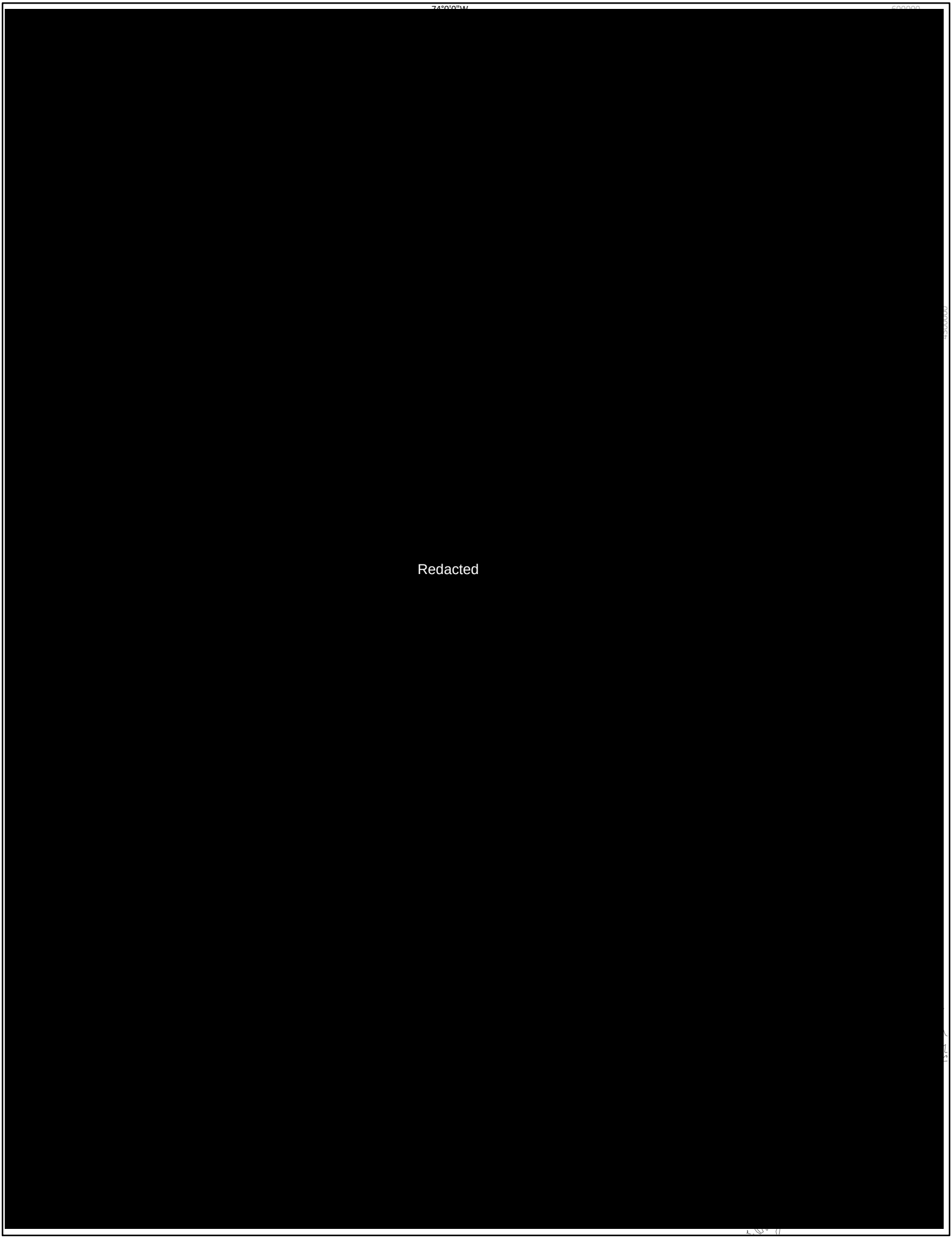
- The potential effects of seafloor-disturbing activities, such as geotechnical exploration (e.g., borings, vibracores, cone penetration tests, etc.), construction activities, installations (e.g., facilities, cable arrays, transmission cables, etc.), maintenance and servicing activities, decommissioning, and any other activities associated with anchoring mechanisms or appurtenances;
- Shallow hazards and geological conditions (including seabed constraints such as boulders, mobile seabed features, and debris);
- Anthropogenic features (e.g., cables/pipelines) or evidence of anthropogenic activities that may pose a hazard to the wind farm development (e.g., commercial vessel anchoring areas, intensive commercial fishing areas);
- Marine archaeological resources; and
- Benthic habitats.

2.0 Project Location

Within New Jersey waters, the Survey Area includes the Upper NY Bay, Lower NY Bay, and Atlantic Ocean/Sea Girt and are inclusive of potential export cable route areas and one potential landfall at Sea Girt, NJ. **Table 1** provides approximate coordinates for the perimeter of the Survey Area in New Jersey State Waters. Maps depicting the Survey Areas are provided as **Figures 4 and 5**. County and municipalities adjacent to the Survey Areas are provided in **Table 2**. Siting sampling locations depends on several factors including findings from the previously conducted benthic survey (March 2023) and geophysical surveys. Geophysical surveys for Leading Light Wind were conducted in 2022 and additional surveying is occurring concurrently with this permit application development and review.

Table 1. Coordinates for Offshore Cable Survey Area Perimeter in New Jersey State Waters

Survey Area	Easting UTM	Northing UTM	Latitude	Longitude
Upper NY Bay	581478.6929	581478.6929	40.6980	-74.0356
Upper NY Bay	579065.6755	579065.6755	40.6553	-74.0647
Upper NY Bay	582212.9713	582212.9713	40.6993	-74.0269
Upper NY Bay	579828.3198	579828.3198	40.6515	-74.0558
Upper NY Bay	578004.1766	578004.1766	40.6516	-74.0773
Lower NY Bay	591620.5963	591620.5963	40.4764	-73.9191
Lower NY Bay	591730.2690	591730.2690	40.4567	-73.9181
Lower NY Bay	584391.1132	584391.1132	40.5162	-74.0038
Lower NY Bay	581311.4773	581311.4773	40.5095	-74.0403
Atlantic Ocean/Sea Girt	587437.3980	587437.3980	40.0673	-73.9747
Atlantic Ocean/Sea Girt	589571.7051	589571.7051	40.1636	-73.9482
Atlantic Ocean/Sea Girt	582960.2281	582960.2281	40.1353	-74.0262
Atlantic Ocean/Sea Girt	582386.2344	582386.2344	40.1052	-74.0334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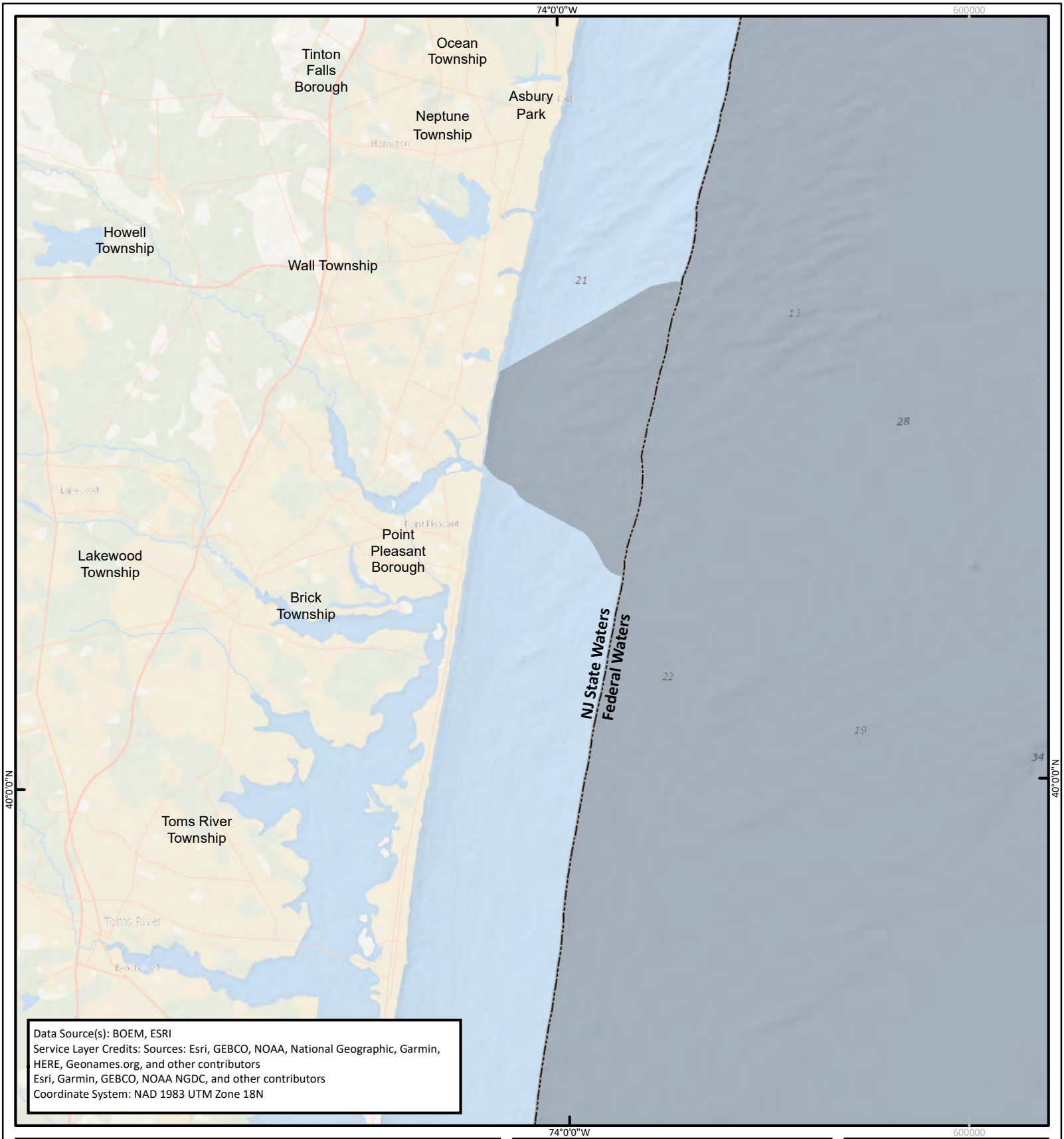

Export Cable Route

Survey Area

State Water Limit

Figure 5. Atlantic Ocean/ Sea Girt Survey Area

Invenergy FUGRO WSP

Author	William Scales
Date	9/28/2023

0 0.5 1 1.5 2 Nautical Miles

0 1 2 3 4 Kilometers

N

LOCATION MAP

Table 2. Municipalities Adjacent to the Survey Areas

Survey Area	Municipality	County	State	Zip
Upper NY Bay	Jersey City, Bayonne	Hudson	NJ	07305, 07002
Lower NY Bay	Middletown Township	Monmouth	NJ	07732
Atlantic Ocean/Sea Girt	Sea Girt Borough	Monmouth	NJ	08750

2.1 Nearshore Geotechnical and Geochemical Program Surveys

Nearshore geotechnical and geochemical borings are associated with the in-water horizontal directional drilling (HDD) exit pit necessary for the proposed landfall sites. The Project is currently considering one (1) landfall within New Jersey and the survey work at that location would consist of five (5) geotechnical borings and CPT and six (6) geochemical borings The total number of geotechnical and geochemical sampling locations within New Jersey waters are provided in **Table 3**.

Table 3. Sampling Locations within New Jersey Waters

Location	Number of Landfall Locations	Geotechnical – Vibracore	Geotechnical – CPT	Geochemical – Vibracore
Nearshore Surveys	1	5	5	6
Export Cable Corridor Surveys	--	60	60	53
Total New Jersey Waters	**1**	**65**	**65**	**59**

2.2 Export Cable Corridor Geotechnical and Geochemical Program Surveys

Vibracore sampling and CPT in-situ testing is proposed along potential export cable corridors. Siting of vibracore sampling and CPT in-situ testing locations depend on several factors including findings from the previously conducted benthic survey and currently ongoing geophysical surveys. Before siting a geotechnical boring, geophysical survey data will be used by the Project's Qualified Marine Archaeologist (QMA), SEARCH, Inc., to clear locations of any potential archaeological resources ahead of any geotechnical activities.

Specific geotechnical locations will be selected to target representative soil units along the export cable corridors. Sampling locations will be spaced nominally 3,280 feet (ft) (1 km or approximately 0.5 nm) apart. The Applicant propose up to 60 geotechnical vibracore sampling locations associated within the export cable corridor could occur within New Jersey waters.

In addition to the geotechnical sampling locations, 53 geochemical sampling locations are proposed within New Jersey waters (**Table 4**). Geochemical sampling locations will be evenly distributed along the export cable corridors at a density of approximately 1 per 3,000 ft (approximately 0.9 km).

Depth of geochemical sampling was determined based on best available state and federal guidance for recommended cable burial depths. Within the Lower NY Bay and Atlantic Ocean/Sea Girt Survey Areas, geochemical borings will be approximately 8 feet below the mudline; while geochemical sampling within the Upper NY Bay Survey Area will be between 16 ft and 21 ft below the mudline. Geochemical sampling locations within the Upper NY Bay Survey Area are within the vicinity of several navigation channels: the Kill Van Kull Channel/Constable Hook Reach, Claremont Terminal Channel and Anchorage Channel. Best practices for crossing navigation channels with transmission cables call for burial as deep as -15ft below authorized depth to account for potential anchor drag and maintenance dredging. Additional information regarding the geochemical sampling locations is provided in **Appendix C**. New Jersey Sediment Sampling and Analysis Plan.

Table 4. Export Cable Corridor Geochemical Sampling Locations

Survey Area	# of Geochemical – Vibracore	Depth of Collection
Upper New York Bay	7	16-21 ft
Lower NY Bay	30	8.0 ft
Atlantic Ocean/Sea Girt	16	8.0 ft

3.0 Project Description

3.1 Archaeological Resources Review

Per Lease Stipulation 5.3.4, prior to conducting the geotechnical survey, the area of potential impact (inclusive of any area associated with vessel jacking or anchoring) will be reviewed by the QMA to ensure activities will not result in impacts to important benthic habitat and/or areas of cultural significance. SEARCH, Inc., as a subcontractor to the Applicant's prime consultant will serve as the QMA during execution of the geophysical and geotechnical surveys. Geophysical data collected during the 2023 survey will be analyzed by the QMA to clear the sampling locations ahead of the geotechnical and geochemical activities at proposed locations. Upon completion of the surveys, the QMA will certify that activities did not impact potential historic properties.

3.2 Nearshore Geotechnical and Geochemical Program Surveys

Up to five geotechnical borings are planned to be drilled to a nominal depth of 30 m below the seafloor within the vicinity of the landfall site in New Jersey. Geotechnical borings will vary in width between 180 millimeters (mm) (7 inches) near the seafloor (initial marine riser casing) to a narrow width of 100 millimeters (4 inches) diameter cores at greater depths. At each geotechnical boring location, a CPT will be conducted approximately 5 m from the borehole location to a nominal depth of 30 m below the seafloor. In-situ CPTs will be performed by using a top push technique. The top push CPT system will use standard 15 square centimeter (cm^2) or 10 cm^2 sized cones (cone diameter 35 mm [1.4 inches]). The CPT tests are considered to be optional and may not be conducted.

Nearshore geochemical cores will be collected to a maximum depth of 9 m (30 ft) below the seafloor. Cores will be handled in accordance with the procedures described in the approved New Jersey Sediment Sampling and Analysis Plan, and the NJDEP Field Sampling Procedure Manual (NJDEP 2005). Cores will have the bottom of the core liner capped and taped on retrieval from the water, and the top of the core liner capped and taped on removal of the core liner from the coring apparatus. The outside of the core liner will then be rinsed with water. If necessary, the core liner will be cut into segments to aid in handling or transportation. In these cases, the newly cut ends of the core segments will be capped and taped. The core will be clearly labeled, including the core or core segment ID, date, and time, and the 'up' and 'down' orientation of the core.

Nearshore sampling will be conducted using a lift boat or self-elevating barge (lift boat). The lift boat will move onto position and then elevate out of the water to conduct drilling or CPT in-situ testing. The lift boat will be jacked above the water level to allow safe working operation and a stable platform for drilling and conducting CPT testing. The lift boat will be elevated above seabed to an elevation equal to at least water depth plus the maximum tidal variation plus the maximum expected wave height (Hmax) plus a safety margin. Navigation and positioning of the lift boat or survey vessel will be conducted using a survey-grade, global positioning system (GPS) or real-time kinematic (RTK) positioning system. Offsets for the moonpool / as built drilling positions will be measured and programmed into the navigation system to enable accurate and concise recording of the actual boring or CPT locations. The nearshore geotechnical survey contractor will be selected prior to survey work. The selected contractor will be familiar with relevant survey standards (i.e., applicable BOEM guidelines, American Society for Testing and Materials [ASTM] standards for geotechnical investigations and laboratory testing, etc.) and be familiar with the use of all applicable soil sampling and in-situ testing equipment and methods. Specific vessels and equipment may vary slightly depending on the selected contractor.

3.3 Geotechnical and Geochemical Program Surveys

The Applicant proposes to conduct up to 60 geotechnical sampling locations and 53 geochemical sampling locations within New Jersey waters. At each geotechnical sampling location, vibracore sampling and CPT in-situ testing will be conducted to a nominal target depth of 5 m (16 ft) below the seafloor. Geochemical testing will be conducted to a nominal target depth of 2.5 m (8 ft) below the seafloor for sampling locations in the Atlantic Ocea/Sea Girt and Lower NY Bay and a target depth of 4.8 to 6.4 m (16 to 21 ft) in the Upper NY Bay.

Vibracore sampling and CPT testing will be conducted using a dynamically positioned, class 2 (DPII) vessel or vessel using live-boating techniques to maintain position. Thermal CPTs will be used to measure in-situ thermal conductivity. Positioning of the vessel and geotechnical equipment will be accomplished by differential global positioning system (DGPS). In deeper water sections of the export cable corridor, an ultra-short baseline (USBL) acoustic tracking system with beacons may be used to position the CPT location.

The Applicant currently anticipates that survey vessels will be mobilized out of New York and/or New Jersey. The survey equipment will be configured aboard the survey vessels to optimize data quality, reduce ambient noise, and to minimize instrumentational cross talk. The survey equipment will be operated in accordance with the manufacturer's and BOEM's recommendations.

System verifications and calibrations will be performed as needed during mobilization, to ensure proper equipment functionality and data quality. A client representative will be on-board the survey vessel(s) (where possible) and responsible for ensuring the survey progresses as expected and that data quality is not compromised.

4.0 Survey Equipment

The proposed geotechnical survey tools are listed in **Table 5**. *If any of the exact systems below are not used during the survey activities, an equivalent will be used in their place.* Equipment specifications are provided in **Appendix D**.

Table 5. Proposed Geotechnical Survey Equipment

Alpine Model P Pneumatic Vibracore System	Alpine manufactured pneumatic system designed for hard packed and soft sediments with 6-m barrel configuration.
Fugro Wison MKV EcoDrive	The WISON MkV cone penetration test (CPT) and sampling system enables in-situ soil properties to be measured and soil samples/cores to be collected from the base of a borehole either offshore or on land.
Fugro Seacalf MKV Deep Drive	Fugro's SEACALF® MkV Deep Drive® is an advanced seabed CPT system with enhanced soil penetration capacity. The system features a unique combination of a coiled rod and a friction reduction system that enables faster acquisition of deeper CPT's from a wide range of vessels.
Fugro Blue Snake	Fugro Blue Snake® is a geotechnical system that integrates CPT and sampling technology to enable safe, fast, and high-quality data acquisition.

5.0 Proposed Impacts

Impacts associated with geotechnical and geochemical investigation to the seafloor are minimal.

5.1 Nearshore Geotechnical and Geochemical Program Surveys

Conservatively, each geotechnical boring has the potential to disturb up to 0.75 cubic meter (m^3) (26 cubic feet [ft^3]) of sediment; CPT has the potential to disturb up to 0.03 m^3 (1 ft^3) of sediment; while geochemical cores have the potential to disturb up to 0.07 m^3 (2.6 ft^3) of sediment. Assuming all geotechnical borings and CPT sampling are conducted to maximum depth of 30 m (100 ft) and geochemical cores to a maximum depth of 9 m (30 ft), the proposed nearshore surveys have the potential to disturb up to 4.3 m^3 (152 ft^3) of sediment. Nearshore geotechnical borings will be sealed with a non-toxic grout mixture.

5.2 Geotechnical and Geochemical Program Surveys

Each individual vibracore has the potential to disturb 0.04 m^3 (1.4 ft^3) of sediment (assuming a 100 mm [4-inch] diameter core barrel); each CPT has the potential to disturb 0.005 m^3 (0.2 ft^3) of sediment and each geochemical core has the potential to disturb 0.02 m^3 (0.7 ft^3) of sediment. Depressions created in the seafloor during sampling would backfill naturally with sediment from the surrounding seabed.

Sampling associated with the export cable corridors has the potential to disturb up to 3.8 m^3 (134 ft^3). **Table 6** provides an estimate of the volume of disturbance associated with the proposed geotechnical and geochemical surveys.

Table 6. Approximate Volume of Disturbance (ft^3) associated with Geotechnical and Geochemical Sampling

Sampling Location	Geotechnical - Vibracore		Geotechnical - CPT		Geochemical - Vibracore	
	# of Samples	Volume of Disturbance	# of Samples	Volume of Disturbance	# of Samples	Volume of Disturbance
Nearshore Surveys	5	132	5	6	6	15
Atlantic Ocean/Sea Girt	5	132	5	5	6	15
Cable Surveys	60	86	60	10	53	38
Upper NY Bay	10	14	10	2	7	5
Lower NY Bay	30	43	30	5	30	21
Atlantic Ocean/Sea Girt	20	29	20	3	16	11
Total New Jersey Waters	**65**	**217**	**65**	**16**	**59**	**53**

5.3 Water Quality Impacts

No measurable elevation in total suspended sediment/turbidity are anticipated from sediment sampling activities. Drilling of the near shore borings will be carried out using forward flush rotary drilling techniques. Flush water for the drilling operation will be seawater, a drilling additive / mud (DUO-VIZ) will be added as required. Flush water and drilling cuttings that are returned to deck will be collected and drummed and disposed of at an approved upland facility.

No untreated sewage would be discharged from the work vessels. Materials such as rubbish, trash, and garbage would not be released overboard from work vessels. Large vessels (more than 79 feet in length) would adhere to the provisions of the U.S. Environmental Protection Agency Vessel General Permit.

Part III. Existing Conditions

The proposed geotechnical survey includes both Lease Area OCS-A-0542 and potential export cable corridors. Geochemical surveys will occur along potential export cable corridors in New York and New Jersey waters. The lease area and portions of the potential export cable corridors in federal waters are not the subject of this application, but a description of these is included for completeness.

Lease Area OCS-A-0542 is located within the Outer Continental Shelf of the New York Bight, offshore from New Jersey and New York. Lease Area OCS-A-0542 has a low gradient slope with water depths ranging between 32 and 54 m (104 and 177 ft) (BOEM 2022).

The New York State Energy Research and Development Authority (NYSERDA) commissioned a series of over 20 studies to evaluate the potential for developing offshore wind within the New York Bight. In 2020, NYSERDA commissioned a reconnaissance-level geophysical survey of the New York Bight that included the lease area and vicinity. The objective of the NYSERDA geophysical survey was to collect data and make it available to support offshore wind development in the New York Bight (NYSERDA 2020). The reconnaissance-level geophysical survey was completed by Gardline Limited under contract to NYSERDA. The survey trackline spacing was nominally 1.8 km (1 nm) between north-south lines and 4.5 km (2.4 nm) between east-west lines. The geophysical survey utilized standard geophysical equipment in accordance with BOEM guidelines.

1.0 Seabed and Surface Sediments

1.1 Offshore Wind Lease Area OCS-A 0542

Hard bottom habitat, such as coral or rocky reefs, do not exist within Lease Area OCS-A-0542 (Leading Light Wind Benthic Survey 1 conducted in April 2023; Northeast Ocean Data Portal 2022). Sixteen of the NYSERDA (2017) sediment profile and plan view imaging (SPI-PV) locations directly overlap with the northern half of Lease Area OCS-A-0542, and six SPI-PV locations were located inside or adjacent to (within 300 m [1,000 ft]) Leading Light Wind's potential export cable corridors. The northern half of Lease Area OCS-A-0542 is uniformly comprised of soft substrate subject to episodic sediment transport events. Grain size is predominantly very fine to medium sand, with some silt, gravel, and shell hash to varying degrees. The substrate is firm with a shallow mean camera prism penetration depth (i.e., 3.5 to 6 cm [1.4 to 2.4 inches]). Penetration depth is a factor of grain size, compaction, porosity, and infaunal bioturbation (NYSERDA 2017). Other publicly available data, obtained from the Northeast Ocean Data Portal (2022), interpret Lease Area OCS-A-0542 and potential export cable corridors as consisting predominately of medium sand, with discrete patches of coarse sand and fine sand, based on interpolation of point-based sediment grain size data (Anderson et al. 2010, as referenced in NYSERDA 2017). Three grab sample locations were located within Lease Area OCS-A-0542, collected as part of an OCS-scale grain size study (usSEABED) program, and were reported as sandy mud and sand, as per the CMECS Substrate Group categories. Preliminary data characterizing the offshore benthic environment in Leading Light Wind's first benthic survey conducted in April 2023 found predominantly homogeneous unconsolidated substrates containing soft bottom communities typical of the North Atlantic.

1.2 Potential Export Cable Corridors

The Leading Light Wind Project is exploring multiple export cable corridors that span water depths from 0 m (at landfall) over the OCS to Lease Area OCS-A-0542 to a maximum depth of approximately 50 m (164 ft) at kilometer point 0.0. Kilometer point 0.0 is located approximately in the center of the lease area. The exceptions are the crossings of the Hudson Shelf Valley, which is crossed by the potential export cable corridors in federal waters.

The continental shelf offshore New Jersey is covered with a layer of Holocene sediment, consisting predominantly of sand with varying amounts of gravel and patches of fine-grained sediments (e.g., USGS 2005; Uptegrove et al. 2012). Patches of gravelly sand are mapped locally. Below the surface, sediments on the New Jersey shelf are variable, reflecting the complex depositional environment during the Pleistocene and Holocene transgressions of the ocean. Generally, deposits are layered and can be several meters thick extending over significant distances. The surface sediments on the shelf partially overlie previous channel-infill sediments. The infill sediments may differ from the sediments outside the incised

channel. The Hudson Shelf Valley is an extension of the Hudson River Valley that begins at the mouth of the Raritan Bay and Lower New York Bay estuary as a depression of 20 to 30 m (33 to 100 ft). It then continues to be approximately 25 to 30 m (82 to 100 ft) deeper than the surrounding shelf floor as it traverses the New York Bight to the shelf break where it becomes the Hudson submarine canyon (Lentz et al. 2014). Maximum water depths of the export cable corridors crossing the Hudson Shelf Valley are (from east to west) 74 m (243 ft), 68 m (222 ft), and 59 m (193 ft).

Previous survey work that overlaps with the potential export cable corridors is limited. Data from the six NYSERDA (2017) locations overlapping with or adjacent to the potential export cable corridors indicate that the mobile soft sediment habitat characterizing the northern half of Lease Area OCS-A-0542 is also present in these shelf locations. The predominant grain size of the sediment is sand, with some silt, gravel, and shell hash (NYSERDA 2017).

The potential export cable corridors traversing the inshore state jurisdictions in New York Bay likely have mobile soft sediment substrate with a mix of sand and silt. The bathymetry in state waters of the Lower New York Bay is variable. This is in part because of dredged navigation channels, previous borrow areas, and sand wave areas formed by swift currents. Sediments in the Lower New York Bay consist of a thick layer of glacial outwash sands that were deposited south of The Narrows (Bokuniewicz and Fray 1979). Glacial sediments in the Lower New York Bay are at least 20 m (65 ft) thick and extend onto the continental shelf.

The Narrows and Upper New York Bay contain sediments generally over 60 m (200 ft) thick (USACE 2004). Sediments in The Narrows and near to the Verrazzano-Narrows Bridge consist of predominantly sand; sediments further to the north consist of predominantly fine-grained silt and clay (Coch and Bokuniewicz 1986). Sediments in the Upper New York Bay consist mostly of sand-clay/silt and sand-silt/clay.

2.0 Benthic Resources

Available benthic infauna, epifauna, and demersal species data are limited. The Leading Light Wind Benthic and Geotechnical and Geochemical survey programs will contribute substantially to the understanding of habitat and benthic resources within the survey area.

2.1 Offshore Wind Lease Area OCS-A 0542

Publicly available benthic infauna surveys within Lease Area OCS-A-0542 is limited. The NYSERDA (2017) report provides some of the most recent descriptions of the benthic epifauna and infauna within the Survey Area. This study classified the offshore study area, which included Lease Area OCS-A-0542, under the CMECS Biotic Subclasses as Soft Sediment Fauna Biotic Subclass, defined as “Areas that are characterized by fine unconsolidated substrates (sand, mud) and that are dominated in percent cover or in estimated biomass by infauna, sessile epifauna, mobile epifauna, mobile fauna that create semi-permanent burrows as homes, or by structures or evidence associated with these fauna (e.g., tilefish burrows, lobster burrows).” This subclass includes the Diverse Soft Sediment Epifauna Biotic Group, defined as “Highly varied and diverse communities of mixed fauna that are present on the surface of soft unconsolidated substrates, holothurians, ophiuroids, anemones, tunicates, mollusks, sea pansies, hydroids, bryozoans, sea urchins, sponges, echiuroids, priapulids, sand dollars, and in sediment grain size, amount of detrital material, and episodic sediment transport (NYSERDA 2017). Macroflora (submerged aquatic vegetation) or hard substrate with attached (sessile) also not been documented in the lease area during previous benthic habitat surveys (Northeast Ocean Data Portal 2022; E & EE 2017; NYSERDA 2017).

2.2 Potential Export Cable Corridors

The potential export cable corridors traverse similar soft sediment habitat as Lease Area OCS-A-0542, as well as into the shallows of the Lower Bay in New Jersey and New York state waters and the intertidal zone at the proposed landfall locations. The benthic habitat consists of similar species as found in the lease area (see above), with some additional species associated with nearshore coastal waters that are shallower than 30 m (100 ft).

Existing information around the potential export cable corridors areas include a benthic survey conducted for the Equinor Offshore Wind Farm Project in 2019 (Equinor Wind 2019). The Equinor benthic survey area overlaps with Leading Light Wind’s section of the secondary New York route, the inshore route leading to New York, and the eastern inshore New Jersey route. The results from those locations indicate a CMECS Biotic Subclass of Soft Sediment Fauna, largely dominated

by polychaetes, but also burrowing anemones, crustacean, gastropods, bivalves, sand dollar beds, and attached mussels. Mussel beds are more prevalent closer to shore within the Lower New York Bay, but with patchy distribution, providing complex habitat (generating shell hash substrate) for other species.

In addition to the bivalves of commercial interests discussed above, the northern quahog (*Mercenaria mercenaria*) has been historically important to commercial and recreational harvesting along the shallow shores and bays of the shoreline from Canada to Florida (Rice 1992). Near the survey area, Sandy Hook has productive northern quahog areas (Dacanay 2016, E&EE 2017, Kraeuter et al. 2009).

The Atlantic horseshoe crab (*Limulus polyphemus*) may exist along any of the potential export cable corridors in water depths shallower than 30 m (100 ft). Adult crabs migrate into the intertidal to spawn, where juveniles then reside a few years prior to migrating into offshore benthic habitats (Grothues et al. 2021). Flatfish of several species are of commercial and recreational fishery importance within the New York Bight, including winter flounder (*Pseudopleuronectes americanus*) and summer flounder (*Paralichthys dentatus*).

Many species of shark preferring warmer waters frequent the nearshore habitats of the coastal New York Bight, in particular their young depend on nursery habitat within estuaries and bays. Several species may overlap with the potential export cable corridors, such as the sand tiger shark (*Carcharias taurus*), and requiem sharks (including tiger shark [*Galeocerdo cuvier*], blue shark [*Prionace glauca*], sandbar shark [*Carcharhinus plumbeus*], Atlantic sharpnose shark [*Rhizoprionodon terraenovae*], and dusky shark [*Carcharhinus obscurus*]).

The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) are potentially present within the cable corridors, particularly during peak spring and fall migrations between their Hudson River spawning grounds (Coastal Critical Habitat Designation) (Northeast Ocean Data Portal 2022), summer residency in shallow estuaries, and the deeper offshore areas and/or regions farther south. As stated above, they have been observed in water depths as deep as 70 m (230 ft); however, they seem to prefer warmer water (12 to 25 degrees Celsius) and low salinity, and thus follow plumes of estuarine waters (Grothues et al. 2021).

Submerged aquatic vegetation (i.e., eelgrass) habitat exists inside the barrier islands along New Jersey and Long Island but does not overlap with the export cable corridors through the Lower Bay (E & EE 2017; NOAA 2022; Northeast Ocean Data Portal 2022). Macroalgae was not observed at any locations along the potential New York route for the Equinor Offshore Wind Farm Project (Equinor Wind 2019; Northeast Ocean Data Portal 2022).

3.0 Fisheries Resources

Table 7 summarizes the designated Essential Fish Habitat (EFH) for species identified by the National Oceanic Atmospheric Administration Fisheries EFH Mapper Report as potentially occurring within the area.

Table 7. Designated EFH Potentially within Survey Area

Species Present	Scientific Name	Eggs	Larvae	Juvenile	Adults
Atlantic Butterfish	*Peprilus triacanthus*	X	X	X	X
Atlantic Cod	*Gadus morhua*	X	X		X
Atlantic Herring	*Clupea harengus*		X	X	X
Atlantic Mackerel	*Scomber scombrus*	X	X	X	X
Atlantic Sea Scallop	*Placopecten magellanicus*	X	X	X	X
Atlantic Surfclam	*Spisula solidissima*			X	X
Black Sea Bass	*Centropristis striata*			X	X
Bluefin Tuna	*Thunnus thynnus*			X	X
Bluefish	*Pomatomus saltatrix*		X	X	X
Clearnose Skate	*Raja eglanteria*			X	X

Species Present	Scientific Name	Eggs	Larvae	Juvenile	Adults
Common Thresher Shark	*Alopias vulpinus*	X	X	X	X
Dusky Shark*	*Carcharhinus obscurus*				
Little Skate	*Leucoraja erinacea*			X	X
Longfin Inshore Squid	*Doryteuthis pealeii*	X		X	X
Monkfish	*Lophius*	X	X		
Northern Shortfin Squid	*Illex illecebrosus*			X	
Ocean Quahog	*Arctica islandica*				X
Ocean Pout	*Zoarces americanus*	X			X
Pollock	*Pollachius virens*		X		
Red Hake	*Urophycis chuss*	X	X	X	X
Sand Tiger Shark*	*Carcharias taurus*			X	
Sandbar Shark*	*Carcharhinus plumbeus*			X	X
Scup	*Stenotomus chrysops*	X	X	X	X
Silver Hake	*Merluccius bilinearis*	X	X		X
Skipjack Tuna	*Katsuwonus pelamis*				X
Smoothound Shark Complex (Atlantic Stock)	*Mustelus*	X	X	X	X
Spiny Dogfish	*Squalus acanthias*				X
Summer Flounder	*Paralichthys dentatus*		X	X	X
Tiger Shark	*Galeocerdo cuvier*			X	X
White Shark*	*Carcharodon carcharias*			X	X
Windowpane Flounder	*Scophthalmus aquosus*	X	X	X	X
Winter Flounder	*Pseudopleuronectes americanus*	X	X	X	X
Winter Skate	*Leucoraja ocellata*			X	X
Witch Flounder	*Glyptocephalus cynoglossus*	X	X		X
Yellowtail Flounder	*Pleuronectes ferruginea*	X	X	X	X
Notes: * Indicates Neonate species may be present					

4.0 Threatened and Endangered Species

4.1 Potential Species within New Jersey Survey Area

Information regarding the historic or current presence of Federal and/or State-listed endangered, threatened, special concern, proposed, or candidate species, or habitat to support those species located in the vicinity of the Survey Area was obtained from the New Jersey Department of Environmental Protection (NJDEP) Natural Heritage Program (NHP), U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) and the National Oceanic and Atmospheric Administration (NOAA) National Marine Fishery Service (NMFS) Section 7 Endangered Species Act Online Mapper.

The response from the NJDEP, dated March 3, 2022, identified 17 threatened or endangered species potentially occurring within the New Jersey Survey Area, and is provided in **Appendix E**. **Table 8** below summarizes the Threatened and Endangered Species Identified by the NJDEP NHP.

Table 8. Threatened and Endangered Species Identified by the NJDEP NHP

Common Name	Scientific Name	New Jersey State Status
Plants		
Seabeach Amaranth**	*Amaranthus pumilus***	Endangered
Sea-beach Knotweed	*Polygonum glaucum*	Endangered
Birds		
American Kestrel	*Falco sparverius*	Threatened
Black Skimmer	*Rynchops niger*	Endangered
Black-crowned Night-heron	*Nycticorax nycticorax*	Threatened
Least Tern	*Sternula antillarum*	Endangered
Osprey	*Pandion haliaetus*	Threatened
Peregrine Falcon	*Falco peregrinus*	Endangered
Piping Plover**	*Charadrius melodus***	Endangered
Roseate Tern**	*Sterna dougallii***	Endangered
Reptiles		
Atlantic Leatherback**	*Dermochelys coriacea***	Endangered
Atlantic Loggerhead**	*Caretta caretta***	Endangered
Mammals		
Fin Whale**	*Balaenoptera physalus***	Endangered
Humpback Whale**	*Megaptera novaeangliae***	Endangered
North Atlantic Right Whale**	*Eubalaena glacialis***	Endangered
Fish		
Atlantic Sturgeon**	*Acipenser oxyrinchus oxyrinchus***	Endangered
Shortnose Sturgeon**	*Acipenser brevirostrum***	Endangered
Notes: **- Federally Listed		

Review of federally listed species via the USFWS IPaC system determined that there are seven (7) potential species for the Survey Area in New Jersey State Waters (**Appendix F**). The USFWS federally listed species include:

- Northern Long-eared Bat (*Myotis septentrionalis*)
- Tricolored Bat (*Perimyotis subflavus*)
- Piping Plover (*Charadrius melodus*)
- Red Knot (*Calidris canutus rufa*)
- Roseate Tern (*Sterna dougallii dougallii*)
- Monarch Butterfly (*Danaus plexippus*)
- Seabeach Amaranth (*Amaranthus pumilus*)

No critical habitats for the USFWS federally listed species were identified by IPaC for the Survey Area. All species identified by the USFWS as potentially occurring within the Survey Area are located onshore and will not be impacted as the geotechnical and geochemical sampling locations are located offshore. ESA-listed species identified by the NOAA ESA Section 7 mapper as occurring within the Survey Area are provided in **Table 9**.

Table 9. NOAA ESA Section 7 Mapper Identified Species within Survey Area

Common Name	Scientific Name	Life Stage	Federal Status
Reptiles			
Atlantic Leatherback	*Dermochelys coriacea*	Migrating and foraging adults and juveniles from May through November	Endangered
Atlantic Loggerhead – Northwest Atlantic DPS	*Caretta caretta*	Migrating and foraging adults and juveniles from May through November	Threatened
Green Sea Turtle – North Atlantic DPL	*Chelonia mydas*	Migrating and foraging adults and juveniles from May through November	Threatened
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Migrating and foraging adults and juveniles from May through November	Endangered
Mammals			
Fin Whale	*Balaenoptera physalus*	Migrating, overwintering, calving and foraging adults and juveniles occasionally present year-round.	Endangered
North Atlantic Right Whale	*Eubalaena glacialis*	Migrating and foraging adults and juveniles occasionally present year-round. Greater likelihood of occurrence from November to April.	Endangered
Fish			
Atlantic Sturgeon – All five DPS	*Acipenser oxyrinchus oxyrinchus*	Migrating and foraging adults and subadults present year-round. Higher concentrations in shallow Atlantic waters during peak spring and fall migration periods.	Threatened/ Endangered[a]
Shortnose Sturgeon	*Acipenser brevirostrum*	Migrating and foraging adults occasionally present from spring to fall in Upper New York Bay.	Endangered
Note: [a] The Chesapeake Bay, New York Bight, Carolina and South Atlantic Distinct Population Segments (DPSs) are all ESA-listed as Endangered; the Gulf of Maine DPS is ESA-listed as Threatened.			

4.2 Protected Species Mitigation and Monitoring

Protected species monitoring will be conducted during geotechnical and geochemical sampling activities and conducted in accordance with the lease stipulations during geotechnical activities. Dedicated and trained crew lookouts or Environmental Monitors (EMs)/Protected Species Observers (PSOs) will perform monitoring when the vessel is in transit to avoid vessel strikes with marine species. Best Management Practices specific to minimizing vessel interactions with protected species and utilization of PSOs are outlined in Sections 4.3.4 and 4.3.5 of the 2023 Geophysical and Geotechnical Survey Plan for OCS-A-0542 Leading Light Wind (rev. 2). Per Section 4.3.4, the following speed limits are required if marine species are observed:

- If a large whale is identified within 500 m (546 yards) of the forward path of any vessel, the vessel operator must steer a course away from the whale at 10 knots (18.5 km/hr) or less until the 500 m minimum separation distance has been established. Vessels may also shift to idle if feasible.
- If a large whale is sighted within 200 m (218 yards) of the forward path of a vessel, the vessel operator must reduce speed and shift the engine to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 500 m. If stationary, the vessel must not engage engines until the large whale has moved beyond 500 m.
- If a sea turtle or manta ray is sighted within the operating vessel's forward path, the vessel operator must slow down to 4 knots (unless unsafe to do so) and steer away as possible. The vessel may resume normal operations once the vessel has passed the individual.
- During times of year when sea turtles are known to occur in the survey area, vessels must avoid transiting through areas of visible jellyfish aggregations or floating vegetation (e.g., sargassum lines or mats). In the event that operational safety prevents avoidance of such areas, vessels must slow to 4 knots while transiting through such areas.
- Vessels operating in water depths with less than 1.2 m (4 ft) clearance between the vessel and the bottom should maintain speeds no greater than 4 knots to minimize vessel strike risk to sturgeon and sawfish.
- Regardless of vessel size, vessel operators must reduce vessel speed to 10 knots (18.5 mph) or less while operating in any Seasonal Management Area (SMA), Dynamic Management Area (DMA)/Slow Zones triggered by visual detection of North Atlantic right whales. The only exception to this requirement is for vessels operating in areas within a DMA/visually triggered Slow Zone where it is not reasonable to expect the presence of North Atlantic right whales (e.g. Long Island Sound, shallow harbors). Reducing vessel speed to 10 knots or less while operating in Slow Zones triggered by acoustic detections of North Atlantic right whales is encouraged.

As part of the New York State permitting process, a Sturgeon Avoidance and Monitoring Plan (SAMP) was developed for geotechnical and geochemical survey activities occurring in the East River, Upper NY Bay and Lower NY Bay between March 1 to June 30 and October 1 to November 30 (time of year restriction [TOYR]). Per the SAMP, the following measures will be implemented when noise-producing geotechnical/geochemical equipment is utilized during the TOYR within New York waters:

- Acoustic Monitoring: Prior to the start of vibracore sampling operations at each location, the Sturgeon Monitor will conduct acoustic monitoring for tagged Atlantic or shortnose sturgeon (or unknown tagged species, assumed to be Atlantic or shortnose sturgeon) within the vicinity of the survey vessel at each location.
- Soft-Start/Ramp-Up: A managed soft start will be employed prior to vibracore sampling. This will include an initial intermittent on/off of 5 seconds on followed by 5 seconds off for 3 cycles will be implemented in place of a soft start, as operation of vibracore equipment at reduced power is not practicable.

Please see the SAMP for further information regarding avoidance and monitoring measures that will be implemented during survey activities (**Appendix G**).

All relevant project design criteria (PDC) and best management practices (BMPs) as described in the NMFS Programmatic Letter of Concurrence dated June 29, 2021 (NMFS 2021) will be followed. Specifically, in June 2021, BOEM completed a programmatic consultation with NMFS under Section 7 of the Endangered Species Act (ESA) for site characterization (HRG, geotechnical, and biological surveys) and site assessment/data collection (deployment, operation, and retrieval of meteorological and oceanographic data buoys) activities associated with Atlantic OCS leases (NMFS 2021). As a result of this consultation, PDCs and BMPs associated with the mitigation, monitoring, and reporting requirements were developed for those activities. If these PDCs and BMPs are updated prior to the start of survey activities, the Applicant will adapt the mitigation protocol accordingly.

Part IV. Compliance Statement for Geotechnical and Geochemical Sampling

Through the authority of the Waterfront Development Act, the NJDEP regulates development in the waterfront area. Pursuant to N.J.A.C. 7:7-2.4 the following waterfront areas are regulated:

1. Within the Hackensack Meadowlands District, any tidal waterway of New Jersey and all lands lying thereunder, up to and including the mean high-water line;
2. Within the CAFRA zone, the regulated waterfront area shall include any tidal waterway of New Jersey and all lands lying thereunder, up to and including the mean high-water line; and
3. In those areas outside both the CAFRA area and the Hackensack Meadowlands District, the regulated waterfront area includes:
    a. All tidal waterways and lands laying thereunder, up to and including the mean high-water line; and
    b. Adjacent upland areas within 1 00 feet of the mean high water line. For properties within 100 feet of the mean high water line, the regulated waterfront area extends inland 500 feet from the mean high water line or to the first paved public road, railroad, or surveyable property line.

The Project is located below the mean high-water line and therefore regulated by the Waterfront Development Act. This Compliance Statement demonstrates the Project's compliance with the Coastal Zone Management Rules (N.J.A.C. 7:7) applicable to the Project.

1.0 Compliance with the Rules on Coastal Zone Management (N.J.A.C. 7:7)

Decisions on uses and development of coastal resources require the consideration of a project with regard to its compliance with the Rules on Coastal Zone Management. These decisions will be made using the three step process consisting of 1) Location Rules, 2) Use Rules, and 3) Resource Rules. Depending on the proposed project's location, purpose, design, and the surrounding region, different specific rules in each of the three steps may be applicable in the decision-making process.

Acceptable development in the coastal zone must comply with the Rules on Coastal Management. **Table 11** presents the Coastal Zone Management Rules and identifies the applicability of each of these to the proposed activity.

Table 10. Applicability of Coastal Zone Management Rules

SUBCHAPTER 9 - SPECIAL AREAS		Factor Potentially Applicable	Factor Not Applicable
7:7-9.2	Shellfish Habitat	X	
7:7-9.3	Surf Clam Areas	X	
7:7-9.4	Prime Fishing Areas	X	
7:7-9.5	Finfish Migratory Pathways	X	
7:7-9.6	Submerged Vegetation Habitat	X	
7:7-9.7	Navigation Channels	X	
7:7-9.8	Canals		X
7:7-9.9	Inlets		X
7:7-9.10	Marina Moorings		X
7:7-9.11	Ports	X	
7:7-9.12	Submerged Infrastructure Routes	X	
7:7-9.13	Shipwrecks and Artificial Reef Habitats	X	
7:7-9.14	Wet Borrow Pits		X
7:7-9.15	Intertidal and Subtidal Shallows		X
7:7-9.16	Dunes		X
7:7-9.17	Overwash Areas		X

SUBCHAPTER 9 - SPECIAL AREAS		Factor Potentially Applicable	Factor Not Applicable
7:7-9.18	Coastal High Hazard Areas		X
7:7-9.19	Erosion Hazard Areas		X
7:7-9.20	Barrier Island Corridors		X
7:7-9.21	Bay Islands		X
7:7-9.22	Beaches		X
7:7-9.23	Filled Water's Edge		X
7:7-9.24	Existing Lagoon Edge		X
7:7-9.25	Flood Hazard Area		X
7:7-9.26	Riparian Zones		X
7:7-9.27	Wetlands	X	
7:7-9.28	Wetland Buffers	X	
7:7-9.29	Coastal Bluffs		X
7:7-9.30	Intermittent Stream Corridors		X
7:7-9.31	Farmland Conservation Areas		X
7:7-9.32	Steep Slopes		X
7:7-9.33	Dry Borrow Pits		X
7:7-9.34	Historic and Archaeological Resources	X	
7:7-9.35	Specimen Trees		X
7:7-9.36	Endangered or Threatened Wildlife or Plant Species Habitats	X	
7:7-9.37	Critical Wildlife Habitat		X
7:7-9.38	Public Open Space	X	
7:7-9.39	Special Hazard Areas		X
7:7-9.40	Excluded Federal Lands		X
7:7-9.41	Special Urban Areas		X
7:7-9.42	Pinelands National Reserve and Pinelands Protection Area		X
7:7-9.43	Meadowlands District		X
7:7-9.44	Wild and Scenic River Corridors	X	
7:7-9.45	Geodetic Control Reference Marks		X
7:7-9.46	Hudson River Waterfront Area		X
7:7-9.47	Atlantic City		X
7:7-9.48	Lands and Waters Subject to Public Trust Rights	X	
7:7-9.49	Dredged Material Management Areas		X

SUBCHAPTER 10 - STANDARDS FOR BEACH & DUNE ACTIVITIES		Factor Potentially Applicable	Factor Not Applicable
7:7-10.2	Standards Applicable to Routine Beach Maintenance		X
7:7-10.3	Standards Applicable to Emergency Post-Storm Beach Restoration		X
7:7-10.4	Standards Applicable to Dune Creation and Maintenance		X
7:7-10.5	Standards Applicable to the Construction of Boardwalks		X

SUBCHAPTER 11 - STANDARDS FOR CONDUCTING & REPORTING THE RESULTS OF AN ENDANGERED OR THREATENED WILDLIFE OR PLANT SPECIES HABITAT ASSESSMENT AND/OR ENDANGERED OR THREATENED WILDLIFE SPECIES HABITAT EVALUATION		Factor Potentially Applicable	Factor Not Applicable
7:7-11.2	Standards for Conducting Endangered or Threatened Wildlife or Plant Species Habitat Assessment	X	
7:7-11.3	Standards for Conducting Endangered or Threatened Wildlife Species Habitat Evaluation	X	
7:7-11.4	Standards for Reporting the Results of Impact Assessment and Habitat Evaluations	X	

SUBCHAPTER 12 - GENERAL WATER AREAS		Factor Potentially Applicable	Factor Not Applicable
7:7-12.2	Shellfish Aquaculture		X
7:7-12.3	Boat Ramps		X
7:7-12.4	Docks and Piers for Cargo & Commercial Fisheries		X
7:7-12.5	Recreational Docks and Piers		X
7:7-12.6	Maintenance Dredging		X
7:7-12.7	New Dredging		X
7:7-12.8	Environmental Dredging		X
7:7-12.9	Dredged Material Disposal		X
7:7-12.10	Solid Waste or Sludge Dumping		X
7:7-12.11	Filling	X	
7:7-12.12	Mooring		X
7:7-12.13	Sand and Gravel Mining		X
7:7-12.14	Bridges		X
7:7-12.15	Submerged Pipelines		X
7:7-12.16	Overhead Transmission Lines		X
7:7-12.17	Dams and Impoundments		X
7:7-12.18	Outfalls and Intakes		X
7:7-12.19	Realignment of Water Areas		X
7:7-12.20	Vertical Wake or Wave Attenuation Structures		X
7:7-12.21	Submerged Cables		X
7:7-12.22	Artificial Reefs		X
7:7-12.23	Living Shorelines		X
7:7-12.24	Miscellaneous Uses		X

SUBCHAPTER 13 – REQUIREMENTS FOR IMPERVIOUS COVER & VEGETATIVE COVER FOR GENERAL LAND AREAS & CERTAIN SPECIAL AREAS		Factor Potentially Applicable	Factor Not Applicable
7:7-13.3	Impervious Cover Requirements that Apply to Sites in the Upland WFD and CAFRA Areas		X
7:7-13.4	Vegetative Cover Requirements that Apply to Sites in the Upland WFD Areas and CAFRA Areas		X
7:7-13.5	Determining if Site is Forested or Unforested		X
7:7-13.6	Upland WFD Area Regions & Growth Rating		X
7:7-13.7	Environmental Sensitivity in the Upland WFD Area		X
7:7-13.8	Development Potential in the Upland WFD Area		X
7:7-13.9	Development Potential for Residential or Minor Commercial Development Site in the Upland WFD Area		X
7:7-13.10	Development Potential for Major Commercial or Industrial Development Site in the Upland WFD Area		X
7:7-13.11	Development Potential for Campground Development Site in the Upland WFD Area		X
7:7-13.12	Development Intensity in the Upland WFD Area		X
7:7-13.13	Impervious Cover Limits for a site in the Upland WFD Area		X
7:7-13.14	Vegetative Cover percentages for a site in the Upland WFD Area		X
7:7-13.15	Coastal Planning Areas in the CAFRA Area		X
7:7-13.16	Boundaries for Coastal Planning Areas, CAFRA Centers, CAFRA Cores, CAFRA Nodes; Non-Mainland Coastal Centers		X
7:7-13.17	Impervious Cover Limits for a site in the CAFRA Area		X
7:7-13.18	Vegetative Cover percentages for a site in the CAFRA Area		X
7:7-13.19	Mainland Coastal Centers		X

SUBCHAPTER 14 - GENERAL LOCATION RULES		Factor Potentially Applicable	Factor Not Applicable
7:7-14..1	Rule on Location of Linear Development		X
7:7-14.2	Basic Location Rule	X	
7:7-14.3	Secondary Impacts	X	

SUBCHAPTER 15 - USE RULES		Factor Potentially Applicable	Factor Not Applicable
7:7-15.2	Housing		X
7:7-15.3	Resort/Recreational		X
7:7-15.4	Energy Facility		X
7:7-15.5	Transportation		X
7:7-15.6	Public Facility		X
7:7-15.7	Industry		X
7:7-15.8	Mining		X
7:7-15.9	Port		X

SUBCHAPTER 15 - USE RULES		Factor Potentially Applicable	Factor Not Applicable
7:7-15.10	Commercial Facility		X
7:7-15.11	Coastal Engineering		X
7:7-15.12	Dredged Material Placement on Land		X
7:7-15.13	National Defense Facilities		X
7:7-15.14	High Rise Structures		X

SUBCHAPTER 16 - RESOURCE RULES		Factor Potentially Applicable	Factor Not Applicable
7:7-16.2	Marine Fish and Fisheries	X	
7:7-16.3	Water Quality	X	
7:7-16.4	Surface Water Use		X
7:7-16.5	Groundwater Use		X
7:7-16.6	Stormwater Management		X
7:7-16.7	Vegetation		X
7:7-16.8	Air Quality		X
7:7-16.9	Public Access	X	
7:7-16.10	Scenic Resources and Design		X
7:7-16.11	Buffers and Compatibility of Use		X
7:7-16.2	Traffic		X
7:7-16.3	Subsurface Sewage Disposal Systems		X
7:7-16.14	Solid & Hazardous Waste		X

1.1 SubChapter 9 – Special Areas Compliance

7:7- 9.2 Shellfish Habitat

Shellfish habitat is defined as an estuarine bay or river bottom which has a history of production for hard clams (Mercenaria mercenaria), soft clams (Mya arenaria), eastern oysters (Crassostrea virginica), bay scallops (Argopecten irradians), or blue mussels (Mytilus edulis). Areas that are determined by the NJDEP to be contaminated by toxins or are located at any boat mooring facility are excluded from this definition. Construction of docks, piers or boat moorings, and new dredging is prohibited. Maintenance dredging within shellfish habitat is conditionally acceptable provided disturbance to shellfish habitat is minimized to the greatest extent possible. New dredging adjacent to shellfish habitat is discouraged, but may be acceptable if it can be demonstrated that the proposed activities will not adversely affect shellfish habitat, population, or harvest. The activity should not result in significant turbidity and sedimentation, re-suspension of toxic chemicals, or otherwise interfere with the natural functioning of the shellfish habitat (N.J.A.C. 7:7-9.2).

Shellfish distribution maps for hard, surf, and clams and mussels and oysters, published by the NJDEP, depicting areas that have a current shellfish density equal to or greater than 0.2 shellfish per square ft or have a history of natural shellfish production were reviewed[1]. Shellfish habitat is not mapped within the vicinity of the Upper NY Bay and Atlantic Ocean/Sea Girt Survey areas. Within the Lower NY Bay Survey area, shellfish distribution maps depict the following:

- Hard clam (moderate abundance) is mapped outside of the survey area, to the southwest, between the Chapel Hill South Channel and Sandy Hook Channel;

[1] https://dep.nj.gov/wlm/maps/

- Blue mussels are mapped alone the edge of the southwestern edge of the survey area, between the Chapel Hill Channel and Sandy Hook Channel; and
- Soft clams are not mapped within the vicinity of the survey area.

According to the NJDEP Safe Shellfish Harvesting National Shellfish Sanitation Program (NSSP) Monitoring Network interactive map[2] and State of New Jersey Shellfish Growing Waters Classification Charts[3] (NJDEP 2022) the Lower NY Bay is designated as prohibited and restricted shellfish habitat.

Geotechnical and geochemical sampling locations within the Lower NY Bay Survey area will be located outside of mapped shellfish habitat. The proposed project would not result in significant turbidity and/or sedimentation, re-suspension of toxic chemicals, or otherwise interfere with the natural functioning of shellfish habitat. Drilling of the near shore borings will be carried out using forward flush rotary drilling techniques. Flush water for the drilling operation will be seawater, a drilling additive / mud (DUO-VIZ) will be added as required. Flush water and drilling cuttings that are returned to deck will be collected and drummed. No untreated sewage would be discharged from the work vessels. Materials such as rubbish, trash, and garbage would not be released overboard from work vessels. Large vessels (more than 79 feet in length) would adhere to the provisions of the U.S. Environmental Protection Agency Vessel General Permit.

No adverse effect on shellfish habitat, population or harvest will occur. No physical destruction of shellfish beds is proposed. The proposed geotechnical and geochemical activities comply with the rule on Shellfish Habitat (N.J.A.C. 7:7-9.2).

7:7- 9.3 Surf Clam Areas

Surf clam areas are coastal waters which can be demonstrated to support significant commercially harvestable quantities of surf clams (Spisula solidissima), or areas important for recruitment of surf clam stocks. This includes areas where fishing is prohibited for research sanctuary or conservation purposes by N.J.A.C. 7:25-12.1(d)4. Surf clams are a marine fish and therefore are also subject to the marine fish and fisheries rule, N.J.A.C. 7:7-16.2 (N.J.A.C. 7:7-9.3(a)).

Distribution maps for surf and soft clams, published by the NJDEP, depicting areas that have a current shellfish density equal to or greater than 0.2 shellfish per square ft or have a history of natural shellfish production were reviewed[4]. Surf clam habitat is not mapped within the vicinity of the Upper NY Bay and Atlantic Ocean/Sea Girt Survey areas. Within the Lower NY Bay Survey area, surf clam is mapped alone the edge of the southwestern edge of the survey area, between the Chapel Hill Channel and Sandy Hook Channel.

According to the NJDEP Safe Shellfish Harvesting National Shellfish Sanitation Program (NSSP) Monitoring Network interactive map[5] and State of New Jersey Shellfish Growing Waters Classification Charts[6] (NJDEP 2022) the Lower NY Bay is designated as prohibited and restricted shellfish habitat.

Geotechnical and geochemical sampling locations within the Lower NY Bay Survey area will be located outside of mapped surf clam habitat. The proposed project should not result in significant turbidity and/or sedimentation, re-suspension of toxic chemicals, or otherwise interfere with the natural functioning of shellfish habitat. Drilling of the near shore borings will be carried out using forward flush rotary drilling techniques. Flush water for the drilling operation will be seawater, a drilling additive / mud (DUO-VIZ) will be added as required. Flush water and drilling cuttings that are returned to deck will be collected and drummed. No untreated sewage would be discharged from the work vessels. Materials such as rubbish, trash, and garbage would not be released overboard from work vessels. Large vessels (more than 79 feet in length) would adhere to the provisions of the U.S. Environmental Protection Agency Vessel General Permit.

No adverse effect on shellfish habitat, population or harvest will occur. No physical destruction of shellfish beds is proposed. The proposed geotechnical and geochemical activities comply with the rule on Surf Clam Areas (N.J.A.C. 7:7-9.3).

[2] https://www.arcgis.com/apps/mapviewer/index.html?webmap=5f6e08fc9e354467a2fd455790ef114a
[3] https://www.nj.gov/dep/bmw/docs/2022classificationcharts.pdf
[4] https://dep.nj.gov/wlm/maps/
[5] https://www.arcgis.com/apps/mapviewer/index.html?webmap=5f6e08fc9e354467a2fd455790ef114a
[6] https://www.nj.gov/dep/bmw/docs/2022classificationcharts.pdf

7:7- 9.4 Prime Fishing Areas

Prime fishing areas include tidal water areas and water's edge areas which have a demonstrable history of supporting a significant local intensity of recreational or commercial fishing activity. These areas include all coastal jetties, groins, public fishing piers or docks, and artificial reefs. Prime fishing areas also include features such as rock outcroppings, sand ridges or lumps, rough bottoms, aggregates such as cobblestones, coral, shell and tubeworms, slough areas and offshore canyons. Prime fishing areas also include areas identified in "New Jersey's Recreational and Commercial Fishing Grounds of Raritan Bay, Sandy Hook Bay and Delaware Bay and The Shellfish Resources of Raritan Bay and Sandy Hook Bay" Figley and McCloy (1988) and those areas identified on the map titled, "New Jersey's Specific Sport Ocean Fishing Grounds." Prohibited uses include sand or gravel submarine mining which would alter existing bathymetry to a significant degree so as to reduce the high fishery productivity of these areas. Disposal of domestic or industrial wastes must meet applicable State and Federal effluent limitations and water quality standards.

According to the NJDEP GIS data for Prime Fishing Grounds of New Jersey, prime fishing grounds are located within the Lower NY Bay Survey Area and the Atlantic Ocean/Sea Girt Survey Area. Impacts to the seabed will be minimal and will not alter the existing bathymetry to a significant degree as to reduce the high fishery productivity of these areas. Therefore, the Project is consistent with the rule on Prime Fishing Areas.

7:7- 9.5 Finfish Migratory Pathways

Finfish migratory pathways are waterways (rivers, streams, creeks, bays and inlets) which can be determined to serve as passageways for diadromous fish to or from seasonal spawning areas, including juvenile anadromous fish which migrate in autumn and those listed by H.E. Zich (1977) "New Jersey Anadromous Fish Inventory" NJDEP Miscellaneous Report No. 41, and including those portions of the Hudson and Delaware Rivers within the coastal zone boundary. Species of concern include: alewife or river herring (Alosa pseudoharengus), blueback herring (Alosa aestivalis), American shad (Alosa sapidissima), striped bass (Morone saxatilis), Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus), Shortnose sturgeon (Acipenser brevirostrum) and American eel (Anguilla rostrata). Development which creates a physical barrier to the movement of fish along a finfish migratory pathway or lowers water quality to such an extent as to interfere with the movement of fish along migratory pathways is prohibited.

The survey area crosses the migratory pathways for fish transiting between the Atlantic Ocean and inshore systems such as the East River, Raritan Bay, Upper New York Bay, and Lower New York Bay, including the federally listed Atlantic sturgeon (*Acipenser oxyrhynchus*). The proposed study activities would not physically impede any migration routes. No measurable increases in total suspended solids (TSS) or turbidity are expected due to sampling activities, therefore water quality impacts are not expected to interfere with fish migration. Noise generated during geotechnical study activities may have temporary effects (i.e., behavioral disturbance) on diadramous fish species that may be present near a sampling site due equipment noise, particularly due to the use of a vibracorer. However, the survey-related noise is not expected to have an adverse effect on fish species given the short duration of the active vibracore operation at each site (i.e., less than approximately 5 minutes) and the ambient underwater noise levels in the vicinity of the Port of New York / New Jersey. Thus, activities are not expected to have a significant adverse effect on finfish migratory pathways and are consistent with the rule on Finfish Migratory Pathways.

7:7-9.6 Submerged Vegetation Habitat

Submerged vegetation habitat special areas consist of water areas supporting, or documented as previously supporting rooted, submerged vascular plants such as widgeon grass (Ruppia maritima), sago pondweed (Potamogeton pectinatus), horned pondweed (Zannichellia palustris) and eelgrass (Zostera marina). In New Jersey, submerged vegetation is most prevalent in the shallow portions of the Navesink, Shrewsbury, Manasquan, and Metedeconk Rivers, and in Barnegat, Manahawkin, and Little Egg Harbor Bays. Development in submerged vegetation beds is prohibited except for trenching for utility pipelines and submarine cables, new dredging of State and Federal navigation channels, maintenance dredging, new dredging of previously authorized marinas and access channels to such marinas, construction of a single noncommercial dock, and the extension of existing piers. Development in uplands or water areas adjacent to, or in, submerged vegetation habitat that results in an increase of erosion and/or turbidity is prohibited unless mitigation measures are provided (N.J.A.C. 7:7-9.6).

According to the New Jersey Submerged Aquatic Vegetation Distribution Maps for Sandy Hook, Asbury Park and Point Pleasant, submerged aquatic vegetation is not mapped within the Survey Areas. The Project complies with the rule on Submerged Vegetation Habitat.

7:7-9.7 Navigation Channels

Navigation channels are tidal water areas including the Atlantic Ocean, inlets, bays, rivers and tidal guts with sufficient depth to provide safe navigation. Navigation channels include all areas between the top of the channel slopes on either side. These navigation channels are often marked with buoys or stakes. Major navigation channels are shown on NOAA/National Ocean Service Charts.

Redacted

7:7-9.11 Ports

Ports are water areas having, or lying immediately adjacent to, concentrations of shoreside marine terminals and transfer facilities for the movement of waterborne cargo (including fluids), and including facilities for loading, unloading, and temporary storage. Port locations in New Jersey include, among others, Newark, Elizabeth, Bayonne, Jersey City, Weehawken, Hoboken, Woodbridge, Perth Amboy, Camden, Gloucester City, Paulsboro and Salem. Any use which would preempt or interfere with port uses of this water area is prohibited.

The Upper NY Bay Survey Area is located adjacent to the Global Marine Terminal and Claremont Terminal in Bayonne City. The Applicant will provide a minimum of 48 hour notice for all in-water work via the US Coast Guard Local Notice to Mariners (District 1 for Upper NY Bay and Lower NY Bay, and District 5 for Atlantic Ocean/Sea Girt). Survey activities will not preempt or interfere with port use; therefore are consistent with the rule on Ports.

7:7-9.12 Submerged Infrastructure Routes

A submerged infrastructure route is the corridor in which a pipe or cable runs on or below a submerged land surface. Any activity which would increase the likelihood of infrastructure damage or breakage, or interfere with maintenance operations is prohibited.

Geophysical surveys will be conducted within the Survey Area prior to the proposed activities. The geophysical surveys will collect side-scan sonar data from a towed, dual-channel, dual-frequency, side-scan, sonar system to produce a continuous planimetric imagery of the seafloor, in order to characterize seabed habitats and sediment distribution, locate surficial boulders, and identify anthropogenic hazards and cultural resources. Geotechnical and geochemical borings will be located to avoid submerged infrastructure routes. The Project complies with the rule on Submerged Infrastructure Routes.

7:7-9.12 Shipwreck and Artificial Reef Habitats

The shipwreck and artificial reef habitats special area includes all permanently submerged or abandoned remains of vessels and other structures, including, but not limited to, artificial reefs, anchors, quarry rocks or lost cargo, which serve as a special marine habitat or are fragile historic and cultural resources. An artificial reef is a man-made imitation of a natural reef created by placing hard structures on the sea floor for the purpose of enhancing fish habitat and fish stock. In time, an artificial reef will attain many of the biological and ecological attributes of a natural reef. Artificial reefs do not include shore protection structures, pipelines and other structures not constructed for the sole purpose of fish habitat.

Geophysical surveys will be conducted within the Survey Area prior to the proposed activities. The geophysical surveys will collect side-scan sonar data from a towed, dual-channel, dual-frequency, side-scan, sonar system to produce a continuous planimetric imagery of the seafloor, in order to characterize seabed habitats and sediment distribution, locate surficial boulders, and identify anthropogenic hazards and cultural resources. Geotechnical and geochemical borings will be located to avoid shipwreck and artificial reef habitats. The Project complies with the rule on Shipwreck and Artificial Reef Habitats.

7:7-9.27 Wetlands

Wetlands or wetland means an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation. All tidal and inland wetlands, excluding the delineated tidal wetlands defined pursuant to N.J.A.C. 7:7-2.3, shall be identified and delineated in accordance with the USEPA three-parameter approach (that is, hydrology, soils and vegetation) specified under N.J.A.C. 7:7A-1.3 of the Freshwater Wetlands Protection Act Rules. Activities in freshwater wetlands are typically regulated under the Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A). Coastal wetlands are mapped pursuant to the Wetlands Act of 1970 (N.J.S.A. 13:9A-1 et seq.).

Development is prohibited in coastal wetlands unless the activity is water dependent, has no prudent or feasible alternative, and will result in minimum alteration or impairment of natural tidal circulation, contour or the natural vegetation in the wetland (N.J.A.C. 7:7-9.27).

The proposed Project occurs within New Jersey State Waters including the Atlantic Ocean, the Lower NY Bay, and the Upper NY Bay. Activities will not be conducted within freshwater wetland and/or mapped coastal wetlands. Therefore, the proposed project complies with the rule on Wetlands.

7:7- 9.28 Wetlands Buffers

Wetlands buffer or transition area means an area of land adjacent to a wetland which minimizes adverse impacts on the wetlands or serves as an integral component of the wetlands ecosystem. Wider buffers than those noted below may be required to establish conformance with requirement of the Coastal Zone Management Rules (N.J.A.C. 7:7).

A wetlands buffer or transition area of up to 150 ft in width shall be established adjacent to all wetlands defined and regulated under the Freshwater Wetlands Protection Act. For all other wetlands, including wetlands regulated under the Wetlands Act of 1970, a wetland buffer of up to 300 ft shall be established.

Development is prohibited in a wetlands buffer around all other wetlands, unless it can be demonstrated that the proposed development will not have a significant adverse impact and will cause minimum feasible adverse impact, through the use of mitigation where appropriate on the wetlands, and on the natural ecotone between the wetlands and surrounding upland (N.J.A.C. 7:7-9.28).

The proposed Project occurs within New Jersey State Waters including the Atlantic Ocean, the Lower Bay, and the Upper Bay, therefore impacts to freshwater or coastal wetland buffers are not proposed. The Project complies with the rule on Wetland Buffers.

The Applicant is proposing to conduct 65 geotechnical vibracore, 65 geotechnical CPT, and 59 geochemical vibracore within the Upper NY Bay, Lower NY Bay, and Atlantic Ocean/Sea Girt. Vibracore borings will range in width from 4 to 7 inches diameter; while CPT have an approximate diameter of 1.4 inches. Impacts associated with geotechnical and geochemical surveys are minimal. Depressions created in the seafloor during sampling would backfill naturally with sediment from the surrounding seabed. No significant increase in turbidity or sedimentation is anticipated from core boring. Impacts to vegetation is not anticipated.

7:7-9.34 Historic and Archaeological Resources

Historic and archaeological resources include objects, structures, shipwrecks, buildings, neighborhoods, districts, and man-made or man-modified features of the landscape and seascape, including historic and prehistoric archaeological sites, which either are on or are eligible for inclusion on the New Jersey or National Register of Historic Places.

Geophysical survey data will be used to determine the location of the proposed vibracore sampling and CPT locations. The 2023 geophysical data will be used by the QMA to clear locations of any potential archaeological resources ahead of any geotechnical activities.

Per Lease Stipulation 5.3.4, prior to conducting the geotechnical survey, the area of potential impact (inclusive of any area associated with vessel jacking or anchoring) will be reviewed by the QMA to ensure activities will not result in impacts to

areas of cultural significance. Upon completion of the geotechnical survey, the QMA will certify that activities did not impact potential historic properties. The Project complies with the rule on Historic and Archaeological Resources.

7:7-9.36 Endangered or Threatened Wildlife or Plant Species Habitats

Endangered or threatened wildlife or plant species habitats are terrestrial and aquatic (marine, estuarine, or freshwater) areas known to be inhabited on a seasonal or permanent basis by or to be critical at any stage in the life cycle of any wildlife or plant identified as "endangered" or "threatened" species on official Federal or State lists of endangered or threatened species, or under active consideration for State or Federal listing. The definition of endangered or threatened wildlife or plant species habitats includes a sufficient buffer area to ensure continued survival of the population of the species as well as areas that serve an essential role as corridors for movement of endangered or threatened wildlife. Absence of such a buffer area does not preclude an area from being endangered or threatened wildlife or plant species habitat.

Development of endangered or threatened wildlife or plant species habitat is prohibited unless it can be demonstrated, through an endangered or threatened wildlife or plant species impact assessment as described at N.J.A.C. 7:7-11, that endangered or threatened wildlife or plant species habitat would not directly or through secondary impacts on the relevant site or in the surrounding area be adversely affected.

Information regarding the historic or current presence of Federal and/or State-listed endangered, threatened, special concern, proposed, or candidate species, or habitat to support those species located in the vicinity of the Survey Area is presented in Part III, Section 4.0 of this application. Consultation with the NJDEP is provided in **Appendix E** and USFWS IPaC information is provided in **Appendix F**.

Impacts associated with geotechnical and geochemical investigation to the seafloor are minimal. Depressions created in the seafloor during sampling would backfill naturally with sediment from the surrounding seabed. No significant increase in turbidity or sedimentation is anticipated from core boring.

The geotechnical and geochemical activities proposed will be conducted in a manner consistent with the requirements prescribed in Invenergy's Commercial Lease OCS-A 0542. Section 6.0 of the 2023 Geophysical and Geotechnical Survey Plan summarizes Leading Light Wind's adherence to the lease terms, conditions, and stipulations relevant to the conduct of the proposed surveys.

As outlined in Section 3.3.5 and Section 4 of the 2023 Geophysical and Geotechnical Survey Plans for OCS-A-0542 Leading Light Wind (rev. 2), protected species monitoring will be conducted during geotechnical activities and conducted in accordance with the lease stipulations. Dedicated and trained crew lookouts or (EMs/PSOs) will perform monitoring when the vessel is in transit to avoid vessel strikes with marine species.

As part of the New York State permitting process, a Sturgeon Avoidance and Monitoring Plan (SAMP) was developed for geotechnical and geochemical survey activities occurring in the East River, Upper NY Bay and Lower NY Bay between March 1 to June 30 and October 1 to November 30 (time of year restriction [TOYR]). Per the SAMP, the following measures will be implemented when noise-producing geotechnical/geochemical equipment is utilized during the TOYR within New York waters:

- Acoustic Monitoring: Prior to the start of vibracore sampling operations at each location, the Sturgeon Monitor will conduct acoustic monitoring for tagged Atlantic or shortnose sturgeon (or unknown tagged species, assumed to be Atlantic or shortnose sturgeon) within the vicinity of the survey vessel at each location.
- Soft-Start/Ramp-Up: A managed soft start will be employed prior to vibracore sampling. This will include an initial intermittent on/off of 5 seconds on followed by 5 seconds off for 3 cycles will be implemented in place of a soft start, as operation of vibracore equipment at reduced power is not practicable.

Please see the SAMP for further information regarding avoidance and monitoring measures that will be implemented during survey activities (**Appendix G**).

All relevant PDC and BMPs as described in the NMFS Programmatic Letter of Concurrence dated June 29, 2021 (NMFS 2021) will be followed. Specifically, in June 2021, BOEM completed a programmatic consultation with NMFS under Section 7 of the ESA for site characterization (HRG, geotechnical, and biological surveys) and site assessment/data collection

(deployment, operation, and retrieval of meteorological and oceanographic data buoys) activities associated with Atlantic OCS leases (NMFS 2021). As a result of this consultation, PDCs and BMPs associated with the mitigation, monitoring, and reporting requirements were developed for those activities. If these PDCs and BMPs are updated prior to the start of survey activities, LLW will adapt the mitigation protocol accordingly.

The proposed mitigation strategy presented in Section 4 of the 2023 Geophysical and Geotechnical Survey Plan covers the mitigation requirements for geotechnical survey activities as outlined in the PDCs and BMPs (NMFS 2021). Presented is also an Alternative Monitoring Plan that outlines the implementation of these measures during nighttime and low-visibility conditions.

Per Section 4.3.1 of the 2023 Geophysical and Geotechnical Survey Plan for OCS-A-0542 Leading Light Wind (ver. 2), all vessel anchoring and any seafloor-sampling activities (i.e., drilling or boring for geotechnical surveys) are restricted from seafloor areas with consolidated seabed features including pavement, scarp walls, and deep/cold-water coral reefs and shallow/mesophotic reefs as defined in the CMECS Geologic Substrate Classifications. All vessel anchoring and seafloor sampling must also occur at least 150 m from any known locations of threatened or endangered coral species. All sensitive live bottom habitats (eelgrass, cold-water corals, etc.) should be avoided as practicable. All vessels in coastal waters will operate in a manner to minimize propeller wash and seafloor disturbance and transiting vessels should follow deep-water routes (e.g., marked channels), as practicable, to reduce disturbance to sturgeon and sawfish habitat.

Due to the limited duration of the geotechnical and geochemical boring activities and temporary disturbance to the seabed, impacts to federal and/or state-listed species is not anticipated. Therefore, the Project complies with the rule on Endangered or Threatened Wildlife or Plant Species Habitat.

7:7-9.38 Public Open Space

Public open space constitutes land areas owned or maintained by State, Federal, county and municipal agencies or private groups (such as conservation organizations and homeowner's associations) and used for or dedicated to conservation of natural resources, public recreation, visual or physical public access or, wildlife protection or management. Public open space also includes, but is not limited to, State Forests, State Parks, and State Fish and Wildlife Management Areas, lands held by the New Jersey Natural Lands Trust (N.J.S.A. 13:1B-15.119 et seq.), lands held by the New Jersey Water Supply Authority (N.J.S.A. 58:1B-1 et seq.) and designated Natural Areas (N.J.S.A. 13:1B-15.12a et seq.) within DEP-owned and managed lands. Development that adversely affects existing public open space is discouraged

The Project will occur in New Jersey State Waters and will not affect public open spaced. The Project will complies with the rule on Public Open Space.

7:7-9.44 Wild and Scenic River Corridors Public Open Space

Wild and scenic river corridors are all rivers designated into the National Wild and Scenic Rivers System and any rivers or segments thereof being studied for possible designation into that system pursuant to the National Wild and Scenic Rivers Act. For rivers designated into the national system, the wild and scenic river corridor shall include the river and adjacent areas located within one-quarter mile from the mean high water line on each side of the river until a Federal River Management Plan has been adopted, after which time the wild and scenic corridor shall be the area defined in the adopted plan. For rivers under study for possible designation into the national system, the wild and scenic river corridor shall include the river and adjacent areas extending one-quarter mile from the mean high water line on each side of the river (N.J.A.C. 7:7-9.44(a)).

Geotechnical and geochemical sampling locations occur within the waterbodies of the Atlantic Ocean, the Lower NY Bay, and the Upper NY Bay. These waterbodies are not listed as wild, scenic, or recreational as defined by the National Wild and Scenic Rivers System. The Project complies with the rule on Wild and Scenic River Corridors.

7:7-9.48 Lands and Waters Subject to Public Trust Rights

Lands and waters subject to public trust rights are tidal waterways and their shores, including both lands now or formerly below the mean high water line, and shores above the mean high water line. Tidal waterways and their shores are subject to the Public Trust Doctrine and are held in trust by the State for the benefit of all the people, allowing the public to fully

enjoy these lands and waters for a variety of public uses. Public trust rights include public access which is the ability of the public to pass physically and visually to, from and along the ocean shore and other waterfronts subject to public trust rights and to use these lands and waters for activities such as navigation, fishing and recreational activities including, but not limited to, swimming, sunbathing, surfing, sport diving, bird watching, walking, and boating. Public trust rights also include the right to perpendicular and linear access.

The Project will occur in New Jersey State Waters. Geotechnical and geochemical borings will not impede the public's ability to pass physically and visually to, from and along the ocean shore and other waterfronts subject to public trust rights.

1.2 SubChapter 11 – Standards for Conducting & Reporting Endangered or Threatened Species Habitat Assessments

An Endangered or Threatened Wildlife or Plant Species Habitat Impact Assessment is required to demonstrate that endangered or threatened wildlife or plant species habitat as defined at NJAC 7:7-9.36 (a) would not, directly or through secondary impacts on the relevant site or surrounding area, be adversely affected by the proposed development. An Endangered or Threatened Wildlife Species Habitat Evaluation is required to demonstrate that a site does not contain suitable habitat, as defined at NJAC 7:7-9.36(a), pursuant to NJAC 7:7-11.3.

Information regarding the historic or current presence of Federal and/or State-listed endangered, threatened, special concern, proposed, or candidate species, or habitat to support those species located in the vicinity of the Survey Area is presented in Part III, Section 4.0 of this application. The Project's compliance with the rule Endangered or Threatened Wildlife or Plant Species Habitat is demonstrated in Part IV, Section 1. Consultation with the NJDEP is provided in **Appendix E** and USFWS IPaC information is provided in **Appendix F**. Therefore, the Project is consistent with the Standards for Conducting & Reporting Endangered or Threatened Species Habitat Assessments.

1.3 SubChapter 12 – General Water Areas

General water areas are all water areas which are located below either the spring high water line or the normal water level of non-tidal waters. General water areas are subject to this subchapter and to special area rules.

7:7-12.11 Filling

Filling is the deposition of material including, but not limited to, sand, soil, earth, and dredged material, into water areas for the purpose of raising water bottom elevations to create land areas. Filling is prohibited in lakes, ponds, reservoirs, and open bay areas at greater than 18 feet, unless the filling is consistent with the Freshwater Protection Act.

Geotechnical and geochemical borings are located within open waters of the Upper NY Bay, Lower NY Bay, and the Atlantic Ocean. Nearshore geotechnical borings will be sealed with a non-toxic grout mixture. All other depressions created in the seafloor during sampling would backfill naturally with sediment from the surrounding seabed. The Project will not result in raising water bottom elevations to create lands areas; therefore the Project is consistent with the rules on Filling.

1.4 SubChapter 16 – Resource Rules

Resource rules set the standards the NJDEP uses to analyze the proposed development in terms of its effect on various resources within coastal zones.

7:7-16.2 Marine Fish and Fisheries

Marine fish are marine and estuarine animals other than marine mammals and birds. Any activity that would adversely impact marine fish, including reproductive, spawning and migratory patterns, or species abundance or diversity is discouraged. The construction of submerged cables and pipelines and mining of sand and gravel to obtain material for beach nourishment are conditionally acceptable.

The Project should not result in significant turbidity and/or sedimentation, re-suspension of toxic chemicals, or otherwise adversely impact marine fish, including reproductive, spawning and migratory patterns, or species abundance or diversity. The proposed project activities comply with the Rule on Marine Fish and Fisheries.

7:7-16.3 Water Quality

Coastal development which would violate the Federal Clean Water Act, or State laws, rules and regulations enacted or promulgated thereto is prohibited. In accordance with N.J.A.C. 7:15 regarding Water Quality Management Planning and Implementation process, coastal development that is inconsistent with an approved Water Quality Management (208) Plan under the New Jersey Water Quality Planning Act (N.J.S.A. 58:11A-1 et seq) is prohibited.

The Project will comply with all applicable State and Federal rules and regulations, including the Federal Clean Water Act. Impacts associated with geotechnical and geochemical investigation to the seafloor are minimal. No significant increase in turbidity or sedimentation is anticipated from core boring; therefore the Project is consistent with the rule on Water Quality

7:7-16.9 Public Access

Public access to the waterfront is the ability of the public to pass physically and visually to, from, and along tidal waterways and their shores and to use such shores, waterfronts and waters for activities such as navigation, fishing, and recreational activities including, but not limited to, swimming, sunbathing, surfing, sport diving, bird watching, walking, and boating. Public accessways and public access areas include streets, paths, trails, walkways, easements, paper streets, dune walkovers/walkways, piers and other rights-of way.

The Project will occur in New Jersey State Waters. Geotechnical and geochemical borings will not impede the public's ability to pass physically and visually to, from and along tidal waterways and their shores and to use such shores, waterfronts and waters. The Project complies with the rule on Public Access.

2.0 Additional Requirements Specific to an Application for an Individual Permit (N.J.A.C. 7:7-23.6)

In addition to meeting the requirements at N.J.A.C. 7:7-23.2 and 23.4, an application for an individual permit shall include the following material, in the number and format specified in the appropriate application checklist:

1. **A complete Property Owner Certification form**

   A copy of the signed Property Owner Certification form is included in **Appendix H**.

2. **Documentation of Public Notice**

   A completed Public Notice form as well as documentation necessary to demonstrate compliance with N.J.A.C. 7:7-24 is included in **Appendix I**. The following information is included in **Appendix I**:

   - Sample notification letters provided to municipal clerk, governmental entities and property owners;
   - List of Municipal and County Officials notified;
   - Copy of certified United States Postal Service white mailing receipt; and
   - Newspaper of Regional Circulation (Asbury Park Press for Monmouth County and The Jersey Journal for Hudson County)

   Please note all proposed geotechnical and geochemical sampling locations are located greater than 200 ft from the closest parcel (Block and lot). Therefore a certified list of property owners within 200 ft of the proposed activity is not required.

3. **Application fees:**

   Per the NJDEP Regulatory Fee Schedule (July 2019), the application fee for authorization under a Waterfront Development Individual Permit (In-Water) is $3,000.

4. **Site plans**

   The Survey Area for the geotechnical and geochemical sampling locations is shown on the site plans included as **Appendix A**.

5. Photographs

Site photographs are provided in **Appendix B**.

6. Compliance Statement

Compliance statement demonstrating the Project complies with the Coastal Zone Management Rules is provided in Part IV of this application. A description of the site characteristics provided in Part III and proposed impacts is provided in Part II of this application.

7. Color copies of tax maps, county road maps and USGS quad maps.

The following color maps are included in this application: USGS quad maps (**Figure 2**) and County Road maps (**Figure 3**). All proposed activities are located in State open water and greater than 200 ft from the closest parcel boundary. Therefore municipal tax maps for the Project are not included.

8. Calculations and Analyses for Stormwater Management Rules (N.J.A.C. 7:8)

The Project is not considered a major development as defined by the New Jersey Stormwater Management Rules (N.J.A.C. 7:8).

9. Natural Heritage Program Letter

A copy of the NJDEP NHP Response Letter is provided in **Appendix E**.

10. Mitigation

The Project will not result in permanent impacts to regulated areas, therefore mitigation ins accordance with N.J.A.C. 7:7 is not required.

11. Additional Requirements

No additional information is required.

Part V. References

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Appendix A. Geotechnical and Geochemical Survey Area Plans

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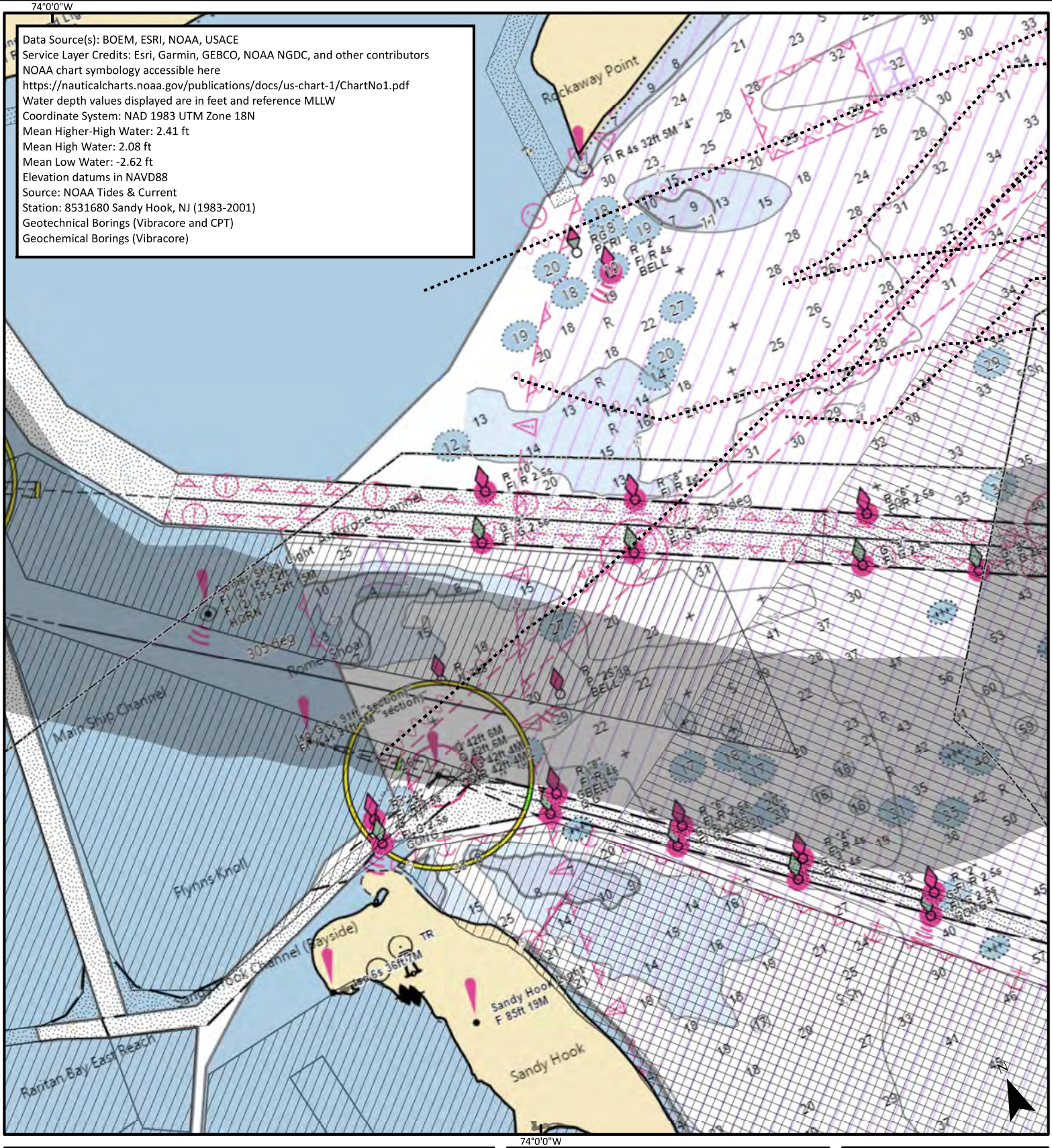

- Survey Area
- Submarine Cable
- USACE Maintained Channel
- Anchorage Area
- Speed Restriction Area (Right Whales)
- State Water Limit

STATE OF NEW JERSEY
MATTHEW D. HOLTHAUS
No. GE52884
LICENSED
PROFESSIONAL ENGINEER

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Date: 2023.09.29 07:57:19-04'00'

MATTHEW D. HOLTHAUS
N.J. PROFESSIONAL ENGINEER
N.J. P.E. LIC. NO. 24GE05288400

Geotechnical and Geochemical Survey Area Plans

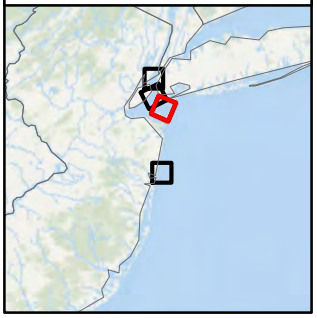
Invenergy FUGRO WSP

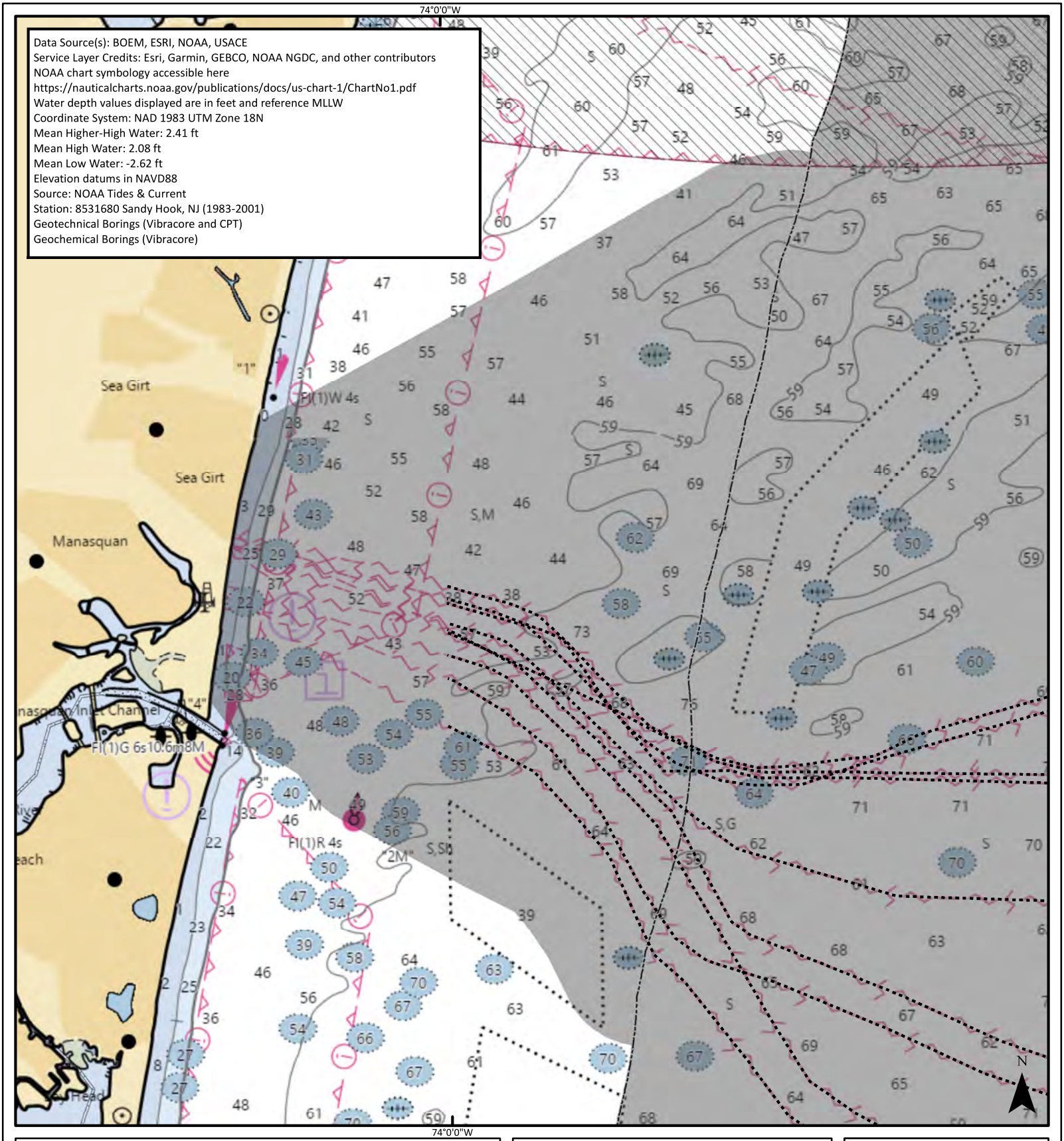
Author	William Scales
Date	9/28/2023

0 0.25 0.5 0.75 1 Nautical Miles

0 0.5 1 1.5 2 Kilometers

LOCATION MAP





Survey Area

Submarine Cable

USACE Maintained Channel

Speed Restriction Area (Right Whales)

State Water Limit

STATE OF NEW JERSEY
MATTHEW D. HOLTHAUS
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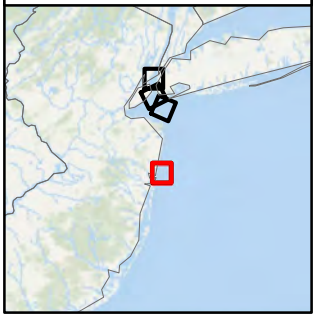
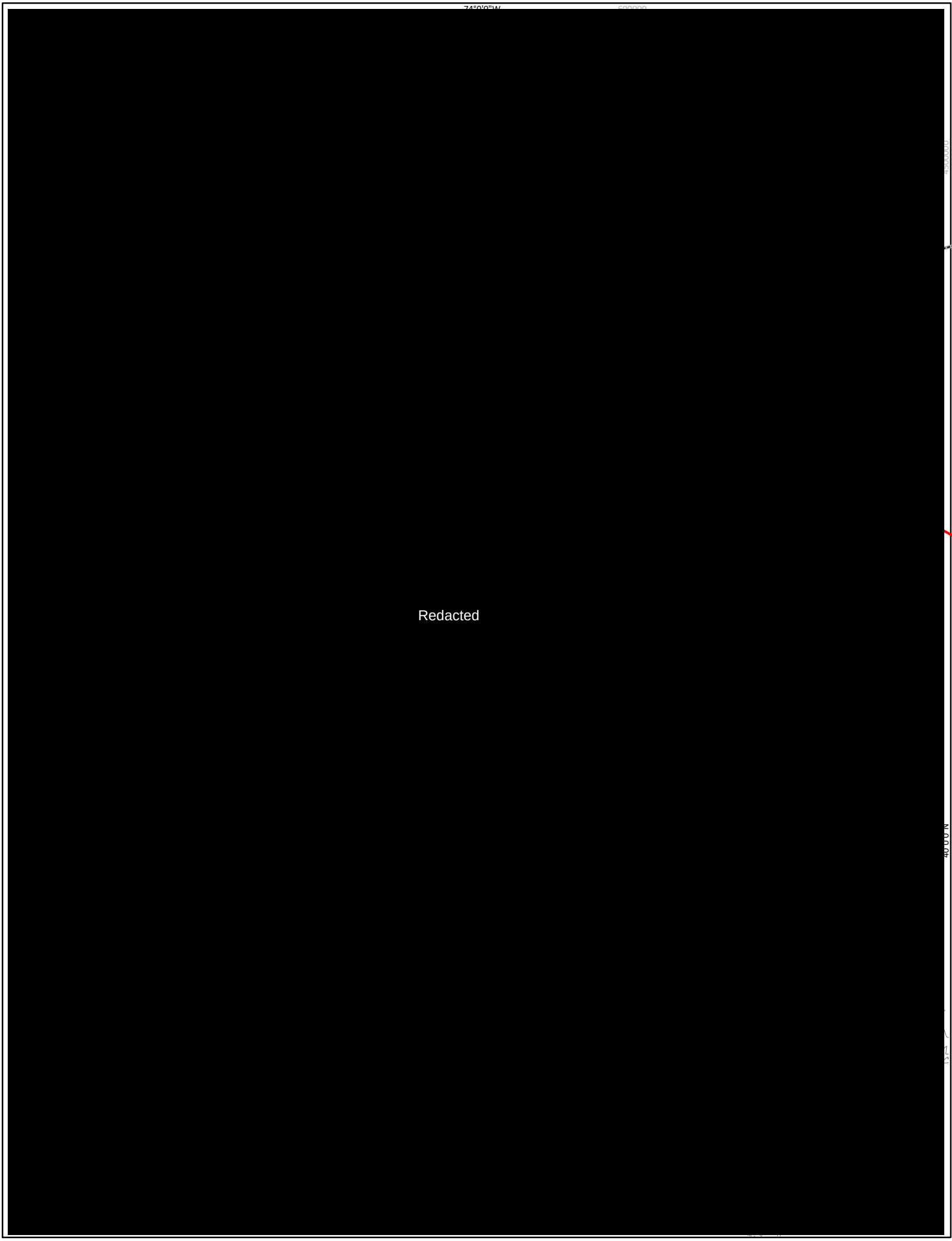
LOCATION MAP



Appendix B. Site Photographs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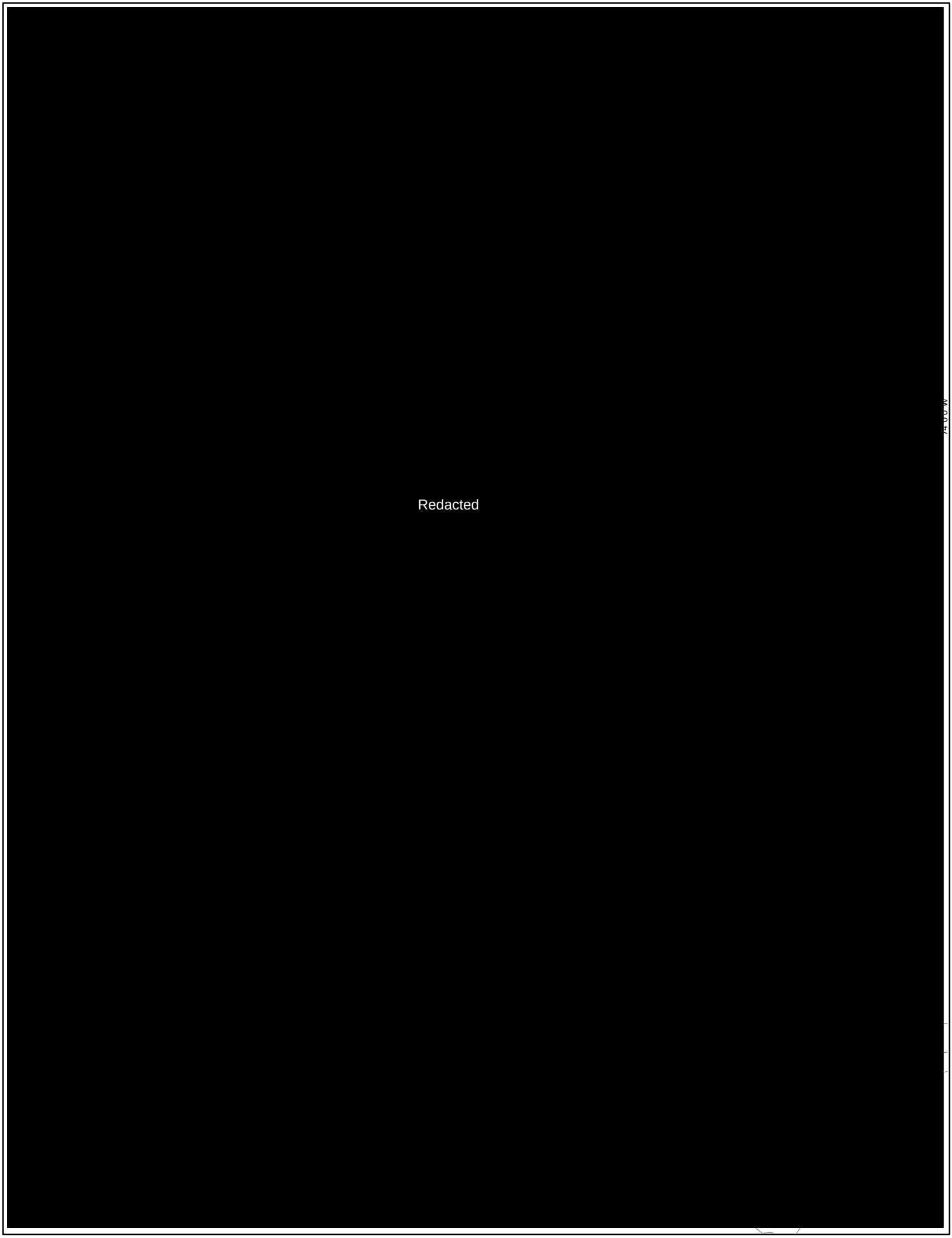
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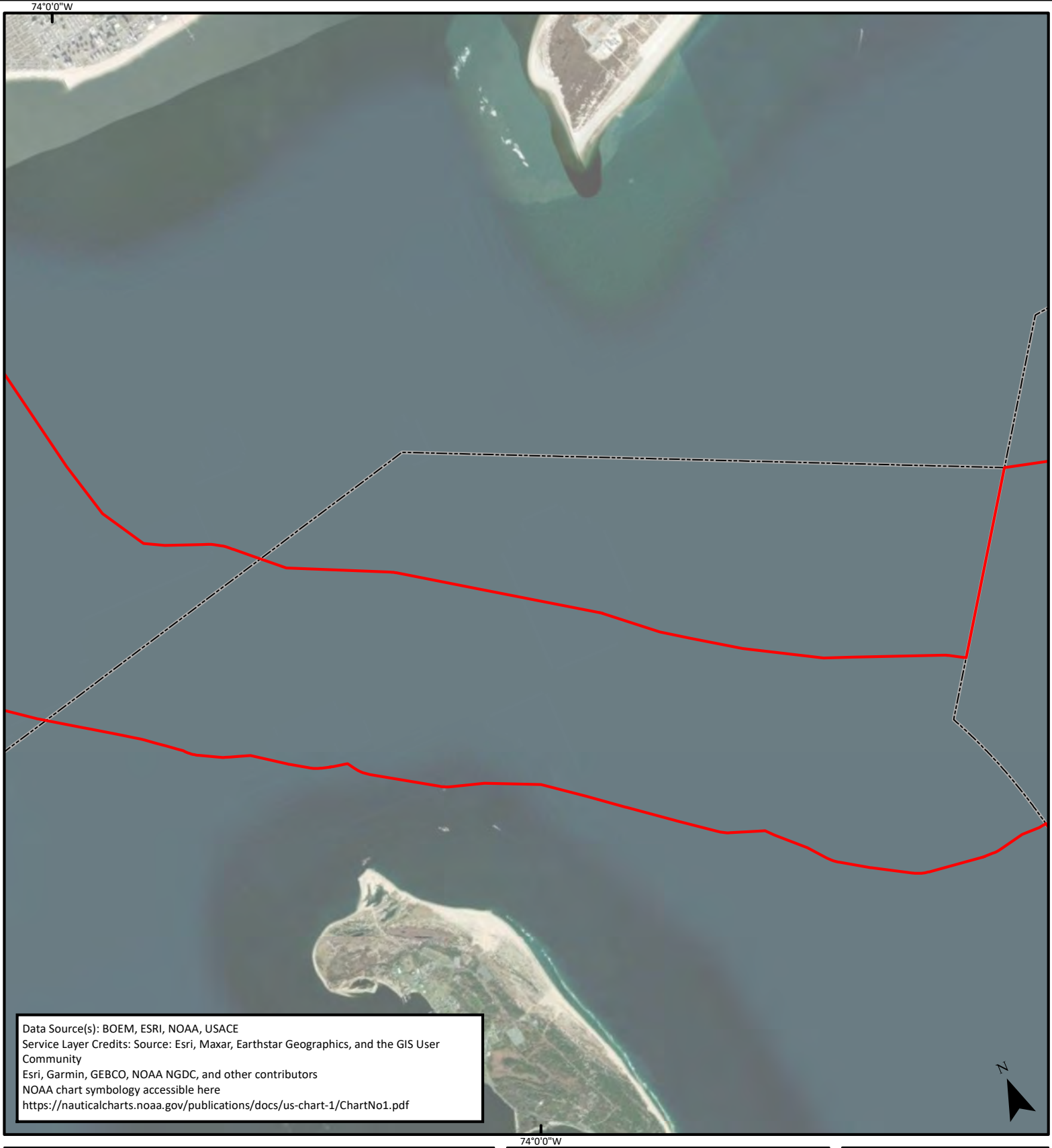


Data Source(s): BOEM, ESRI, NOAA, USACE
Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
NOAA chart symbology accessible here
https://nauticalcharts.noaa.gov/publications/docs/us-chart-1/ChartNo1.pdf

Survey Area

State Water Limit

Aerial View of Survey Areas

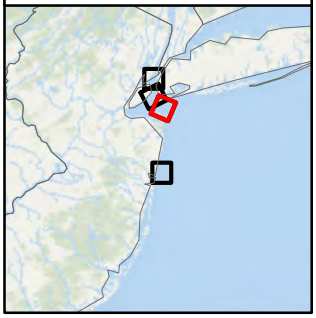
Invenergy FUGRO WSP

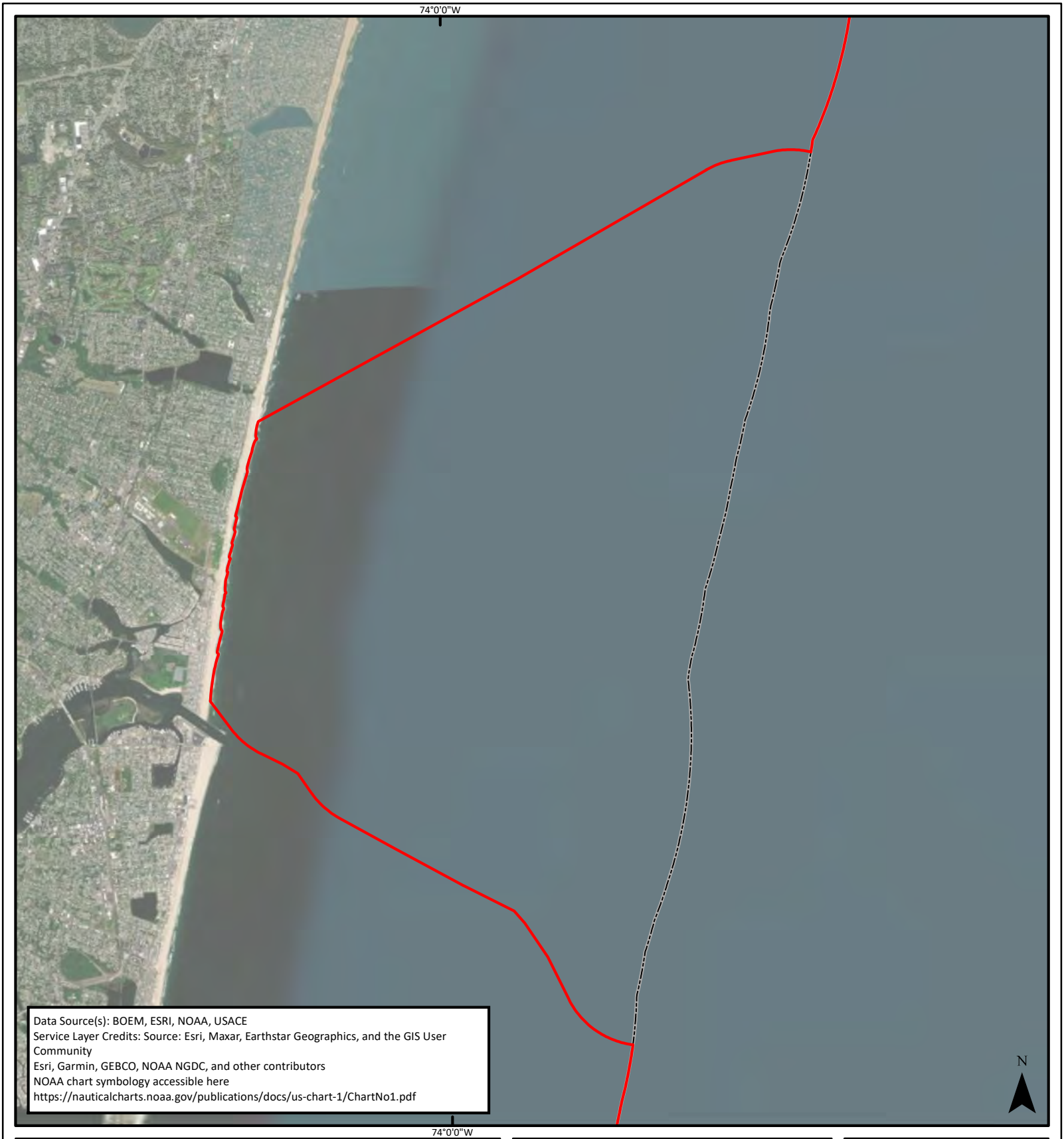
Author	William Scales
Date	9/28/2023

0 0.25 0.5 0.75 1 Nautical Miles

0 0.5 1 1.5 2 Kilometers

LOCATION MAP





Survey Area

State Water Limit

Aerial View of Survey Areas

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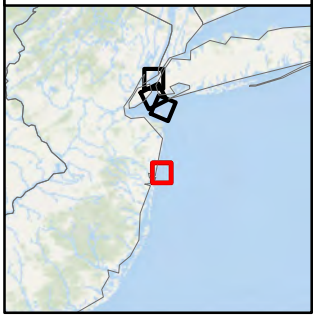
LOCATION MAP



Appendix C. New Jersey Sediment Sampling and Analysis Plan and NJDEP SSAP Approval Letter

State of New Jersey

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Land Resource Protection
Mail Code 501-02A
P.O. Box 420
Trenton, New Jersey 08625-0420
www.nj.gov/dep/landuse

SHAWN M. LATOURETTE
Commissioner

August 4, 2023

Kirsty Cronin
Assistant Vice President, Environmental Scientist
WSP USA Inc.
350 Mount Kemble Avenue, Suite 200
Morristown, NJ 07960

RE: Sediment Sampling & Analysis Plan
File and Activity No.: 0000-23-0002.1 DRG230002
Project: Invenergy Leading Light Wind

Dear Ms. Cronin:

This is in response to your June 27, 2023, request for approval of a sediment sampling and analysis plan from the Office of Dredging & Sediment Technology (ODST) for transmission line routes that would connect to an offshore wind energy generation facility.

After reviewing the proposed sampling plan and analysis plan entitled "New Jersey Sediment and Analysis Plan for OCS-A-0542 Leading Light Wind", dated June 2023, the Office of Dredging and Sediment Technology (ODST) approves the collection of sample locations that are proposed in three locations in New Jersey Waters; Sea Girt, Sandy Hook, and Upper New York Bay. The specific core locations are depicted in the above referenced document in sections 9. SEA GIRT NORTH SEDIMENT CORE SAMPLE LOCATIONS, 13. SANDY HOOK SEDIMENT CORE SAMPLE LOCATIONS, and 16. UPPER NEW YORK BAY SEDIMENT CORE SAMPLE LOCATIONS.

Regarding the required sediment sampling tests, ODST requires the following analysis:

- Tier I Physical/Geotechnical testing, ODST approves of the proposed grain size analysis, total organic carbon, and percent moisture content as proposed in the SSAP.

- Tier II Bulk Sediment Chemistry shall include Semi-Volatiles Compounds, Polychlorinated biphenyls (PCBs) as Aroclors, Organochlorine Pesticides, Inorganics. For cores in Sandy Hook and Upper New York Bay only, analysis shall also be run for Polychlorinated dibenzo dioxins and furans (PCDDs and PCDFs; 17 congeners).

- Tier II Modified Elutriate is not required for any cores.

Sediment sampling plan implementation requirements shall conform to the requirements set forth in the "New Jersey Dredging Projects Sediment Sampling and Analysis Plan (SSAP) Template", version 4.0, available at https://dep.nj.gov/wp-content/uploads/wlm/downloads/caf/ssap-version-4.0.pdf.

It is further noted that the project now qualifies for *N.J.C. 7:7-4.20 Permit-by-rule 20 – implementation of a sediment sampling plan for sampling in a water area as part of a dredging or dredged material management activity or as part of a remedial investigation of a contaminated site*, and that activities that qualify for this permit-by-rule also qualify for a water quality certificate pursuant to Section 401 of the Federal Clean Water Act, U.S.C. 33 §§ 1251 et seq.

The Division reserves the right to require additional turbidity modeling and/or contaminated sediment transport and fate modeling depending on the results of the sediment analysis. **It is recommended that sediment results be forward to ODST when they become available and prior to submission of any permit applications.**

If you have any questions, please feel free to contact me at gary.nickerson@dep.nj.gov.

Sincerely,

Gary Nickerson
Office of Dredging and Sediment Technology

New Jersey Sediment Sampling and Analysis Plan for OCS-A-0542 Leading Light Wind

For Review by the
New Jersey Department of Environmental Protection, Office of Dredging & Sediment Technology

Submitted by:

Invenergy Wind Offshore LLC

Prepared by:

WSP USA Inc

June 2023

Table of Contents

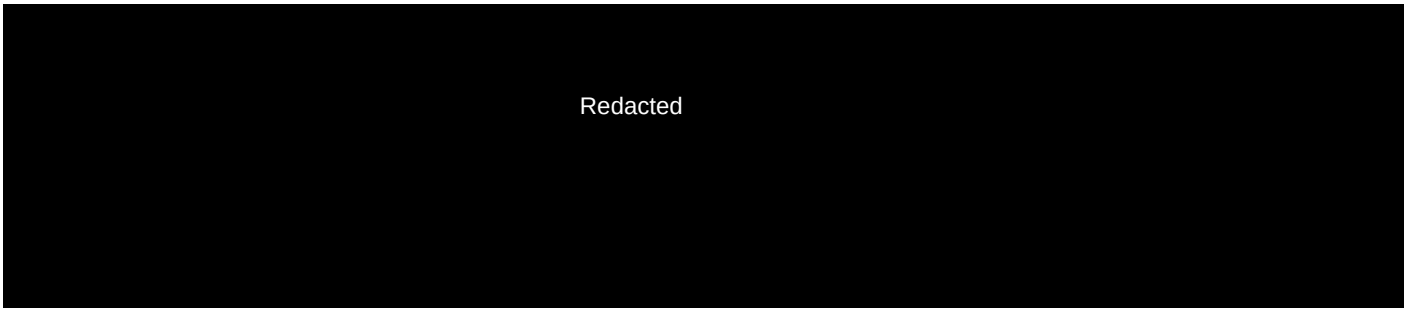
Contains Privileged, Confidential, and Proprietary Information

1. SAMPLING SITE INFORMATION

Site Location	Municipality	County	State	Zip
Sea Girt Beach	Sea Girt Borough	Monmouth	NJ	08750
Sandy Hook Bay/Lower NY Bay	Middletown Township	Monmouth	NJ	07732
Upper New York Bay	Jersey City, Bayonne	Hudson	NJ	07305, 07002

2. PROJECT DESCRIPTION

Invenergy Wind Offshore LLC (the "Applicant") executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) (40 nautical miles [nm]) east of Atlantic City and 150 km (80 nm) south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km (50+ nm) of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore. The Applicant previously obtained the necessary New Jersey (NJ) state and federal permits to conduct benthic surveys within the proposed Project area (NJDEP File and Activity #0000-23-0002.1 DRG230001).



Detailed information regarding the proposed geotechnical survey program is provided in the 2023 Geophysical and Geotechnical Survey Plan for OCS-A-0542 Leading Light Wind (rev. 2) prepared for review by the Bureau of Ocean Energy Management (BOEM) (**Appendix A**). The geotechnical and geochemical survey program includes data collection for site characterization and project design that will allow Leading Light Wind to identify, avoid, and minimize potential impacts to natural resources throughout project development, construction, and operations.

This Sediment Sampling and Analysis Plan was designed to collect data that would allow flexibility in the design and construction of potential cable alignments, to evaluate areas that may result in sediment disturbance, and to satisfy New Jersey Department of Environmental Protection (NJDEP) permitting requirements. The SSAP will evaluate geophysical and chemical analysis along several proposed route options within three general offshore locations in New Jersey waters: Sea Girt Beach, Sandy Hook/Lower New York Bay, Upper New York Bay. Sediment sampling location maps for each offshore location and proposed cable route options are provided in **Sections 7 and 11**.

3. PROPOSED IN-WATER SEDIMENT DISTURBANCE

Cable trenching using a cable plough, jet plough, self-propelled trencher, or similar technology.

Leading Light Wind plans to install the HVDC submarine cable along the sections of alignment using a cable laying vessel or specialized outfitted barge. The cable will be installed within a trench below the seabed using a burial tool such as a cable plough, jet plough, or self-propelled trencher. A combination of burial tools may be used depending on the substrate conditions or installation constraints along the route, as determined by pre-installation surveys. Sampling and analysis for New Jersey landfall locations is not included in this SSAP.

4. APPLICANT INFORMATION

Applicant Name: Carmen C. Bernett, Senior Manager, Environmental Compliance & Strategy, Invenergy

Applicant Phone Number: 708.883.3878

Email Address: cbernett@invenergy.com

5. AGENT INFORMATION

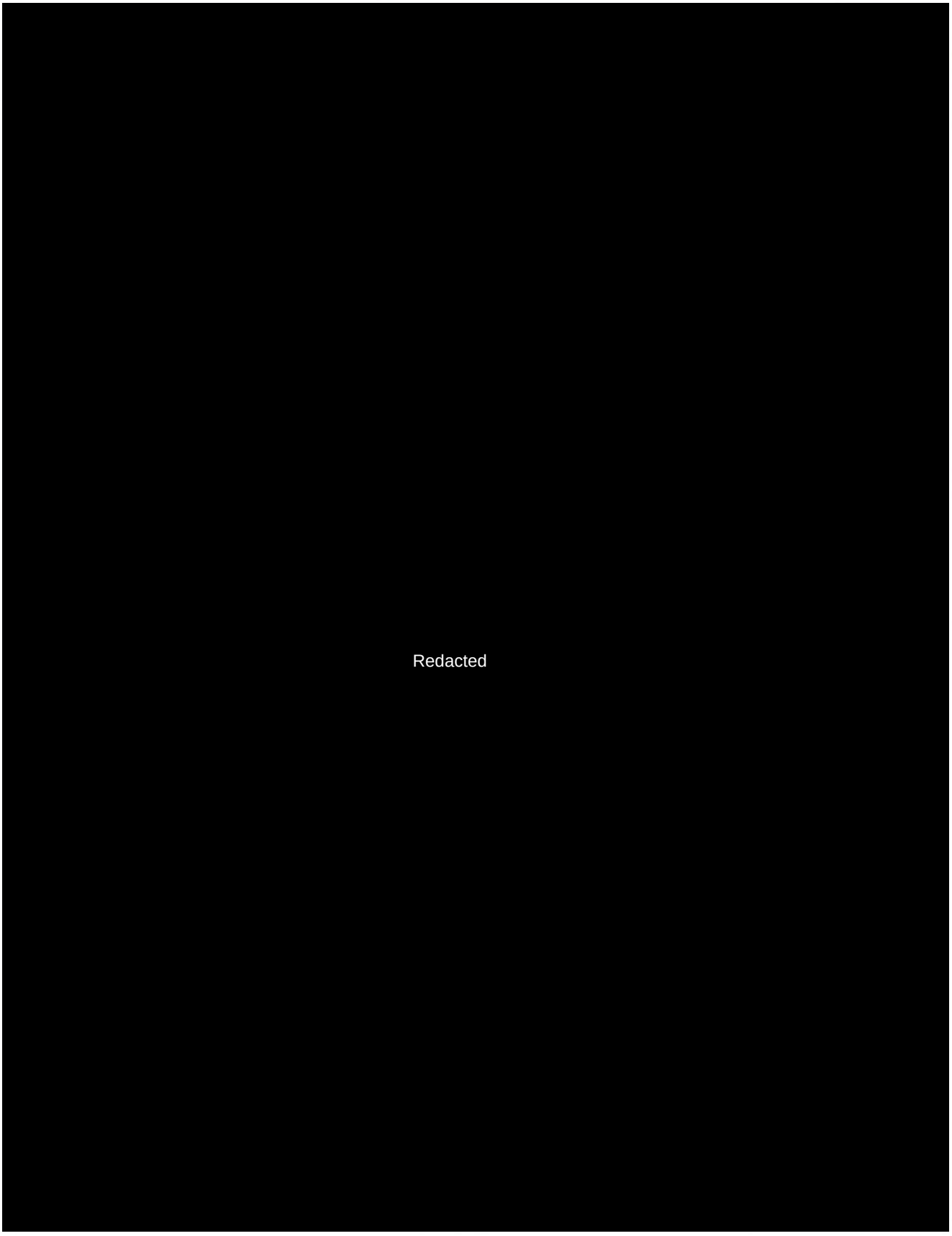
Agent Name: Katie Axt, Assistant Vice President, WSP USA

Agent Phone Number: 212.951.2730

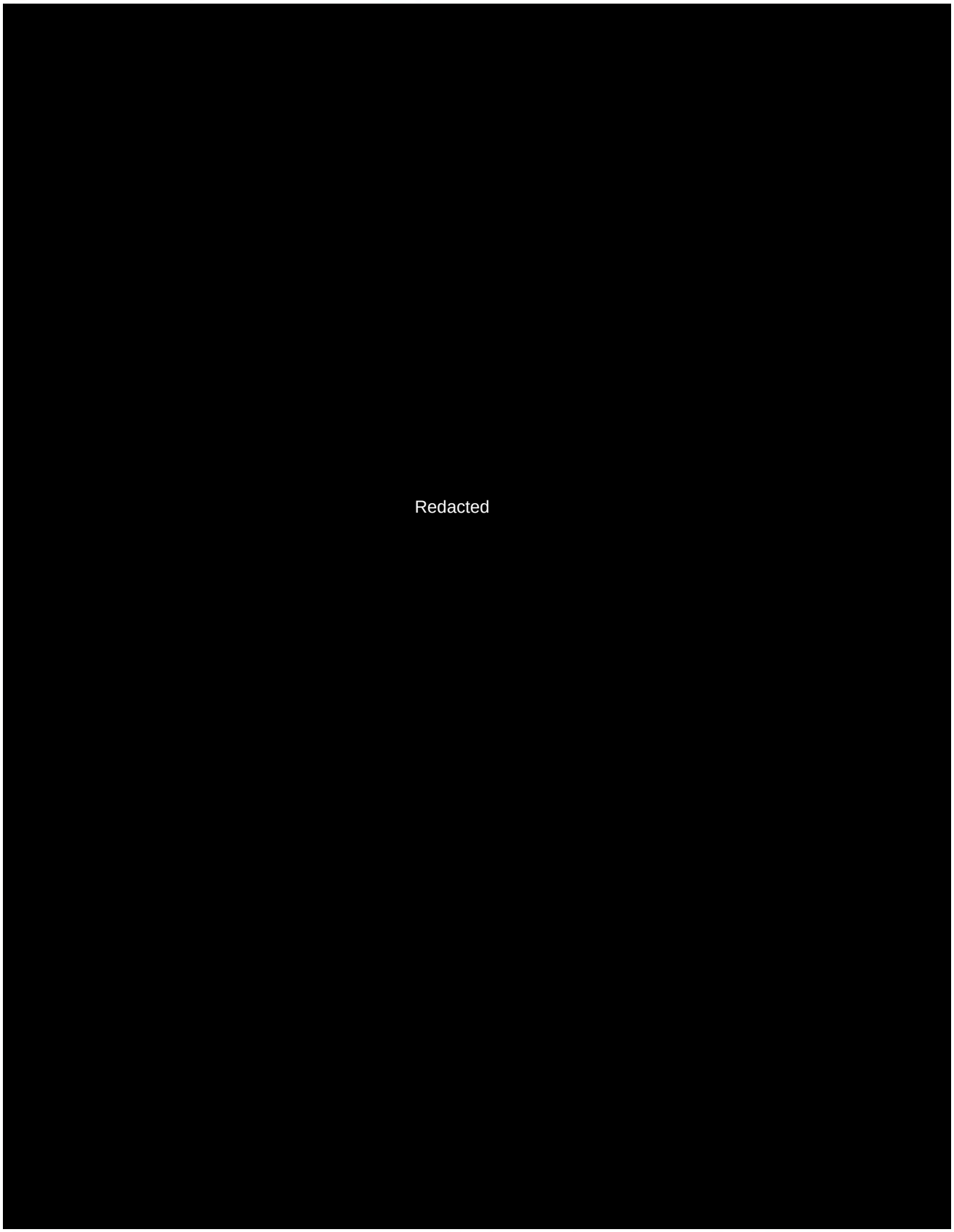
Email Address: katie.axt@wsp.com

Address: WSP USA ● Penn 1 250 W 34th Street, 4 FL ● New York, NY 10119

6. PROJECT OVERVIEW MAP



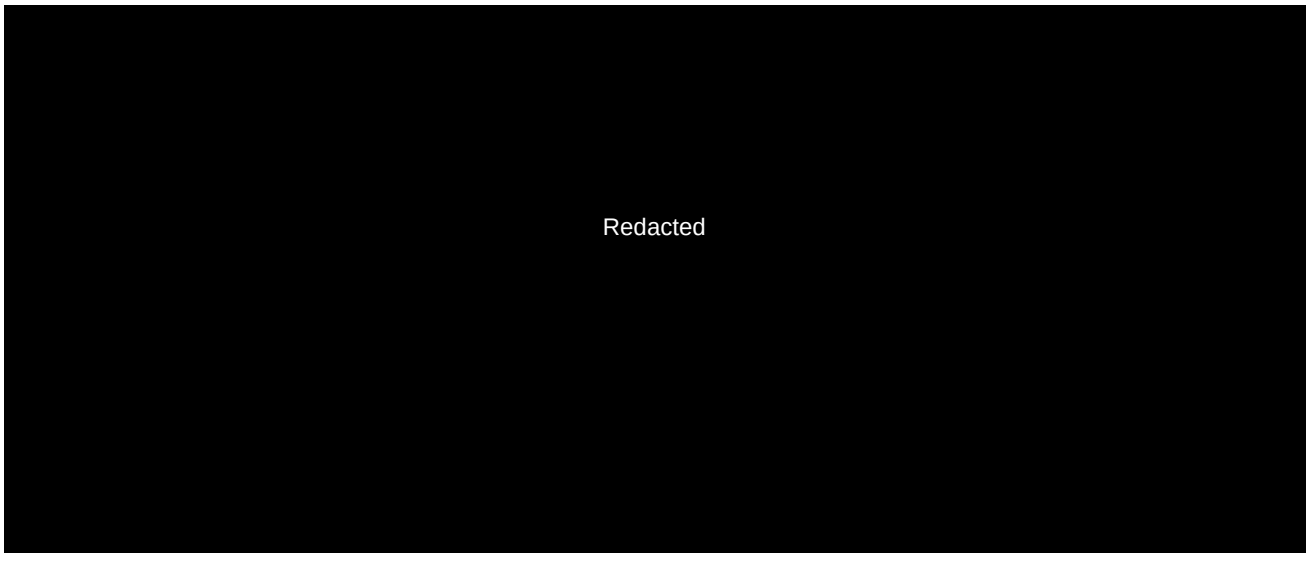
7. SEA GIRT CABLE ROUTES MAP



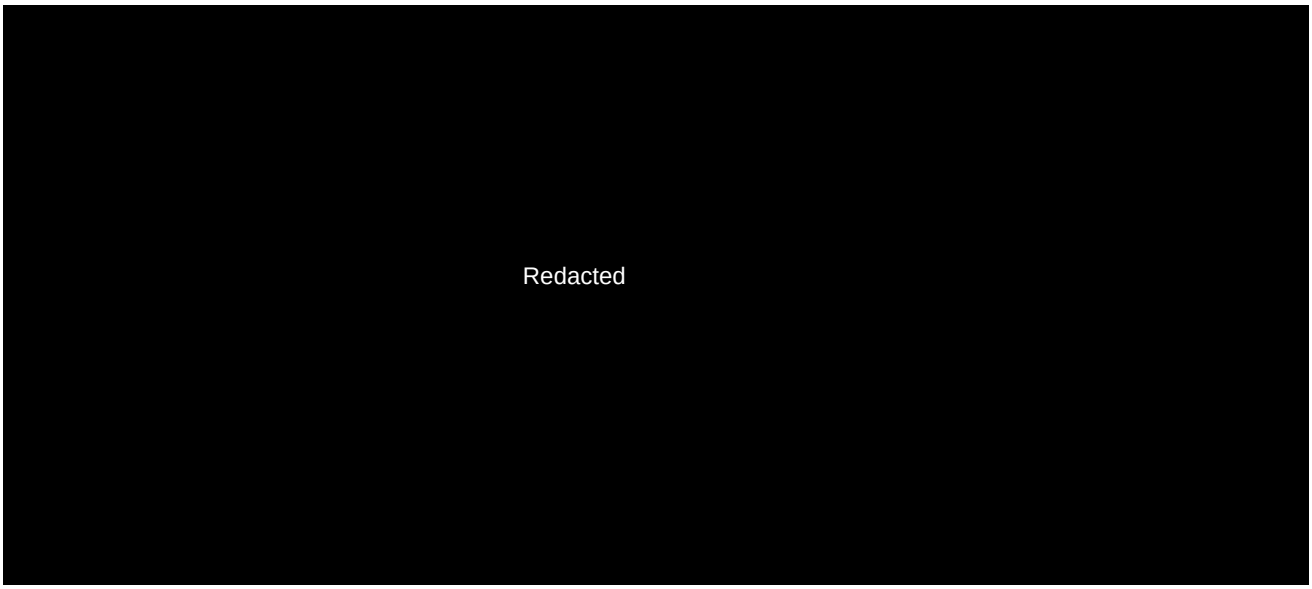
8. SEA GIRT CABLE ROUTES PROJECT PARAMETERS

Extent of area of sediment disturbance (square feet)	96,698 sf
Total length of sediment disturbance (feet)	North Route: 25,069 feet South Route: 23,280 feet
Total width of sediment disturbance (feet)	2 feet
Proposed depth of sediment disturbance	7 feet below existing mudline
Proposed depth of overdredge (feet below MLW)	1 foot
Estimated volume of sediment disturbance (no overdredge)	25,070 cy
Estimated volume of overdredge (cubic yards)	3,581 cy
Estimated total volume of sediment disturbance (including overdredge)	28,651 cy
Known contaminate spills	No known nearby spills/contamination based on NJ-GeoWeb search.
Outfalls within 500 feet	None noted.
Intakes within 500 feet	None noted.
In-Water Structures in the vicinity.	None noted.
Boat/Vessel Fueling Stations within 500 ft.	None noted.
Total number of proposed samples	16 samples. 1 per 3,000 feet. Evenly distributed along the cable route.

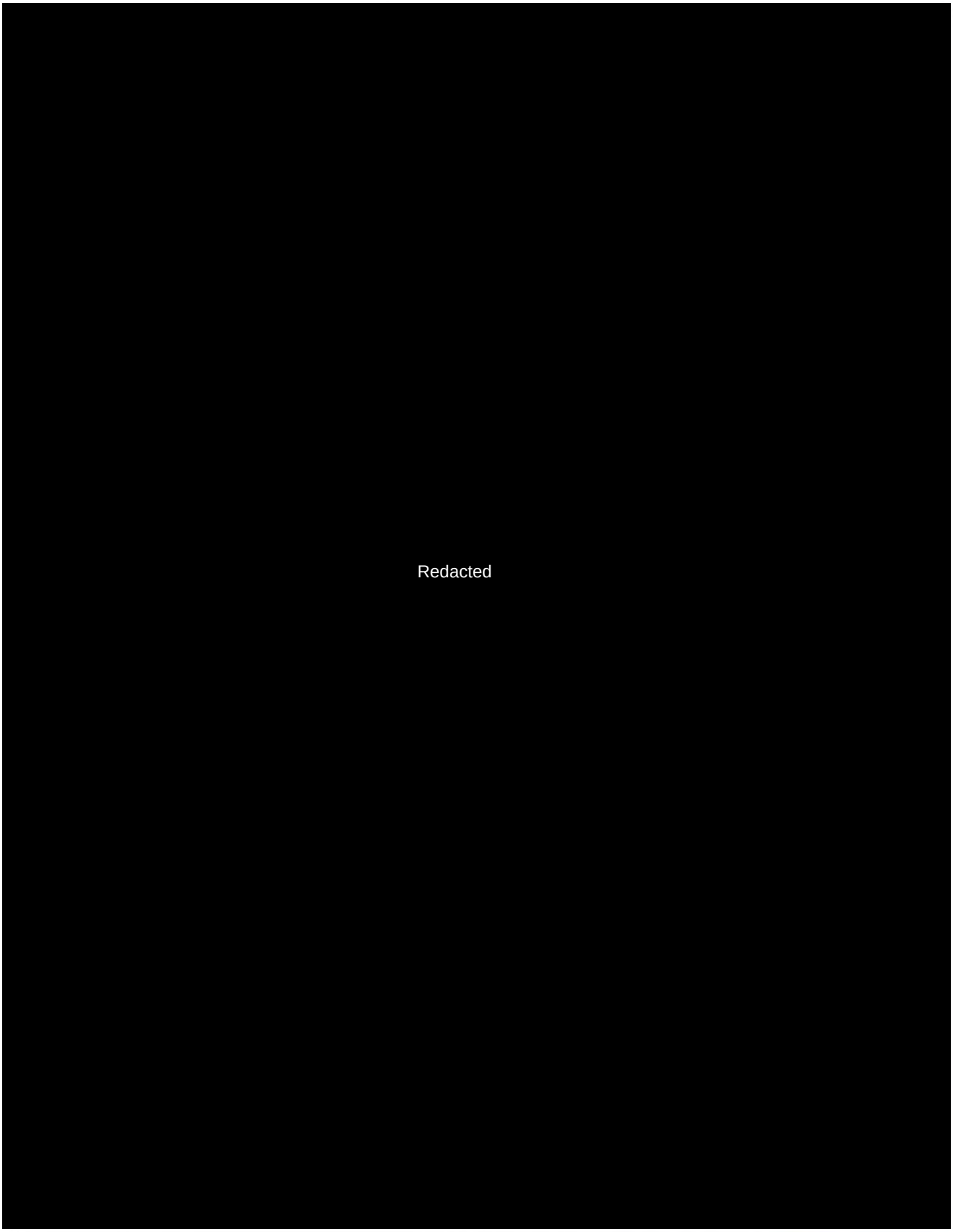
9. SEA GIRT NORTH SEDIMENT CORE SAMPLE LOCATIONS



10.0 SEA GIRT SOUTH SEDIMENT CORE SAMPLE LOCATIONS



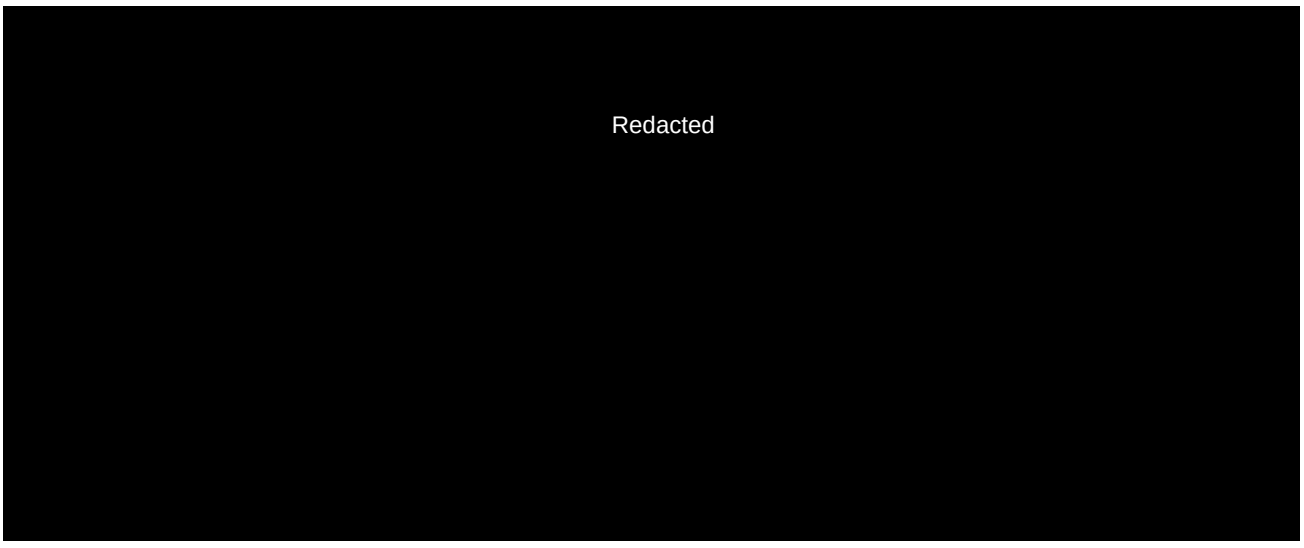
11. SANDY HOOK CABLE ROUTES MAP

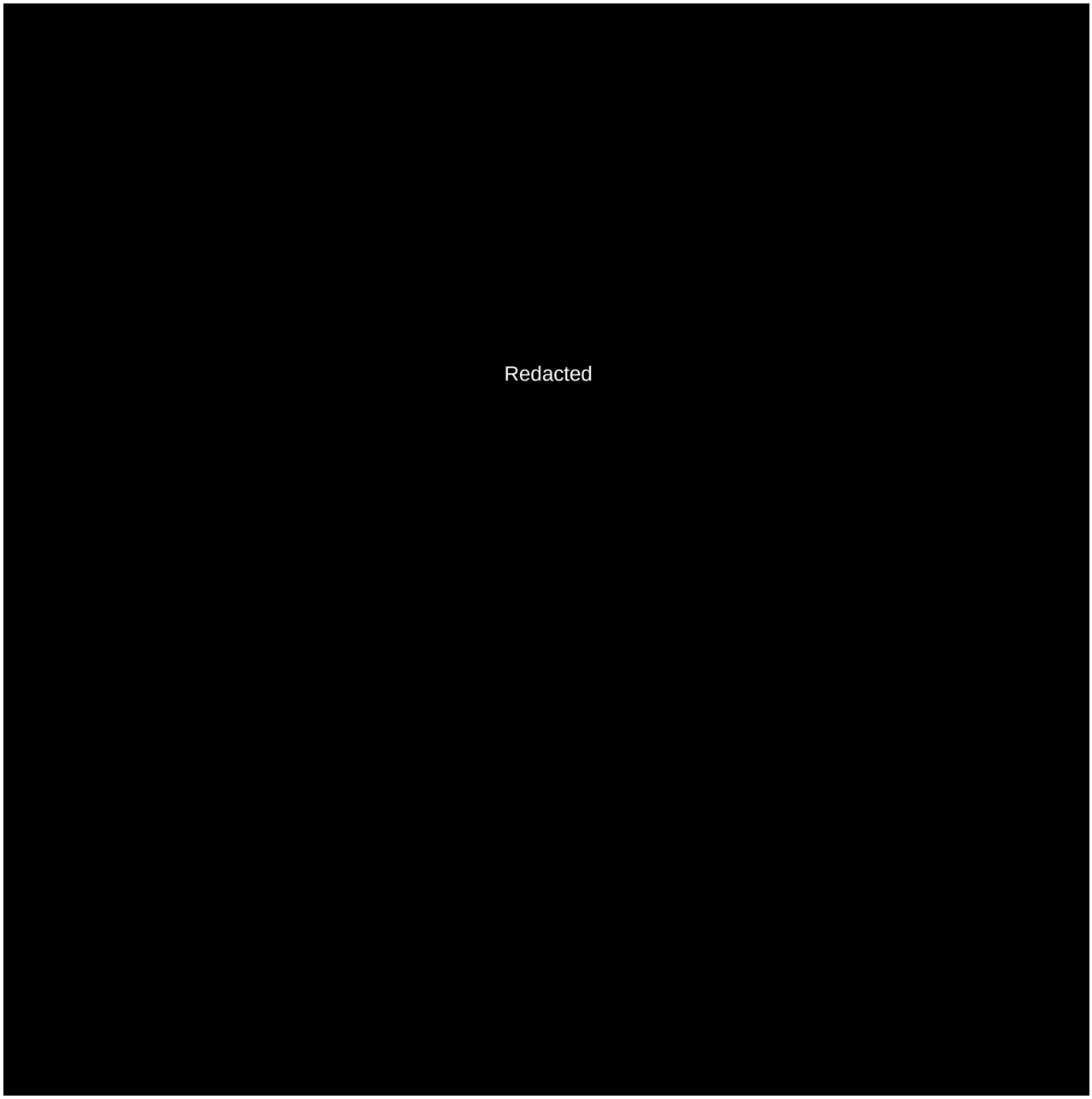


12. SANDY HOOK CABLE ROUTES PROJECT PARAMETERS

Extent of area of sediment disturbance (square feet)	177,424 sf
Total length of sediment disturbance (feet)	88,712 feet
Total width of sediment disturbance (feet)	2 feet
Proposed depth of sediment disturbance	7 feet below existing mudline
Proposed depth of overdredge (feet below MLW)	1 foot
Estimated volume of sediment disturbance (no overdredge)	46,000 cy
Estimated volume of overdredge (cubic yards)	6,570 cy
Estimated total volume of sediment disturbance (including overdredge)	52,750 cy
Known contaminate spills	No known nearby spills/contamination based on NJ-GeoWeb search
Outfalls within 500 feet	None noted.
Intakes within 500 feet	None noted.
In-Water Structures in the vicinity.	None noted.
Boat/Vessel Fueling Stations within 500 ft.	None noted.
Total number of proposed samples	30 samples. 1 per 3,000 feet. Evenly distributed along the cable route.

13. SANDY HOOK SEDIMENT CORE SAMPLE LOCATIONS

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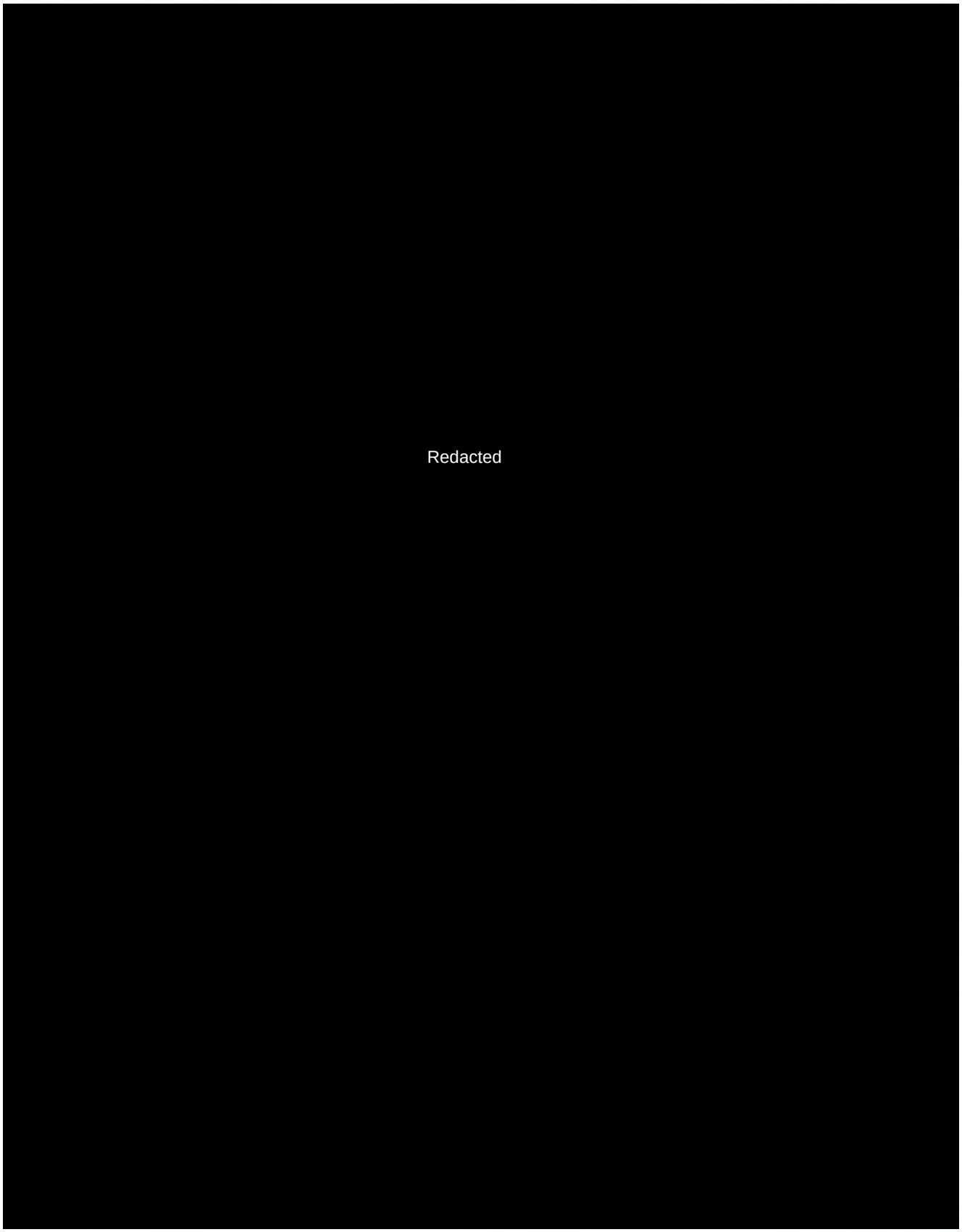
14. UPPER NEW YORK BAY CABLE ROUTE MAP



15. UPPER NEW YORK BAY CABLE ROUTE PROJECT PARAMETERS

Extent of area of sediment disturbance (square feet)	311,520 sf
Total length of sediment disturbance (feet)	155,760 ft
Total width of sediment disturbance (feet)	2 feet
Proposed depth of sediment disturbance	Redacted
Proposed depth of overdredge (feet below MLW)	1 foot
Estimated volume of sediment disturbance (no overdredge)	173,000-230,000 cy
Estimated volume of overdredge (cubic yards)	11,538 cy
Estimated total volume of sediment disturbance (including overdredge)	184,600-242,000 cy
Known contaminate spills	No known nearby spills/contamination based on NJ-GeoWeb search
Outfalls within 500 feet	None noted.
Intakes within 500 feet	None noted.
In-Water Structures in the vicinity.	None noted.
Boat/Vessel Fueling Stations within 500 ft.	None noted.
Total number of proposed samples	7 samples. 1 per 3,000 feet. Evenly distributed along the cable route.

16. UPPER NEW YORK BAY SEDIMENT CORE SAMPLE LOCATIONS

ral

Redacted

17. PLANNED CORE SAMPLE COMPOSITING SCHEME

Core compositing is not proposed for any of the cable routes.

18. PROPOSED SEDIMENT MANAGEMENT

Cable Trenching: Natural resettlement within the confines of the trench.

As noted, the cable will be installed in a trench by cable plough, jet plough, self-propelled trencher, or similar technology. Leading Light Wind does not anticipate any additional mechanical means needed to backfill the trench along the proposed submarine cable routes. It is anticipated that sediments displaced during cable installation will resettle within the confines of the trench. As a result, it is not anticipated for the need to externally manage sediments, other than sediment sampling waste. Sediment-sampling waste will be sampled and disposed of in accordance with applicable regulatory requirements.

19. PROPOSED SEDIMENT SAMPLING TESTS

Representative subsamples of each homogenized core sample (or distinct strata) and composite analytical sample will be collected and analyzed for grain size distribution, Total Organic Carbon (TOC), and percent moisture.

Samples will also be analyzed for Bulk Sediment Chemistry, Elutriate, Effluent (Modified) Elutriate, as specified below. Individual sediment core samples comprised of greater than 90% sand will be excluded from bulk chemical testing and will not be composited with other sediment samples.

Tier 1 Physical /Geotechnical Testing	Grain size distribution	ASTM D422, D4381, or equivalent method, with hydrometer
	Total Organic Carbon	USEPA 440.0, USEPA SW-846 9060A, or equivalent method
	Percent Moisture Content	ASTMD653, D2216, D4643, Standard Method 2540D, or equivalent method
Tier II Bulk Sediment Chemistry	Semi-Volatile Compounds (SVOCs)	EPA 8270D
	Polychlorinated biphenyls (PCBs): Aroclors	EPA 8081B
	Organochlorine Pesticides	EPA 8082A
	Inorganics – Metals, cyanide, mercury, hexavalent and trivalent chromium)	EPA 6010D/6020B, 9012B, 7471B, 3060A/7196A
Tier II Modified Elutriate, if required	Same target analytes as Bulk Chemistry.	

20. ANALYTICAL REQUIREMENTS

All analytical procedures must be conducted by a laboratory certified by the Department to conduct that procedure pursuant to the Regulations Governing the Certification of Laboratories and Environmental Measurements (N.J.A.C. 7:18) or the National Environmental Laboratory Accreditation Program (NELAP). The achieved analytical detection limits for all contaminants in the Target Analyte List will be less than the applicable regulatory criteria and guidance values to which the data will be compared when evaluating the potential impacts of the proposed project. Where the Practical Quantitation Limit (PQL) for a contaminant is greater than the applicable regulatory criteria, the analytical detection limit must not exceed the PQL.

Bulk Sediment Chemistry/Aquatic Placement – NJDEP Ecological Screening Criteria
http://www.nj.gov/dep/srp/guidance/ecoscreening/

Elutriate and Effluent (Modified) Elutriate – NJDEP Surface Water Quality Standards (acute and chronic; saline and/or freshwater, as appropriate)

http://www.nj.gov/dep/rules/rules/njac7_9b.pdf

21. SAMPLING PLAN IMPLEMENTATION REQUIREMENTS

Sediment core sampling collection procedures must be consistent with those in the NJDEP Field Sampling Procedures Manual (2005), available at http://www.state.nj.us/dep/srp/guidance/fspm .

Sediment core sampling collection procedures will be consistent with the following implementation guidelines:

1. NJDEP will be notified of any deviations from the approved SSAP prior to the homogenizing, compositing, and analysis of the collected sediment samples.
2. All sediment core sample collection activities will be properly documented. Detailed field notes/observations during sampling will be documented in a field sampling logbook.
3. NJDEP GPS Data Collection Standards will be used for positioning methods when locating all sampling points.
4. All sampling equipment will be properly cleaned before and after the collection of each individual sediment core sample.
5. An inert plastic liner will be used in conjunction with each sediment core sampling device; this plastic liner will not be reused.
6. All individual sediment core samples are to be taken to the sediment characterization depth, as specified in this document, and not any deeper.
7. When collecting sediment core samples, the project applicant will ensure that a sufficient volume of sediment is collected to conduct all of the tests (geotechnical and chemical) specified in the SSAP.
8. Individual sediment core samples must be photographed prior to homogenization, with the sample identification number, a length scale, and date included in the photograph.
9. Provide core logs showing the depth of sampling (below the sediment surface and Mean Low Water) and a qualitative description of the sediment for each individual sediment core sample.
10. Only sediment core samples collected correctly may be homogenized, composited, and analyzed.
11. Individual sediment core samples may be homogenized in their entirety for analysis provided that there no distinct strata (apparent grain size distribution, composition, and visual characteristics) present that are greater than two (2) feet in depth. The Department shall be notified of any sediment core samples that show grain size stratification prior to homogenizing.
12. The entire sediment core sample (or distinct strata, when present) must be homogenized – “representative” sub-samples of a non-homogenized sediment core sample must not be collected, composited, and analyzed.
13. Individual sediment core samples may be composited only if the grain size distribution of the sediment is similar. Individual samples will not be composited if the percentage clay, silt, or sand differ by more than 20%. NYSDEC

will be notified of any sediment core samples that show varying grain size distribution prior to compositing samples.

14. Representative subsamples of each homogenized core sample (or distinct strata) are combined in equal proportions (by mass) to form the composite analytical sample.
15. The sample preservation requirements and holding times for each analysis, as specified in the analytical methods used, will be adhered to. NYSDEC will be notified if alternatives are proposed prior to analysis.
16. Sample Chain of Custody requirements must be consistent with those specified in the NJDEP Field Sampling Procedures Manual (2005).
17. If implementation of the approved SSAP does not provide data that are representative of, or fully characterizes, the sediment to be dredged, the applicant understands that the Department may require the collection and analyses of additional sediment samples.
18. Analytical laboratories must follow all the required QA/QC procedures specified in the analytical methods used. Any deviations from these procedures must be documented and justified in the Analytical Data Report
19. All routine procedures associated with the sampling, handling, transport, storage, preservation, and analysis of the sediment should be specified in standard operating procedure (SOP) documents maintained by the parties actually collecting and analyzing the sediment.

22. REPORTING REQUIREMENTS

The sediment data package will be included in any future NJDEP LRP permit application packages. Any data package submitted to NJDEP will comply with the QA/QC requirements outlined in Appendix B of the Dredging Manual. The package will be provided to NJDEP electronically.

In addition, a data summary table of the results in a spreadsheet will be provided with the data package. The data summary table will present a comparison of the bulk sediment chemistry results to the Department's Ecological Screening Criteria. Where required, modified elutriate results will be compared to the New Jersey Surface Water Quality Criteria. The summary tables will present data with identical units and highlight all results that exceed applicable criteria. Units for bulk sediment chemistry must be presented in milligrams per kilogram (mg/kg).

23. SSAP CERTIFICATIONS

I certify that I provided accurate information and will comply with the requirements listed in the approved Sediment Sampling and Analysis Plan.

Printed Name:	Bryan Schueler, Vice President Invenergy Wind Offshore LLC
Date:	6/26/2023
Signature:	DocuSigned by: 485AED04FDD945B...

DS

Department Review and Approval (Department signature upon approval)

The Department hereby approves the Sediment Sampling and Analysis Plan dated for implementation.

NJDEP File No.	
Printed Name:	
Date:	
Signature:	

Appendix D. Survey Equipment and Vessels

Appendix B. G&G Survey Equipment Specifications

Since the G&G survey contractor(s) have not been selected at this time, either the G&G survey equipment described in this appendix will be utilized or similar equipment. Invenergy can provide the specific vessels to BOEM when the contractor(s) are selected, if requested.

MGC® R2 SB50

KONGSBERG

GYRO COMPASS AND INS

A new family of products with motion sensing and gyro compass functionality is introduced. The MGC R2 product includes three Ring Laser Gyros and three linear accelerometers. The MGC R2 is now available in a subsea bottle depth rated to 50 meters (SB50).

Typical applications
The MGC R2 SB50 is designed for portable seabed mapping systems where the MGC is to be mounted on the multibeam transducer head. With input of data from a GNSS system, the MGC R2 SB50 is a fully inertial navigation system (INS). It can output heading, roll, pitch, heave and position. Acceleration and velocity of linear motions, as well as angular rates, are output from the unit. The MGC product outputs both processed and raw (gyro and accelerometer) sensor data.

The proven PFreeHeave® algorithms are part of the navigation algorithms that enable down to 2 cm accuracy in delayed heave output and 5 cm accuracy in real-time heave output. The linear position and velocity measurements can be output in up to four different points on the vessel.

Function
The MGC can operate in Gyrocompass mode and Integrated Navigation mode. In the Gyrocompass mode, only input of speed is required. In this mode the product will output heading, roll, pitch and heave accurately. In the Integrated Navigation mode, input of speed, position and PPS from a GNSS system is required (VTG, GGA, ZDA). In this mode the product will output heading, roll, pitch, heave and position.

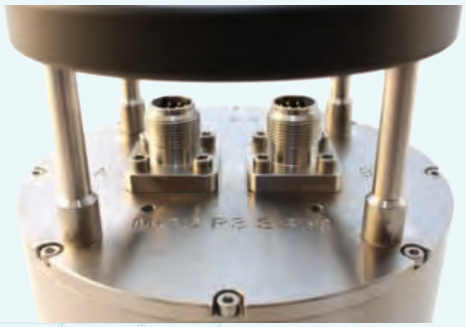
The unit is delivered with Windows based configuration and data presentation software, the MRC+. In this software vector arms from where the MGC is mounted to the center of gravity (CG) and two individually configurable monitoring points (MPs) can be defined. The heave measurements can be output in four different locations (the MGC itself, CG, MP1 and MP2) simultaneously on serial lines or Ethernet ports. A typical monitoring point is the echo sounder transducer head.

Variables output
The MGC outputs heading, roll and pitch and corresponding angular rate vectors. The unit outputs relative (dynamic) heave position, velocity and acceleration. In the Integrated Navigation mode it also outputs absolute position in north and east direction in addition to height above the ellipsoid.

Digital I/O protocols
MGC data is available through both Ethernet interface and serial lines enabling easy distribution of data to multiple users on board the vessel. Output protocols for commonly used survey equipment are available on two individually configurable serial lines and Ethernet/UDP.

FEATURES

- 0.02° roll and pitch accuracy
- 0.1° heading accuracy GNSS aided
- Includes INS capability
- Delivered in titanium housing, depth rated to 50 metres
- Outputs on RS-232, RS-422 and Ethernet
- High output data rate (200 Hz)
- Precise heave at long wave periods by use of PFreeHeave® algorithms
- Lever arm compensation to two individually configurable monitoring points
- Small size and low power consumption
- Each MGC delivered with a Calibration Certificate
- Selectable communication protocols in the Windows based configuration software



TECHNICAL SPECIFICATIONS

MGC R2 SB50

ORIENTATION OUTPUT

Angular orientation range	±180°
Resolution in all axes	0.001°
Accuracy roll, pitch	0.02° RMS
Accuracy heading	0.15° RMS sec.lat
Accuracy heading (GNSS aided)	0.1° RMS sec.lat
Heading settling time to data available	<5 min from start-up
Heading settling time to full accuracy (typical)	17 min from start-up

GYRO OUTPUT

Angular rate range	±149°/s
Angular rate noise	0.020°/s RMS
Bias stability (absolute bias)	0.008°/h RMS
Angle Random Walk	0.035°/ √h
Scale factor error	0.001 % RMS

ACCELERATION OUTPUT

Acceleration range (all axes)	±45 m/s2
Bias stability (absolute bias)	80 µg RMS
Acceleration noise	0.0003 m/s2 RMS
Velocity Random Walk	3.3 µg/√Hz
Scale factor error	0.008% RMS

HEAVE OUTPUT

Output range	±50 m, adjustable
Periods (real-time)	0 to 25 s
Periods (delayed)	0 to 50 s
Heave accuracy (real-time)	5 cm or 5% whichever is highest
Heave accuracy (delayed)	2 cm or 2% whichever is highest

POSITION OUTPUT

Free inertial	20 nm/h

ELECTRICAL

Voltage input	24 V DC nominal (18 to 32 V DC)
Power consumption	Max 12 W (typical 11 W)
Serial ports:	
Com1	Bidirectional RS-422
Com2	Output only, RS-232
Com3 & Com4	Input only, user configurable RS-232, RS-422
Ethernet output ports	5
Ethernet UPD/IP	10/100 Mbps
Digital output variables	24 (max), Serial or Ethernet
Data output rate (max)	200 Hz
Timing	< 1 ms

INPUT FORMATS

NMEA 0183, incl. GGA, VBW, VTG, ZDA or MRU Normal format

OUTPUT FORMATS

- MRU normal
- NMEA 0183 proprietary
- Atlas Fansweep
- Seapath binary 23, 25, 26
- KM binary
- RDI ADCP
- NMEA GGA, GLL, HDT, THS, ROT, VTG, GST, VER, HCR
- Sounder
- EM3000
- TSS1
- PFreeHeave®
- MDL Trim Cube
- Tokimec PTVG

OTHER DATA

MTBF (computed)	50000 h
MTBF (service history based)	100000 h
Material	Titanium
Connector	2 8-pin Seacon 5506-1508 (male)

WEIGHTS AND DIMENSIONS

Dry weight	10.5 kg
Submerged weight	5.5 kg
Dimensions (HxLxW)	275 x 184 x 184 mm

ENVIRONMENTAL SPECIFICATIONS

Operational temperature range	-15 °C to +55 °C
Storage temperature range	-25 °C to +70 °C
Enclosure protection	IP68
Vibration	IEC 60945/EN 60945

ELECTROMAGNETIC COMPATIBILITY

Compliance to EMCD, immunity/emission	IEC 60945/EN 60945

September 2019

Specifications subject to change without any further notice.

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KONGSBERG

MRU 5+ MK-II

KONGSBERG

THE ULTIMATE MARINE MOTION SENSOR

The MRU 5+ product is upgraded with the best MEMS based gyro technology available. With exceptional low angle noise and bias stability the product is ideal for integrated INS/GNSS systems and demanding survey applications.

Unique components
The MRU 5+ provides documented roll and pitch accuracy of 0.008° and angle noise less than 0.002°. Every unit is delivered with an individual calibration certificate documenting this accuracy. This is made possible by use of accurate inertial sensors including three rate gyros and linear accelerometers. The accelerometers included are of excellent tactical navigation grade performance.

For this upgraded MRU 5+ product a new MEMS based gyro is developed by Kongsberg Seatex AS called MRG5 (Mru Rate Gyro) model 5. The MRG5 is optimized for use in high-end applications. The MRU rate gyro combines very low noise, excellent bias stability and outstanding gain accuracy and is the best MEMS rate gyro available for maritime applications.

Very high reliability is achieved by using solid-state sensors with no moving parts and the proven MRU electrical and mechanical construction.

Easy to set up and use
Interfacing the MRU 5+ to various sonar systems is made easy by including data protocols for the most commonly used multibeam echo sounder systems in the software. Using the configuration cable and the Windows version of the configuration software, MRC+, a series of simple menu prompts allow the user to choose the optimum configuration for his application. The MRU 5+ and the MRC+ software are flexible and can accommodate a wide variety of application types.

PFreeHeave® Algorithm
The PFreeHeave algorithm uses past measurements to output a correct and phase-free heave from MRU 5+. PFreeHeave has an advantage in long swell conditions and for applications that can utilize a heave signal that is delayed some minutes, typical seabed mapping applications.

Digital I/O protocols
MRU data is available through an Ethernet interface enabling easy distribution of MRU data to multiple users on board the vessel. Output protocols for commonly used survey equipment are available on two individually configurable serial lines and Ethernet/UDP.

External communication
The MRU 5+ accepts external input of speed and heading information on separate serial lines for improved accuracy in heave, roll and pitch during turns and accelerations. For time synchronization the MRU accepts 1-second time pulse (1PPS) input.

FEATURES

- 0.008° roll and pitch accuracy
- Exceptional low angle noise and bias stability
- High output data rate (200 Hz)
- Outputs on RS-232, RS-422 and Ethernet
- Precise heave at long wave periods by use of PFreeHeave®
- algorithm
- Each MRU delivered with Calibration Certificate
- No limitation in mounting orientation
- Lever arm compensation to two individually configurable
- monitoring points
- Meets IHO special order requirements
- Small size, light weight, low power consumption
- 2-year warranty

TECHNICAL SPECIFICATIONS

MRU 5+ MK-II

ORIENTATION OUTPUT

Angular orientation range	±180°
Resolution in all axes	0.001°
Angle noise roll, pitch	0.002° RMS
Accuracy [1], [2] roll, pitch (for a ±5° amplitude)	0.008° RMS

GYRO OUTPUT

Angular rate range	±75°/s
Angular rate noise	0.008°/s RMS
Bias stability (in run bias)	0.03°/h RMS
Bias stability (absolute bias)	20°/h RMS
Angle Random Walk	0.006°/√h (typical)
Scale factor error	0.03 % RMS

ACCELERATION OUTPUT

Acceleration range (all axes)	±30 m/s2
Bias stability (absolute bias)	80 µg RMS
Acceleration noise	0.0003 m/s2 RMS
Velocity Random Walk	3.3 µg/√Hz
Scale factor error	0.008% RMS

HEAVE OUTPUT

Output range	±50 m, adjustable
Heave accuracy for 0 to 25 s motion periods (real-time)	5 cm or 5% whichever is highest (RMS)
Heave accuracy for 10 s motion period (real-time)	1 cm or 3% whichever is highest (RMS)
Heave accuracy for 0 to 50 s motion periods (delayed)	2 cm or 2% whichever is highest (RMS)
Heave velocity accuracy	0,01 m/s RMS

ELECTRICAL

Voltage input	10 to 36 V DC
Power consumption	Max 8 W (typical 7.2 Watts)
Serial ports:	
Com1	Bidirectional RS-422
Com2	Bidirectional RS-422 from junction box, user configurable RS-232, RS-422
Com3 & Com4	Input only, user configurable RS-232, RS-422
Analog channels (junction box)	# 4, ±10 V, 14 bit resolution
Ethernet output ports	5
Ethernet UPD/IP	10/100 Mbps
Data output rate (max)	200 Hz
Timing	< 1 ms

INPUT FORMATS

NMEA 0183, incl. HDT, HDM, ZDA, GGA, VTG, VHW, VBW or MRU Normal format

DATA OUTPUT PROTOCOLS

- MRU normal	- Sounder
- NMEA 0183 proprietary	- EM3000
- Atlas Fansweep	- TSS1
- Seapath binary 23, 25, 26	- PFreeHeave®
- PRDID	- KM binary

OTHER DATA

MTBF (computed)	50000 h
MTBF (service history based)	100000 h
Material	Anodised aluminium
Connector (MIL. spec.)	Souriau 851-36RG 16-26S50

WEIGHT AND DIMENSIONS

Weight	2.2 kg
Dimensions	Ø 105 x 140 mm (4.134" x 5.525")

ENVIRONMENTAL SPECIFICATIONS

Operational temperature range	-5 °C to +55 °C
Storage temperature range	-25 °C to +70 °C
Enclosure protection	IP66
Vibration	IEC 60945/EN 60945

ELECTROMAGNETIC COMPATIBILITY

Compliance to EMCD, immunity/emission	IEC 60945/EN 60945

[1] *When the MRU is exposed to a combined two-axes sinusoidal angular motion with 10 minutes duration.*

[2] *When the MRU is stationary over a 30-minute period.*

November 2018

Specifications subject to change without any further notice.

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KONGSBERG

SEA-BIRD SCIENTIFIC

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SBE 19plus V2
SeaCAT Profiler CTD

The SBE 19plus V2 SeaCAT measures conductivity, temperature, and pressure at 4 scans/sec (4 Hz) and provides high accuracy and resolution, reliability, and ease-of-use for a wide range of research, monitoring, and engineering applications. Pump-controlled, T-C ducted flow minimizes salinity spiking caused by ship heave and allows for slow descent rates without slowing sensor responses, improving dynamic accuracy and resolving small scale structure in the water column. The 19plus V2 supports numerous auxiliary sensors (dissolved oxygen, pH, turbidity, fluorescence, oil, PAR, nitrates, altimeter, etc.) with six A/D channels and one RS-232 data channel. Data is recorded in memory and can also be output in real-time in engineering units or raw HEX. Nine alkaline D-cells provide power for up to 60 hours of profiling.

The 19plus V2 is commonly used autonomously, recording data internally. It can also provide real-time acquisition and display over short cables via the RS-232 interface; a load-bearing cable for hand-hauled, real-time profiling is available. External power and communication over 10,000 m of single-core, armored cable can be provided with the SBE 36 Deck Unit and PDIM. The 19plus V2 is easily integrated with a Sea-Bird Water Sampler; both real-time and autonomous auto-fire operations are possible.

In moored mode, the 19plus V2 records data at user-programmable intervals. This is easily configured with setup commands and by removing the profiling T-C Duct and installing optional anti-foulant devices.

Shown with optional cage, SBE 5P pump, & SBE 43 DO sensor

Features

- Conductivity, Temperature, Pressure, and up to seven auxiliary sensors.
- User-programmable mode: profiling at 4 Hz, or moored sampling at user-programmable intervals.
- RS-232 interface, internal memory, and internal alkaline batteries (can be powered externally).
- Pump-controlled, T-C ducted flow to minimize salinity spiking.
- Depths to 600, 7000, or 10,500 m.
- Seasoft® V2 Windows software package (setup, data upload, real-time data acquisition, and data processing).
- Next generation of the SeaCAT family, field-proven since 1987.
- Five-year limited warranty.

Components

- Unique internal-field conductivity cell permits use of T-C Duct, minimizing salinity spiking.
- Aged and pressure-protected thermistor has a long history of exceptional accuracy and stability.
- Pressure sensor with temperature compensation is available in eight strain-gauge ranges (to 7000 m) and eleven Digiquartz® ranges (to 10,500 m). *Note: Sampling rate 2 Hz when Digiquartz installed.*
- Pump runs continuously (profiling mode), providing correlation of CTD and plumbed auxiliary sensor measurements.

www.seabird.com sales@seabird.com +1 425-643-9866

SBE Sea-Bird Electronics

SEA·BIRD SCIENTIFIC

sea-birdscientific.com
info@sea-birdscientific.com

SBE 19plus V2
SeaCAT Profiler CTD

The SBE 19plus V2 SeaCAT measures conductivity, temperature, and pressure at 4 scans/sec (4 Hz) and provides high accuracy and resolution, reliability, and ease-of-use for a wide range of research, monitoring, and engineering applications. Pump-controlled, T-C ducted flow minimizes salinity spiking caused by ship heave and allows for slow descent rates without slowing sensor responses, improving dynamic accuracy and resolving small scale structure in the water column. The 19plus V2 supports numerous auxiliary sensors (dissolved oxygen, pH, turbidity, fluorescence, oil, PAR, nitrates, altimeter, etc.) with six A/D channels and one RS-232 data channel. Data is recorded in memory and can also be output in real-time in engineering units or raw HEX. Nine alkaline D-cells provide power for up to 60 hours of profiling.

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Shown with optional cage, SBE 5P pump, & SBE 43 DO sensor

Features

- Conductivity, Temperature, Pressure, and up to seven auxiliary sensors.
- User-programmable mode: profiling at 4 Hz, or moored sampling at user-programmable intervals.
- RS-232 interface, internal memory, and internal alkaline batteries (can be powered externally).
- Pump-controlled, T-C ducted flow to minimize salinity spiking.
- Depths to 600, 7000, or 10,500 m.
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- Pump runs continuously (profiling mode), providing correlation of CTD and plumbed auxiliary sensor measurements.

www.seabird.com sales@seabird.com +1 425-643-9866

SBE Sea-Bird Electronics

Specification sheet

VEGAPULS C 23

Two-wire 4 … 20 mA/HART

Radar sensor for continuous level measurement

Technical data

Measuring range up to	30 m (98.43 ft)
Deviation	≤ 2 mm
Beam angle	4°
Measuring frequency	W-band (80 GHz technology)
Output signal	4 … 20 mA/HART
Mounting connection	Thread G1, 1 NPT, R1
Process pressure	-1 … +3 bar (-100 … +300 kPa/-14.5 … +43.51 psig)
Process temperature	-40 … +80 °C (-40 … +176 °F)
Ambient temperature	-40 … +80 °C (-40 … +176 °F)
Bluetooth standard	Bluetooth 5.0 (downward compatible to Bluetooth 4.0 LE)
Effective range Bluetooth typ.	25 m (82 ft)
Operating voltage	12 … 35 V DC
Protection rating	IP66/IP68 (3 bar, 24 h) acc. to IEC 60529, Type 4X/6P acc. to UL 50

Application area

The VEGAPULS C 23 is the ideal radar sensor for non-contact level measurement with high accuracy requirements in all standard applications where a high degree of protection and particularly good signal focusing are required. It is particularly suitable for level measurement in water treatment, in pumping stations and rain overflow basins, for flow measurement in narrow channels, for level monitoring in rivers and lakes and for many other industrial applications.

The sensor is suitable both for measuring liquids and for use on bulk solids silos or bulk solids containers.

Your benefit

- Exact measuring results independent of product, process and ambient conditions
- Unaffected by vessel installations due to very good signal focusing
- Maintenance-free operation due to non-contact 80 GHz radar technology

Function

The sensor emits a continuous radar signal through the antenna. The emitted signal is reflected by the medium and received as an echo by the antenna.

The frequency difference between the emitted and received signal is proportional to the distance and depends on the filling height. The determined filling height is converted into a respective output signal and output as measured value.

Materials

The wetted parts of the instrument are made of PVDF. The connection cable is PUR insulated.

A complete overview of the available materials and seals can be found on our homepage under " *Products*" and " *Configure & Order*".

Housing versions

The housing is optimized for applications in the water/waste water industry and manufactured of PVDF. Due to the encapsulated cable gland, protection rating IP66/IP68 (3 bar) is achieved.

Electronics versions

The instruments are available in different electronics versions. Apart from the two-wire electronics with 4 … 20 mA/HART, two digital versions with SDI-12 and Modbus/Levelmaster protocol are possible.

Approvals

Worldwide approvals are available for VEGA instruments, e.g. for use in hazardous areas, on ships or in hygienic applications.

The technical data in the respective safety instructions are valid for approved instruments (e.g. with Ex approval). In some cases, these data can differ from the data listed herein.

You can find detailed information on the existing approvals with the appropriate product on our homepage.

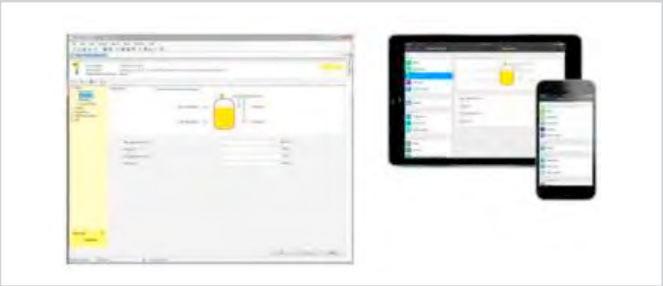
Adjustment

Adjustment via the signal cable
The adjustment of the instrument is carried out via the interface adapter VEGACONNECT and a PC with the adjustment software PACTware and corresponding DTM.

Wireless adjustment via Bluetooth
The Bluetooth version of the device enables wireless connection to smartphones/tablets (iOS/Android) or Windows PCs.

Wireless connection to standard operating devices

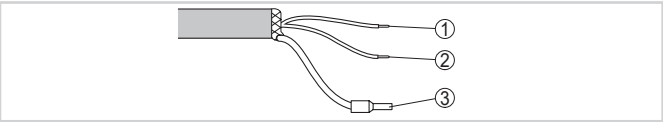
Operation is via a free app from the " *Apple App Store*", the " *Google Play Store*" or the " *Baidu Store*". Alternatively, adjustment can also be carried out via PACTware/DTM and a Windows PC.



Adjustment via PACTware or app

Adjustment via remote systems
Further adjustment options are possible via a HART Communicator as well as manufacturer-specific programs such as AMS™ or PDM.

Electrical connection

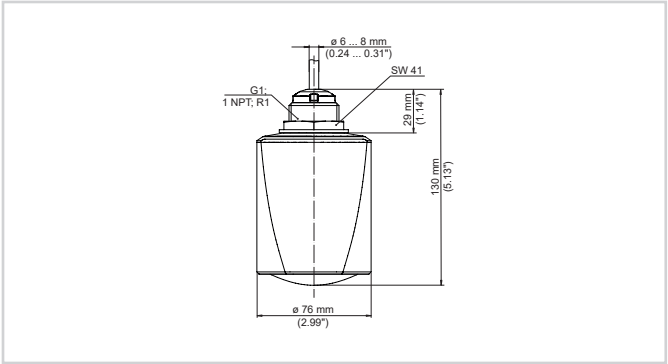


Wire assignment in permanently connected connection cable

1 *Brown (+) to voltage supply or to the processing system*
2 *Blue (-) to voltage supply or to the processing system*
3 *Shielding*

You can find details on electrical connection in the instrument operating instructions at www.vega.com/downloads.

Dimensions



Dimensions VEGAPULS C 23

Mounting accessories

For the VEGAPULS C 23 the suitable mounting accessories for ceiling or wall mounting is available.

Example mounting strap - wall mounting with adjustable sensor holder

You can find further information on the mounting accessory on our homepage.

Information

You can find further information on the VEGA product line on our homepage.

In the download section on our homepage you'll find operating instructions, product information, brochures, approval documents, instrument drawings and much, much more.

Software accessories such as the current device software and the appropriate operating software are also available there.

Instrument selection

On our homepage under " *Products*" you can select the suitable measuring principle and instrument for your application.

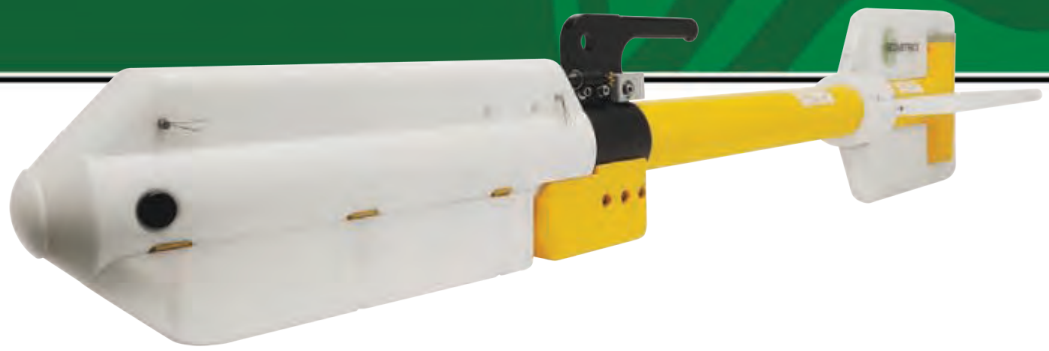
There you will also find detailed information on the available device versions.

Contact

You can find your personal contact person at VEGA on our homepage under " *Contact*".

G-882
Cesium Marine Magnetometer

GEOMETRICS
Innovation • Experience • Results



Geometrics' G-882 Marine Magnetometer is the leading marine system in the industry with over 1,000 systems sold! The G-882 is the only system that meets the standards for UXO clearance in the North Sea.

This very high-resolution Cesium vapor marine magnetometer is low in cost, small in size, and offers flexibility for professional surveys in shallow or deep water. Use your personal computer with our MagLog™ software to log, display and print GPS position and magnetic field data.

The system directly interfaces to all major side-scan manufacturers for tandem tow configurations. Being small and lightweight, it is easily deployed and operated by one person. But add several streamlined weight collars and the system can quickly weigh more than 100 lbs for deep-tow applications.

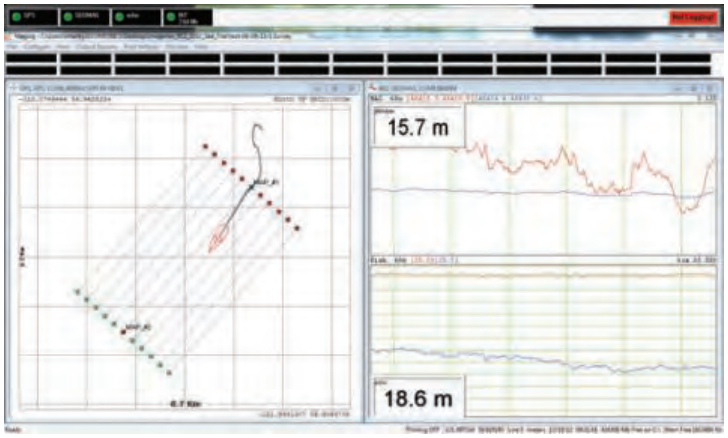
This marine magnetometer system is particularly well-suited for the detection and mapping of all sizes of ferrous objects. This includes anchors, chains, cables, pipelines, ballast stones and other scattered shipwreck debris, munitions of all sizes (UXO), aircraft, engines and any other object with a magnetic expression. The G-882 is also perfect for geological studies. Its high sensitivity and high sample rates are maintained for all applications.

Objects as small as a 5-inch screwdriver are readily detected provided that the sensor is close to the seafloor and within practical detection range (refer to table on back).

FEATURES & BENEFITS

- **Cesium Vapor High Performance** – Highest detection range and high probability of detecting all sized ferrous targets.
- **Streamlined Design for Tow Safety** – Low probability of fouling in fishing lines or rocks. Rugged fiber-wound fiberglass housing.
- **Sample at up to 20Hz** – Unparalleled data density while also covering larger areas per day.
- **Sensor can be Rotated for Optimal Signal** – Can be used worldwide.
- **Easy Portability and Handling** – No winch required. Built-in easy-carry handle. Operable by a single man; only 44 lb with 200 ft cable.
- **Combine Multiple Systems for Increased Coverage** – Internal CM-221 Mini-counter provides multi-sensor sync and data concatenation, allowing side-by-side coverage which maximizes detection of small targets and reduces noise.
- **Export Version Available** – Use anywhere in the world without need for an export license (except embargoed countries). See specifications.

SPECIFICATIONS | G-882 Cesium Marine Magnetometer



MagLogLite™ Data Logging software is included with each magnetometer and allows recording and display of data and position with automatic anomaly detection. Additional software options include: MagLog Pro™, advanced logging software; MagMap™, a plotting and contouring package; and MagPick™ post-acquisition processing software.

MAGNETOMETER / ELECTRONICS

Operating Principle: Self-oscillating split-beam Cesium vapor (non-radioactive).

Operating Range: 20,000 to 100,000 nT.

Operating Zones: The earth's field vector should be at an angle greater than 10° from the sensor's equator and greater than 6° away from the sensor's long axis. Automatic hemisphere switching.

Noise: <0.004 nT/$\sqrt{\text{Hz}}_{\text{rms}}$. (SX (export) version: <0.02 nT/$\sqrt{\text{Hz}}_{\text{rms}}$).

Max Sample Rate: 20 Hz.

Heading Error: < 1 nT (over entire 360° spin).

Output: RS-232 at 1,200 to 19,200 Baud.

Power: 24 to 32 VDC, 0.75 A at power-on and 0.5 A thereafter.

MECHANICAL

Sensor Fish

DIA: 7 cm; L: 137 cm (2.75x54 in) (with fin assembly).
Weight: 18 kg (40 lb).

Includes sensor and electronics and 1 main weight. Additional collar weights are 6.4 kg (14 lb) each; total of 5 capable.

Tow Cable

DIA: 12 mm; L: 800 m (0.47 in x 2,625 ft).
Weight: 7.7 kg (17 lb) with terminations.
Break strength: 1,630 kg (3,600 lb)
Bend diameter: 30 cm (12 in).

Typical Detection Range for Common Objects

1.	Ship: 1000 tons	0.5 to 1 nT at 800 ft (244 m)
2.	Anchor: 20 tons	0.8 to 1.25 nT at 400 ft (120 m)
3.	Automobile	1 to 2 nT at 100 ft (30 m)
4.	Light Aircraft	0.5 to 2 nT at 40 ft (12 m)
5.	Pipeline (12 inch)	1 to 2 nT at 200 ft (60 m)
6.	Pipeline (6 inch)	1 to 2 nT at 100 ft (30 m)
7.	Iron: 100 kg	1 to 2 nT at 50 ft (15 m)
8.	Iron: 100 lb	0.5 to 1 nT at 30 ft (9 m)
9.	Iron: 10 lb	0.5 to 1 nT at 20 ft (6 m)
10.	Iron: 1 lb	0.5 to 1 nT at 10 ft (3 m)
11.	Screwdriver: 5-inch	0.5 to 2 nT at 12 ft (4 m)
12.	Bomb: 1000 lb	1 to 5 nT at 100 ft (30 m)
13.	Bomb: 500 lb	0.5 to 5 nT at 50 ft (16 m)
14.	Grenade	0.5 to 2 nT at 10 ft (3 m)
15.	Shell: 20 mm	0.5 to 2 nT at 5 ft (1.8 m)

ENVIRONMENTAL

Operating Temperature: -35°C to +50°C (-30°F to +122°F).

Storage Temperature: -45°C to +70°C (-48°F to +158°F).

Altitude: 9,000 m (30,000 ft).

Depth: 4,000 psi (2,730 m; 8956 ft).

Water Tight: O-Ring sealed for up to 4,000 psi depth operation.

ACCESSORIES

Standard: Operation manual, shipping/storage container, ship kit with tools and hardware, power supply, MagLogLite™, MagMap™ and MagPick™ processing software, depth transducer, altimeter.

Optional: Steel tow cable to 6,000 m (19,600 ft) with telemetry, longitudinal or transverse gradiometer, plastic Pelican® case, MagLogPro™, collar weights.

GEOMETRICS
Innovation • Experience • Results

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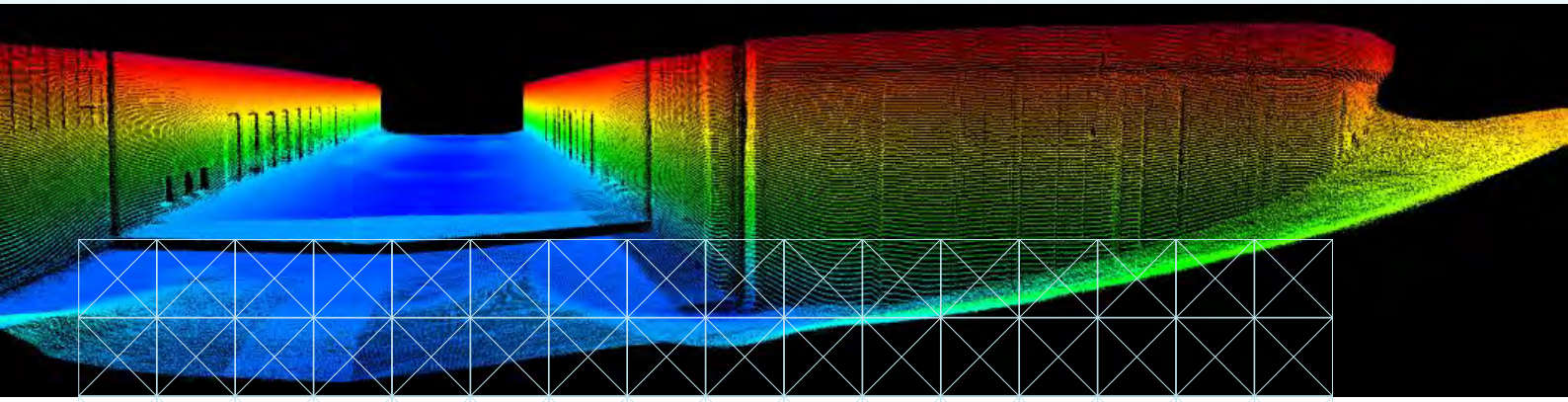
EM® 2040 MKII

KONGSBERG



MULTIBEAM ECHO SOUNDER

The EM 2040 MKII is a true wide band high resolution shallow water multibeam echo sounder, an ideal tool for any high resolution mapping and inspection application. With the release of the EM 2040 MKII series Kongsberg Maritime has upgraded the hardware and software to increase the swath and improve the data quality of our EM 2040 series.

Key facts

The operating frequency range of the EM 2040 MKII is 200 to 400 kHz. The operator can on the fly choose the best operating frequency for the application: 300 kHz for near bottom, 200 kHz for deeper waters and 400 kHz for very high resolution inspection. Due to the large operating bandwidth, the system has an output sample rate up to 60 kHz. The system can effectively operate with very short pulse lengths, the shortest pulse being 14 microseconds giving a raw range resolution (CT/2) of 10.5 mm.

By utilizing both CW and FM chirp pulses, the system can achieve long range capability with a high resolution giving the system a maximum depth range in cold ocean water of 600 m at 200 kHz and a swath width up to 900m.

The angular coverage for the 200 and 300 kHz is up to 170°, with coverage up to 7.5 times water depth on a flat bottom. For a dual transducer system, 200° angular coverage or 10 times the water depth is achieved on a flat bottom.

As an option the EM 2040 MKII can be delivered with dual swath capability, allowing a sufficient sounding density to meet survey coverage standards along track while maintaining a high vessel speed.

Components

The EM 2040 MKII is a modular system, fully prepared for upgrading to cater for more demanding applicatons. The basic system has four units: a transmit transducer, a receive transducer, a processing unit and a hydrographic workstation.

The EM 2040 MKII receiver is 0.7° and is delivered with a 0.4° or 0.7° transmitter(s). The transmit fan is divided into three sectors pinging simultaneously at separate frequencies ensuring a strong and beneficial dampening of multibounce interference.

A single transmitter with dual receiver setup fully exploits the unique angular coverage of our three-sector transmitter for full 200° angular coverage per ping. The specialised dual transmitter and receiver setup is ideal where mounting requires a large separation of receivers, where mounting the transmitter at the keel is not an option or for ROV pipeline surveying and free span detection. This configuration transmits on a single sector per transmitter with selectable frequency in steps of 10 kHz from 200 to 400 kHz.

The standard depth rating of the EM 2040 MKII transducers is 6000 m, making it ideal for operation on subsea vehicles such as ROVs or AUVs.

443810 /A March 2019

FEATURES

- High resolution
- Wide frequency range
- FM chirp
- Roll, pitch and yaw stabilisation
- Nearfield focusing - both on transmit and receive
- Short pulse lengths, large bandwidth
- Seabed image
- Depth rated to 6000 m
- Easy to install

Options:

- Water column logging
- Water column display
- Extra detections
- Dual swath
- Dual RX
- Dual TX

TECHNICAL SPECIFICATIONS

Frequency range	200 to 400 kHz
Max ping rate	50 Hz
Swath coverage sector	Up to 170° (single receiver) / 200° (dual receiver)
Beam patterns	Equiangular, equidistant and high density
No. of beams per ping	400 (Single RX)/800 (Single RX, Dual Swath)/1600 (Dual RX, Dual Swath)
Roll stabilised beams	± 15°
Pitch stabilised beams	± 10°
Yaw stabilised beams	± 10°

Coverage example for EM 2040 with bottom type rock (BS = - 10 dB), NL = 45 dB, FM mode

Operating mode	Cold ocean water			Cold fresh water		
EM 2040-04:	**Max depth**	**Max coverage single RX**	**Max coverage dual RX**	**Max depth**	**Max coverage single RX**	**Max coverage dual RX**
200 kHz	635 m	920 m	980 m	1360 m	1990 m	2110 m
300 kHz	480 m	670 m	760 m	740 m	1100 m	1270 m
400 kHz	315 m	410 m	430 m	430 m	570 m	610 m
EM 2040-07:						
200 kHz	600 m	880 m	930 m	1300 m	1870 m	2000 m
300 kHz	465 m	640 m	725 m	700 m	1050 m	1200 m
400 kHz	300 m	385 m	410 m	375 m	540 m	570 m

Pulse lengths	200 kHz mode		300 kHz mode		400 kHz mode	
	CW	**FM**	**CW**	**FM**	**CW**	**FM**
Normal mode	38, 108 & 324 µs	3 & 12 ms	38, 108 & 324 µs	2 & 6 ms	27, 54 & 108 µs	N/A
Single sector mode	19, 38 & 81 µs	1.5 ms	19, 38 & 81 µs	1.5 ms	14, 27 & 54 µs	N/A
	200 - 400 kHz CW in 10 kHz step			**200 - 400 kHz FM in 10 kHz step**		
Dual TX model	14, 27, 54, 135, 324 & 918 µs			3 & 12 ms		

Max no. of beams per ping	Single swath	Dual swath
Single RX	400	800
Dual RX	800	1600

	Beamwidth			Physical dimensions (excluding connectors and mounting arrangements)	
	200 kHz	**300 kHz**	**400 kHz**	**Dimensions**	**Weight**
TX EM 2040-04	0.7°	0.5°	0.4°	727 x 142 x 150 mm (LxWxH)	45 kg
TX EM 2040-07	1.5°	1°	0.7°	407 x 142 x 150 mm (LxWxH)	23 kg
RX	1.5°	1°	0.7°	407 x 142 x 136 mm (LxWxH)	22 kg
Processing Unit (2U for 19" rack)*				482.5 x 424 x 88.6 mm (WxDxH)	10.5 kg
Portable Processing Unit (IP67)				370 x 390 x 101 mm (WxDxH)	10.5 kg

Laptop, HWS and monitor can be delivered on request.

Specifications subject to change without any further notice.

Front page: Curtesy of Port of London.

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KONGSBERG

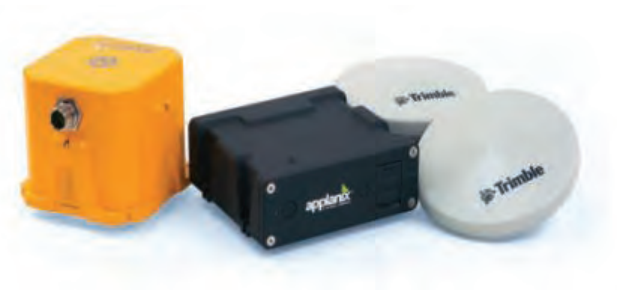
POS MV™

WAVEMASTER II SPECIFICATIONS

MAXIMIZE YOUR ROI WITH POS MV WAVEMASTER II

POS MV WaveMaster II is a user-friendly, turnkey system designed and built to provide accurate attitude, heading, heave, position, and velocity data of your marine vessel and onboard sensors. POS MV is proven in all conditions, and is the georeferencing and motion compensation solution of choice for the hydrographic professional.

POS MV blends GNSS data with angular rate and acceleration data from an IMU and heading from the GPS Azimuth Measurement System (GAMS) to produce a robust and accurate full six degrees-of-freedom position and orientation solution.



PERFORMANCE SUMMARY - POS MV WAVEMASTER II ACCURACY[1]

	DGPS	Fugro Marinestar®	IARTK	POSPac MMS PPP	POSPac MMS IAPPK	During GNSS Outage
Positioning	0.5 - 2 m[2]	Horizontal: 10 cm 95% Vertical: 15 cm 95%	Horizontal: +/- (8 mm + 1 ppm x baseline length)[3] Vertical: +/- (15 mm + 1 ppm x baseline length)[3]	Horizontal: < 0.1 m Vertical: < 0.2 m	Horizontal: +/- (8 mm + 1 ppm x baseline length)[3] Vertical: +/- (15 mm + 1 ppm x baseline length)[3]	~ 9 m for 60 s outage(RTK) ~ 3 m for 30 s outage(RTK) ~ 2 m for 60 s outage(IAPPK)
Roll & Pitch[4]	0.03˚	0.02°	0.02°	< 0.02°	0.015°	0.04°
Heading[4]	0.015° with 4 m baseline 0.03° with 2 m baseline	-	-	-	-	< 2° per hour degradation (negligible for outages <60 s)
Heave TrueHeave™	5 cm or 5%[5] 2 cm or 2%[6]	-	-	-	-	5 cm or 5%[5] 2 cm or 2%[6]

PCS OPTIONS

COMPONENT	DIMENSIONS	WEIGHT	TEMPERATURE	HUMIDITY	POWER
Rack Mount PCS	L = 442 mm, W = 356 mm, H = 46 mm	3.9 kg	-20 ºC to +70 ºC	10 - 80% RH	AC 120/230 V, 50/60 Hz, auto-switching 40 W
Small Form Factor PCS	L = 167 mm, W = 185 mm, H = 68 mm	2.5 kg	-20 ºC to +60 ºC	0- 100% RH	DC 10-34 V, 35 W (peak)

INERTIAL MEASUREMENT UNIT (IMU)

ENCLOSURE	DIMENSIONS	WEIGHT	TEMPERATURE	IP RATING
Between Decks	L = 158 mm, W = 158 mm, H = 124 mm	2.5 kg	-40 ºC to +60 ºC	IP65
Submersible	Ø100 mm (base plate Ø132 mm) X 104 mm[7]	2.7 kg	-40 ºC to +60 ºC	IP68

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)

COMPONENT	DIMENSIONS	WEIGHT	TEMPERATURE	HUMIDITY
GNSS Antenna	Ø178 mm, W = 73 mm	0.45 kg	-50 ºC to +70 ºC	0-100% RH

[1] 1 sigma unless otherwise stated
[2] Depending on quality of differential corrections
[3] Assumes 1 m IMU-GNSS antenna offset
[4] No range limit
[5] Whichever is greater, for periods of 20 seconds or less
[6] Whichever is greater, for periods of 35 seconds or less
[7] Height excludes connector

1. ETHERNET INPUT OUTPUT

Ethernet	(10/100 base-T)
Parameters	Time tag, status, position, attitude, heave, velocity, track and speed, dynamics, performance metrics, raw IMU data, raw GNSS data
Display Port	Low rate (1 Hz) UDP protocol output
Control Port	TCP/IP input for system commands
Primary Port	Real-time (up to 200 Hz) UDP protocol output
Secondary Port	Buffered TCP/IP protocol output for data logging to external device

2. SERIAL RS232 INPUT OUTPUT

5 COM Ports	User assignable to: NMEA output (0-5), Binary output (0-5), Auxiliary GNSS input (0-2), Base GNSS correction input (0-2)

3. NMEA ASCII OUTPUT

Parameters	NMEA Standard ASCII messages: Position ($INGGA), Heading ($INHDT), Track and Speed ($INVTG), Statistics ($INGST), Attitude ($PASHR, $PRDID), Time and Date ($INZDA, $UTC)
Rate	Up to 50 Hz (user selectable)
Configuration	Output selections and rate individually configurable on each assigned com port

4. HIGH RATE ATTITUDE OUTPUT

Parameters	User selectable binary messages: attitude, heading, speed
Rate	Up to 200 Hz (user selectable)
Configuration	Output selections and rate individually configurable on each assigned com port

5. AUXILIARY GNSS INPUTS

Parameters	NMEA Standard ASCII messages: $GPGGA, $GPGST, $GPGSA, $GPGSV
Uses Aux input with best quality	
Rate	1 Hz

6. BASE GNSS CORRECTION INPUTS

Parameters	RTCM V2.x, RTCM V3.x, CMR and CMR+, CMRx input formats accepted. Combined with raw GNSS observables in navigation solution
Rate	1 Hz

7. DIGITAL I/O

1PPS	1 pulse-per-second Time Sync output, normally high, active low pulse
Event Input (2)	Time mark of external events. TTL pulses > 1 msec width, rising or falling edge, max rate 200 Hz

8. USER SUPPLIED EQUIPMENT

- PC for POSView Software (Required for configuration): Pentium 90 processor (minimum), 16 MB RAM, 1 MB free disk space, Ethernet adapter (RJ45 100 base T), Windows 7 or Windows 8
- PC for POSPac MMS Post-processing Software: Pentium III 800Mhz or equivalent (minimum), 512 MB RAM, 400 MB free disk space, USB Port (for Security Key if specified, not required for network license), Windows 7 or Windows 8

Scan the QR Code on your mobile device to access information on POS MV

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Trimble BX992

DUAL ANTENNA RECEIVER WITH INTEGRATED INERTIAL NAVIGATION SYSTEM AND MSS BAND DEMODULATOR

GNSS AND INERTIAL TIGHT INTEGRATION

Taking advantage of Trimble's expertize in both GNSS and Inertial technology the Trimble® BX992 module has been designed for applications requiring continuous centimeter accuracy in a compact package. By integrating inertial sensors on the same module, robust high accuracy positions and orientations are produced in all environments.

TRIMBLE MAXWELL™ 7 TECHNOLOGY

The Trimble BX992 supports triple frequency for the GPS, GLONASS, BeiDou and Galileo constellations. As the number of satellites in the constellations grows the BX992 is ready to take advantage of the additional signals. This delivers the quickest and most reliable RTK initializations for centimeter positioning. For applications that do not require centimeter accuracy the BX992 integrated GNSS-Inertial engine also delivers high accuracy GNSS, DGNSS positions in the most challenging environments such as urban canyons. With the latest Trimble Maxwell™ 7 Technology, the BX992 provides:

- 2 x 336 Tracking Channels
- Trimble Everest Plus™ multipath mitigation
- Advanced RF Spectrum Monitoring and Analysis
- Proven low-elevation tracking technology

With the option of utilizing OmniSTAR or RTX services, the BX992 delivers varying levels of performance down to centimeter-level without the use of a base station.

ROBUST CENTIMETER ACCURATE SOLUTIONS

The Trimble BX992 integrates the latest in precision inertial sensors in a compact package. With the BX992 you are buying a robust navigation solution, not just a GNSS receiver.

Key features include:

- High update rate position and orientation solutions
- Dual antenna for rapid heading alignment
- Continuous positioning in GNSS denied environments
- Lever arm calculation from antenna to navigation point of interest
- Robust Moving Baseline RTK for precision landing on moving platforms

TRIMBLE PROPOINT ENGINE

The Trimble BX992 is now available with the ProPoint Engine. For optimal performance in GNSS degraded conditions the ProPoint Engine delivers premium accuracy, availability and integrity for your application.

FLEXIBLE INTERFACING

The Trimble BX992 was designed for easy integration and rugged dependability. Customers benefit from the Ethernet connectivity available on the board, allowing high speed data transfer and configuration via standard web browsers. USB, CAN and RS-232 are also supported. Just like other Trimble embedded technologies, easy to use software commands simplify integration and reduce development times. An intuitive 3D interactive graphical web page allows easy input of lever arms. Dynamic and graphic models for various vehicle types can also be selected.

Different configurations of the module are available. All features are password-upgradeable, allowing functionality to be upgraded as your requirements change.

Key Features

- Trimble Maxwell™ 7 technology
- Trimble ProPoint™ positioning engine (Optional)
- Onboard high accuracy inertial sensor package integrated with GNSS for precise position and orientation
- 336 channels for multi-constellation GNSS support
- Trimble RTX and OmniSTAR Support
- Compact design for mobile applications
- Flexible RS232, USB and Ethernet interfacing
- Centimeter-level position accuracy
- Advanced RF spectrum monitoring
- Rugged IP67 enclosure

DATASHEET

Trimble BX992 Enclosure

TECHNICAL SPECIFICATIONS[1]

- Trimble Maxwell™ 7 Technology
- Trimble ProPoint™ positioning engine (optional)
- Onboard Advanced MEMS inertial sensors
- Position Antenna based on 336 Channel Maxwell 7 chip:
  - GPS: L1 C/A, L2E, L2C, L5
  - BeiDou: B1, B2, B313
  - GLONASS: L1 C/A, L2 C/A, L3 CDMA[14]
  - Galileo[2]: E1, E5A, E5B, E5AltBOC, E6[14]
  - IRNSS: L5
  - QZSS: L1 C/A, L1 SAIF,L1C, L2C, L5
  - SBAS: L1 C/A, L5
  - MSS L-Band: OmniSTAR, Trimble RTX
- Vector Antenna based on second 336 Channel Maxwell 7 chip:
  - GPS: L1 C/A, L2E, L2C, L5
  - BeiDou: B1, B2, B3
  - GLONASS: L1 C/A, L2 C/A, L3 CDMA[14]
  - Galileo[2]: E1, E5A, E5B, E5AltBOC, E6[14]
  - IRNSS: L5
  - QZSS: L1 C/A, L1 SAIF, L1C, L2C, L5, LEX
- High precision multiple correlator for GNSS pseudorange measurements
- Trimble Everest Plus™ multipath mitigation
- Supports Trimble CenterPoint RTX, Trimble FieldPoint RTX (only with ProPoint Engine) and Trimble RangePoint RTX (only with ProPoint Engine)[15]
- Advanced RF Spectrum Monitoring and Analysis
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Proven Trimble low elevation tracking technology
- Reference outputs/inputs:
  - CMR, CMR+, sCMRx, RTCM 2.1, 2.2, 2.3, 3.0, 3.1[12], 3.2
- Navigation Outputs:
  - ASCII: NMEA-0183 GSV, AVR, RMC, HDT, VGK, VHD, ROT, GGK, GGA, GSA, ZDA, VTG, GST, PJT,PJK, BPQ, GLL, GRS, GBS and Binary: Trimble GSOF, NMEA2000
- 1 Pulse Per Second Output
- Event Marker Input Support
- Supports Fault Detection & Exclusion (FDE), Receiver Autonomous Integrity Monitoring (RAIM)

COMMUNICATION

- 1 USB 2.0 Device port
- 1 LAN Ethernet port:
  - Supports links to 10BaseT/100BaseT auto-negotiate networks
  - All functions are performed through a single IP address simultaneously—including web GUI access and raw data streaming
  - Network Protocols supported:
    - > HTTP (web GUI)
    - > NTP Server
    - > NMEA, GSOF, CMR over TCP/IP or UDP
    - > NTripCaster, NTripServer, NTripClient
    - > mDNS/uPnP Service discovery
    - > Dynamic DNS
    - > eMail alerts
    - > Network link to Google Earth
    - > Support for external modems via PPP
    - > RNDIS Support
- 2 x RS232 ports:
  - Baud rates up to 460,800
- 1 CAN Port
- Control Software:
  - HTML web browser, Internet Explorer, Firefox, Safari, Opera, Google Chrome

PERFORMANCE SPECIFICATIONS

Time to First Fix (TTFF)[7]
- Cold Start[8] ..... <45 seconds
- Warm Start[9] ..... <30 seconds
- Signal Re-acquisition ..... <2 seconds

Velocity Accuracy[3,4]
- Horizontal ..... 0.007 m/sec
- Vertical ..... 0.020 m/sec

Maximum acceleration GNSS tracking ..... ±11 g

Inertial Sensors
- Maximum acceleration ..... ±6 g
- Maximum angular rate ..... ±350 deg/sec

Maximum Operating Limits[10]
- Velocity ..... 515 m/sec
- Altitude ..... 18,000 m
- RTK initialization time[3] ..... typically <8 seconds
- RTK initialization reliability[3] ..... >99.9 %
- Position Latency[5] ..... <20 ms

Maximum Position/Attitude Update Rate ..... 100 Hz

PHYSICAL AND ELECTRICAL CHARACTERISTICS

Size ..... 185 mm x 93 mm x 43 mm

Power ..... 9 VDC to 30 VDC
Typical 3.0 W (L1/L2 GPS + L1/L2 GLONASS)

Weight ..... 0.76 kg

Connectors
- I/O ..... D-sub DE9 and DA26
- GNSS Antenna ..... 2 x TNC (Female)

Antenna LNA Power Input
- Input voltage ..... 3.3 VDC to 5 VDC
- Maximum current ..... 400 mA

Minimum required LNA Gain ..... 32.0 dB

ENVIRONMENTAL CHARACTERISTICS[11]

Temperature
- Operating ..... –40 °C to +75 °C
- Storage ..... –55 °C to +85 °C

Vibration ..... MIL810F, tailored
Random 6.2 gRMS operating
Random 8 gRMS survival

Mechanical shock MIL810D
±40 g 10ms operating
±75 g 6ms survival

Operating Humidity ..... 5% to 95% R.H. non-condensing, at +60 °C

IP Rating IP67

ORDERING INFORMATION

Module Part Number X08567-XX

Module ..... Trimble BX992 GNSS available in a variety of configurations from L1 SBAS upwards

Evaluation Kit ..... Includes interface board, power supply

1 Trimble BX992 is available in a variety of software configurations. Specifications shown reflect full capability.
2 Developed under a License of the European Union and the European Space Agency.
3 May be affected by atmospheric conditions, signal multipath, and satellite geometry. Initialization reliability is continuously monitored to ensure highest quality.
4 1 sigma level, when using Trimble Zephyr 2/3 antennas, Add 1 ppm for RTK position accuracies.
5 At maximum output rate.
6 GPS only and depends on SBAS System performance. FAA WAAS accuracy specifications are <5 m 3DRMS.
7 Typical observed values.
8 No previous satellite (ephemerides / almanac) or position (approximate position or time) information.
9 Ephemerides and last used position known
10 As required by the U.S. Department of Commerce to comply with export licensing restrictions.
11 Dependent on appropriate mounting/enclosure design.
12 Input only network correction
13 The hardware of this product is designed for Beidou B3 compatibility (trial version) and its firmware will be enhanced to fully support such new signals as soon as the officially published signal interface control documentation (ICD) becomes available.
14 There is no public GLONASS L3 CDMA or Galileo E6 ICD. The current capability in the receivers is based on publicly available information. As such, Trimble cannot guarantee that these receivers will be fully compatible.
15 Detailed specifications are available at oemgnss.trimble.com
16 Also available in configurations with RTK accuracies limited to 10 and 30 centimeters.

Specifications subject to change without notice.

POSITIONING SPECIFICATIONS[3,4,16]

	Autonomous	SBAS	DGNSS	RTK	INS-Autonomous	INS-SBAS	INS-DGNSS	INS-RTK
No GNSS Outages								
Position (m)	1.00 (H) 1.50 (V)	0.50 (H) 0.85 (V)	0.25 (H) 0.50 (V)	0.008 (H) 0.015 (V)	1.00 (H) 1.50 (V)	0.50 (H) 0.85 (V)	0.40 (H) 0.60 (V)	0.05 (H) 0.03 (V)
Roll/Pitch (deg)	N/A	N/A	N/A	N/A	0.10	0.10	0.10	0.10
Heading (deg) on 2 m Baseline	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
10 second GNSS Outages								
Position (m)	N/A	N/A	N/A	N/A	1.50 (H) 1.80 (V)	1.20 (H) 1.20 (V)	1.00 (H) 1.00 (V)	0.30 (H) 0.20 (V)
Roll/Pitch (deg)	N/A	N/A	N/A	N/A	0.10	0.10	0.10	0.10
Heading (deg) on 2 m Baseline	N/A	N/A	N/A	N/A	0.50	0.50	0.50	0.50

Contact your local dealer today

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Europe/EMEA

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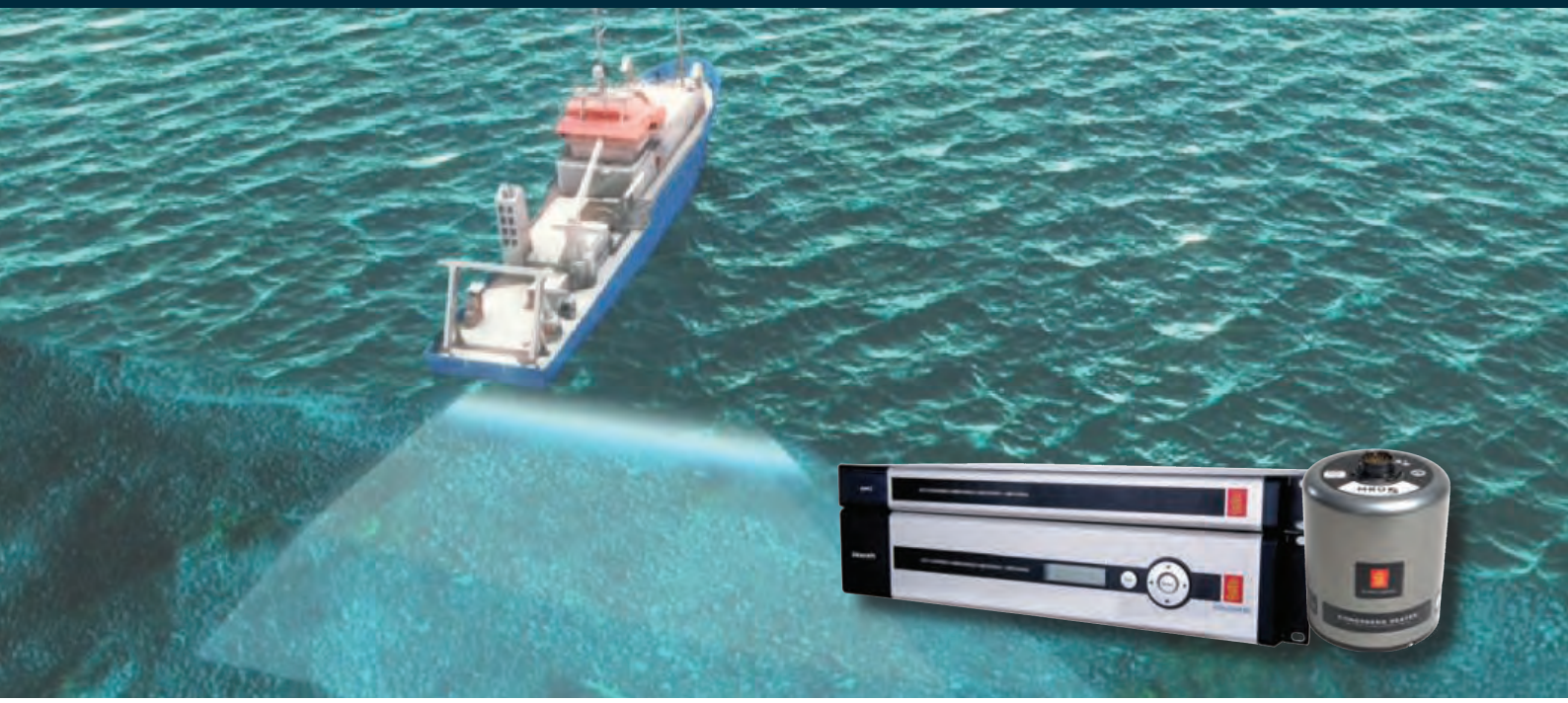
SEAPATH® 380 SERIES

KONGSBERG



THE ULTIMATE HEADING, ATTITUDE AND POSITIONING SENSOR

The Seapath 380 series uses a state-of-the-art dual frequency GNSS receiver, inertial technology and processing algorithms to provide surveyors with the best possible accuracy in position, attitude and timing. All available GPS, GLONASS, Galileo, Beidou and QZSS satellites are used in the position solution.

Function
The advanced Seapath navigation algorithms integrate RTK GNSS data with the inertial sensor data from the MRU. This gives the Seapath 380 unique advantages compared to stand-alone RTK products. The Seapath product's accurate roll, pitch and heading measurements allow the RTK antenna position to be referenced to any point on the vessel where accurate position and velocity are required. All data from Seapath have the same time stamp and the output is in real-time. Subdecimetre position accuracy can be achieved through download of satellite orbit and clock data from the internet and by post processing of satellite and IMU data.

Product range
The Seapath 380 series is delivered in the following product range:

- Seapath 380-3 with MRU 3 to 0.08° roll and pitch accuracy
- Seapath 380-H with MRU H to 0.03° roll and pitch accuracy
- Seapath 380-5 with MRU 5 to 0.02° roll and pitch accuracy
- Seapath 380-5+ with MRU 5+ MK II to 0.008° roll and pitch accuracy

Note: The MRU 3 model part of Seapath 380-3 has to be mounted in a fixed direction relative to the vessel and with the connector pointing up or down. Otherwise the performance of the Seapath 380-3 will be degraded.

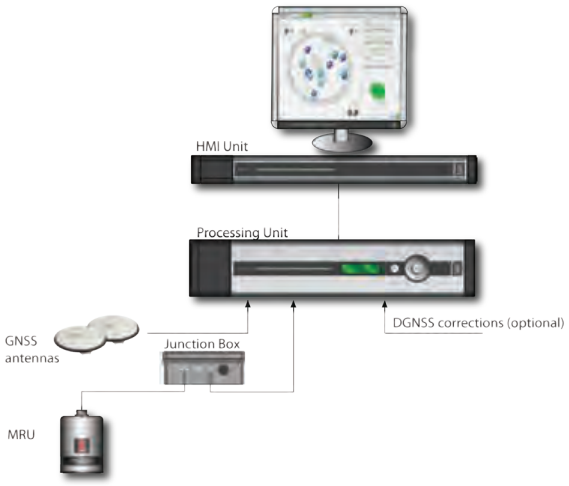
System configuration
This Seapath series is a two-module solution with a processing unit and a HMI unit connected via Ethernet. The processing unit run all critical computations independent from user interface on the HMI unit to ensure continuous and reliable operation. Multiple HMI units can be connected to the same processing unit in a networked architecture. The HMI units present the vessel motion in a clear and easy-to-understand format.
The Seapath is operated through the operator software installed on one or several HMI units. This software is used for performance monitoring, configuration and troubleshooting of the system.

Interfaces
The processing unit has eight RS-232/422 serial lines, four Ethernet LANs and three analog output channels. This makes distribution of Seapath data to various users onboard almost endless. DGNSS corrections of various quality and sources are input on a configurable RS-232/422 serial line or Ethernet.

Applications
By using standard DGNSS, Fugro XP2/G2/G4/G4+ and RTK corrections, the Seapath 380+ is a unique solution for hydrographic surveying and dredging work demanding the most comprehensive and accurate surveying data available.

FEATURES SEAPATH 380 SERIES

- 0.008° to 0.08° roll and pitch accuracy dependent on model
- 2 cm heave accuracy by use of the PFreeHeave® algorithms
- Meets IHO special order requirements
- Robust against GNSS dropouts due to the inertial sensor part of the product
- 555-channel dual frequency GPS/GLONASS/Galileo/Beidou receiver
- All available GPS/GLONASS/Galileo/Beidou/QZSS satellites are used in the positioning solution
- Includes ionospheric compensation methods to reduce Sun-spot 24 cycle effects
- Fugro XP2/G2/G4/G4+ corrections and RTK supported
- RTK corrections format RTCM and CMR supported
- Includes SBAS corrections (WAAS, EGNOS, MSAS, GAGAN)
- All data have the same time stamp and to an accuracy of 0.001 s to the actual measurement time
- Logging of raw satellite and IMU data possible



TECHNICAL SPECIFICATIONS

PERFORMANCE

Heading accuracy, Seapath 380-5+	0.04° RMS (4 m baseline) 0.065° RMS (2.5 m baseline)
Heading accuracy, Seapath 380-3, H, 5	0.05° RMS (4 m baseline) 0.075° RMS (2.5 m baseline)
Heave accuracy (real-time)	5 cm or 5 % whichever is highest
Heave accuracy (delayed signal)	2 cm or 2 % whichever is highest
Heave periods (real-time), except Seapath 380-3	1 to 25 seconds
Heave periods (real-time), Seapath 380-3	0 to 18 seconds
Heave periods (delayed signal)	1 to 50 seconds
Position accuracy DGNSS/GLONASS	0.5 m RMS or 1 m 95 % CEP
Position accuracy SBAS	0.5 m RMS or 1 m 95 % CEP
Position accuracy Fugro XP2/G2/G4/G4+	0.1 m RMS or 0.2 m 95 % CEP
Position accuracy RTK (X and Y)	1 cm + 1 ppm RMS
Position accuracy RTK (Z)	2 cm + 1 ppm RMS
Velocity accuracy	0.03 m/s (RMS)
Range to RTK reference station	10 km
UHF radio frequencies (radio not included in standard package)	430 to 470 MHz 390 to 430 MHz (optional)

DATA OUTPUTS

Communication ports	8 serial RS-232/RS-422 lines and 16 Ethernet UPD/IP ports
Data output interval	Programmable in 0.005-se steps and 1PPS pulse
Data update rate	Up to 200 Hz
Analog output	3 user configurable channels, +/- 10 Volt
1PPS signal accuracy	220 nsec

POWER SPECIFICATIONS

Processing Unit	100 to 240 V AC, 75 W (max)
HMI Unit	100 to 240 V AC, 40 W (max)
Monitor	100 to 240 V AC, 23 W (max)
IMU	24 V DC from Processing Unit
GNSS antenna	5 V DC from Processing Unit

Specifications subject to change without any further notice.

WEIGHTS AND DIMENSIONS

Processing Unit	5.4 kg, 89 x 485 x 357 mm
HMI Unit	3.8 kg, 44 x 485 x 330 mm
Monitor	3.8 kg, 383 x 380 x 170 mm
IMU	2.4 kg, 140 x Ø105 mm
GNSS antenna	0.5 kg, 69 x 185 mm

ENVIRONMENTAL SPECIFICATIONS

Operational temperature range

Processing and HMI Unit	-15 to +55 ºC
Monitor	+5 to +40 °C
IMU	-5 to +55 °C
GNSS antenna	-40 to +85 °C

Storage temperature range

Processing and HMI Unit	-20 to +70 ºC
Monitor	-20 to +60 ºC
IMU	-25 to +70 ºC
GNSS antenna	-40 to +85 ºC

Enclosure protection

Processing and HMI Unit	IP 21 (rear)
Monitor	IP 21 (rear)
IMU	IP 66
GNSS antenna	IP 66
Cables	IP 67
Connectors	IP 67

Mechanical

Vibration	IEC 60945/EN 60945

Electromagnetic compatibility

Compliance to EMCD, immunity/emission	IEC 60945/EN 60945

PRODUCT SAFETY

Compliance to LVD, standard used	IEC 60950-1/EN 60950-1

January 2018

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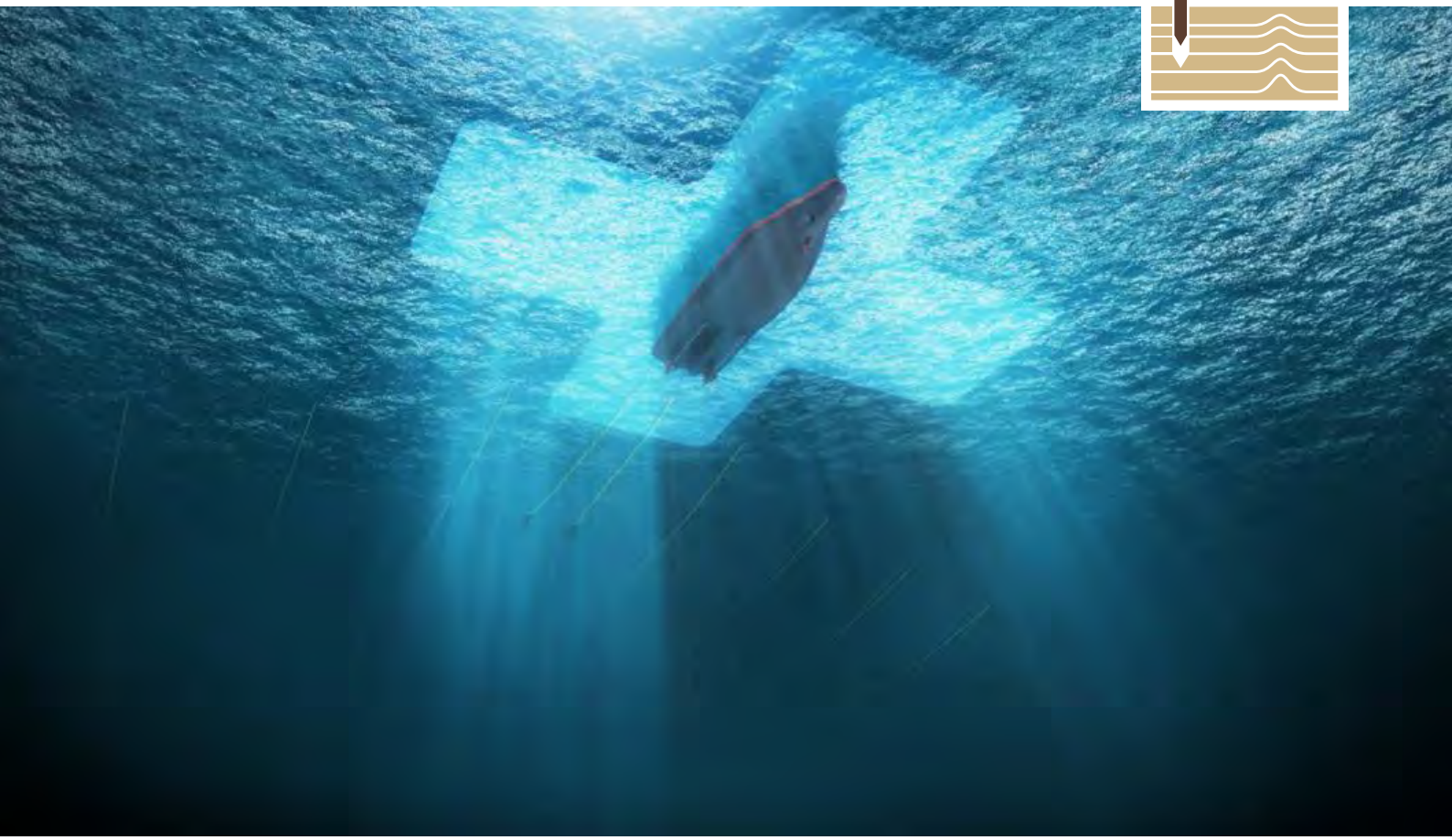


STARFIX. G2+
AN ULTRA HIGH ACCURACY SERVICE FOR OFFSHORE APPLICATIONS

Starfix.G2+ is a further advancement in the field of GNSS augmentation, which delivers ultra-high accuracy positioning to our customers.

The Starfix.G2+ is a further advancement in the field of GNSS augmentation, which delivers ultra-high accuracy positioning to our customers.

This new positioning service is based on advanced Integer Ambiguity Resolution (IAR) technology which is a further development of Precise Point Positioning (PPP). The basis of the IAR technique is the derivation an additional set of carrier-phase corrections from the Fugro reference station network (known as Uncalibrated Phase Delays or UPD).

The implementation of the UPD corrections in the Fugro StarPack software results in the carrier-phase ambiguities being resolved (fixed to integer values) resulting in a positioning accuracy at the centimetre level.

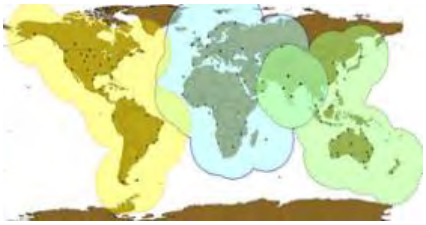
When the Starfix.G2+ service is enabled, the Fugro StarPack software will compute a centimetre Starfix.G2+ position. If for some reason the carrier-phase ambiguities cannot be resolved then the solution will fall back to a standard decimetre PPP solution.

The Starfix.G2+ corrections are supplied to our customers via L-Band satellite links to give global coverage.

The UPD Corrections are generated for 3 geographical regions as these provide significantly better results when compared to a single global set of corrections. These regions are:

1. North and South America
2. Europe, Africa and Middle East
3. Asia and Australia

Although the corrections are divided into regions, our customers do not need to be inside the region in order for the service to work, but should always choose the region closest to their work location.

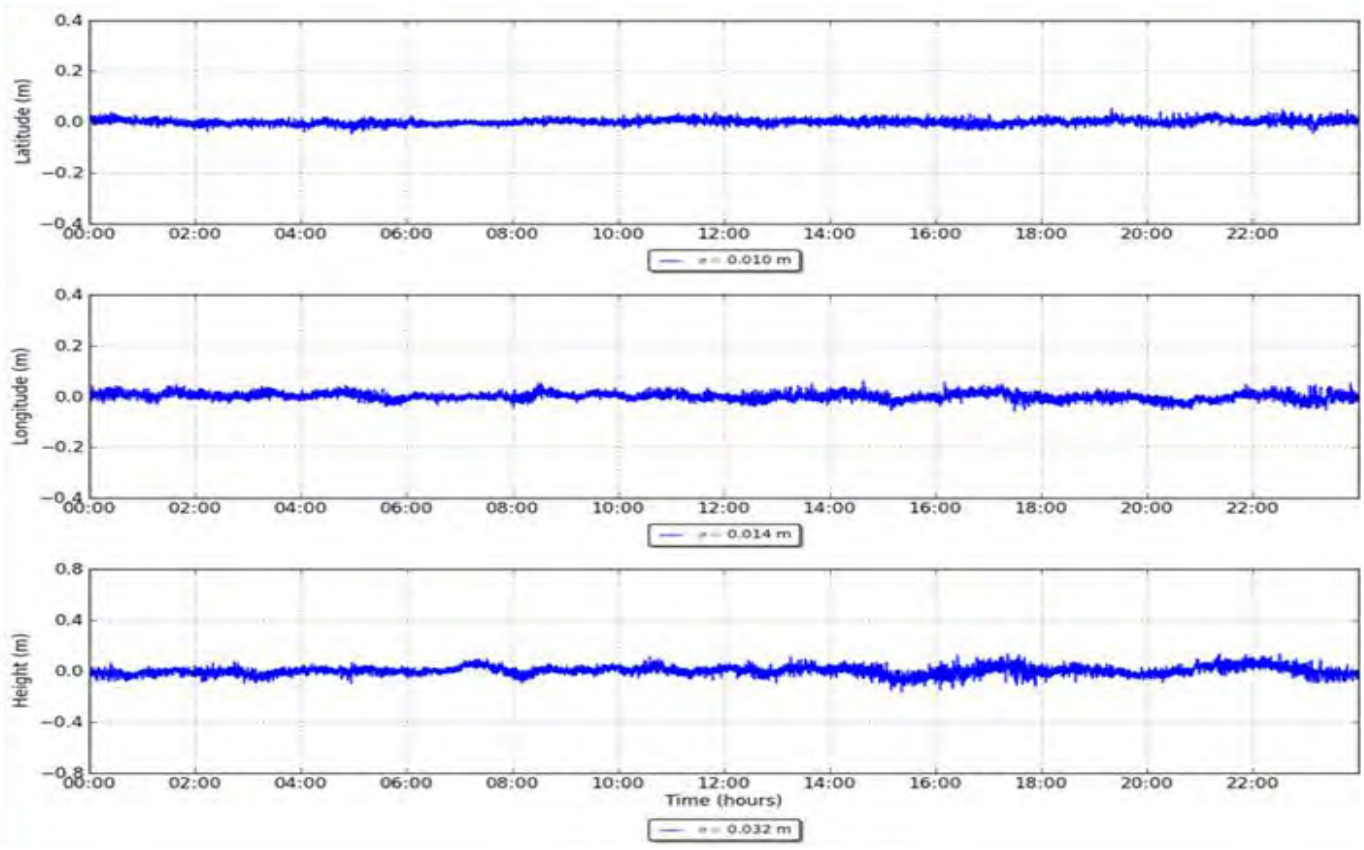


Solution accuracy; the following table illustrates Starfix.G2+ accuracy over 24 hours over 2 days from four locations

	E (SD)	N (SD)	H (SD)
Bergen (14/03/2015)	0.014 m	0.010 m	0.032 m
Bergen (15/03/2015)	0.016 m	0.013 m	0.034 m
Brownsville (14/03/2015)	0.012 m	0.011 m	0.037 m
Brownsville (15/03/2015)	0.011 m	0.010 m	0.027 m
Houston (14/03/2015)	0.013 m	0.011 m	0.032 m
Houston (15/03/2015)	0.011 m	0.010 m	0.029 m
Leidschendam (14/03/2015)	0.013 m	0.010 m	0.028 m
Leidschendam (15/03/2015)	0.014 m	0.012 m	0.032 m

The Starfix.G2+ service is currently available to customers using Fugro's StarPack GNSS systems.

Starfix.G2+ performance plots for Bergen, on 14th March 2015.



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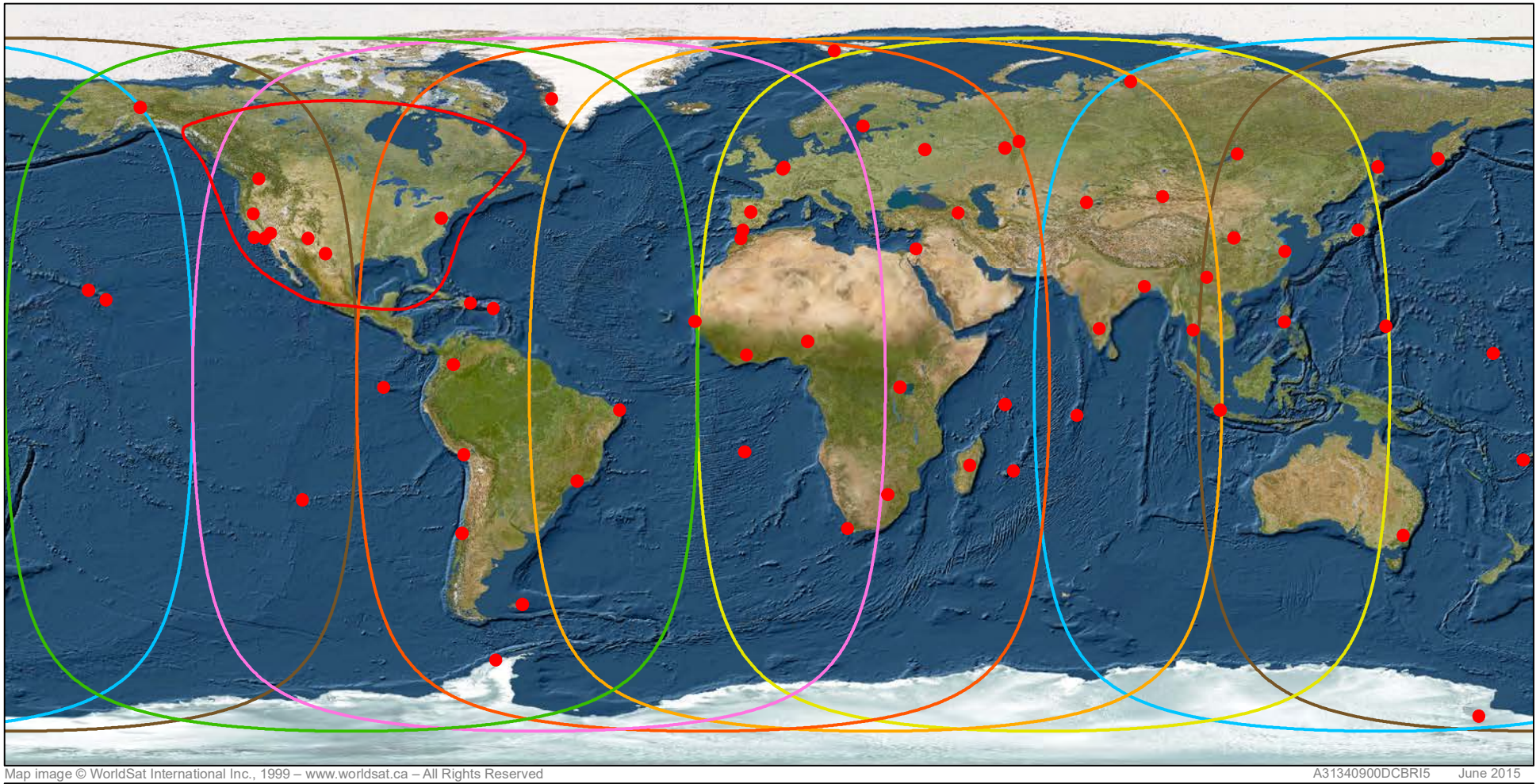
Email: starfix@fugro.no
www.starfix.com

STARFIX

FUGRO

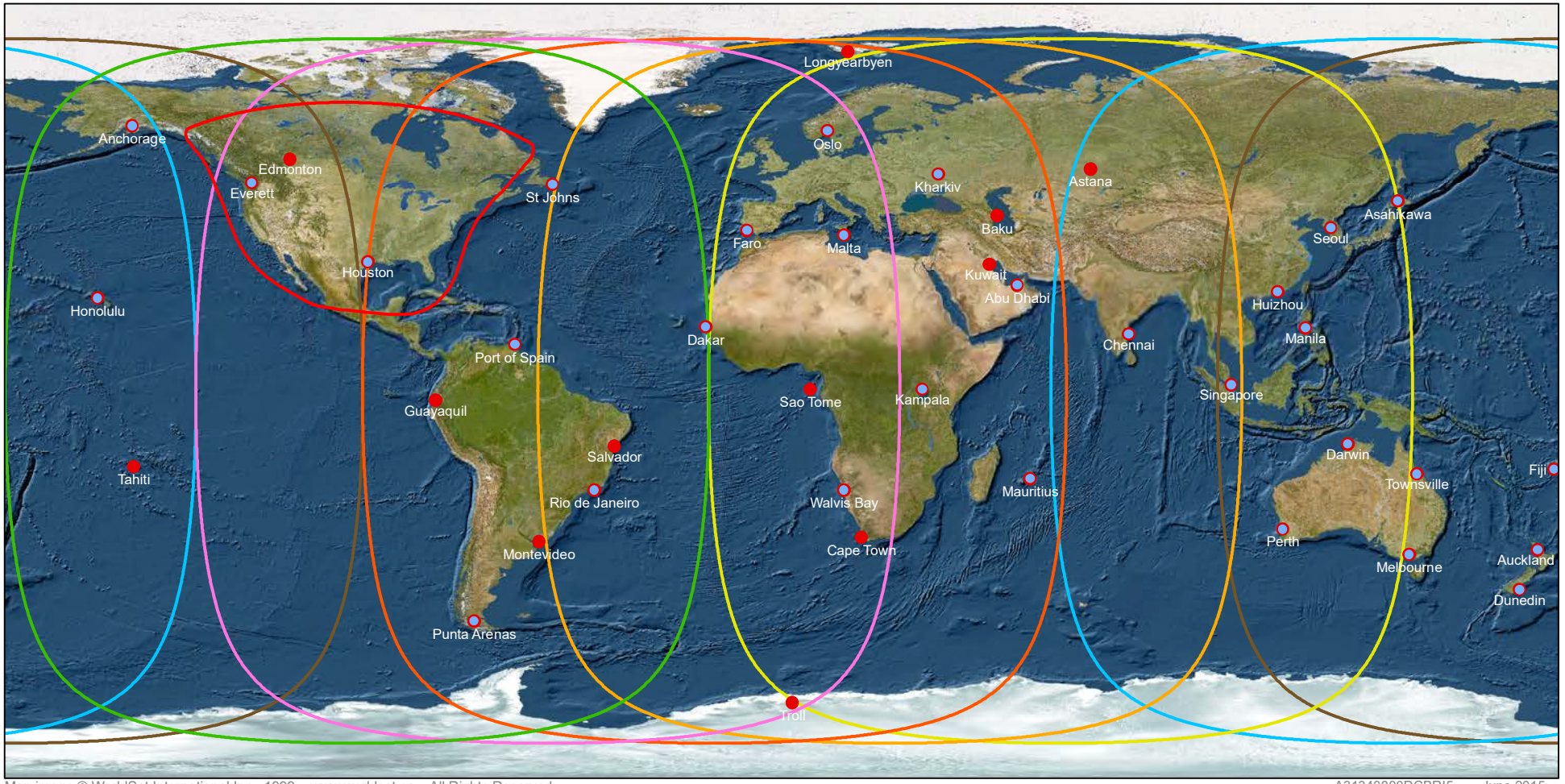
XP and **XP2** GPS and GLONASS Orbit/Clock Reference Stations and Broadcast (3rd party)



STARFIX

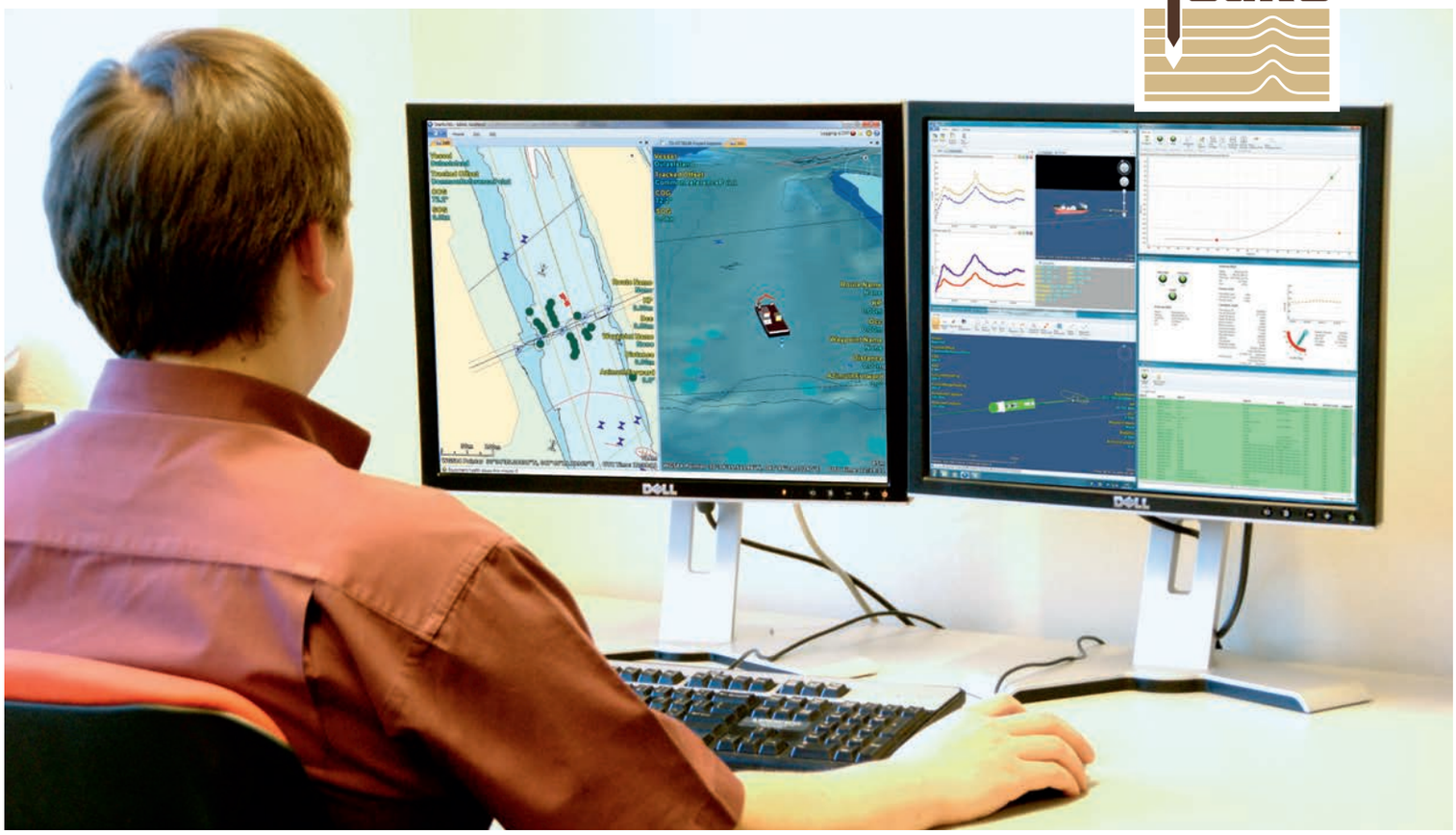
FUGRO

G4 (GPS, GLONASS, Beidou, Galileo) and **G2** (GPS, GLONASS) Orbit/Clock Reference Stations (Fugro)



A31340800DCBRI5 June 2015

G2 Reference Stations	ASAT	AORW	ESAT	AUSAT
G4 Reference Stations	MSV	AORE	IOR	POR



FUGRO STARFIX**NG**

StarfixNG is Fugro's new software platform for offshore survey operations. It has been built using the latest development tools and techniques. Flexibility and scalability on top of a robust layer of common positioning, navigation and QC functions allow StarfixNG to be adapted to any type of job. With its unique 'solution' approach, specific functionality is available as building blocks to be used as needed.

Covers wide range of offshore survey job types

Dedicated solutions for specific tasks can be configured in any combination. This allows seamless transition between activities on the same job.

Extensive hardware support

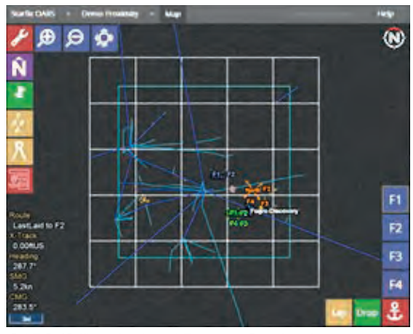
A large database with sensor codecs and vessels are included. Fugro hardware like StarPack and StarPort is automatically detected and can be configured once connected. The diagram style hardware configuration offers an intuitive user interface.

Easy integration with Starfix Classic

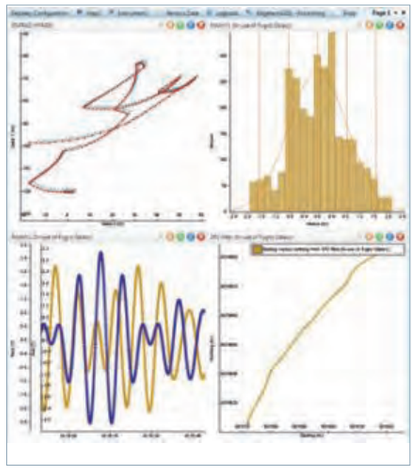
The internal message protocol is compatible with Starfix Classic. This provides the flexibility to exchange data with Starfix Classic modules and run them simultaneously.

Uses industry standards

StarfixNG uses various industry standards like the EPSG Geodesy database and ENC background maps. Also de-facto standards like Autocad DWG for exchange of CAD data are well supported.



OARS (Office-Assisted Remote Services).



Plots: Scatter plot, Histogram, Time series and Position plot

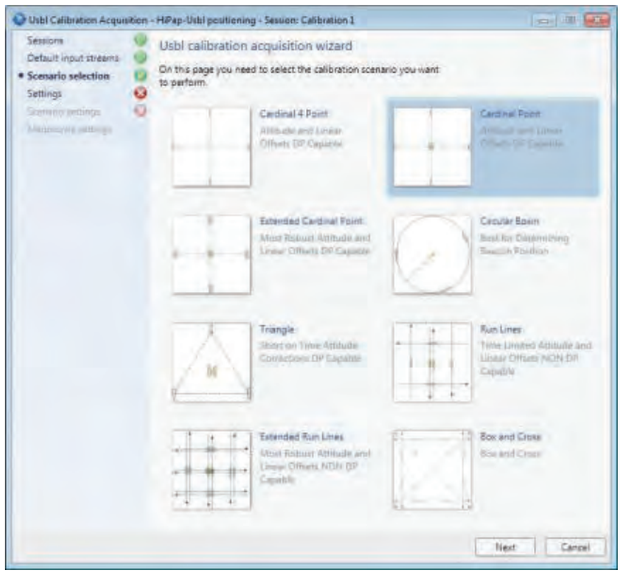
STARFIX**NG**

Extensive QC, Calibration and reporting tools

These include various types of plots, real time comparisons and solutions to check or determine latency, offsets and misalignments. There are built-in and custom reports.

Scalable across network

From a basic positioning task on a single computer to complex multi vessel jobs with a wide variety of sensors and solutions, StarfixNG can be distributed over multiple computers and displays.



Usbl calibration configuration

Comprehensive displays

- 3D and 2D map views with ENC backgrounds
- Dedicated map options for specific tasks
- Instrument panels
- Plots
- Dashboards

Dedicated solutions

- Anchor / Rig Move Solution
- Catenary
- Inclinocam™ Monopile Installation
- GNSS (MultiFix, Tides, StarTrack…)
- FineTrack
- Metrology
- Streamer modelling
- Towed objects
- Deep lay
- Survey scheduler
- OARS (Office-Assisted Remote Services)
- and more…

Device Calibrations

Task based calibration procedures with detailed client reporting for devices such as

- USBL
- Heading sensors.
- GNSS verifications

Spatial Data Management

- Survey lines, Routes and Waypoints
- Avoidance zones and Proximity monitoring
- Eventing
- Proposed locations
- Symbology / Vector data
- AutoCAD DWG / DXF

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2260 AA, Leidschendam
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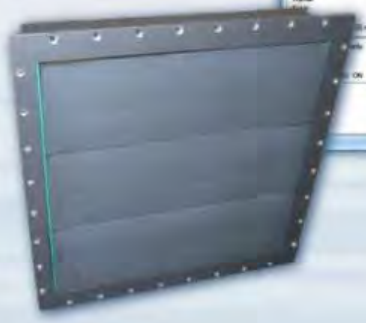
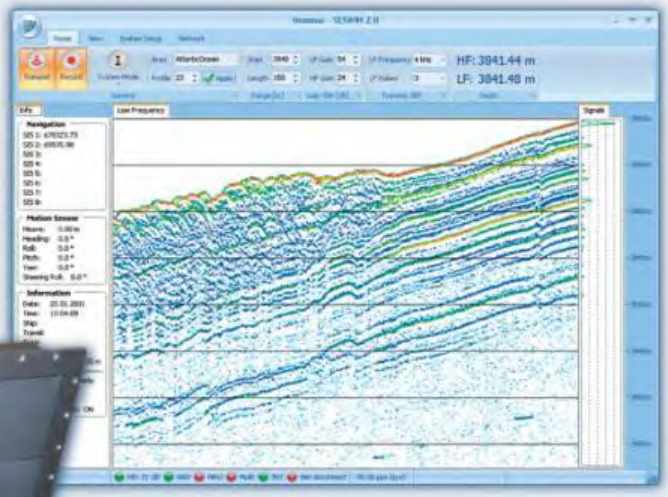
www.fugro.com



Transducer ▼



▲ *Screenshot of the operating software*

Top-side unit ▶

INNOMAR deep-36

Parametric Sub-bottom Profiler

▶ Performance

- water depth range: 5 – 6,000 m (option 10,000 m)
- penetration: up to 150 m, depending on sediments
- layer resolution: up to 12 cm
- motion compensation: heave, roll, pitch (option)
- beam width @ 3 dB: ± 1.5° / footprint < 5.5 % of water depth for all frequencies

▶ Transmitter

- primary frequencies: approx. 36 kHz (band 30 – 42 kHz)
- secondary low frequencies: 2, 3, 4, 5, 6, 7 kHz (band 1 – 10 kHz)
- primary source level: > 245 dB//µPa re 1 m
- pulse width: 0.15 – 5 ms
- pulse rate: up to 40/s
- multi-ping mode
- pulse type: CW, Ricker, LFM (chirp)

▶ Acquisition

- primary frequency (echo sounder, bottom track)
- secondary low frequency (sub-bottom data, multi-frequency mode)
- sample rate 48 kHz @ 24 bit

▶ System Components

- transceiver unit 19 inch / 16 U (WHD: 0.52 m x 0.74 m x 0.50 m; 95 kg)
- transducer with frame excl. cable (WHD: 0.90 m x 0.30 m x 0.90 m; 335 kg)
- system control: internal PC
- KVM remote control

▶ Software

- SESWIN data acquisition software
- SES Convert SEG-Y/XTF data export
- SES NetView remote display
- ISE post-processing software

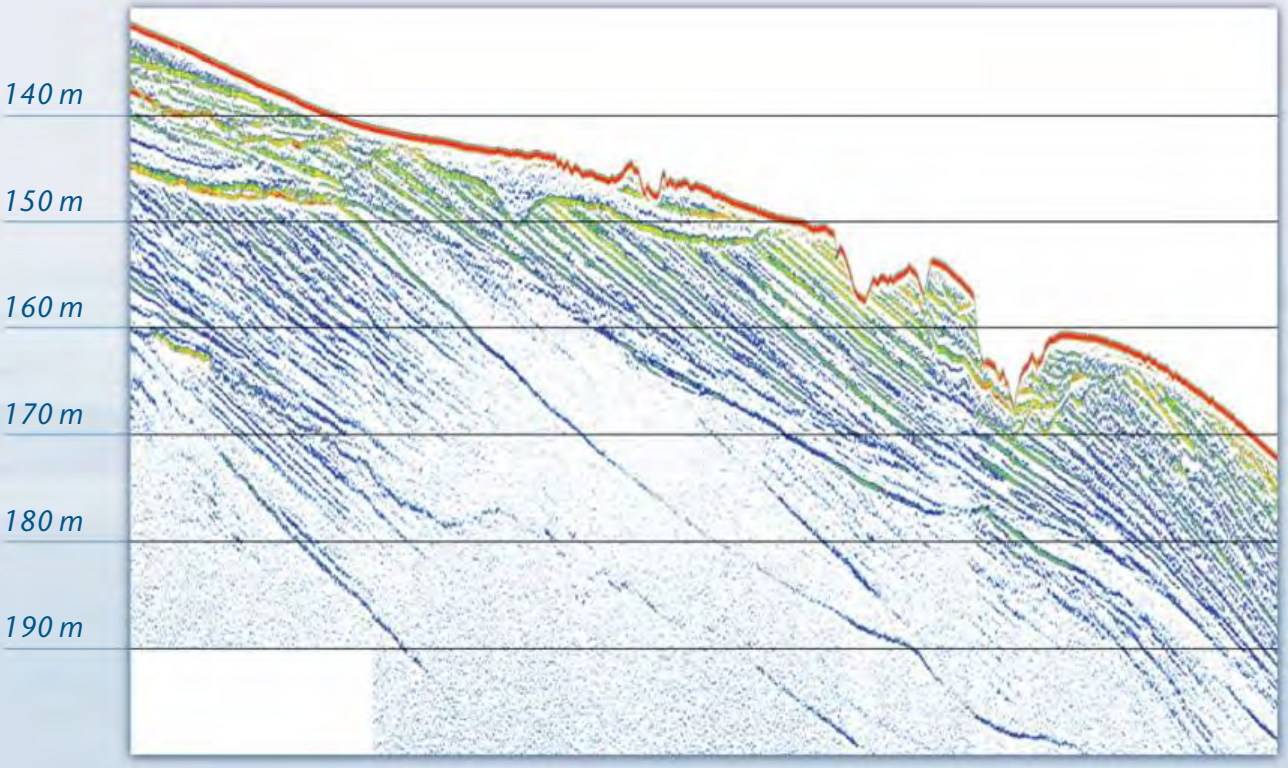
▶ Power Supply Requirements

- 100 – 240 V AC / 50 – 60 Hz
- power consumption < 900 W

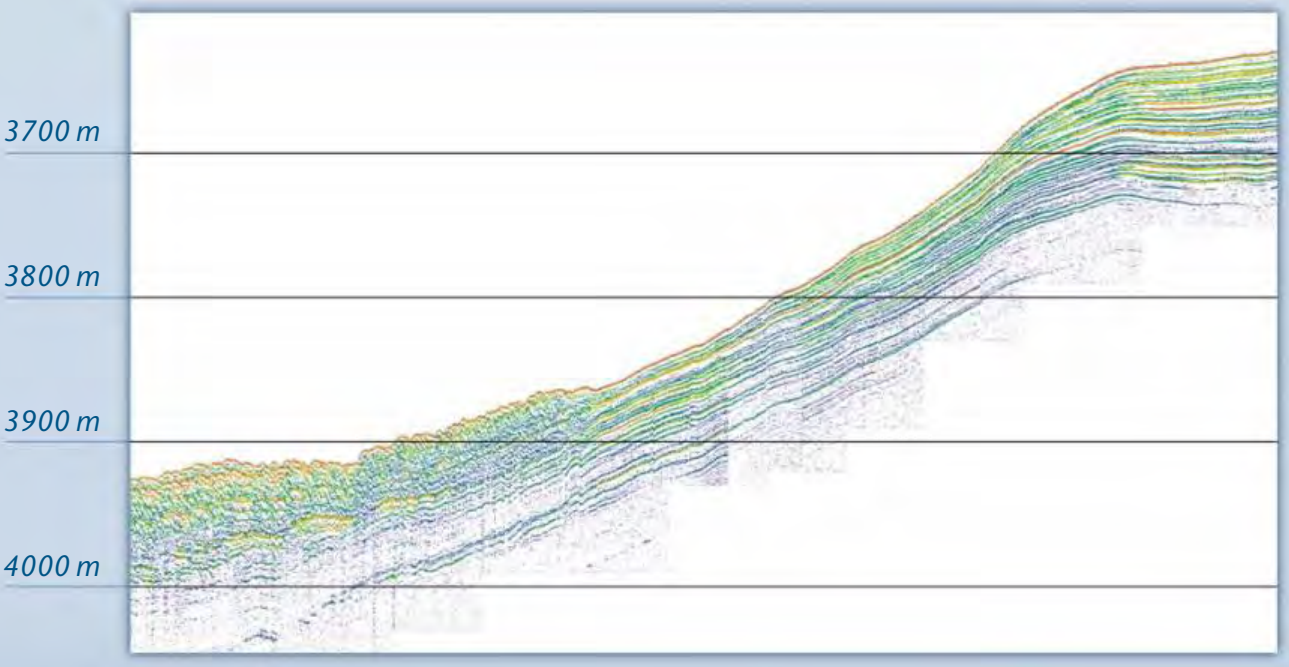
Innomar

www.innomar.com

Survey examples of SES-2000 deep-36



South Korean Coast echo plot example
Frequency 4 kHz, pulse length 750 µs, profile length 11 km, survey speed 13 knots



Atlantic Ocean (Argentina) echo plot example *– Frequency 4 kHz, pulse length 1500 µs, profile length 65 km*

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Innomar

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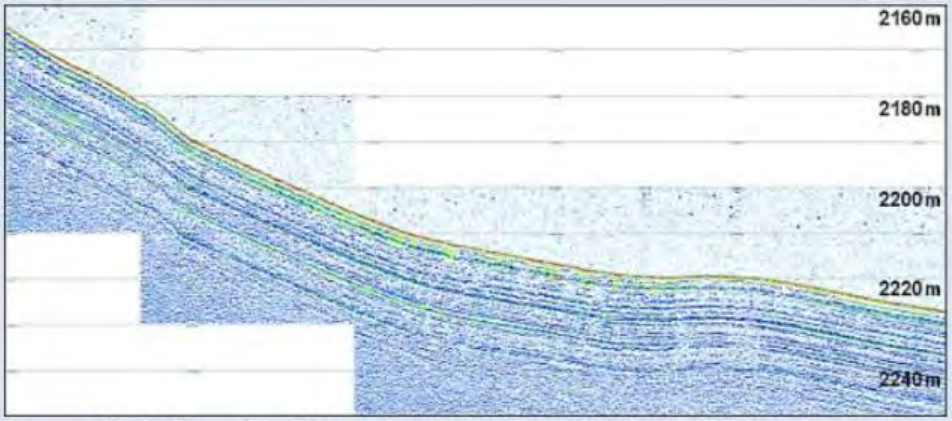
Innomar SES-2000 *medium-100* SBP

The **Innomar SES-2000** ***medium-100*** parametric sub-bottom profiler is designed for offshore applications down to 2,000m water depth. The transducer can be either mounted over-the-side or in the hull.

The **Innomar SES-2000** ***medium-100*** SBP acquires full-waveform data that can be processed with any seismic software (SEG-Y format). **Innomar** also provides the ISE post-processing software specialized on the **Innomar SES-2000** SBP data.

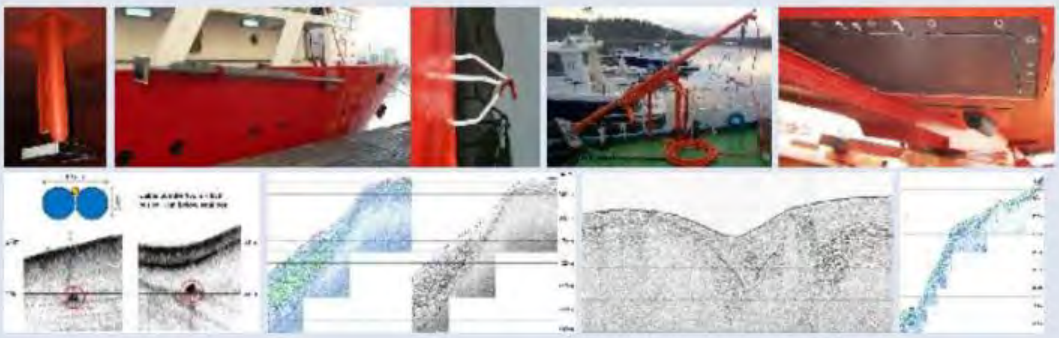
Application examples are given in the Deep Water Applications section.

A **new version with reduced weight and size** has been released in 2016 to improve equipment handling for mobile installations.



Innomar SES-2000 ***medium-100*** parametric sub-bottom profiler echoprint data example in deep water (range 2,160–2,250m; sediment penetration about 30m; frequency 5kHz).

Please find some installation and data examples below (click on picture to enlarge).



Technical Specification

Water depth range	2 – 2,000m
Sediment penetration	up to 70m (depending on sediment type and noise)
Range / Layer resolution	< 1cm / up to 5cm
Transmit beam width (-3dB)	approx. ±1° / footprint <3.5% of water depth
Primary frequencies (PF)	approx. 100kHz (frequency band 85 – 115 kHz)
Primary source level	>247dB//µPa re 1m
Secondary low frequency (SLF)	centre freq. user selectable: 4, 5, 6, 8, 10, 12, 15 kHz (total frequency band 2 – 22 kHz)
Pulse width	user selectable 0.07 – 2 ms
Pulse type	Ricker, CW, LFM chirp
Ping rate	up to 40 pings/s
Topside unit (transceiver)	W 0.52m × D 0.40m × H 0.58m (19"/12U) / 56kg
Transducer (incl. 30m cable)	pole-mounted: W 0.50m × D 0.50m × H 0.12m / 60kg hull-mounted: W 0.60m × D 0.50m × H 0.20m / 90kg
Heave / Roll / Pitch compensation	heave, roll (depending on external sensor data)
Data acquisition	digital 24bit @ 96kHz sample rate; PF 100kHz envelope echosounder data / bottom track; SLF full-waveform sub-bottom data
Auxiliary Input	GNSS, HRP sensor, trigger
Auxiliary Output	trigger, bottom track, analogue SLF
Power Supply	100–240V AC / <550W

Included Features

- Roll beam stabilization
- SLF full waveform data acquisition (sub-bottom data)
- Multi-ping mode for maintaining a high pulse rate in deep waters
- Multi-frequency signals
- LFM chirp (full SLF bandwidth)

Optional Features

- Bottom slope control

Software

- SESWIN data acquisition software
- SES Convert data converter software (SES/RAW to SEG-Y, XTF, ASCII)
- SES NetView for display of online echoprints and system information on remote computers (via Ethernet) for QC
- ISE post-processing software incl. GIS module

4205

TRI-FREQUENCY / MOTION TOLERANT SIDE SCAN SONAR SYSTEM

FEATURES

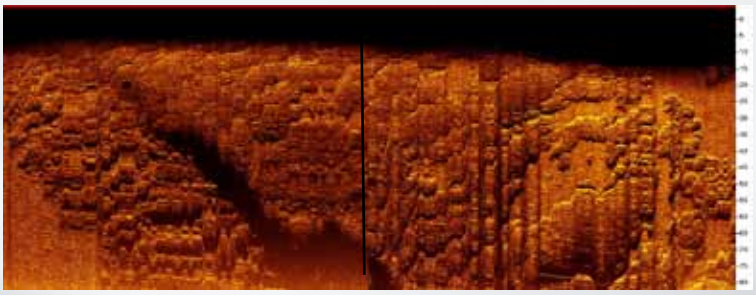
- Tri frequency side scan sonar
- Motion tolerant mode
- Improved target positioning
- Crisp, high resolution CHIRP images
- Increased towfish power to support a wider range of additional 3rd party sensors
- Single pulse high resolution mode

APPLICATIONS

- Cable & pipeline surveys
- Geological/geophysical surveys
- Mine countermeasures (MCM)
- Geohazard surveys
- Channel clearance
- Search and recovery
- Archeological surveys

The next generation 4205 is a versatile side scan sonar system that can be configured for almost any survey application from shallow to deep water operations. The 4205 utilizes EdgeTech's Full Spectrum® CHIRP technology to provide crisp, high resolution imagery at ranges up to 50% greater than non-CHIRP systems; thus allowing customers to cover larger areas and save money spent on costly surveys. In addition to the high-resolution imagery that EdgeTech is known for, the 4205 comes with a number of new features which makes the system even more flexible and powerful in offshore operations. The 4205 is available in either a tri-frequency side scan sonar configuration or motion tolerant and multi-pulse configuration. The tri-frequency version allows surveyors the option to operate any two frequencies simultaneously from the tri-frequency system. Long range operations for example can be achieved with a selection of 230/540kHz combination. Then, on-demand the system can be changed to a 540/850kHz system for an even higher resolution survey. The 4205 motion tolerant configuration with multi-pulse provides surveyors the ability to operate either at faster survey speeds or in more adverse weather conditions while still obtaining high quality underwater imagery. Additionally, this configuration can be operated in a single pulse high-resolution mode for those operations that require an even more finite view of the seafloor.

In both the tri-frequency and motion tolerant/ multi-pulse configurations, towfish and target positioning has been improved with the integration of a more accurate heading sensor that can be coupled with an optional USBL beacon. Additionally, all systems now come with Increased towfish power to support a wider range of additional 3rd party sensors. All EdgeTech 4205 systems are comprised of a topside system and a reliable stainless steel towfish. Topside processors are rack mountable and come with easy-to-use GUI software that can be installed on the optional industrial workstation, laptop, or customer provided PC.



Motion Tolerant Mode Sonar example: During turbulant condtions, the data on the left of side of this image was recorded using the EdgeTech 4205 Motion Tolerant mode. The right side of the image, depicting motion induced striping was captured without the Motion Tolerant mode for comparison.

For more information please visit EdgeTech.com

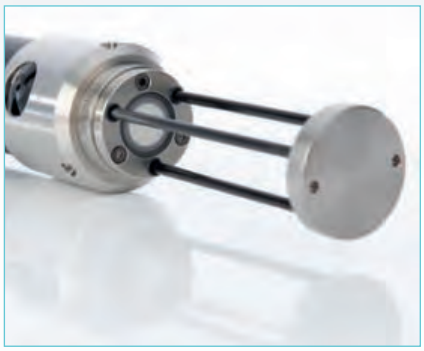
info@EdgeTech.com | USA 1.508.291.0057

4205

TRI-FREQUENCY / MOTION TOLERANT SIDE SCAN SONAR SYSTEM

KEY SPECIFICATIONS

SONAR SPECIFICATIONS	4205 TRI-FREQUENCY	4205 MULTI-PULSE/MOTION TOLERANT (MP/MT) AND HIGH DEFINITION MODE	
Frequency	Choice of either 120/410/850 kHz or 230/540/850 kHz	Choice of either 120/410 kHz, 230/540 kHz,or 230/850 kHz	
Operating Range (meters/side)	120 kHz: 600m, 230 kHz: 350m, 410 kHz: 200m, 540 kHz: 150m, 850 kHz: 90m		
		MP/MT	HDM
Horizontal Beam Width	120 kHz: 0.7° 230 kHz: 0.44° 410 kHz: 0.28° 540 kHz: 0.26° 850 kHz: 0.23°	120kHz: 0.95° 230kHz: 0.62° 410kHz: 0.40° 540kHz: 0.36° 850kHz: 0.33°	0.7° 0.44° 0.28° 0.26° 0.23°
		MP/MT	HDM
Resolution Along Track	120 kHz: 2.4m @ 200m 230 kHz: 1.2m @ 150m 410 kHz: 0.5m @ 100m 540 kHz: 0.45m @ 100m 850 kHz: 0.20m @ 50m	120kHz: 3.3m @ 200m 230kHz: 1.7m @ 150m 410kHz: 0.7m @ 100m 540kHz: 0.6m @ 100m 850kHz: 0.26m @ 50m	2.4m @ 200m 1.2m @ 150m 0.5m @ 100m 0.45m @ 100m 0.20m @ 50m
Resolution Across Track	120kHz 8cm; 230KHz 3cm; 410kHz 2 cm; 540kHz 1.5cm; 850kHz 1cm		
Vertical Beam Width	50°		
Depression Angle	Tilted down 25°		
TOWFISH	STAINLESS STEEL		
Diameter	12 cm (4.75 inches)		
Length	140 cm (55 inches)		
Weight in Air	52 kg (115 pounds)		
Depth Rating (Max)	2,000m		
Standard Sensors	Heading, pitch & roll		
Optional Sensor Port	(1) Serial – RS 232C, Bi-directional & 28 VDC +/- 4%		
Options	Pressure Sensor, Magnetometer, Integrated USBL Acoustic Tracking System, Built-in Responder Nose, Depressor, Power Loss Pinger and Custom Sensors		
TOPSIDE PROCESSOR	4205 INTERFACE		
Hardware	19" rack mount interface (150 watt or 400 watt)		
Display & Interface	Optional industrial workstation, laptop, or customer provided PC		
Power Input	115/230 VAC		
File Format	Native JSF or XTF		
Sensor Interfaces	Ethernet, RS 232		
TOW CABLE			
	Coaxial Kevlar or double-armored up to 6,000m, winches available		



miniSVP
Sound Velocity Profiler

The miniSVP has been developed to provide a cost effective tool for the collection of Sound Velocity Profiles without compromising the quality of the data. Ideally suited to hydrographic survey operations, from coastal to deep water, the miniSVP will appeal to survey companies and academia alike, being simple to use and easy to handle.

DATA SHEET

Product Details

SOUND SPEED

DATALOG X2 SOFTWARE

Bluetooth

Valeport Limited
St. Peter's Quay, Totnes,
Devon TQ9 5EW United Kingdom

Telephone: +44 (0) 1803 869292
Email: sales@valeport.co.uk
www.valeport.co.uk

VALEPORT

Sensors

Fitted with Valeport's digital time of flight sound velocity sensor, a PRT temperature sensor, and piezo-resistive pressure transducer.

Sound Velocity

Range	1375 - 1900m/s
Resolution	0.001m/s
Accuracy	±0.02m/s

Temperature

Range	-5°C - +35°C
Resolution	0.001°C
Accuracy	±0.01°C

Pressure

Range	5, 10, 30, 50, 100, 300 or 600 Bar
Resolution	0.001% range
Accuracy	±0.05% range

Data Acquisition

Features a selection of pre-programmed sampling regimes, covering many standard applications. Data may be sampled from 1 to 16Hz, making it suitable for rapid profiling or for continuous measurement at a fixed point.

Sampling Modes

Continuous	Regular output from all sensors at 1, 2, 4, 8 or 16Hz
Profile	Logs data as the device falls (or rises) by a defined amount through the water column.

Communications

Will operate autonomously, with setup and data extraction performed by direct communications with PC. Operates in real time, with a choice of communication protocols fitted as standard and selected by pin choice on the output connector.

RS232	Up to 200m cable, direct to serial port
RS485	Up to 1000m cable
Baud Rate	38400, 57600 or 115200
Protocol	8 data bits, 1 stop bit, No parity, No flow control
Bluetooth	Bluetooth logger and communication set available for cable free data recovery. Bluetooth module is limited to a depth rating of 500m.

Memory

Fitted with a solid state non-volatile Flash memory, capable of storing over 10 million lines of data (equivalent to 10,000 profiles to 500m, at 1m profile resolution).

Electrical

Internal	1 x C cell, 1.5V alkaline or 3.6V lithium
External	9 – 28V DC
Power	<250mW
Battery Life	approximately 30 hours operation (alkaline) approximately 90 hours operation (lithium)
Connector	SubConn MCBH10F

Physical

Materials	Acetal or Titanium housing (as ordered) Polycarbonate & Composite sensor components. Stainless steel (316) deployment cage
Depth Rating	500m (Acetal) 6000m (Titanium)
Note:	Maximum deployment depth may be limited by pressure transducer range
Instrument Size	Main Housing: 48mmØ Sensor Body: 54mmØ Length: 435mm (including connector)
Deployment Cage	110mmØ x 450mm long
Weight	0.8kg (Acetal) | 1.6kg (Titanium)
Shipping	51 x 42 x 27cm | 10kg

Software

The system is supplied with DataLog X2 software, for instrument setup, data extraction and display. DataLog X2 is licence free.

Ordering

0660001-XX	miniSVP Sound Velocity Profiler in Acetal Supplied with: • Deployment cage • Switch plug • 3m comms lead • DataLog X2 software • Manual and transit case
0660001BT-XX	miniSVP Sound Velocity Profiler in Acetal Supplied with: • Deployment cage • Switch plug • Bluetooth logger/communication set • DataLog X2 software • Manual and transit case
Note:	**XX** denotes pressure transducer range Select from 5, 10, 30 or 50bar
0660002-XX	miniSVP Sound Velocity Profiler in Titanium Supplied with: • Deployment cage • Switch plug • 3m comms lead • DataLog X2 software • Manual and transit case
Note:	**XX** denotes pressure transducer range. Select from 5, 10, 30, 50, 100, 300 or 600 Bar

Datasheet Reference: miniSVP | February 2021

xylem
Let's Solve Water

CastAway-CTD

WITH PROFILING AND ANALYSIS SOFTWARE

Reliable Data in Minutes

The CastAway®-CTD is a lightweight, easy to use instrument designed for quick and accurate conductivity, temperature, and depth profiles. Each cast is automaticallly referenced with both time and location using its built-in GPS receiver. The CastAway software displays profiles of the casts in addition to mapping the locations of the data collection points. Data integrate directly with RiverSurveyor Live and HYPACK® software, and can also be exported to MATLAB® for applying sound speed corrections.

The rugged, non-corrosive housing, AA battery power and computer-free operation reflect the technician-friendly pedigree of the CastAway-CTD.

- Plots of conductivity, temperature, salinity and sound speed versus depth can be viewed immediately on color LCD screen
- 5Hz response and sampling rate, accurate to 0.1 (PSS-78), 0.05°C
- Internal GPS and Bluetooth wireless data download
- Fully compatible with the RiverSuveyor-Live, HydroSurveyor and HYPACK

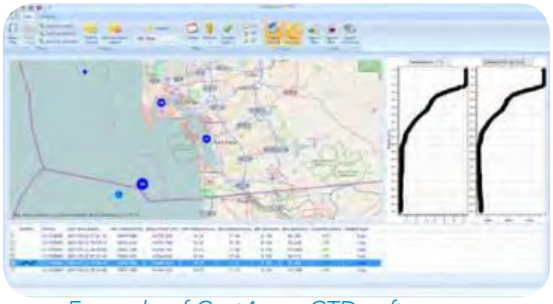
SonTek
a xylem brand

CastAway-CTD

The CastAway-CTD Output Parameters

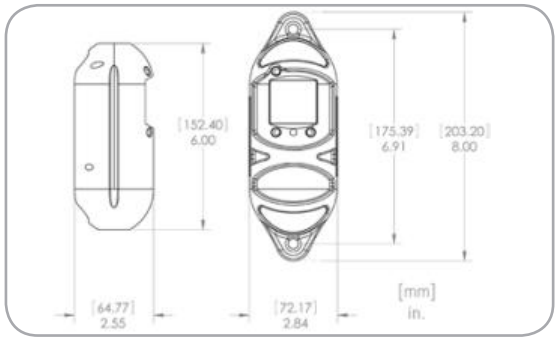
	Range	Resolution	Accuracy	Measured or Derived
Conductivity	0 to 100,000 µS/cm	1µS/cm	± 0.25% ± 5 µS/cm	Measured
Temperature	-5° - 45° C	0.01° C	± 0.05° C	Measured
Pressure	0 to 100 dBar	0.01 dBar	± 0.25% FS	Measured
Salinity	Up to 42 (PSS-78)	0.01 (PSS-78)	± 0.1 (PSS-78)	PSS-78[3]
Sound Speed	1400 - 1730 m/s	0.01 m/s	± 0.15 m/s	Chen-Millero[4]
Density[1]	990 to 1035 kg/m^3	0.004 kg/m^3	± 0.02 kg/m^3	EOS80[5]
Depth	0 to 100 m	0.01m	± 0.25% FS	EOS80[5]
Specific Conductivity[2]	0 to 250,000 µS/cm	1µS/cm	± 0.25% ±5 µS/cm	EOS80[5]
GPS			10 m	

[1]Based on temperature resolution and accuracy.
[2]Based on 100,000 µS/cm at -5° C.
[3]1978 Practical Salinity Scale.
[4]Chen-Millero, 1977. Speed-of-sound in sea water at high pressures.
[5]International Equation of State for sea water (EOS-80).



Example of CastAway-CTD software

Rugged CastAway-CTD storage case



Memory	15 MB (750+ casts based on typical usage)
Communications	Bluetooth class II, up to 10 m range
Power	2 "AA" alkaline batteries, 40 hours continuous use
Data Output Format	- ASCII (CSV) -Hypack -MATLAB® -CARIS
Environmental	- Depth range: 0-100 m - Use temperature: -5° to 45° C - Storage temperature: -10° to 50° C
Sampling Modes	- Casting (up/down) - Point sample (moving the unit back and forth)
Software	- Windows XP/Vista/8/10 - Geo-referenced - Multi-language - Data plots, filtering, import/export
Accessories	- Rugged plastic storage/shipping case - Polyurethane jacket - 15m deployment line - Bluetooth dongle - 4 "AA" alkaline batteries - Two locking carabiners - Three magnetic stylus pens - Cleaning brush
Thermistor Response	Less than 200 ms (5 Hz)
Sampling Rate	5 Hz
Weight	In air: 1.0 lb (0.45 kg) In water: 0.06 lbs (0.03 kg)

xylem
Let's Solve Water

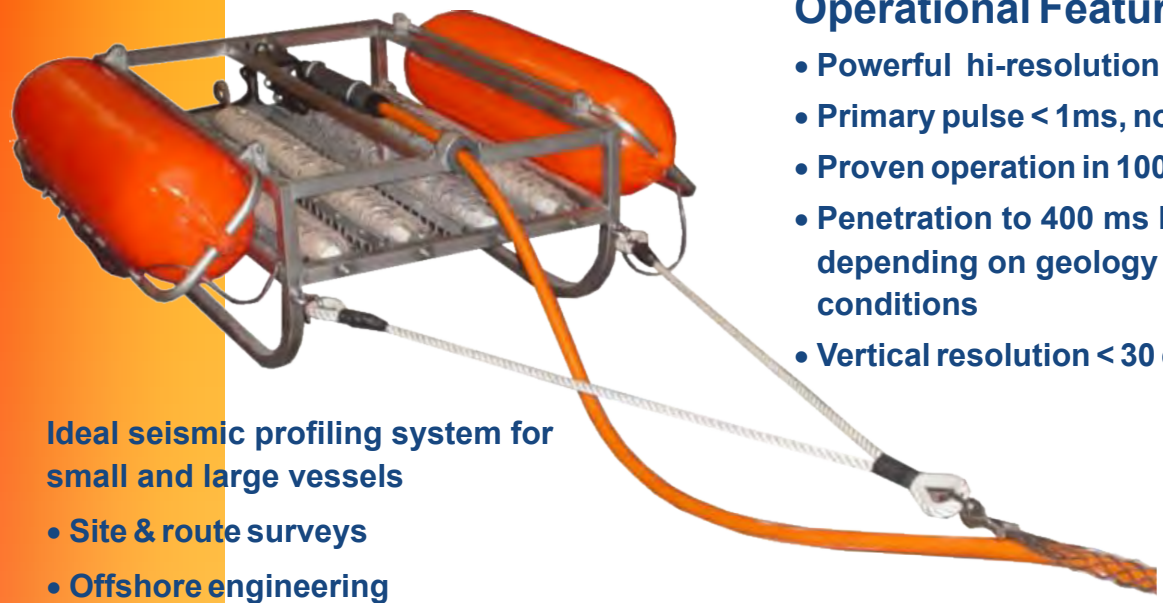
SonTek, a Xylem brand
9940 Summers Ridge Road
San Diego, CA 92121
Tel +1 858.546.8327(US)
inquiry@sontek.com

Quick access to the video and training resources you need at **sontek.com/videos**

sontek.com/castaway-ctd

Geo-Source 200 - 400

Marine Multi-Tip Sparker System

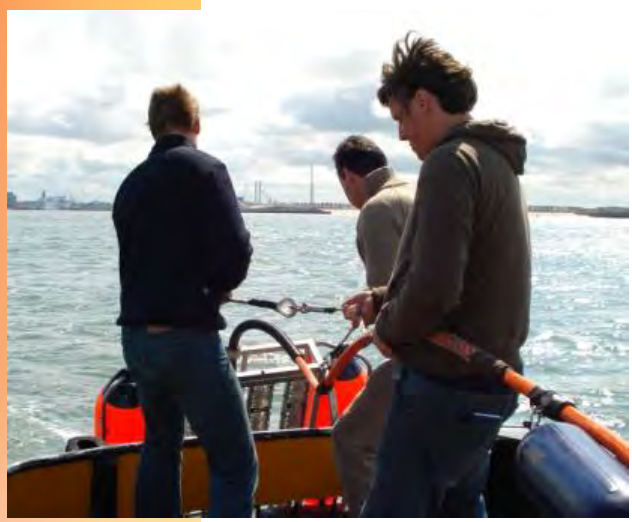


Operational Features

- Powerful hi-resolution seismic source
- Primary pulse < 1ms, no ringing
- Proven operation in 1000 m water depth
- Penetration to 400 ms below seabed, depending on geology and survey conditions
- Vertical resolution < 30 cm

Ideal seismic profiling system for small and large vessels

- Site & route surveys
- Offshore engineering
- Mineral exploration
- Oceanographic research



INNOVATIVE Preserving Electrode Mode

The innovative Geo-Source 200 has been designed for operation with the Geo-Spark 1000 pulsed power supply (PPS) using the patented **Preserving Electrode Mode.** This mode uses a NEGATIVE electric discharge pulse instead of a positive pulse.

(Please note that this negative pulse is NOT the same as the simple reversal of the positive polarity of a 'standard' power supply.)

Maintenance free electrodes 5 year guarantee

The Preserving Electrode Mode **reduces the tip wear to practically zero**. You can shoot day after day, week after week, month after month with practically **NO tip maintenance.**

Always a stable acoustic pulse

Zero tip wear is essential for the **acoustic repeatability** of the pulse, which depends largely on a constant, unaltered electrode surface and tip insulation.

Efficient & Cost Effective

With the Geo-Spark HV power supplies you will save a lot of time and money, since the electrodes do NOT burn off like in all other systems.

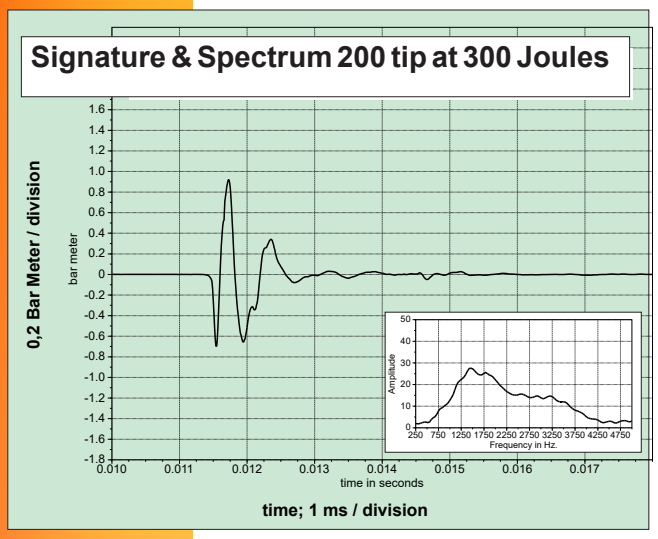
You don't need to trim tips during the survey. There is no need to have any stock of consumables.

Examples of Records

To see examples of our sparker records, please visit the 'Downloads' page on our website: ***www.geo-spark.com***

Geo-Source 200-400

Technical Specifications



Maintenance free electrodes, no trimming, stable signature

Electrodes Geometry

The electrode modules are evenly spaced in a planar array of 0.75 m x 1.00 m. This geometry not only enhances the downward projection of the acoustic energy, it also reduces the primary pulse length, since all tips are perfectly in phase.

Control of Source Parameters 200 - 400 tips

The advanced Geo-Source 200-400 design gives you total control of the source depth and the energy (Joules) per tip

Source depth

Two floats provide a stable towing configuration and insure the proper depth of the electrode tips. This is critical to achieve constructive interference between the primary pulse and its own sea-surface reflection (surface ghost)

Number of tips in use and Energy per tip

Four individually powered electrode modules of 50 or 100 tips each allow you to distribute the energy from the Geo-Spark power supply over 50, 100....., up to 400 tips. (Each tip has an exposed surface area of 1.4 mm^2.)

200 tips, the classic 200 tip configuration is normally used with the Geo-Spark 1000 PPS and consists of four 50-tip electrode modules. This configuration gives an excellent hi-res pulse over the 100 to 500 J power range.

400 tips, for higher energies above 1000 J, and in particular with the Geo-Spark 2000X, we recommend a 400 tip configuration with 4 x 100-tip electrode modules

Coaxial High Voltage (HV) Power/Tow Cable

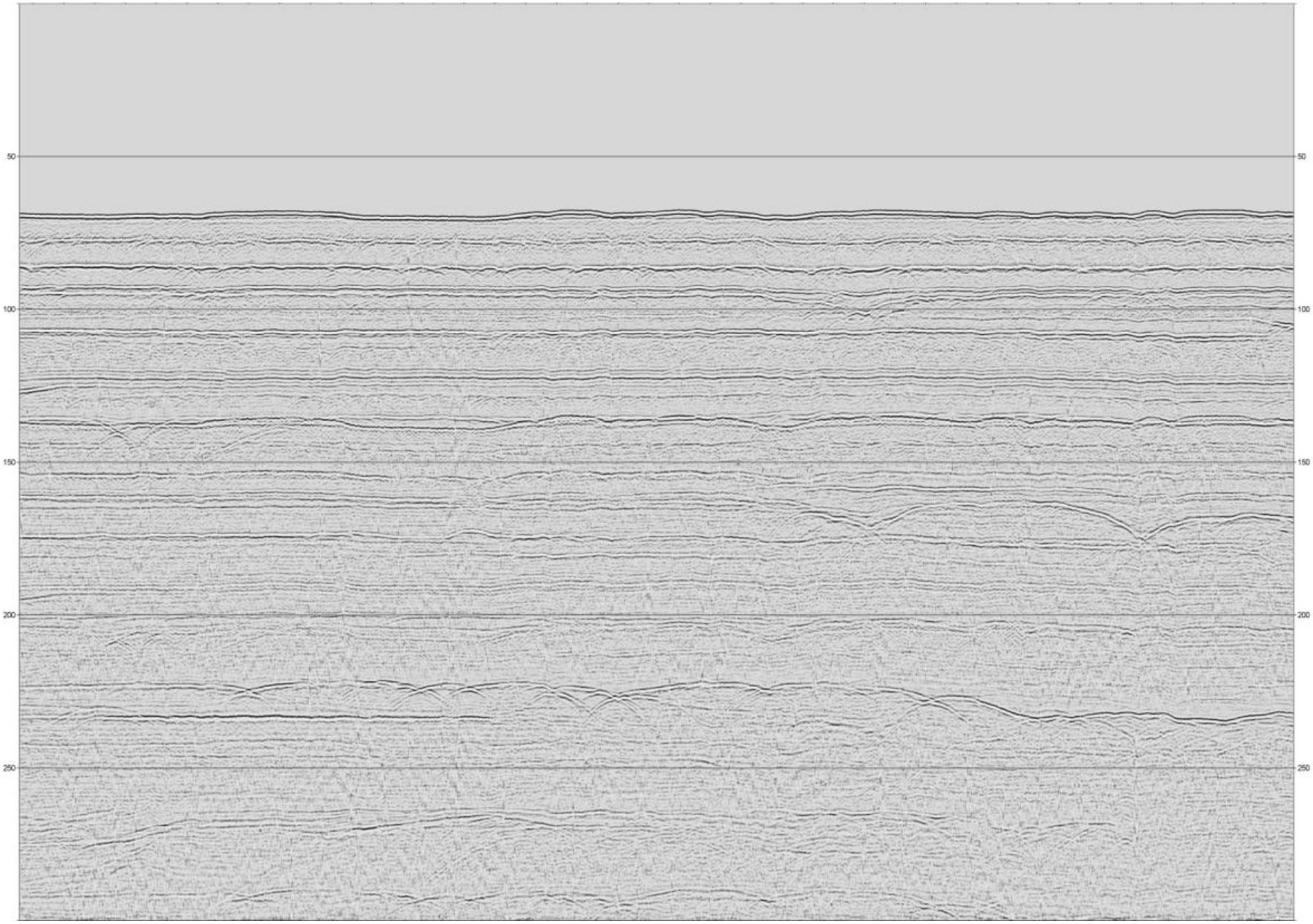
The Geo-Source 200 is towed by a very high quality, Kevlar-reinforced, coaxial power/tow cable with stainless steel kellum grip. This dedicated high voltage (HV) cable contains **4 x 10 mm^2** inner cores (negative) plus a **40 mm^2** braiding (ground-referenced). It is designed to have a very low self-inductance to preserve the high dI/dt pulse output of the Geo-Spark 1000 PPS.

The coaxial structure of the HV cable reduces the electromagnetic interference to the absolute minimum.

The wet end of the cable is terminated with four special HV connectors to the electrode modules and a ground connector to the frame. Connecting or disconnecting the cable to the Geo-Source 200 takes only 10 minutes; so you can handle the sparker sled and the HV cable as independent units.

The dry end of the cable is terminated at the Geo-Source 200 patch panel, which allows you to select the number of electrode arrays in use

GEO Marine Survey Systems b.v.
Sheffieldstraat 8, 3047 AP Rotterdam
The Netherlands
Phone: + 31 10 41 55 755
Fax: +31 10 41 55 351
info@geomarinesurveysystems.com
Website: www.geo-spark.com



RESOURCES

Location: Thailand

Date: August 2008

Client: MVM Surveys

Water Depth: 50 - 300 m

Acquisition

Source: Geo-Spark 200
Power Supply: Geo-Spark 1 kJ
Power: 300 J
Streamer: Geo sense
Recording System: Geo-Trace 2
Shot interval: 0.5 s
Record length: 300 ms
Sample Rate: 8000 Hz

Processing

Frequency filtering
Gain
Swell filter
Muting

Display

Horizontal scale 1:4000
Vertical scale 1 cm = 8 ms
One timeline every 50 ms

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Netherlands

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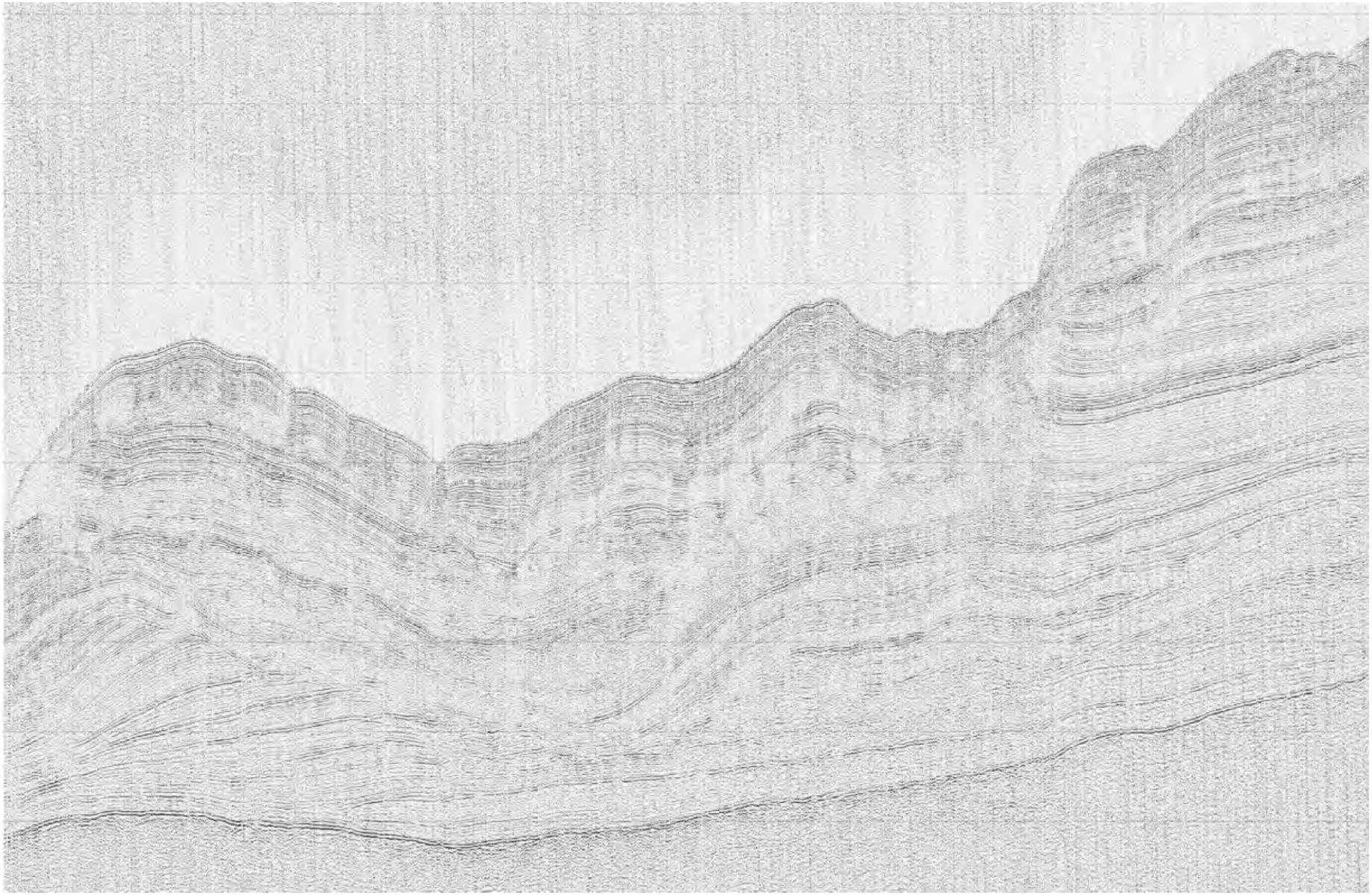
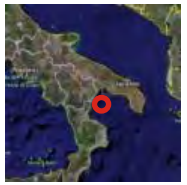
Geo-Spark 200 Thailand- August 2008



RESOURCES



Location: Taranto Italy

Date: May 2005

Client: Nautilus

Water Depth: 450 - 650 m

Acquisition

Source: Geo-Spark 200
Power Supply: Geo-Spark 1 kJ
Power: 700 J
Streamer: Geo-sense 8 elements
Recording System: Geo-Trace 2
Shot interval: 3 s
Record length: 1500 ms
Sample Rate: 8000 Hz

Processing

Frequency filtering
Gain
Swell filter
Muting

Display

Horizontal scale 1:12000
Vertical scale 1 cm = 15 ms
One timeline every 50 ms

Alternating sand and clay layers.
Strong reflector at the base of layer turbiditic sequence represents the top of Messinian evaporites.

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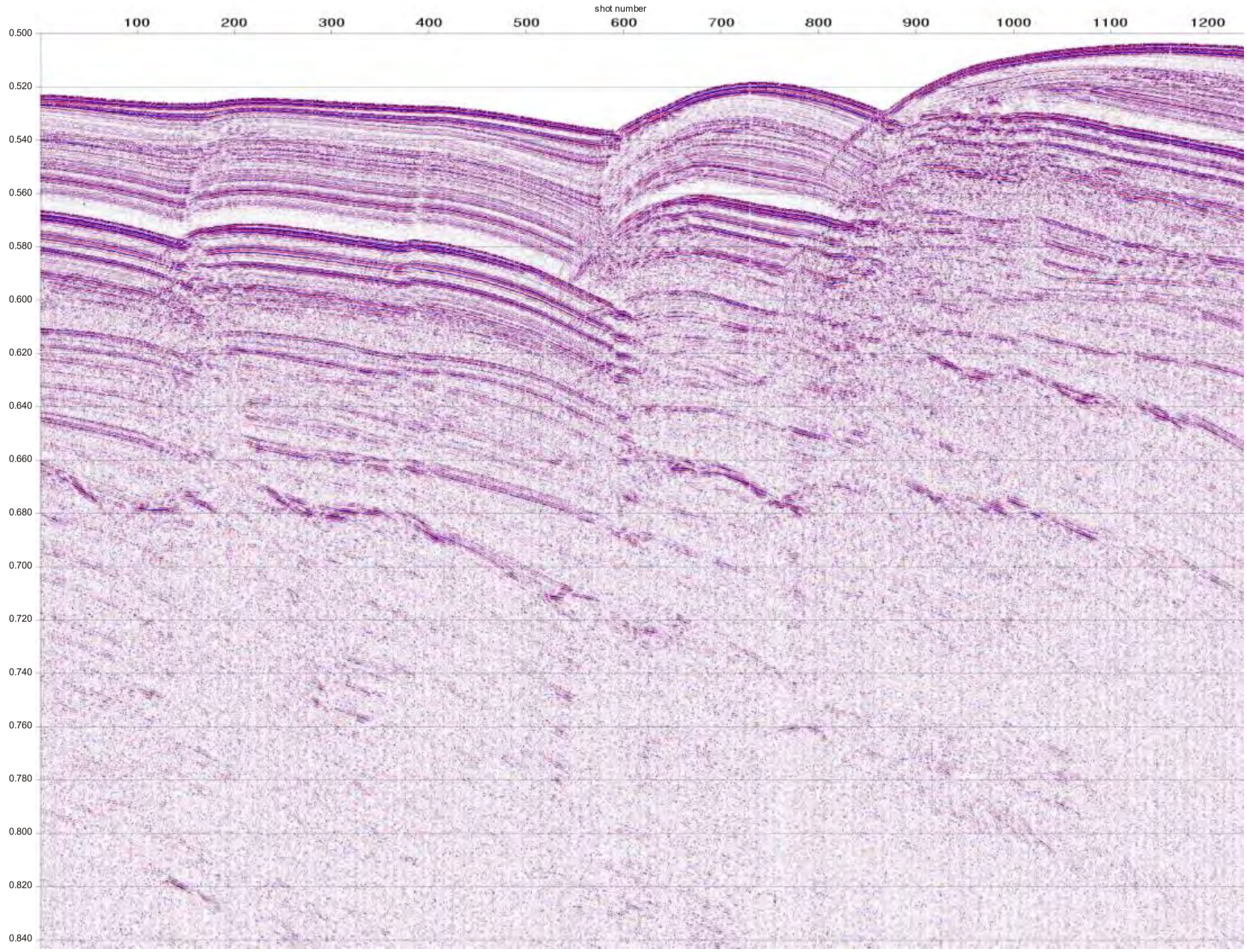
Taranto Italy - May 2005

Approximately 500m



RESOURCES

Location: Mediterranean Sea, Egypte

Date: October 2005

Client : Impresub

Water Depth: 350 - 400 m

Acquisition

Source: Geo-Spark 200
Power Supply: Geo-Spark 1 KJ
Streamer: Geo sense 8 elements
Recording System: Geo-Trace 2
Shot interval: 2 s
Record length: 1000 ms
Sample Rate: 10000 Hz

Display

Horizontal scale 1:9000
Vertical scale 1 cm = 10 ms
One timeline every 20 ms

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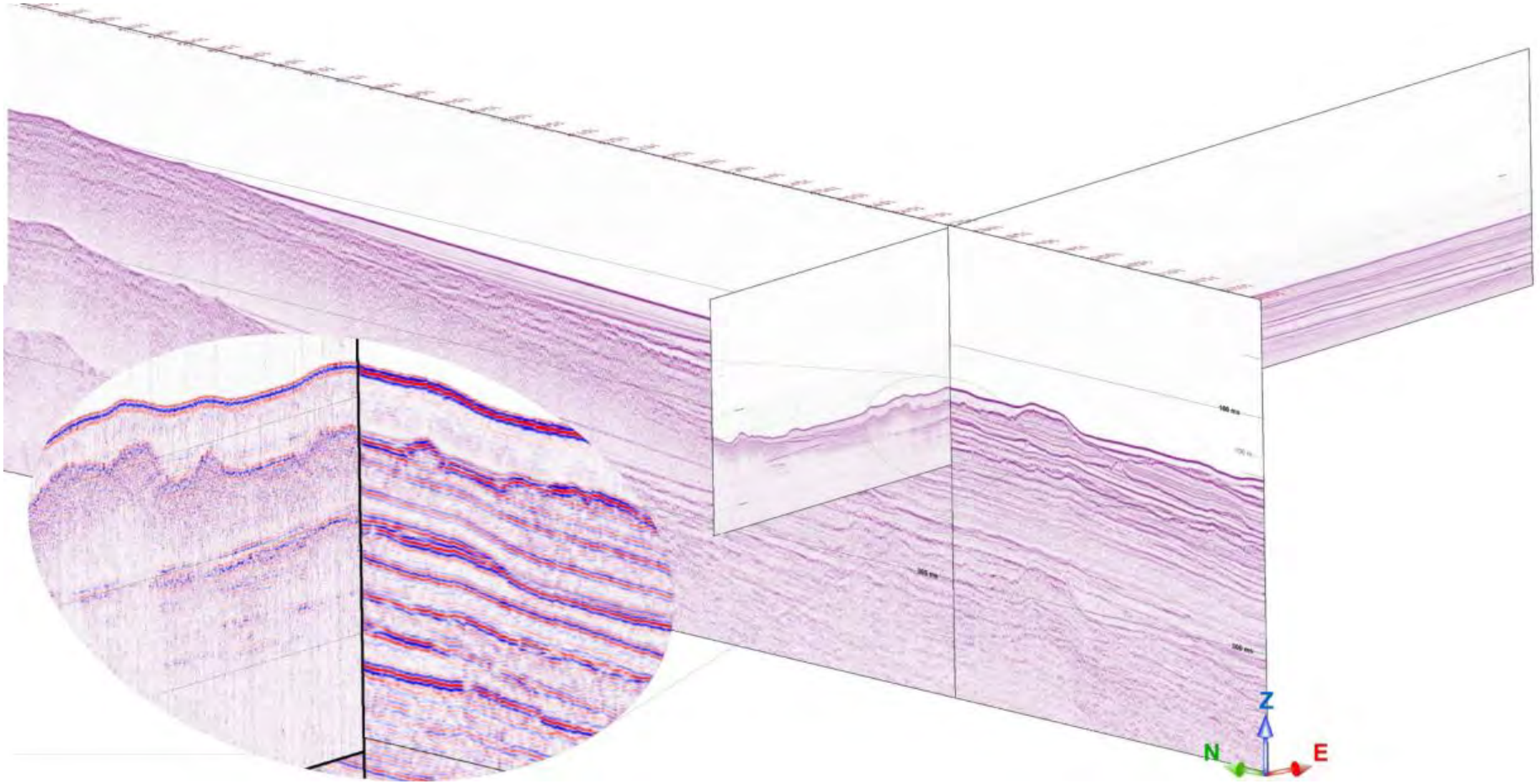
Mediterranean Sea Egypt , October 2005

Approximately 500m

Comparison between the Sparker Geo-Spark 800 and a Chirp system.

Appreciate the difference of resolution and penetration.

RESOURCES



Location: Elba Italy

Date: November 2004

Water Depth: 75 - 115 m

Courtesy of Danillo Morelli, Trieste University

Acquisition

Source: Geo-Spark 800
Power Supply: Geo-Spark 6 kJ
Recording System: Geo-Trace 2
Shot interval: 2 s
Record length: 1000 ms
Sample Rate: 6000 Hz

Sparker Processing

Frequency filtering
Gain
Swell filter
Muting

Display

Horizontal scale 1:5000
Vertical scale 1 cm = 25 ms
One scale line every 100 ms
Data displayed in 3D with OpendTect

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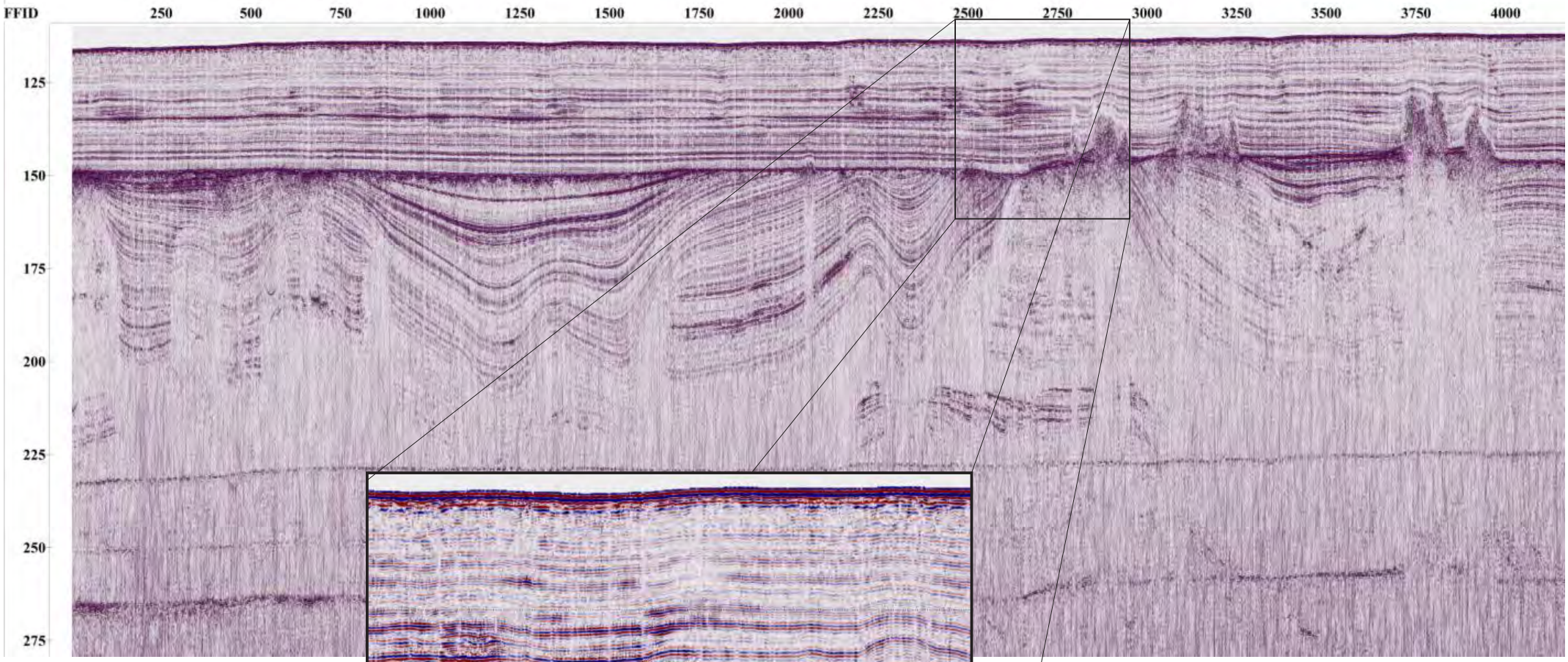
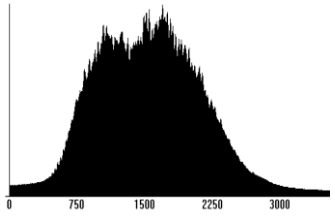
Elba Italy - November 2004

Approximately 200m

M03





Appreciate the frequency content up to 3000 Hz and the decimeter scale resolution

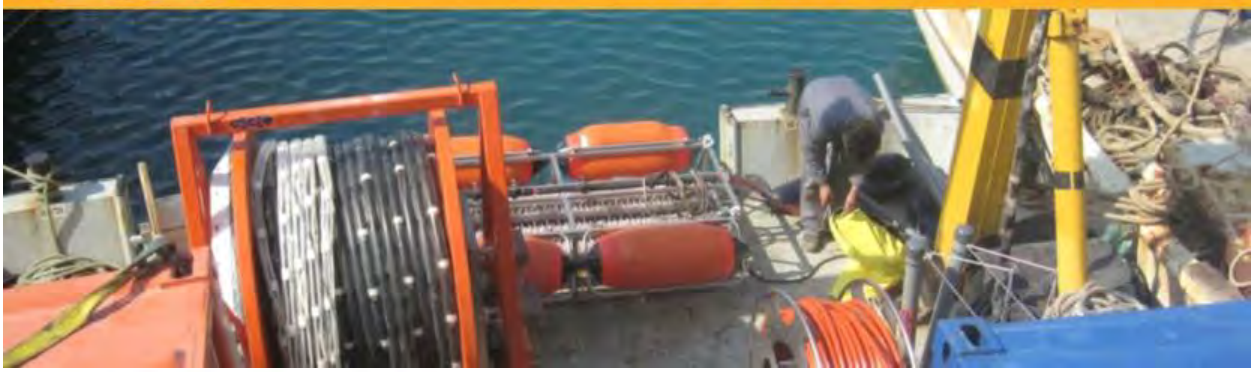
Sparker profile shot with the Geo-Source 200 LW using the Geo-Spark 1000 pulsed power supply

Energy: 300 J, Negative Discharge Technology

Vertical Scale in meters, Aspect ratio 1 :20

Location: Sicily, Gellasabbia
Date: May 2012
Geophysicist: Dr. Henrique Duarte

MARINE SURVEY SYSTEMS



Ultra Hi-Res Streamers

Our streamers are specially designed to meet hi-res seismic requirements.

The high quality materials used ensure high sensitivity and the best performance in terms of **bandwidth** and **S/N** ratio for both single and multi channel acquisition.

GEO-SENSE MULTI CHANNEL STREAMERS

Download Brochure

Hydrophones:	AQ 2000 or Sensor SQ05
Frequency spectrum:	10 - 10000 Hz
Channels:	Up to 96
Pre-amp coupled:	yes
Active group length:	0.5 m
Group interval:	3.125 m / 6.25 m
Outer Diameter:	31.3 mm (up to 24 channels), 41.3 mm (24 - 48 channels), 51.3 mm (48-96 channels)
Recommended with:	MULTI-TRACE 24-48

GEO-SENSE MINI-STREAMERS

Download Brochure

Hydrophones:	AQ 2000 or Sensor SQ05
Frequency spectrum:	---
Pre-amp coupled:	yes
Active group length:	2.8 m (8 elements), 7.4 m (24 elements), 15 m (48 elements)
Recommended with:	MINI-TRACE II, GEO-SENSE FILTER/GAIN INTERFACE

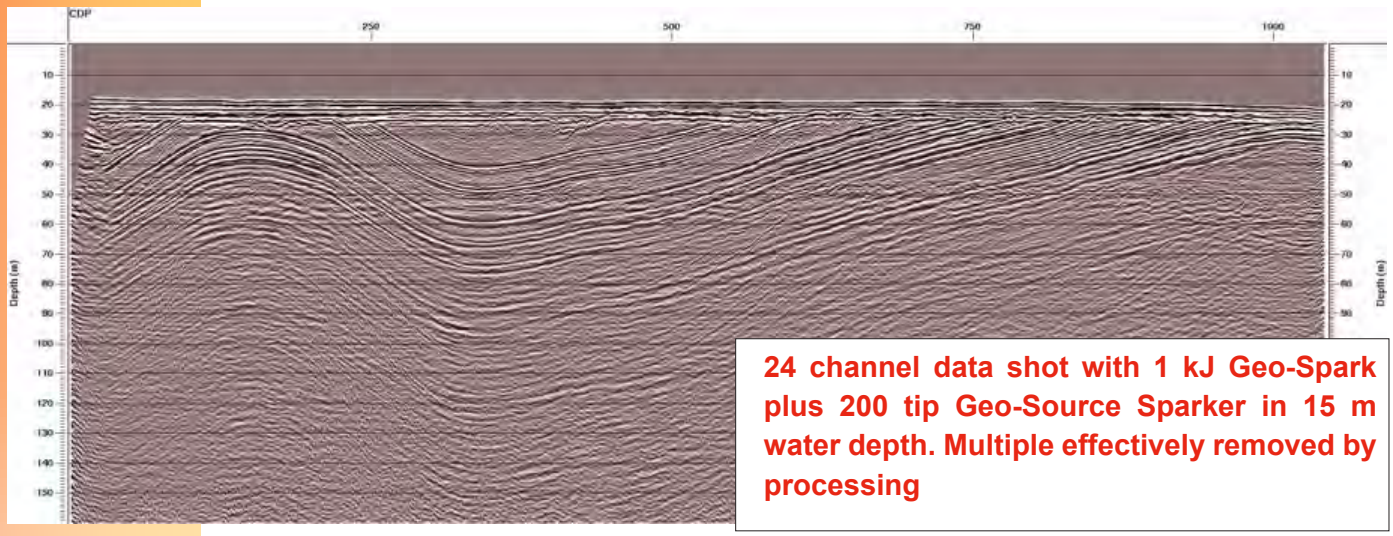
Geo-Sense Light-weight UHRS 24 - 48 Channel Streamers

Main Characteristics

- Small diameter skin (41 mm), small bending radius, < 40 cm
- Very rugged harness made of Delrin spacers plus two 5 mm Kevlar ropes with > 3000 kg breaking strength
- Compact, stainless steel cable reel for easy and safe deployment
- Multi-Trace 24 A-D module integrated in cable reel, minimizing E-noise
- No connectors, all in one section
- Specially designed to capture the HF spectrum from the Geo-Source Sparkers
- Short 3-element active section of 50 cm minimizes spacial filtering
- Small group interval of 3,125 m allows detailed velocity analysis
- Classic analogue design, repairable in any cable shop

Streamer Outrigger

Too many times streamer perfomance is compromised by a bad towing configuration. The use of a 6-8 m outrigger is imperative to keep the streamer out of the prop wash



24 channel data shot with 1 kJ Geo-Spark plus 200 tip Geo-Source Sparker in 15 m water depth. Multiple effectively removed by processing

Geo-Sense Light-weight UHRS

Technical Specifications 24 - 48 channel model

STREAMER GEOMETRY (standard for 24 channels)

Group Length,	50 cm
Group Spacing:	3.125 m spacing between the groups
	Note customized spacing available upon request
Deck Lead:	25 m armoured LAN
Tow lead:	75.0 m
Front-Stretch:	12.5 m
Total Active Length:	75 m
Tail-Stretch:	12.5 m
Total length streamer c/w tow lead	75 tow lead + 12.5 + 75 + 12.5 = 175 m

STREAMER STRUCTURE

Jacket size ID & OD:	35 mm & 41,3 mm
Jacket material:	Unreinforced polyurethane, wall thickness 3.14 mm
Connectors	none, all in one length
Spacing of spacers	24 cm
Stress members	2 x 5 mm Kevlar rope, breaking strength >3000 kg
Ballast fluid:	Shell Sol T (standard)
Buoyancy:	Slightly positive, must be zero balanced using lead
Wiring:	32 twisted pair, super flexible, conductor diam 0,38mm
Shielding	100 % ground shielding all along

HYDROPHONE

type;	AQ 2000 or Sensor
No of hydrophones per group:	3 (three)
Frequency response:	1 Hz to 10,000 Hz ± 3.0 dB
Sensitivity:	201 dBV re 1 uPa @ 20 C
Sensitivity Change vs. Frequency:	±0.25 dB from 1 Hz to 1 kHz
Sensitivity Change vs. Frequency:	±2.00 dB 1 kHz to 10 kHz
Sensitivity Change vs. Temperature:	< 0.03 dB per 1° C change
Capacitance hydrophone:	4.5 nF @ 20° C

PRE-AMP

Type	GEO, High imp, low noise, differential pre-amplifier
Gain:	26 dB
Size:	60 x 16 mm
Gain:	26 dB
Ground reference:	Single-ended
Power :	9 -12 V DC (polarity protected)
High-pass:	-3 dB : 3 Hz
Low-pass:	-3 dB :13 kHz
ESD handling	conform IEC 61000-4 norm

TOW -CABLE

Length:	Standard 75 m
Diameter:	18 mm
Type:	31 or 62 screened twisted pair extra flex 26 AWG
Insulation:	Polyurethane
Strain member:	Double reverse spiral Kevlar, 25 kg breaking strength
Termination	62 pin ITT D connector compatible with Multi-Trace 24

MANUAL CABLE REEL for 24 channel	Manual SS Cable reel with integrated Multi-Trace foot print 120 x 70 cm, height 120 cm, weight 280 kg LAN deck lead to acquisition PC
ELECTRIC WINCH for 48 channel	foot print 160 x 170 cm, height 180 cm, weight 480 kg LAN deck lead to acquisition PC
Depth Control	Lead-in depth controller, AIS-GPS option

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The Netherlands

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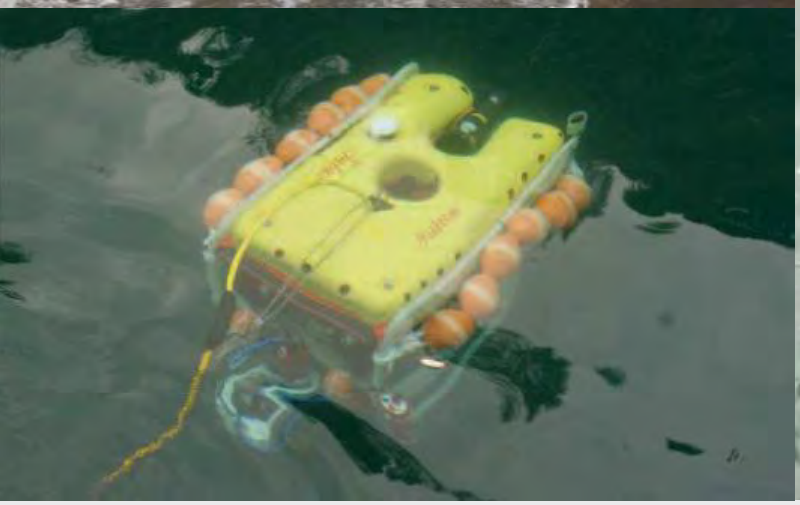
Website: www.geo-spark.com



Sonardyne
SOUND IN DEPTH

SUBSEA TECHNOLOGY

Mini-Ranger 2 is part of our family of sixth-generation (6G) Ultra-Short BaseLine (USBL) underwater target tracking systems. It offers a standard operating range of 995 metres (extendable up to 4,000 metres) and the ability to simultaneously track up to 10 subsea targets (e.g. divers, ROVs and structures) at very fast update rates. These features mean that Mini-Ranger 2 is ideal for nearshore operations on small, quiet vessels, vessels of opportunity, pipelay vessels and construction barges that need survey grade positioning performance without the cost and complexity of a deep water USBL solution.

SONARDYNE MINI-RANGER 2 USBL UNDERWATER TARGET TRACKING SYSTEM

SYSTEM OVERVIEW

Mini-Ranger 2 calculates the position of your underwater targets by measuring the range (distance) and bearing (heading) from a vessel-mounted transceiver to an acoustic transponder fitted to each target; a technique known as Ultra-Short BaseLine (USBL) positioning. One of the main advantages of USBL is that no other in-water acoustic equipment has to be deployed before underwater operations can start. Only the targets being tracked need to be equipped with a transponder.

The Wideband 2 digital signal technology and Sonardyne 6G hardware inside Mini-Ranger 2 provides precise acoustic ranging that is easy to set up and operate, even in the most challenging subsea operating environments. These features improve the efficiency of subsea survey operations, reduce vessel delays and generate cost savings for owners.

Mini-Ranger 2 is compact and highly portable, comprising a rack, desk or console mountable Ethernet Serial Hub (ESH), HPT 3000 acoustic transceiver and software, which is installed on your PC or ruggedised laptop. A wide range of Sonardyne 6G mini transponders can be used with Mini-Ranger 2, allowing you to select the most appropriate beacon for each task. These include: Wideband Sub-Mini 6+ (WSM 6+), Release Transponder 6 family (RT 6), Wideband Mini Transponder 6 (WMT 6) and the ultra-small Nano.

WHAT YOU NEED TO KNOW

- Portable and quick to install on all types of vessel
- 0.2% system accuracy when optimised
- 995 metres standard tracking range; exempt from export control for fast, uncomplicated international shipping
- Tracking range extendable up to 4,000 metres depending on operating set-up
- Fast target position updates; up to 3 per second
- Automatic discovery and tracking of Sonardyne 6G transponders
- Audio Codec for live listening and recording acoustics
- Audio and visual diagnostic tools enable optimised performance
- Importable DXF chart backdrops

HPT 3000

At the heart of Mini-Ranger 2 is the HPT (High Performance Transceiver) 3000 transceiver. Small and lightweight, HPT 3000 is perfect for installation using temporary, over-the-side deployment arrangements.

The transceiver features a unique design of receiver array and transmitter, optimised to provide excellent tracking performance in shallow water, at high elevations, as well as in deeper water. USBL precision is dependent on the baseline between the receiver elements and signal to noise. This is where the HPT 3000 excels; its larger diameter array provides excellent precision and noise rejection.

A key feature of the HPT 3000 is Ethernet-based communications. This means connection to the topside computer (via the Ethernet Serial Hub, or ESH) is simple as it can be connected through a vessel's network via a single network socket – eliminating USB-to-serial drivers and their associated compatibility problems. Ethernet communications also enables in-water diagnostics, allowing you to both listen to, and visualise, signals and noise in the water.

ETHERNET SERIAL HUB

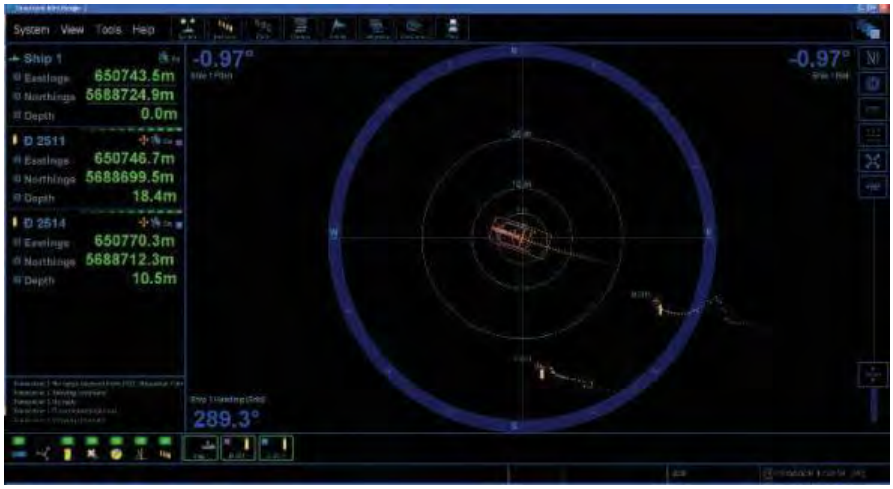
The ESH provides the interface between peripheral sensors, acoustic instruments, mains power and the software running on the PC. The ESH also supports responder trigger and one pulse per second synchronisation across systems.

SOFTWARE

Mini-Ranger 2 uses the same modern and intuitive software as our deep water USBL system, Ranger 2. An extensive set of tools are included to allow you to optimise system performance, including real-time audio and visual signal and noise analysis displays. Our CASIUS calibration tool is also included to correctly calibrate gyro and VRU offsets further improving positioning accuracy. A built-in calibration routine of the internal magnetic sensor minimises the time between installation and tracking.

If you need to track and also communicate with AUVs and drones, an optional Marine Robotics pack is available. Used in conjunction with our Nano AvTrak 6 transceiver on your vehicle, the pack unlocks a host of features such as Data Exchange – used to enable modem functionality utilising Wideband 2 digital signal processing, which supports user data transfer rates from 200 to 9,000 bps.

Software Mini-Ranger 2 shares the same modern and intuitive interface as our established Ranger 2 USBL system ensuring users quickly become confident in its use.



Ethernet Serial Hub and HPT 3000
The Ethernet Serial Hub (ESH) is a 1U-high (desk, console or 19in rack-mounted) unit for interfacing the HPT 3000 transceiver, GPS and user's PC running the Mini-Ranger 2 software. The HPT 3000 is designed for portable installation on small boats. It offers excellent performance in shallow water, at high elevations, as well as in deeper water.

Transponder options
Mini-Ranger 2 is compatible with a wide range of transponders including: Nano (below left top), WSM 6+ (below left bottom), RT 6-3000 (below right), as well as aircraft pinger locators.

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FUGRO
WISON® MKV ECODRIVE

The WISON MkV cone penetration test (CPT) and sampling system enables in situ soil properties to be measured and soil samples/cores to be collected from the base of a borehole either offshore or on land. Tests can be performed at any depth up to 1000m below the drill floor, subject to the capability of the drilling system.

EQUIPMENT

The WISON tool consists of a wireline downhole jacking unit with a 1.5 m or 3 m stroke and a thrust capacity of 100 kN.

TEST PROCEDURE

Tests can be performed consecutively or intermittently throughout the borehole, providing a continuous or semicontinuous profile of measured parameters.
The WISON is lowered to the bit by its electro-hydraulic umbilical, where it seats and latches under its own weight. The test sequence is then activated from a surface control cabin and the piezocone penetrometer is hydraulically pushed nto the soil, at a constant rate of 2 cm/s.

Throughout the test, the measurements of cone resistance, sleeve friction and pore pressure are displayed graphically in the control cabin.

These data are simultaneously recorded, which facilitates processing, interpretation and presentation of the data.

Upon reaching the maximum stroke, or the limiting thrust of 100 kN, the test is terminated and the system depressurised.

The drill string is lifted to extract the push rod from the soil and the WISON unit is retrieved. The whole operation takes 10 to 15 minutes, depending on conditions.

ENVIRONMENTALLY FRIENDLY

The tool is driven by Fugro EcoDrive fluid, an eco-friendly alternative to traditionally used hydraulic oil.

Equipped with a new type of umbilical, the system shows the following strengths:

- High push force achievable
- Highly consistent rate of penetration
- Robust and reliable umbilical
- Quick retermination time

REACTION FORCE

During the test sufficient reaction force is required to balance the penetration thrust.

TEST INTERPRETATION

With the aid of empirical correlations, the cone measurements can be used to estimate soil type, relative density and angle of internal friction of granular soils, and undrained shear strength of cohesive soils as well as other factors such as stress history.

CONE AND PROBE SELECTION

A range of cones and probes of different sizes, capacities and functions has been developed to cope with the wide variety of soil and soft rock types that can be encountered.

COMPATIBILITY

The WISON MkV system is compatible with Fugro downhole tools, e.g. the piston sampler, wireline push sampler and coring device.

EXPERIENCE

Since its debut, over a million tests have been performed throughout the world with the WISON system.

WISON tools on deck of the vessel

Equipment specification

Maximum depth below drill floor	1000 m
Length of stroke	1.5 m / 3 m
Maximum thrust	100 kN
Handling, power and data communication	Umbilical cable (UCE)
Termination	Remote Measuring and Control (RMC)

Sampling and coring tools

Wireline push sampler	2" / 3" diameter. Thin / thick walled, core catcher optional
Piston sampler	3" diameter, thin walled 1 m length
Coring device	Suitable for stiff to hard clays, cemented soils and rock 62.5 mm core diameter 1.5 m / 3 m core length

Compatible probes, sensors and samplers

Piezocone penetrometer 5 cm², 10 cm² and 15 cm²
Temperature cone
Dual seismic cone
Insitu vane
Electrical conductivity cone
Temperature cone
Ball probe
Fugro pore water sampler
Natural gamma cone
Magnetometer cone

Piezocone penetrometer

FUGRO.COM/CONTACTS

P-S Suspension Logging

Overview

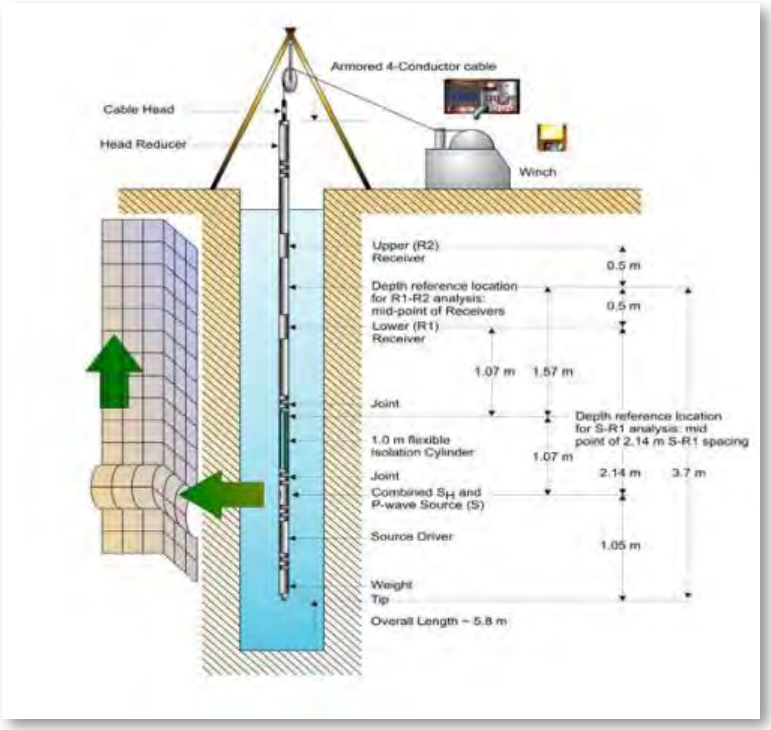
The P-S Suspension Logging technique is a wireline method for determining the in-situ compressional (P) and shear (S) wave velocity profile of the subsurface. This velocity data profile is then used to determine dynamic soil and rock properties, which can be used for engineering analysis. As it is a wireline method, the technique is ideal for offshore applications and the electro-mechanical source does not require permitting compared to other seismic techniques. Furthermore, as the source and receiver are both housed within the probe, the technique can be conducted at great depths and in conditions where conventional mudline or surface-based sources suffer from poor coupling.

Fugro have been providing the P-S Logging services since 2004. Over the years, an in-depth understanding of the technique has been developed through working with a wide variety of projects and Clients including:

- Numerous offshore geotechnical campaigns in the Gulf of Mexico, including PEMEX and BP;
- Nearshore wind farm studies in the North Sea and Irish Sea for Shell, RWE and Npower;
- Onshore geologic and geotechnical site investigations including QA/QC of nuclear projects in the US and overseas.

Instrumentation

Fugro use the Robertsons Geologging P-S suspension probe, which generates shear waves by in-direct excitation rather than relying upon a mode conversion (as used in conventional sonic logging tools). The tool generates an internal compressional wave, that upon impacting the wall of the boring, generates both compressional and shear waves within the surrounding strata. The travel time of these waves are then measured using two receivers located within the wireline tool.



Schematic illustration of the P-S Suspension Probe

Anchorage, AK
Phoenix (Chandler), AZ
Tucson, AZ
Ventura, CA
Los Angeles, CA
Novato, CA
Oakland, CA
Santa Maria (Orcutt), CA
Sacramento (Roseville), CA
San Luis Obispo, CA
Santa Barbara, CA
Santa Clarita, CA
Santa Fe Springs, CA
Tustin, CA
Valencia, CA
Walnut Creek, CA
Golden, CO
Boulder, CO
Washington, DC
Gainesville, FL
Augusta, GA
Baton Rouge, LA
Lafayette, LA
Lake Charles, LA
New Orleans, LA
Columbia, MD
Houston, TX
Austin, TX
Beaumont, TX
Dallas, TX
Fort Worth, TX
Pasadena, TX
San Antonio, TX
Waco, TX
Norfolk, VA
Calgary, AB

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P-S Suspension Logging

MEASUREMENTS
▪ Formation compressional wave velocity - V_p
▪ Formation shear wave velocity - V_s

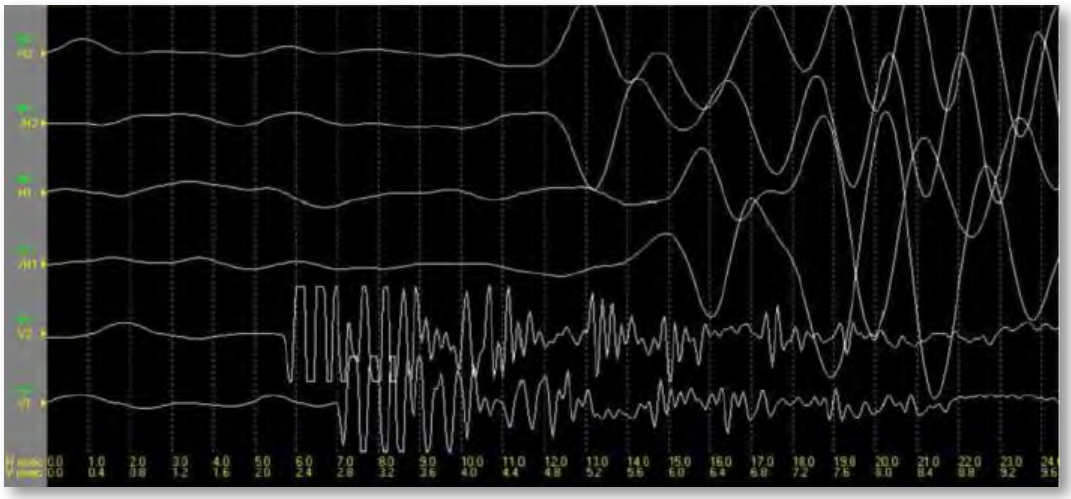
APPLICATIONS	
Engineering	▪ Rock strength and elasticity ▪ Correction of seismic velocity ▪ Calculation of dynamic parameters

OPERATING CONDITIONS	
Borehole type	▪ Open-hole, water-filled

SPECIFICATIONS	
▪ Diameter, 54mm	▪ Receiver type, 3D hydrophones
▪ Length, 8.25m (assembled)	▪ Receiver spacing, 1000mm (3.28ft)
▪ Probe weight, 38kg	▪ Waveform acquisition period, 5.12ms to 409.6ms
▪ Max. temperature, 70^{0}C	▪ Sampling, 2.5us minimum
▪ Max. pressure, 20MPa	▪ Down-hole gain, 0db to 42db (surface control)
▪ Source mechanism, solenoid activated hammer	

Measurement Procedure

P-S Suspension Logging is conducted in an open-hole after completion of drilling, sampling and other in-situ test activities. The P-S Suspension Logging probe, measuring 8.25 m in length, is lowered into the drill pipe, and its depth measured with an electronic encoder. Once lowered to the base of the boring, the seismic source is actuated. During each actuation, three individual actuations 'shots' are made, which are recorded by both the near and far hydrophone. During the first and second of these 'shots', the source actuates in two opposing directions, allowing measurements of the shear waves to be made with the primary particle motion in two opposing polarizations. During the third shot, the transit times of the compressional waves are measured. By analyzing the difference in arrival times between the near and far hydrophones, the interval velocity can be calculated for the 1-meter section of soil column. The P-S Suspension Logging probe is then raised, and held at the next test elevation for the next source actuation. This sequence is repeated until the P-S Suspension Logging probe exits the boring.



Typical P-S Suspension Logging shot record

Anchorage, AK
Phoenix (Chandler), AZ
Tucson, AZ
Ventura, CA
Los Angeles, CA
Novato, CA
Oakland, CA
Santa Maria (Orcutt), CA
Sacramento (Roseville), CA
San Luis Obispo, CA
Santa Barbara, CA
Santa Clarita, CA
Santa Fe Springs, CA
Tustin, CA
Valencia, CA
Walnut Creek, CA
Golden, CO
Boulder, CO
Washington, DC
Gainesville, FL
Augusta, GA
Baton Rouge, LA
Lafayette, LA
Lake Charles, LA
New Orleans, LA
Columbia, MD
Houston, TX
Austin, TX
Beaumont, TX
Dallas, TX
Fort Worth, TX
Pasadena, TX
San Antonio, TX
Waco, TX
Norfolk, VA
Calgary, AB

fugroconsultants.com

FUGRO
SEACALF® MKV DEEP DRIVE®

Fugro's SEACALF® MkV Deep Drive® is an advanced seabed cone penetration test (CPT) system with enhanced soil penetration capacity. The system features a unique combination of a coiled rod and a friction reduction system that enables faster acquisition of deeper CPT's from a wide range of vessels.

INNOVATIVE CPT SOLUTIONS

CPT data is essential for concept development and design of an offshore asset. Challenging project and permitting milestones, reducing levelised cost of energy and safe operations are key drivers for innovation in offshore wind. Separating scopes in a seabed and a downhole phase has become common practice to accelerate fieldwork completion. Therefore, developers are continuously researching into methods to accelerate reporting delivery, reduce HSSE exposure and CO_2 emissions.

DEEPER SOIL PENETRATION

The innovative SEACALF® MkV Deep Drive® reduces the friction that typically accumulates along the rod during a test enabling deeper soil penetration without having to increase thrust capacity and weight of the system.

HIGH-QUALITY DATA

The Continuous Drive System transfers the thrust force to the rod through its innovative dual clamp design. This eliminates slippage and ensures a constant 20 mm/sec penetration rate is maintained to acquire high quality data, even in variable soil conditions.

BENEFITS

- Up to 60% deeper soil penetration capacity reduces fieldwork duration and CO_2 emissions
- Reduced HSSE exposure from the coiled rod system eliminating manual rod building
- High-quality data through controlled penetration rate from the Continuous Drive System
- Global availability and mobilisation from a range of vessels due to compact design
- Near real time access to data via secure cloud-based web portals (optional)

SEACALF® MKV DEEP DRIVE®

Technical Specifications

General

Weight submerged	Max 260 kN (reduced weight possible)
Height	5.5 m
Footprint	3 m x 3 m
Rated water depth	3000 m
Push capacity	0 kN – 200 kN
Pull capacity	0 kN – 200 kN
Penetration length	0 m – 55 m (longer coils available upon request)
Penetration rate	20 mm/s

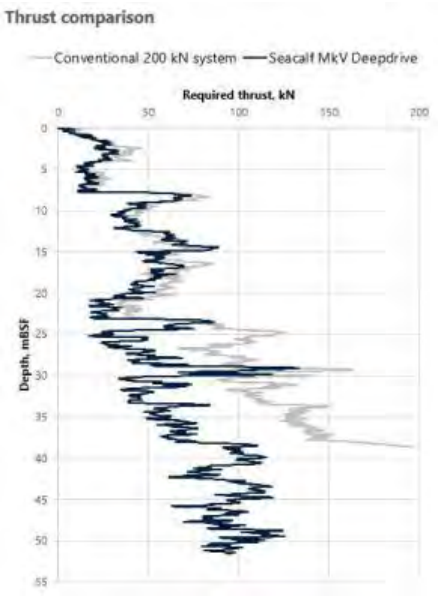
Sensors and communication

Communication	Fibre optic
Seabed system sensors	Roll and pitch
Thrust machine sensors	Thrust, displacement, velocity
System diagnostics	Various pressure and displacement sensors

Cones and probes

Piezocone penetrometer	Cone resistance, sleeve friction, pore pressure
Electrical conductivity cone	Electrical conductivity (S/m)
Temperature cone	Temperature (°C)
Dual seismic cone	Shear wave velocity (m/s)
Natural gamma cone	Natural gamma ray (CPS)
Magnetometer cone	Magnetic flux density, magnetic field horizontal and vertical angle (T,°)
Piezoprobe	Pore pressure (MPa)

SEACALF® MkV Deep Drive® system



The SEACALF® MkV Deep Drive® achieved 14 m of additional penetration and a 45 % reduction in thrust at the conventional system's refusal depth

FLEXIBLE AND ROBUST DEPLOYMENT

With a compact and durable design, the system can be globally mobilised and is compatible with vessels equipped with a traditional A-frame, an offshore crane, or a geotechnical rig with a moonpool or over the side configuration. In addition, an automated motion controlled launch and recovery system can be included to improve weather workability and reduce HSSE risks for your project.

SAFE AND EFFICIENT FIELDWORK COMPLETION

The system is equipped with a 15 cm² piezocone penetrometer and can be adapted to integrate with a range of sensors (refer to technical specifications) for efficient fieldwork completion without unnecessary mode changes. The push rod consists of a flexible thick-walled steel rod that is stored in a coil and straightened or re-coiled by a mechanical device during testing. The coiled rod system eliminates the need to manually build a rod from 1-meter sections, significantly reducing HSSE exposure, deployment time and downtime due to potential rod breakages.

THE FUGRO DIFFERENCE

Our track record and Geo-data expertise enable efficient CPT acquisition and high-quality data that support the design of your offshore asset and reduces installation risks for your project. Our state-of-the-art CPT systems and network of local in-house geotechnical consultants are ready to support your next offshore project. Real time access to your project data via secure web-based portals ensures access to your data when and where you need to accelerate your design process and project delivery. We continuously develop our geotechnical tools and technology to deliver safe and reliable CPT operations for a safe and liveable world.

FUGRO.COM/CONTACTS

FUGRO BLUE SNAKE®

Fugro Blue Snake® is a geotechnical system that integrates cone penetration testing (CPT) and sampling technology to enable safe, fast and high-quality data acquisition.

HIGH-QUALITY DATA

High-quality CPT data and soil samples are essential for engineering and design optimisation of an offshore asset.
To improve geotechnical data correlation and ensure high-quality data, Fugro's Blue Snake® acquires geotechnical data in a single pass and the tests are completed consecutively at a fixed distance.

ON-TIME DELIVERY ASSURANCE

Challenging project timelines are a key driver for innovation in the offshore wind industry. The Blue Snake® accelerates acquisition and delivery of geotechnical data through efficient testing and improved weather workability ensured by its custom integrated launch and recovery system (LARS).

SAFE, EFFICIENT AND SUSTAINABLE OPERATIONS

Fugro's Blue Snake® minimises HSSE exposure by reducing manual handling with a customised LARS for controlled lifting of the system. The Blue Snake® is deployed from the LARS, which is compatible with a range of vessels of opportunity, independent from crane handling capabilities. The efficient testing approach can deliver a potential reduction in carbon footprint of up to 50%.

BENEFITS

- High-quality data with the CPT test and samples acquired in a single pass improving data correlation
- Assured on-time delivery enabled by an efficient testing approach and improved weather workability
- Minimised HSSE exposure through reduced manual handling and use of a customised LARS
- Reduced carbon footprint achieved by less fuel consumption

FUGRO BLUE SNAKE®

Technical Specifications

General

Water depth range	3 m – 100 m
Weight total	40 tonne
Weight Transport	35 tonne
Dimension	40 ft container, 10 ft power pack container
CT Function	Constant tension on wires and heave motion compensation

Template

Weight submerged	Max 132 kN (reduced weight possible)
Height	7.9 m
Footprint	2.8 m x 2.8 m
Rated water depth	100 m
CPT push capacity	100 kN
Penetration length	6 m (longer length available upon request)
Penetration rate	20 mm/s
HPC push capacity	90 kN – 100 kN
HPC barrel length	6 m

LARS

SWL	15 tonne
Weight	25 tonne
Height	9.8 m operation, 2.9 m transport
Length	12.2 m
Width	2.5 m
Horizontal range	2 m 90° position, 4.6 m 115° position
Seastate	2.5 m vessel heave motion with an 8 second wave period

Cones and probes

Piezocone penetrometer	Cone resistance, sleeve friction, pore pressure
Various cones	Other cones upon request

KEY FEATURES

- CPT testing to 6 m, which can be extended to 10 m with a 10 tonne push capacity
- HPC to 6 m, variable thrust control (up to 9-10 tonne) and measures real-time penetration of HPC
- Customised LARS, including constant tension, motion reference unit, dual line deployment and a gantry for controlled lifting
- Potential add-on sensors e.g. thermal conductivity
- Frame settlement gauge for accurate positioning
- Adjustable ballast plate for a range of soil conditions

Fugro Blue Snake® seabed template with integrated CPT and seabed sampling technology

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FUGRO
TEMPERATURE CONE PENETROMETER

Fugro's temperature cone penetrometer provides insights into the heat flow characteristics of soil, such as, in situ ground temperature, in situ temperature gradient, thermal conductivity and volumetric heat capacity. The temperature cone penetrometer can be used in both onshore and offshore environments and supports the design of high-voltage power cables, ground source heat systems, pipelines, and for the detection of permafrost layers.

APPLICATION

Heat flow characteristics of soil are important design parameters for assets of which performance and reliability can be impacted by the temperature. For example, thermal conductivity of the soil is key in the design of high-voltage power cables to prevent cable damage caused by overheating or thermal restrictions for the cable during operations. For the design of pipeline assets, temperature data is essential, as the temperature can impact the viscosity of fluids being transported, the flow rates and pipeline pressures. A temperature cone penetrometer provides the in situ thermal testing required for insights into heat flow characteristics for your project.

EQUIPMENT DETAILS

Fugro's temperature cone penetrometer is similar to a piezocone penetrometer with a temperature sensor positioned within the cone tip. This combines measurement of heat flow characteristics and traditional cone penetration testing (CPT) parameters for efficient data acquisition.

BENEFITS

- Fast data turnaround during fieldwork
- High-quality data ensures an optimised asset and thermal design
- Flexible operations as the temperature cone penetrometer can be deployed from various CPT systems
- Reduced risk of thermal restrictions or remedial actions impacting operations

TEMPERATURE CONE PENETROMETER

The temperature cone penetrometer is suitable for thermal conductivity testing in soil with a cone resistance of minimum 3 MPa. Softer soils may require the use of a heat flow needle probe to ensure continuity in ground condition testing and for a reliable deviation. A selection of temperature cone penetrometers with varying specifications is available and tailored to suit site-specific ground conditions.

Measurement range and applicable ground conditions:

- Measuring range 0 – 60 °C
- Accuracy 3 °C
- In situ soil temperature measurement in all soil types suitable for CPT
- Heat flow characterisation in soils with a cone resistance of minimum 3 MPa

Other temperature measuring ranges available upon request.

TEST PROCEDURE

The test procedure follows the below listed steps:

1. Advance the temperature cone penetrometer to the required test depth
2. Interrupt penetration and monitor temperature until practical equilibrium with the surrounding soil temperature is achieved
3. Continue advancement of the temperature cone penetrometer to the next test depth and repeat step 2 or retract

Typically, the second step takes less than 10 minutes for water-saturated soil and less than 15 minutes for unsaturated soil. The duration depends on factors such as the ground conditions, probe geometry and the initial temperature difference between tool and ground.

Fugro's temperature cone penetrometer can be deployed in both onshore and offshore environments

Technical Specifications

General	T-CP10	T-CP15
Cone base area	10 cm^2	15 cm^2
Calibrated range (default)	50 kN	75 kN
Maximum rating	100 kN	150 kN
Measured and derived parameters	Cone resistance Sleeve friction Temperature Inclination Pore pressure (available upon request, not available in combination with thermal conductivity testing) In situ ground temperature Thermal conductivity Empiric volumetric heat capacity (based on CPT correlations)	
Temperature measuring range (default)	0 - 60 °C (other measuring ranges available on request)	
Application	The temperature cone penetrometer can be used in combination with a wide range of Fugro's land, seabed and downhole based CPT systems, including the WISON®, SEASCOUT® and SEACALF® systems. Refer to the specific system datasheets for more information.	

FUGRO.COM/CONTACTS

Appendix E. NJDEP Natural Heritage Program Correspondence

State of New Jersey
MAIL CODE 501-04
DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE PARKS, FORESTS & HISTORIC SITES
OFFICE OF NATURAL LANDS MANAGEMENT
501 East State Street
P.O. Box 420, Mail Code 501-04
Trenton, NJ 08625-0420
Tel. (609) 984-1339 • Fax (609) 984-0427

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

March 3, 2023

Kirsty Cronin
WSP USA
350 Mt. Kemble Ave.
Morristown, NJ 07960

Re: Invenergy Leading Light Wind - G&G Surveys
Atlantic Ocean and Lower New York Bay
Sea Girt Borough, Monmouth County

Dear Kirsty Cronin:

Thank you for your data request regarding rare species information for the above referenced project site.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.3) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the map(s) submitted with the Natural Heritage Data Request Form into our GIS. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the immediate vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the county (or counties), referenced above, can be downloaded from https://nj.gov/dep/parksandforests/natural/heritage/database.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from https://nj.gov/dep/parksandforests/natural/docs/nhpcodes_2010.pdf.

Beginning May 9, 2017, the Natural Heritage Program reports for wildlife species will utilize data from Landscape Project Version 3.3. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive web application at the following URL,

https://njdep.maps.arcgis.com/apps/webappviewer/index.html?id=0e6a44098c524ed99bf739953cb4d4c7, or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

For additional information regarding any Federally listed plant or animal species, please contact the U.S. Fish & Wildlife Service, New Jersey Field Office at http://www.fws.gov/northeast/njfieldoffice/endangered/consultation.html.

Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements (species and/or ecological communities) or their locations. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 23-4007461-27027

Table 1: On Site Data Request Search Results (6 Possible Reports)

Report Name	**Included**	**Number of Pages**
1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	Yes	1 page(s) included
2. Natural Heritage Priority Sites On Site	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches	Yes	3 page(s) included
4. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.3	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Stream Habitat File	No	0 pages included
6. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	Yes	1 page(s) included

Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

Scientific Name	Common Name	Federal Protection Status	State Protection Status	Regional Status	Grank	Srank	Identified	Last Observed	Location
Vascular Plants									
Amaranthus pumilus	Seabeach Amaranth	LT	E	LP, HL	G2	S1	Y	2014-09-12	Wreck Pond on both sides of Spring Lake/Sea Girt border, and south 2.8 km to Main St. in Manasquan, in Monmouth County.
Polygonum glaucum	Sea-beach Knotweed		E	LP, HL	G3	S1	Y	2011-08-25	Sea Girt, from northern border by Wreck Pond south to National Guard Training Center.

Total number of records: 2

Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Amphibia								
	Fowler's Toad	Anaxyrus fowleri	Occupied Habitat	2	NA	Special Concern	G5	S3
Aves								
	American Kestrel	Falco sparverius	Breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	American Kestrel	Falco sparverius	Non-breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	American Oystercatcher	Haematopus palliatus	Nesting Area	2	NA	Special Concern	G5	S3B,S3N
	Black Skimmer	Rynchops niger	Foraging	4	NA	State Endangered	G5	S1B,S1N
	Black-crowned Night-heron	Nycticorax nycticorax	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Brown Thrasher	Toxostoma rufum	Breeding Sighting	2	NA	Special Concern	G5	S3B,S4N
	Caspian Tern	Hydroprogne caspia	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Common Tern	Sterna hirundo	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Glossy Ibis	Plegadis falcinellus	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Horned Lark	Eremophila alpestris	Non-breeding Sighting	2	NA	Special Concern	G5	S2B,S3N
	Least Tern	Sternula antillarum	Foraging	4	NA	State Endangered	G4	S1B,S1N
	Least Tern	Sternula antillarum	Nesting Colony	4	NA	State Endangered	G4	S1B,S1N
	Little Blue Heron	Egretta caerulea	Foraging	2	NA	Special Concern	G5	S3B,S3N

Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Osprey	Pandion haliaetus	Foraging	3	NA	State Threatened	G5	S2B,S4N
	Osprey	Pandion haliaetus	Nest	3	NA	State Threatened	G5	S2B,S4N
	Peregrine Falcon	Falco peregrinus	Urban Nest	4	NA	State Endangered	G4	S1B,S3N
	Piping Plover	Charadrius melodus	Nesting Area	5	Federally Listed Threatened	State Endangered	G3	S1B,S1N
	Roseate Tern	Sterna dougallii dougallii	Foraging	5	Federally Listed Endangered	State Endangered	G4T3	S1B,S1N
	Snowy Egret	Egretta thula	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Tricolored Heron	Egretta tricolor	Foraging	2	NA	Special Concern	G5	S3B,S3N
Mammalia								
	Fin Whale	Balaenoptera physalus	Live Individual Sighting	5	Federally Listed Endangered	State Endangered	G3G4	S1
	Humpback Whale	Megaptera novaeangliae	Foraging Area	5	Federally Listed Endangered	State Endangered	G4	S1
	Humpback Whale	Megaptera novaeangliae	Live Individual Sighting	5	Federally Listed Endangered	State Endangered	G4	S1
	North Atlantic Right Whale	Eubalaena glacialis	Live Individual Sighting	5	Federally Listed Endangered	State Endangered	G1	S1
Osteichthyes								

Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Atlantic Sturgeon	Acipenser oxyrinchus	Migration Corridor - Adult Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
	Atlantic Sturgeon	Acipenser oxyrinchus	Migration Corridor - Juvenile Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
	Shortnose Sturgeon	Acipenser brevirostrum	Migration Corridor - Adult Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
Reptilia								
	Atlantic Leatherback	Dermochelys coriacea	Occupied Habitat	5	Federally Listed Endangered	State Endangered	G2	S1
	Atlantic Loggerhead	Caretta caretta	Occupied Habitat	5	Federally Listed Threatened	State Endangered	G3	S1

Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program

Scientific Name	Common Name	Federal Protection Status	State Protection Status	Grank	Srank
Vertebrate Animals					
Phocoena phocoena	Harbor Porpoise			G4G5	S3
Tursiops truncatus	Bottlenose Dolphin			G5	S3

Total number of records: 2

Table 2: Vicinity Data Request Search Results (6 possible reports)

Report Name	Included	Number of Pages
1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	Yes	1 page(s) included
2. Natural Heritage Priority Sites within the Immediate Vicinity	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches	Yes	3 page(s) included
4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.3	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Stream Habitat File	No	0 pages included
6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	Yes	1 page(s) included

Immediate Vicinity of the Project Site
Based on Search of Natural Heritage Database
Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

Scientific Name	Common Name	Federal Protection Status	State Protection Status	Regional Status	Grank	Srank	Identified	Last Observed	Location
Vascular Plants									
Amaranthus pumilus	Seabeach Amaranth	LT	E	LP, HL	G2	S1	Y	2014-09-12	Wreck Pond on both sides of Spring Lake/Sea Girt border, and south 2.8 km to Main St. in Manasquan, in Monmouth County.
Polygonum glaucum	Sea-beach Knotweed		E	LP, HL	G3	S1	Y	2011-08-25	Sea Girt, from northern border by Wreck Pond south to National Guard Training Center.

Total number of records: 2

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Amphibia								
	Fowler's Toad	Anaxyrus fowleri	Occupied Habitat	2	NA	Special Concern	G5	S3
Aves								
	American Kestrel	Falco sparverius	Breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	American Kestrel	Falco sparverius	Non-breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	American Oystercatcher	Haematopus palliatus	Nesting Area	2	NA	Special Concern	G5	S3B,S3N
	Bald Eagle	Haliaeetus leucocephalus	Foraging	4	NA	State Endangered	G5	S1B,S2N
	Black Skimmer	Rynchops niger	Foraging	4	NA	State Endangered	G5	S1B,S1N
	Black-crowned Night-heron	Nycticorax nycticorax	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Brown Thrasher	Toxostoma rufum	Breeding Sighting	2	NA	Special Concern	G5	S3B,S4N
	Caspian Tern	Hydroprogne caspia	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Common Tern	Sterna hirundo	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Glossy Ibis	Plegadis falcinellus	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Horned Lark	Eremophila alpestris	Non-breeding Sighting	2	NA	Special Concern	G5	S2B,S3N

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Least Tern	Sternula antillarum	Foraging	4	NA	State Endangered	G4	S1B,S1N
	Least Tern	Sternula antillarum	Nesting Colony	4	NA	State Endangered	G4	S1B,S1N
	Little Blue Heron	Egretta caerulea	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Northern Harrier	Circus cyaneus	Breeding Sighting	4	NA	State Endangered	G5	S1B,S3N
	Osprey	Pandion haliaetus	Foraging	3	NA	State Threatened	G5	S2B,S4N
	Osprey	Pandion haliaetus	Nest	3	NA	State Threatened	G5	S2B,S4N
	Peregrine Falcon	Falco peregrinus	Urban Nest	4	NA	State Endangered	G4	S1B,S3N
	Piping Plover	Charadrius melodus	Nesting Area	5	Federally Listed Threatened	State Endangered	G3	S1B,S1N
	Roseate Tern	Sterna dougallii dougallii	Foraging	5	Federally Listed Endangered	State Endangered	G4T3	S1B,S1N
	Snowy Egret	Egretta thula	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Tricolored Heron	Egretta tricolor	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Yellow-crowned Night-heron	Nyctanassa violacea	Foraging	3	NA	State Threatened	G5	S2B,S2N
	Yellow-crowned Night-heron	Nyctanassa violacea	Nesting Colony	3	NA	State Threatened	G5	S2B,S2N
Mammalia								

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
	Fin Whale	Balaenoptera physalus	Live Individual Sighting	5	Federally Listed Endangered	State Endangered	G3G4	S1
	Humpback Whale	Megaptera novaeangliae	Foraging Area	5	Federally Listed Endangered	State Endangered	G4	S1
	Humpback Whale	Megaptera novaeangliae	Live Individual Sighting	5	Federally Listed Endangered	State Endangered	G4	S1
	North Atlantic Right Whale	Eubalaena glacialis	Live Individual Sighting	5	Federally Listed Endangered	State Endangered	G1	S1
Osteichthyes								
	Atlantic Sturgeon	Acipenser oxyrinchus	Migration Corridor - Adult Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
	Atlantic Sturgeon	Acipenser oxyrinchus	Migration Corridor - Juvenile Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
	Shortnose Sturgeon	Acipenser brevirostrum	Migration Corridor - Adult Sighting	5	Federally Listed Endangered	State Endangered	G3	S1
Reptilia								
	Atlantic Leatherback	Dermochelys coriacea	Occupied Habitat	5	Federally Listed Endangered	State Endangered	G2	S1
	Atlantic Loggerhead	Caretta caretta	Occupied Habitat	5	Federally Listed Threatened	State Endangered	G3	S1

Other Animal Species
In the Immediate Vicinity of the Project Site Based on
Additional Species Tracked by
Endangered and Nongame Species Program

Scientific Name	Common Name	Federal Protection Status	State Protection Status	Grank	Srank
Vertebrate Animals					
Phocoena phocoena	Harbor Porpoise			G4G5	S3
Tursiops truncatus	Bottlenose Dolphin			G5	S3

Total number of records: 2

Appendix F. USFWS IPaC Report

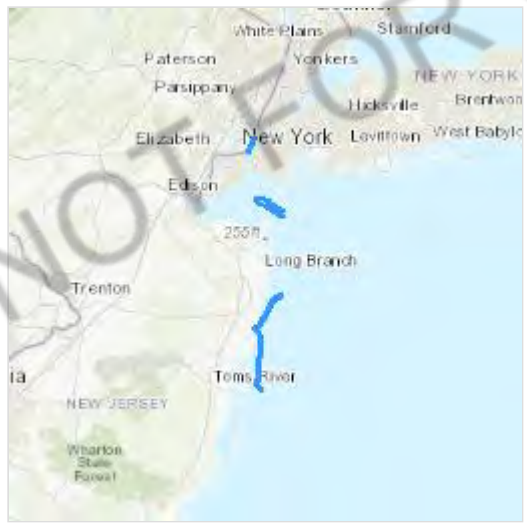
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

New Jersey and New York



Local offices

New Jersey Ecological Services Field Office

(609) 646-9310

4 E. Jimmie Leeds Road, Suite 4

Galloway, NJ 08205

Long Island Ecological Services Field Office

(631) 286-0485
(631) 286-4003

340 Smith Road
Shirley, NY 11967-2258

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Piping Plover Charadrius melodus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot Calidris canutus rufa Wherever found There is **proposed** critical habitat for this species. https://ecos.fws.gov/ecp/species/1864	Threatened
Roseate Tern Sterna dougallii dougallii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2083	Endangered

Insects

NAME	STATUS

Monarch Butterfly Danaus plexippus Wherever found	Candidate

This species only needs to be considered if the following condition applies:

- The monarch is a candidate species and not yet listed or proposed for listing. There are generally no section 7 requirements for candidate species (FAQ found here: https://www.fws.gov/savethemonarch/FAQ-Section7.html).

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9743

Flowering Plants

NAME	STATUS
Seabeach Amaranth Amaranthus pumilus Wherever found	Threatened

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/8549

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species

- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Oystercatcher Haematopus palliatus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Oct 15 to Aug 31
Black Guillemot Cepphus grylle This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds May 15 to Sep 10

Black Scoter Melanitta nigra — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Black Skimmer Rynchops niger — Breeds May 20 to Sep 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5234

Black-billed Cuckoo Coccyzus erythropthalmus — Breeds May 15 to Oct 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9399

Black-legged Kittiwake Rissa tridactyla — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Blue-winged Warbler Vermivora pinus — Breeds May 1 to Jun 30

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Bobolink Dolichonyx oryzivorus — Breeds May 20 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Brown Pelican Pelecanus occidentalis — Breeds Jan 15 to Sep 30

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Canada Warbler Cardellina canadensis — Breeds May 20 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Cerulean Warbler Dendroica cerulea — Breeds Apr 29 to Jul 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/2974

Chimney Swift Chaetura pelagica — Breeds Mar 15 to Aug 25

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Eider Somateria mollissima — Breeds Jun 1 to Sep 30

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Common Loon gavia immer — Breeds Apr 15 to Oct 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/4464

Common Murre Uria aalge — Breeds Apr 15 to Aug 15

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Cory's Shearwater Calonectris diomedea — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Double-crested Cormorant phalacrocorax auritus — Breeds Apr 20 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/3478

Dovekie Alle alle — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/6041

Eastern Whip-poor-will Antrostomus vociferus — Breeds May 1 to Aug 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Golden Eagle Aquila chrysaetos — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Great Shearwater Puffinus gravis — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Gull-billed Tern Gelochelidon nilotica — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9501

Hudsonian Godwit Limosa haemastica — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Kentucky Warbler Oporornis formosus — Breeds Apr 20 to Aug 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

King Rail Rallus elegans — Breeds May 1 to Sep 5

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8936

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Long-eared Owl asio otus — Breeds Mar 1 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3631

Long-tailed Duck Clangula hyemalis — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/7238

Manx Shearwater Puffinus puffinus — Breeds Apr 15 to Oct 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prairie Warbler Dendroica discolor — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prothonotary Warbler Protonotaria citrea — Breeds Apr 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Purple Sandpiper Calidris maritima — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Razorbill Alca torda — Breeds Jun 15 to Sep 10

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red Phalarope Phalaropus fulicarius — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-breasted Merganser Mergus serrator — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-necked Phalarope Phalaropus lobatus — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-throated Loon Gavia stellata — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Ring-billed Gull Larus delawarensis — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Roseate Tern Sterna dougallii — Breeds May 10 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Royal Tern Thalasseus maximus — Breeds Apr 15 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Ruddy Turnstone Arenaria interpres morinella — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Rusty Blackbird Euphagus carolinus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Surf Scoter Melanitta perspicillata — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Thick-billed Murre Uria lomvia — Breeds Apr 15 to Aug 15

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

White-winged Scoter Melanitta fusca — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Willet Tringa semipalmata — Breeds Apr 20 to Aug 5

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wilson's Storm-petrel Oceanites oceanicus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

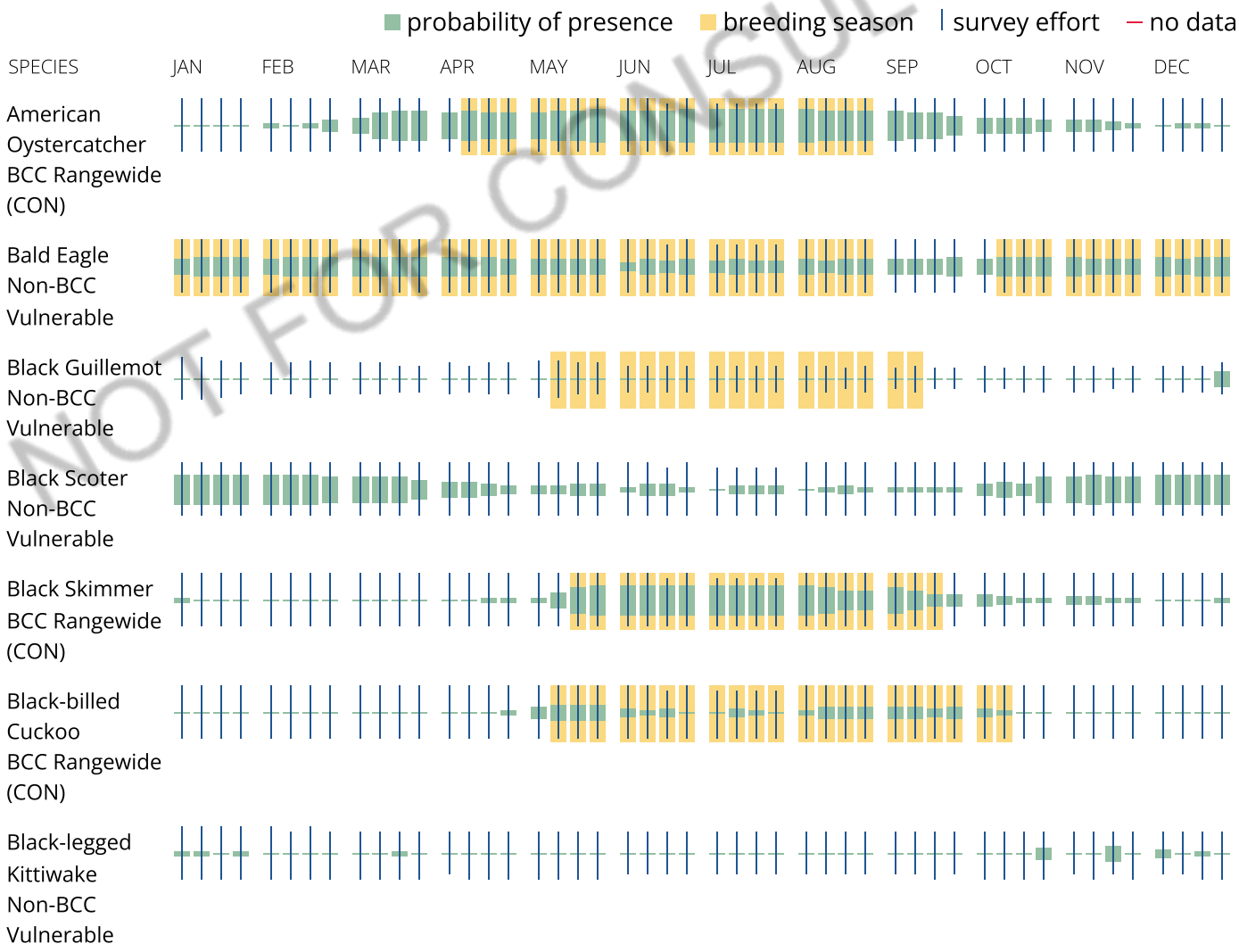
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

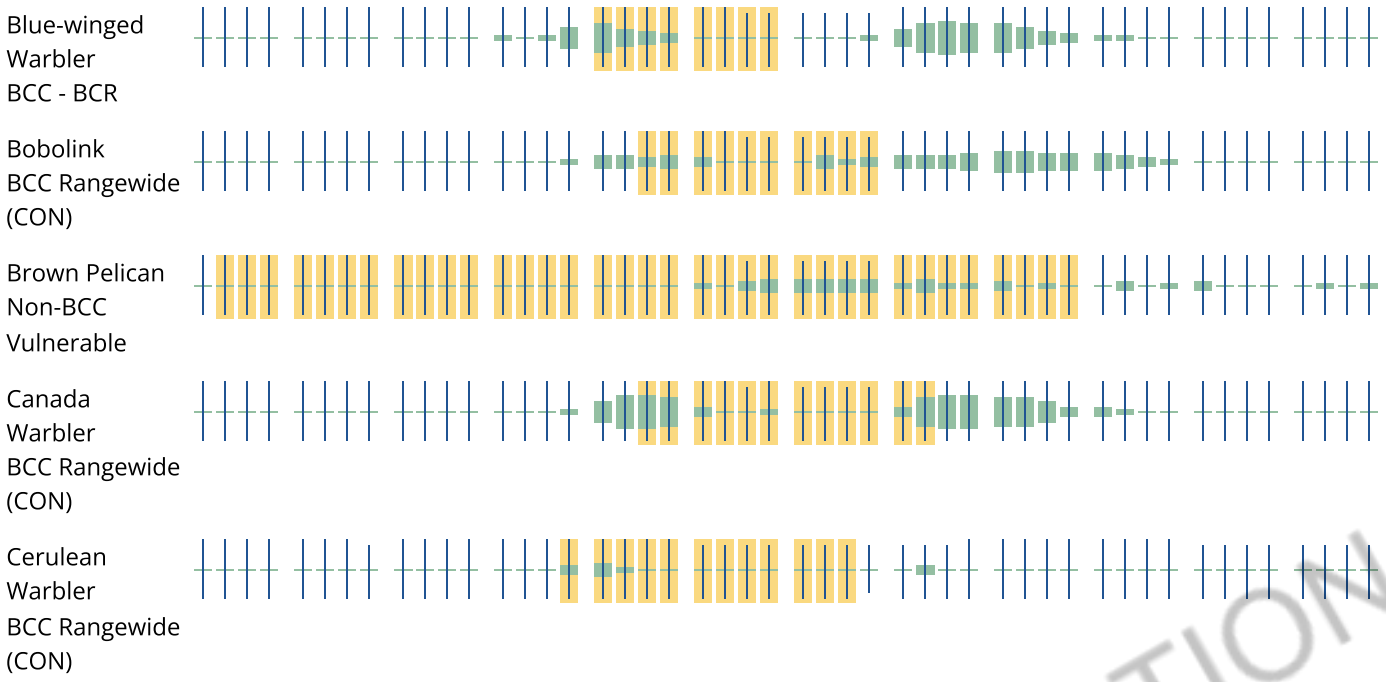
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

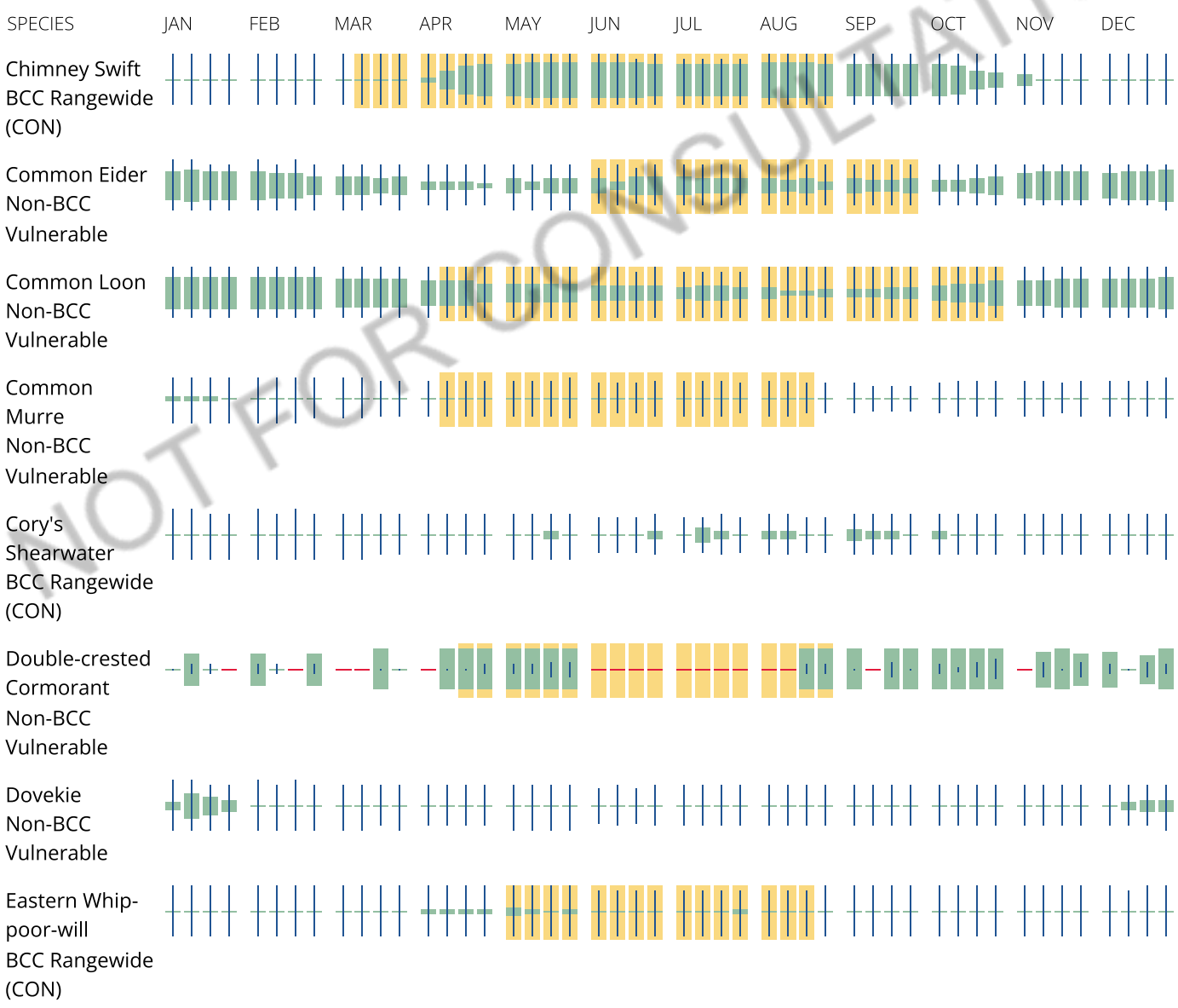
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

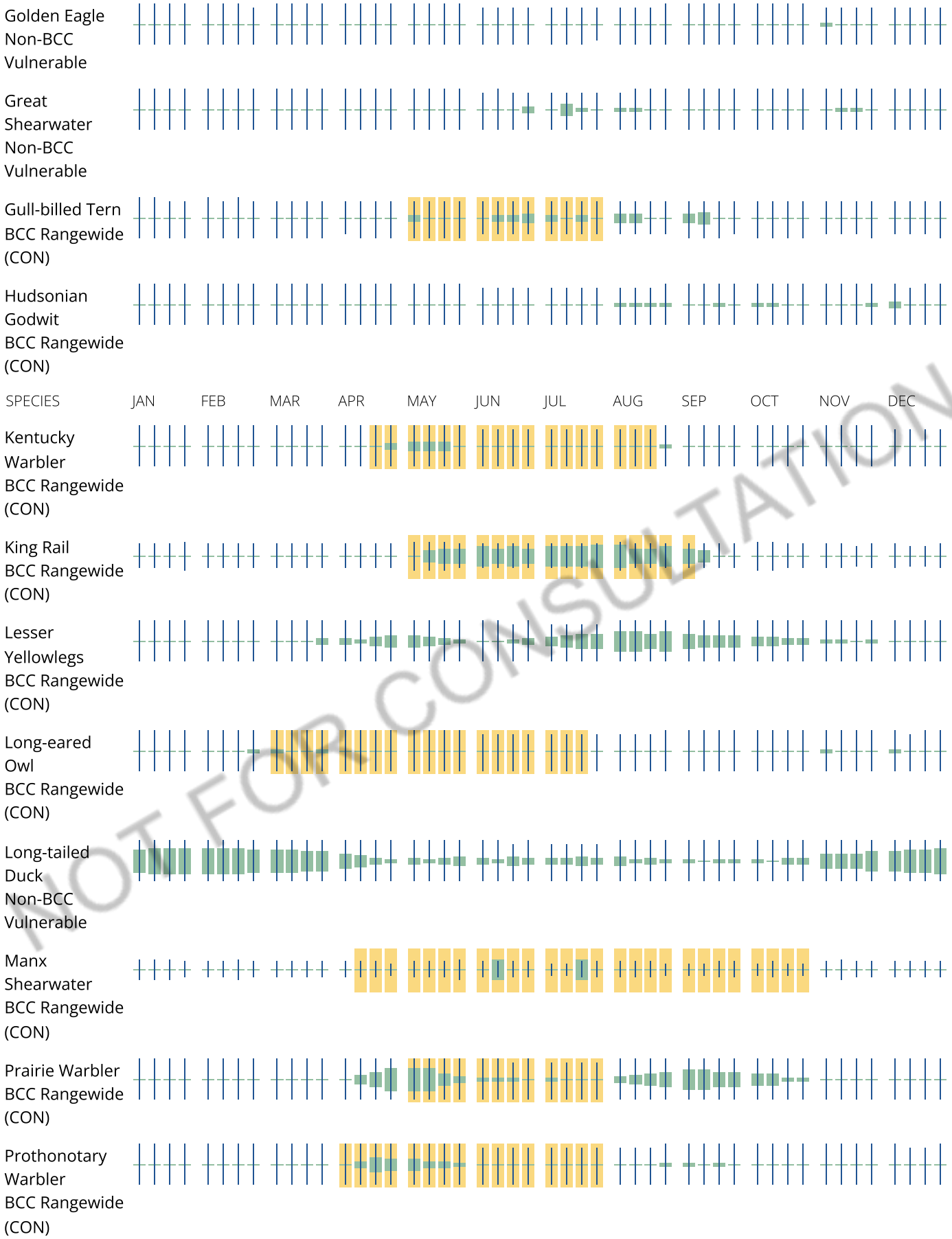
No Data (–)
A week is marked as having no data if there were no survey events for that week.

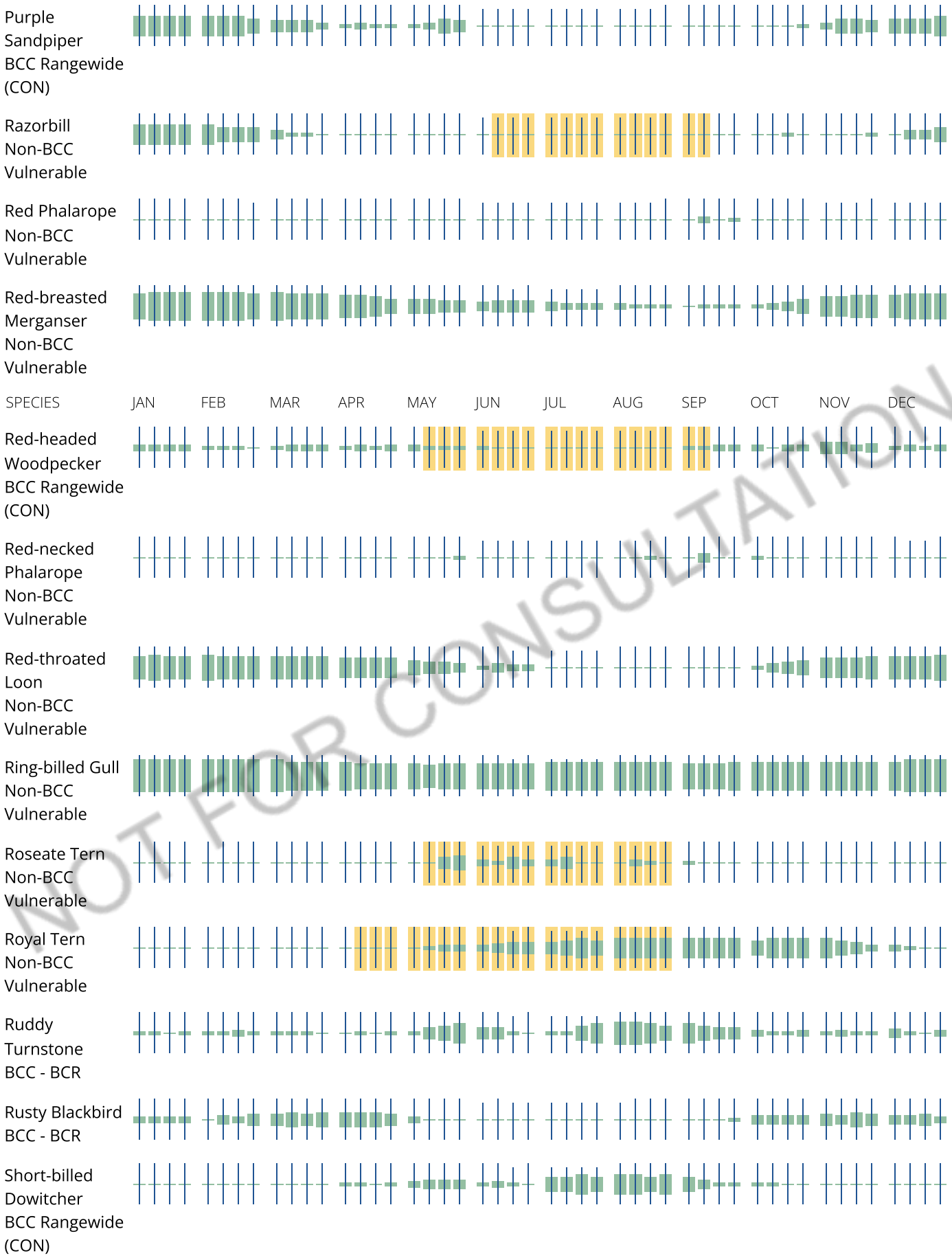
Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

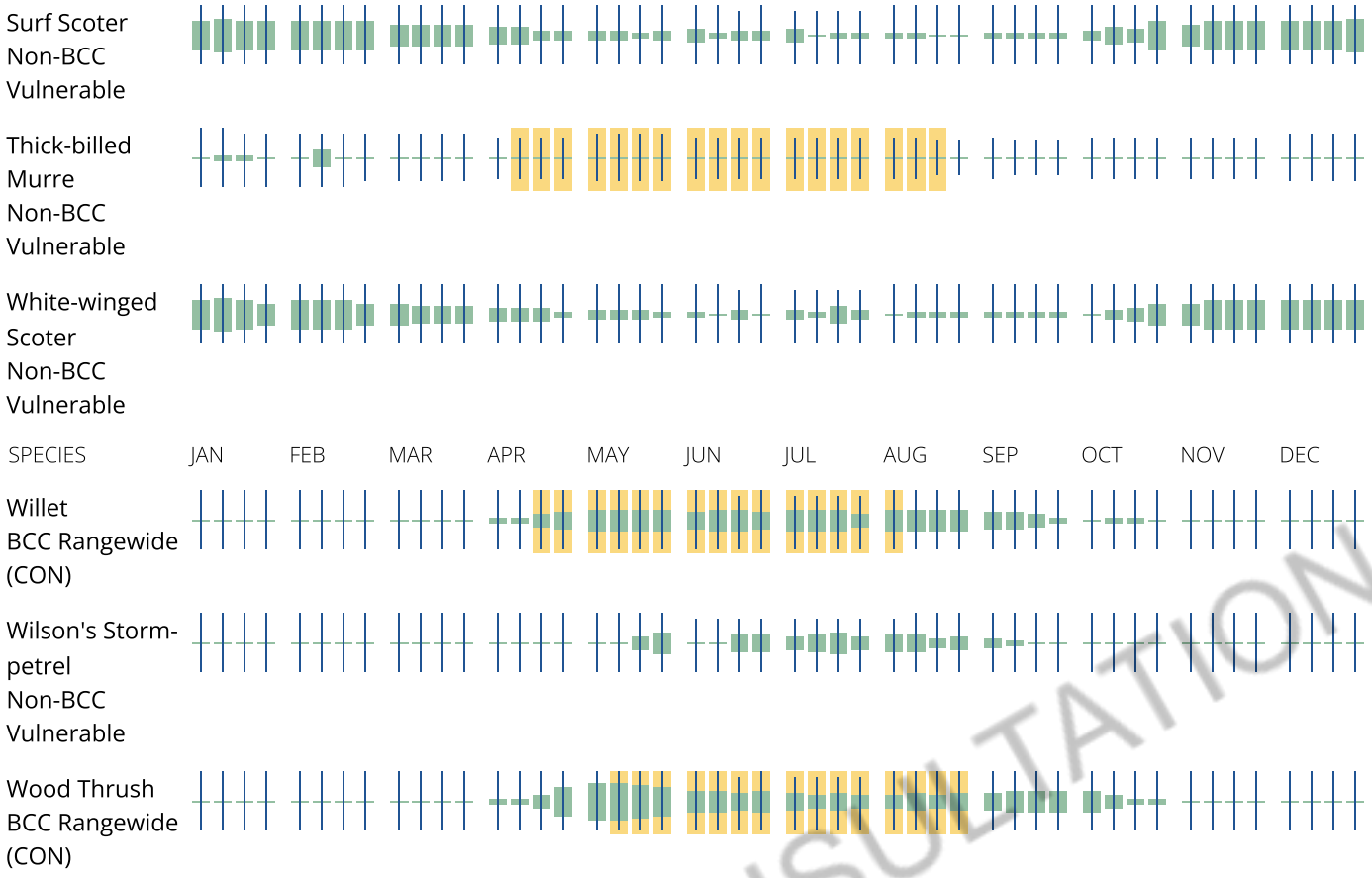












Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact

Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Coastal Barrier Resources System

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

This location overlaps the following CBRS unit(s):

Otherwise Protected Area (OPA)

OPAs are denoted with a "P" at the end of the unit number. The only prohibition within OPAs is on Federal flood insurance. ***CBRA consultation is not required for projects within OPAs.*** *However, agencies providing disaster assistance that is contingent upon a requirement to*

purchase flood insurance after the fact are advised to disclose the OPA designation and information on the restrictions on Federal flood insurance to the recipient prior to the commitments of funds.

NJ-01P - FI 11/16/1991

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the official CBRS maps. The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact CBRA@fws.gov.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

This location did not intersect any wetlands mapped by NWI.

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies.

Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix G. Sturgeon Avoidance and Monitoring Plan

Sturgeon Avoidance and Monitoring Plan
2023-2024 Invenergy Leading Light Wind Geotechnical & Geochemical Survey

(Revised July 26, 2023)[1]

Project Description

Invenergy Wind Offshore LLC (the "Applicant") executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) (40 nautical miles [nm]) east of Atlantic City and 150 km (80 nm) south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km (50+ nm) of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore. A general overview of the Project area is included as **Figure 1**. The Applicant previously obtained the necessary state and federal permits to conduct benthic surveys within the proposed Project area.

Detailed information regarding the proposed geophysical and geotechnical survey program is provided in the 2023 Geophysical and Geotechnical Survey Plan for OCS-A-0542 Leading Light Wind (rev. 2) prepared for review by the Bureau of Ocean Energy Management (BOEM).

The Applicant is planning to conduct a geotechnical and geochemical survey program during 2023 to collect data for characterization of the seafloor and subsurface conditions in the lease area and potential export cable corridors. Geotechnical surveying will be conducted in the lease area to support the planning and design of wind turbine and offshore power substation foundations, inter-array cables, and export cable(s). Geotechnical surveying will also be conducted along potential export cable corridors to support the planning and design of the export cable(s). In addition, geochemical sampling will be conducted along potential export cable corridors.

Location of survey sampling depends on several factors including findings from previously conducted benthic surveys (March 2023) and currently ongoing geophysical surveys. For this reason, an Offshore Cable Survey Area has been developed to account for variations along the potential export cable corridors in the Lower New York Bay (New York waters). In addition, a Supplemental Offshore Cable Survey Area has been developed if additional data is required in the Upper New York Bay and East River (New York waters). Within New Jersey waters, the Survey Area includes the Upper New York Bay, Lower New York Bay, and Atlantic Ocean. Currently, the Applicant is considering two shore landfall sites in the Offshore Cable Survey Area and three additional shore landfall sites in the Supplemental Offshore Cable Survey Area. Maps depicting the Survey Areas are included as **Figures 4 and 5.**

Discussions with the New York State Department of Environmental Conservation (NYSDEC) identified the proposed survey area in New York State waters as supporting the endangered Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*). NYSDEC also highlighted concerns over impacts from the proposed survey activities affecting aggregation areas of Atlantic sturgeon for the New York Bight Distinct Population Segment (DPS). This proposed Sturgeon Avoidance and Monitoring Plan (SAMP) was developed to be implemented during vibracoring activities associated with the offshore survey should such activities occur during the NYSDEC-established time-of-year restriction periods for the Atlantic sturgeon and the shortnose sturgeon: March 1 to June 30 and October 1 to November 30. The NYS/USACE Joint Permit Application Form and Itemized Responses and Project Description (Enclosure 2), dated June 2, 2023, provides details on the proposed activities within New York waters.

The paragraph below briefly summarizes information relevant to this Sturgeon Avoidance and Monitoring Plan (SAMP). Please note this SAMP only applies to surveys within New York waters.

[1] Revised September 28, 2023 for inclusion in NJDEP Waterfront Development Individual Permit. Figure numbers have been revised to reflect NJDEP application figures. Reference to USACE/NYS Joint Permit Application Enclosures have been deleted.

Sediment sampling associated with the offshore cable corridor is scheduled to be conducted from August 2023 to December 2023 (approximately 16 weeks). The Applicant is planning to use a class 2 dynamically positioned vessel or vessel that uses live-boating techniques to maintain position and perform the majority of sampling in New York waters (i.e., no anchoring will be necessary). At 4 near shore sampling locations with a water depth of less than 50 to 60 feet (15 to 17.5 meters), sediment sampling will be conducted using a lift boat or self-elevating barge (lift boat).

The source level of vibracoring, the sampling activity that is expected to generate the greatest amount of noise, is not expected to exceed NOAA's noise-injury threshold of 187dB re 1µPa RMS for sturgeon (2 grams or larger). Sturgeon disturbance may occur within approximately 1,000 feet (320 meters) of the vibracoring based on NOAA's behavioral disturbance threshold of 150 dB re 1µPa RMS. As such, it is assumed that sturgeon may avoid or leave the immediate area during operation of the vibracorer. Therefore, there is a risk that vibracoring activities may have a minor, temporary impact on sturgeon. However, the disturbance would be localized and brief (approximately 10 – 20 minutes) for each vibracore. Other offshore survey activities in New York, include piezo-cone penetrometer tests, are not expected to significantly affect sturgeon. Therefore, the offshore survey activities are not expected to adversely affect sturgeon.

This SAMP will further reduce risk of an incidental take of Atlantic and shortnose sturgeon.

Atlantic and Shortnose Sturgeon Life History Review

Atlantic sturgeon are migratory, anadromous fish that occur along the eastern seaboard of the United States, often in aggregations concentrated along the coasts of New York and New Jersey generally within 5 miles (mi; 8 kilometers [km]) of the shoreline (Dunton et al. 2010; Frisk et al. 2019). According to Dunton et al. (2015), Atlantic sturgeon are largely confined to water depths less than 66 feet (ft; 20 meters [m]), and aggregations tend to occur in nearshore waters at the mouths of large bays (Chesapeake and Delaware Bays) or estuaries (Hudson and Kennebec Rivers) during the fall and spring, then disperse throughout the Mid-Atlantic Bight during the winter. Aggregation areas have been documented as occurring along the coasts of New York and New Jersey, including two known aggregation areas in the New York Bight area off Sandy Hook, New Jersey and Rockaway, New York (Frisk et al. 2019; NMFS 2020). Peak Atlantic sturgeon concentrations typically occur in the aggregation areas from April through June (spring) and October through November (fall), though this varies annually and may begin as early as March (spring) and September (fall) (Laney et al. 2007; Dunton 2014; Dunton et al. 2010, 2015). These aggregations occur in waters depths of less than 50 ft (15 meters). While many Atlantic sturgeon migrate relatively quickly through the aggregation areas (i.e., in less than 2.5 hours), some linger for days, exhibiting non-directional movement that suggests foraging behavior (Dunton 2014). Some of the sturgeon in the Rockaway and Sandy Hook aggregation areas move to and from the Hudson River where, as indicated above, Atlantic sturgeon spawn (NMFS 2022; Bain et al. 1998). A separate set of juveniles, sub-adults, and non-breeding adults continue their migration northeast along the Long Island coast and spend the summer in Long Island Sound (Dunton 2014; Dunton et al. 2012; O'Leary et al. 2014). Atlantic sturgeon originating from any of the five DPSs may occur in the Action Area (Dunton et al. 2012; O'Leary et al. 2014).

The other federally and state-listed endangered fish species that has the potential to occur in the survey area is the shortnose sturgeon. The shortnose sturgeon occurs in most major river systems along the U.S. eastern seaboard. In the northern portion of its range, shortnose sturgeon have been found in the Chesapeake Bay system; the Delaware River; the Hudson River; the Connecticut River and Lower Merrimack River in Massachusetts; the Piscataqua River in New Hampshire; the Kennebec River system and Penobscot River in Maine; and the Saint John River in New Brunswick, Canada (SSSRT 2010). Adult shortnose sturgeon migrate and forage in the northern portions of the survey area (NOAA GARFO 2022). The use of marine waters by shortnose sturgeon is thought to be limited to the estuaries of their natal rivers. In the Hudson River, from late spring through early fall, adult sturgeon occur in deep channel freshwater and brackish habitats. Shortnose sturgeon have been recorded in a large portion of the Hudson River estuary, however in a 1998 study most were documented between approximately River Kilometer 38 and 122 (RM 24 and 76) (Bain et al. 1998). When passive acoustic telemetry was used in the Hudson River, shortnose sturgeon were detected north of River Kilometer 225 (RM 140) in Troy during the spring and stretched south to River Kilometer 25 (RM 15) in the summer (Pendleton et al. 2018). A study in the Gulf of Maine showed shortnose sturgeon using estuaries to undertake coastal migrations between both large and small rivers (Zydlewski et al. 2011). Additionally, shortnose sturgeon detected in the Connecticut River were tagged in the

Housatonic River, the Hudson River, and the Merrimack River, suggesting that shortnose sturgeon south of Maine were also using coastal waters to move between nearby river systems (Savoy 2004; NOAA GARFO 2022). Shortnose sturgeon have not been recorded in the Harlem River or portions of the action area within the East River (Tomicheck et al. 2014).

Sturgeon Acoustic Tracking in the New York Bight

The use of acoustic transmitters to track movements of Atlantic sturgeon in the New York Bight has been verified as an accurate tracking method in recent years. Studies conducted by Melnychuk et al. (2017), Frisk et al. (2019), and Ingram et al. (2019) revealed the effectiveness of acoustic transmitter tracking of Atlantic sturgeon within the New York Bight. These data have indicated that occurrence of individuals in the New York Bight is seasonal, with the months of July to September being among the lowest occurrences and November to January being the highest occurrences (Ingram et al. 2019). As mentioned above, shortnose sturgeon acoustic tagging studies in New York are limited compared to Atlantic sturgeon with the state leading the only known efforts at this time.

Leading Light Wind Sturgeon Avoidance and Monitoring Plan

The Applicant proposes to use an acoustic telemetry system to monitor for the occurrence of previously tagged Atlantic and shortnose sturgeon in conjunction with the proposed virbracore activities during the Atlantic sturgeon restriction periods identified by NYSDEC as March 1 to June 30, and October 1 to November 30. The Applicant proposes to contract an independent Sturgeon Monitor to use the acoustic telemetry system to monitor for the presence of tagged sturgeon when vibracore sampling is conducted. The monitoring activities will be carried out in advance of switching on the vibracorer. If the investigation is performed outside the restriction periods, then no sturgeon monitoring will be performed.

Atlantic Sturgeon Tag Codes

The Applicant is aware of approximately 1,000 active tags for Atlantic sturgeon that were included in the 2023 update of the Atlantic Coast Telemetry (ACT) Network/Mid-Atlantic Acoustic Telemetry Observation System (MATOS) database. The total number of active shortnose sturgeon tags in the ACT database is 124 at this time. Additionally, efforts will be made to contact known sturgeon tag researchers, with more persistent efforts made for those that are understood by NYSDEC to have tagged the most in the area (bolded below), in order to add tag numbers to the Monitoring Plan spreadsheets that may not have yet been submitted to ACT/MATOS. The researchers include, but are not necessarily limited to:

- **Mr. Tom Savoy (Connecticut DEP)**
- **Dr. Keith Dunton (Monmouth University)**
- **Dr. Dewayne Fox (Delaware State University)**
- **Dr. Michael Frisk/Mr. Evan Ingram (Stony Brook University)**
- Dr. Gail Wippelhause (Maine Dept of Marine Resources)
- Mr. Hal Brundage (ERC, Inc)
- Mr. Matt Fisher (Aquatic Solutions, formerly Delaware Department of Nat Resources and Env. Control)
- Dr. Jason Kahn (NOAA)
- Dr. Matt Balazik (Virginia Commonwealth University/US Army Corp of Engineers)
- Dr. Eric Hilton and Dr. Pat McGrath (Virginia Institute of Marine Sciences)
- Mr. Carter Watterson (U.S. Navy)
- Mr. Joseph Iafrate (University of Michigan)
- Mr. Michael Loeffler (North Carolina Department of Marine Fisheries)
- Dr. Bill Post (South Carolina DNR)
- Dr. Adam Fox (University of Georgia)
- Mr. Richard M. Pendleton (NYSDEC)
- Mr. Patrick Sullivan (Cornell University)

Acoustic Telemetry Monitoring Methods

The project is currently considering up to five (5) shore landfall sites within New York. At each shore landfall site, two (2) nearshore geotechnical borings and cone penetration tests (CPT) will be conducted. In addition, fifteen (15) geochemical samples would be taken at each potential landfall location. A total of four (4) marine nearshore geotechnical sampling locations and thirty (30) geochemical sampling locations are proposed near landfall locations on Staten Island adjacent to the Lower New York Bay and Anchorage Channel within the Offshore Cable Survey Area. An additional six (6) marine geotechnical sampling locations and forty-five (45) geochemical sampling locations in the Upper New York Bay and East River (Staten Island and Brooklyn) may be conducted within the Supplemental Offshore Cable Survey Area.

Vibracore sampling and CPT in-situ testing will be conducted along up to three export cable corridor options associated with potential landfall locations in New York. Location of vibracore sampling and CPT in-situ testing locations depends on several factors including findings from the previously conducted benthic surveys and geophysical surveys. Geophysical survey data will be used to determine the location of the proposed vibracore sampling and CPT locations. The 2023 geophysical data will be used by the Qualified Marine Archaeologist (QMA) to clear locations of any potential archaeological resources ahead of any geotechnical activities.

Specific geotechnical locations will be selected to target representative soil units along the export cable corridors. Sampling locations will be spaced nominally 1 km (approximately 0.5 nm) apart. Within Water of the State of New York, up to 40 vibracore sampling locations are proposed within the Offshore Cable Survey Area. An additional 20 vibracore sampling locations could occur within the Supplemental Offshore Cable Survey Area. Geophysical data and sediment chemistry samples will be collected from 27 locations within the Offshore Cable Survey Area. An additional 17 sediment chemical sampling locations will be conducted in the Supplemental Offshore Cable Study Area. Total number of geotechnical and geochemical sampling locations within New York waters is provide in **Table 1**. *The final number and positions of sample locations may vary based on agency feedback and ongoing route analysis, but all locations would remain within reasonable proximity of currently proposed sample locations.*

It is anticipated that vibracoring equipment will be operated for approximately 20 minutes at each of the proposed sample sites and equipment will remain on the seabed for an additional 5 minutes (total of 25 minutes). These durations will be affected by weather conditions and sea state at the time of the sampling.

Table 1. Sampling Locations within New York and New Jersey Waters

Location	Number of Landfall Locations	Geotechnical – Vibracore	Geotechnical – CPT	Geochemical - Vibracore
Near Shore Surveys	5	10	10	75
Offshore Cable Survey Area (NY)	2	4	4	30
Supplemental Offshore Cable Survey Area (NY)	3	6	6	45
Export Cable Surveys		60	60	44
Offshore Cable Survey Area (NY)	---	40	40	27
Supplemental Offshore Cable Survey Area (NY)	---	20	20	17
Total New York Waters	**5**	**70**	**70**	**119**

Final locations may differ based on ongoing consultation with agencies, including NYSDEC, and the positioning capability of the sampling vessel at the time of sampling. Prior to the start of vibracore sampling operations at each location, the Sturgeon Monitor will conduct acoustic monitoring for tagged Atlantic or shortnose sturgeon (or unknown tagged species, assumed to be Atlantic or shortnose sturgeon) within the vicinity of the survey vessel at each location. During this observation period, deck crew will be setting up rigging, performing core tube preparation, and readying for sampling initiation.

When the hydrophone is deployed, the sturgeon monitor will record time and GPS coordinates in a field log (electronic spreadsheet acceptable). Monitoring will be performed at each vibracore sample site for 30 minutes prior to vibracorer deployment. Most acoustic telemetry tags are programmed to signal once randomly within a 60 to 180 second interval to prevent signal interference with other tags. Therefore, the 30-minute window will allow for 10 to 30 transmissions of tags within the area. The Sturgeon Monitor will conduct the monitoring by lowering a pole mounted with a Vemco VR100 acoustic receiver, or similar, with an omnidirectional hydrophone into the water from the vessel. If deployment via pole is not feasible (e.g., fall hazard), a demarcated tethered line may be used to lower the hydrophone. Maximum distance of detection between receiver and transmitters is assumed to be 1,969 ft (600 m) based on the Frisk et al. (2019) study. Additionally, factors such as the power and frequency of the tag and surrounding environmental conditions (e.g., physical properties of the water, underwater ambient noise, topography and vegetation) will affect the distance of detection by the receiver and transmitter (DeCelles and Zemeckis 2014; Mathies et al. 2014).

When an acoustic tag is detected, the Sturgeon Monitor will cross-reference the detected tag ID with the compiled MATOS/ACT Network database to determine if the detected tag indicates that an Atlantic or shortnose sturgeon is currently present in the monitoring area. The tag database will contain the list of active acoustic transmitters currently in use for all tagged species that are included in the ACT Network/MATOS databases. At the request of the researchers, provided information, including tag ID codes, species ID, and related metadata, will remain confidential, and Sturgeon Monitors will be made aware of the sensitive nature of this information. LLW will only use the provided information during the monitoring program for the purposes of identifying whether a tag belongs to an Atlantic or shortnose sturgeon. When no acoustic transmitters belonging to an Atlantic or shortnose sturgeon or unidentified species have been detected for the final 15 minutes of the monitoring period, the Sturgeon Monitor will notify the work crew that sampling activities may begin (allows for detection of 5 to15 transmissions from a single tag within the detection range).

If no tagged Atlantic or shortnose sturgeon (or unknown tagged species, assumed to be Atlantic or shortnose sturgeon) are detected during the final 15 minutes of the monitoring period, vibracoring will commence. The sturgeon monitor will record the time that the hydrophone is removed from the water. No real-time monitoring will be performed during sampling due to personnel safety concerns during coring operations. Once vibracoring operation is initiated at a given location, it is unlikely that the vibracorer could be shut down prior to core extraction without compromising the integrity of the sample and/or sampling equipment. Additionally, interference during vibracoring could occur at similar frequencies of the transmitters which would make it difficult to detect sturgeon while actively vibracoring.

If during the final 15 minutes of the monitoring period tagged Atlantic or shortnose sturgeon (or unknown tagged species, assumed to be Atlantic or shortnose sturgeon) are detected, then the 15-minute interval resets and is repeated until no detections are identified for a full 15-minute interval. If after three continuous 15-minute intervals sturgeon are still detected, then the onboard representative may approve relocation to another sampling site. If the sampling site is moved, the 30-minute monitoring period would start again in the same manner as indicated above. As stated above, if the decision is made to not relocate, activities will not be initiated until no detections are identified for a minimum 15-minute period.

Data Delivery and Reporting

A report of the acoustic detection data collected throughout the duration of the surveys during the Atlantic or shortnose sturgeon time-of-year restriction periods will be provided to NYSDEC within 30 days of completing the survey (extensions may be approved in writing by NYSDEC). All raw data (e.g., sample location [latitude/longitude], time and tag ID) collected during sturgeon monitoring will also be delivered to NYSDEC within 30 days in an Excel file format. LLW may also share the data with other relevant federal and state agencies, as well as researchers affiliated with the MATOS Network or other appropriate non-governmental organizations.

Protected Species Protocols

Reporting Injured or Dead Protected Species

The Applicant will ensure that sightings of any injured or dead protected species by staff/crew on the survey vessel during the proposed survey will be reported to BOEM, NMFS, and the NMFS Greater Atlantic (Northeast) Region's Stranding Hotline within 24 hours of sighting, regardless of whether the injury or death is caused by the survey vessel. If the survey vessel causes injury or death through collision, then LLW will notify BOEM within 24 hours. If LLW is responsible for the injury or death, then LLW will ensure that the vessel assists in any salvage effort per NMFS's request.

The required incident report includes the following:

1. Contact
2. Species identification
3. Fork length/weight
4. Condition of specimen/description of animal
5. Fish decomposed (Y/N)
6. Tagged (Y/N) and tag number
7. Genetic samples collected (Y/N)
8. Location transmitted to and date
9. Name and type of platform
10. Date/time animal observed and/or collected
11. Environmental conditions at time of observation
12. Water temperature/depth
13. Description of location of animal and events 24 hours leading up to and after the incident
14. Photos
15. Date/Time reported to NMFS Stranding Hotline

Reporting Observed Impacts to Protected Species

LLW will report any observed takes of protected species resulting in injury or mortality within 24 hours to BOEM and NMFS. LLW will also report any observations concerning impacts on ESA-listed species to BOEM and NMFS Northeast Region's Stranding Hotline within 48 hours. For further details and procedures on reporting incidents of dead or injured sturgeon and other protected species, please see LLW's Reporting Measures in Section 4.3.6 for the 2023 Geophysical and Geotechnical Survey Plan for OCS-A-0542 (Enclosure 11).

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Appendix H. Property Owner Certifications Forms

New Jersey Department of Environmental Protection
Land Use Management Program
Division of Land Use Regulation

PROPERTY OWNER CERTIFICATION

INSTRUCTIONS: All applicants are required to complete Sections A and B of this form. Applicants who are individual owners of record of the property upon which the activities will occur must also complete Section C.

All other persons who are required to certify to this application in accordance with N.J.A.C. 7:7-23.2(d), N.J.A.C. 7:7A-16.2(d), and N.J.A.C. 7:13-18.2(d) must complete Sections A and C.

Separate forms may be submitted for each signatory, or a single form may be submitted with all required signatures.

SECTION A. SITE INFORMATION (required)

Project Name: Leading Light Wind

Applicant's Name: Invenergy Wind Offshore - Bryan Schueler, VP

Street Address: NA

Municipality: Bayonne City, Jersey City, Middletown, County: Hudson & Monmouth Zip Code: NA

Blocks and Lots: Sea Girt Borough, Manasquan Borough

SECTION B. SIGNATURE OF APPLICANT

The undersigned applicant hereby certifies that he/she is one of the following: 1) an owner of the site on which the activity is proposed or conducted; 2) an agent designated by the site owner(s) to obtain the permit, verification, or letter of interpretation on the owner's behalf; 3) a representative of a public entity proposing an activity within a right-of-way or easement that is held or controlled by that entity or that will be appropriated by the entity under the power of eminent domain; OR 4) a person with the legal authority to perform the proposed activities.

The undersigned applicant also certifies to the following:

1. Does the application include any activities within an easement or right-of-way? ☐ Yes ☒ No

   If "**Yes**," has written consent from all easement or right-of-way holders in accordance with N.J.A.C. 7:7-23.2(g), 7:7A-16.2(g), and 7:13-18.2(g) been attached to this form? ☐ Yes ☐ No
2. Will any part of the project be located within property belonging to the State of New Jersey? ☒ Yes ☐ No
3. Does the application include activities on any property owned by any public agency that would be encumbered by Green Acres? ☐ Yes ☒ No
4. Does this project require a Section 106 (National Register of Historic Places) Determination as part of a federal approval? ☐ Yes ☒ No

Applicant's Name: Bryan Schueler, VP Date: 9/28/2023

Applicant's Signature: DocuSigned by: 485AED04FDD945B...

Applicant's Name: _____ Date: _____

Applicant's Signature: _____

Applicant's Name: _____ Date: _____

Applicant's Signature: _____

Applicant's Name: _____ Date: _____

Applicant's Signature: _____

SECTION C. PROPERTY OWNER'S CERTIFICATION

All individual owners of record of the property upon which the activities will occur must certify to this application unless the applicant is a corporation, partnership, sole proprietorship, municipality, or State, Federal, or other public entity. If the applicant is a corporation, a principal executive officer of at least the level of vice president must certify below. In the case of partnerships and sole proprietorships, a general partner or the proprietor, respectively, is required to certify. For a municipality or for a State, Federal, or other public entity, the certification must be provided by either a principal executive officer or ranking elected official.

A duly authorized representative may sign this application on behalf of any individual who is required to certify provided that the authorization is made in writing and is submitted as part of this application. Please note that in lieu of a property owner's signature, a legal agreement with the current property owner may be attached to this form. Acceptable legal agreements include, but are not limited to, certificates of eminent domain and certificates of inverse condemnation. **Please note that contracts of sale are not considered an acceptable substitute for a property owner's signature.**

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining and preparing the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment. I hereby grant permission for the conduct of the proposed activities and consent to allow access to the site by representatives or agents of the Department for the purpose of conducting a site inspection(s) of the property in question.

Name of Owner/Easement Holder: N/A Date: _____

Signature: _____

Specific Block(s) and Lot(s) Owned: _____

Name of Owner/Easement Holder: _____ Date: _____

Signature: _____

Specific Block(s) and Lot(s) Owned: _____

Name of Owner/Easement Holder: _____ Date: _____

Signature: _____

Specific Block(s) and Lot(s) Owned: _____

Name of Owner/Easement Holder: _____ Date: _____

Signature: _____

Specific Block(s) and Lot(s) Owned: _____

Name of Owner/Easement Holder: _____ Date: _____

Signature: _____

Specific Block(s) and Lot(s) Owned: _____

Name of Owner/Easement Holder: _____ Date: _____

Signature: _____

Specific Block(s) and Lot(s) Owned: _____

Appendix I. Proof of Public Notification

Appendix I1. Public Notice Form

New Jersey Department of Environmental Protection
Land Use Management Program
Division of Land Use Regulation

PUBLIC NOTICE

SECTION A. SITE INFORMATION

Applicant's Name: Invenergy Wind Offshore, - Bryan Schueler, VP

Street Address: _____

Municipality: Bayonne City, Jersey City, Middletown, County: Hudson & Monmouth Zip Code: NA

Blocks and Lots: Sea Girt Borough, Manasquan Borough

SECTION B. STANDARD NOTICE REQUIREMENTS

Except as provided at item 6 below, public notice of the application shall be provided no more than 30 calendar days prior to submitting the application and no later than the date the application is submitted to the Department.

1. Public notice is required for all of the following (*check all that apply*):

- ☐ A flood hazard area general permit authorization (except general permit 1)
- ☐ A flood hazard area individual permit
- ☐ A flood hazard area verification
- ☐ A coastal general permit authorization
- ☐ A CAFRA individual permit
- ☒ An in-water waterfront development individual permit
- ☐ An upland waterfront development individual permit
- ☐ A coastal wetlands individual permit
- ☐ A freshwater wetlands individual permit
- ☐ A freshwater wetlands transition area waiver
- ☐ A freshwater wetlands general permit authorization (except general permit 15)
- ☐ A freshwater wetlands general permit 15 **(please skip to Section C)**

2. Has a copy of the entire application been sent to the municipal clerk of each municipality in which the proposed activity or project is located? ☒ Yes ☐ No

Note: For electronic submissions, the application consists of a description of the project, which must include the lot and block, municipality, and county, the specific permit(s)/authorization(s) being sought, and all items that will be uploaded to the submission service, including all required items on the applicable application checklist(s).

If "**Yes**," did you attach a copy of the certified United States Postal Service white mailing receipt, or other written receipt, and a copy of any letter sent with the application to this form? ☒ Yes ☐ No

3. Have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to the all following applicable agencies? ☒ Yes ☐ No

- The construction official of each municipality in which the site is located
- The environmental commission, or other government agency with similar responsibilities, of each municipality in which the site is located
- The planning board of each municipality in which the site is located
- The planning board of each county in which the site is located

If "**Yes**," did you attach **both** of the following to this form? ☒ Yes ☐ No

- A copy of the certified United States Postal Service white mailing receipt or other written receipt
- A copy of the notice letter

4. Is the application for a coastal permit for an activity within the 12-mile circle with Delaware, as described at N.J.A.C. 7:7-1.2(c), or within 200 feet of the 12-mile circle? ☐ Yes ☒ No

   If "**Yes**," have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to the State of Delaware, Department of Natural Resources & Environmental Control, Delaware Coastal Management Program, 89 Kings Highway, Dover, DE 19901? ☐ Yes ☐ No

   If "**Yes**," did you attach **both** of the following to this form? ☐ Yes ☐ No

   - A copy of the certified United States Postal Service white mailing receipt or other written receipt
   - A copy of the notice letter

5. Is the application for a waterfront development individual permit to install a submarine cable in the ocean or to perform sand mining in the ocean? ☐ Yes ☒ No

   If "**Yes**," have you submitted a description of the project, the specific permit(s)/authorization(s) being sought, and a copy of the NOAA nautical chart showing the proposed cable route or the limits of the proposed sand mining area to **all** of the following entities? ☐ Yes ☐ No

   - Garden State Seafood Association
   - National Fisheries Institute
   - North Atlantic Clam Association
   - Rutgers Cooperative Extension
   - New Jersey Shellfisheries Council
   - New Jersey Marine Fisheries Council

6. Does the application include a CAFRA individual permit? ☐ Yes ☒ No

   If "**No**," skip to Question 7.

   If "**Yes**," has newspaper notice, consisting of a legal notice or display advertisement, been published in the official newspaper of the municipality in which the site is located or a newspaper of general circulation in the municipality? ☐ Yes ☐ No

   If "**Yes**," did you attach a copy of the published newspaper notice, the date of publication, and the name of the newspaper to this form? ☐ Yes ☐ No

   If "**No**," did you verify that a newspaper notice, consisting of a legal notice or display advertisement, will be published in the official newspaper of the municipality in which the site is located or a newspaper of general circulation in the municipality no more than **10 calendar days** after the application is submitted to the Department? ☐ Yes ☐ No

   Note: A copy of the published newspaper notice, the date of publication, and the name of the newspaper must be submitted to the Department within this timeframe.

7. Does the application include one or more of the activities listed below (**other than those proposed in a freshwater wetlands individual permit application**)? ☐ Yes ☒ No

   - A delineation of one-half mile or longer of a regulated water
   - A mosquito control activity subject to flood hazard general permit 2
   - A linear project of one-half mile or longer
   - A shore protection development, including beach nourishment, beach and dune maintenance, or dune creation of one-half mile or longer
   - A public development on a site of 50 acres or more
   - An industrial or commercial development on a site of 100 acres or more
   - A project to remove sediment or debris from a channel of one-half mile or longer
   - Maintenance dredging of a State navigation channel of one-half mile or longer
   - A trail or boardwalk of one-half mile or longer subject to a freshwater wetlands general permit or transition area waiver

If you answered "**No**," to question 7:

Have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to all owners of real property, including easements, located **within 200 feet of the property boundary of the site**? ☒ Yes ☐ No

If "**Yes**," did you attach **all** of the following to this form? ☒ Yes ☐ No

- A copy of the certified United States Postal Service white mailing receipt or other written receipt
- A copy of the notice letter
- A certified list of all owners of real property, including easements, within 200 feet of the property boundary, prepared by the municipality with a date of certification no earlier than one year prior to the date of the application

If you answered "**Yes**," to question 7, answer questions I. and II. below:

I. Have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to all owners of property, including easements, **within 200 feet of any proposed above-ground structure**? ☐ Yes ☐ No

If "**Yes**," did you attach **all** of the following to this form? ☐ Yes ☐ No

- A copy of the certified United States Postal Service white mailing receipt or other written receipt
- A copy of the notice letter
- A certified list of all owners of real property, including easements, within 200 feet of the property boundary, prepared by the municipality with a date of certification no earlier than one year prior to the date of the application

II. For all applications, **except CAFRA individual permits**, has newspaper notice, consisting of a legal notice or display advertisement been published in the official newspaper of the municipality in which the site is located or a newspaper of general circulation in the municipality? ☐ Yes ☐ No

If "**Yes**," did you attach a copy of the published newspaper notice, the date of publication, and the name of the newspaper to this form? ☐ Yes ☐ No

8. Will the proposed activity or project disturb 5,000 square feet of land or more? ☐ Yes ☒ No

If "**Yes**," have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to the local Soil Conservation District? ☐ Yes ☐ No

If "**Yes**," did you attach a copy of the certified United States Postal Service white mailing receipt or other written receipt **and** a copy of the notice letter to this form? ☐ Yes ☐ No

9. Is the proposed activity or project located within the Pinelands Area as designated under the Pinelands Protection Act at N.J.S.A. 13:18A-11(a)? ☐ Yes ☒ No

If "Yes," you are also required to complete Section D of this form.

10. Does the application include a freshwater wetlands individual permit application? ☐ Yes ☒ No

If "**No**," skip to Question 11.

If "**Yes**," does the proposed project involve more than 10 acres of fill? ☐ Yes ☐ No

If "**Yes**," has newspaper notice been published in a newspaper with regional circulation in the region in which the site is located? ☐ Yes ☐ No

If "**Yes**," did you attach a copy of the published newspaper notice, the date of publication, and the name of the newspaper to this form? ☐ Yes ☐ No

If "**No**," has newspaper notice consisting of a legal notice or display advertisement been published in the official newspaper of the municipality in which the site is located or a newspaper of general circulation in the municipality? ☐ Yes ☐ No

If "**Yes**," did you attach a copy of the published newspaper notice, the date of publication, and the name of the newspaper to this form? ☐ Yes ☐ No

11. Does the application include a flood hazard individual permit based on a hardship exception? ☐ Yes ☒ No

If "**Yes**," do all notice letters and published newspaper notices attached to this form (under questions 3, 4, 7, and 8 above, as applicable) include a description of the nature of the hardship as well as the citation and subject matter of each requirement for which the hardship exception is being requested? ☐ Yes ☐ No

SECTION C. FRESHWATER WETLANDS GENERAL PERMIT 15

This section only applies to applications that include a freshwater wetlands general permit 15.

1. Is the applicant a Federal agency conducting activities on Federal land? ☐ Yes ☐ No

If "Yes," public notice is not required for this activity.

2. Has a display advertisement describing the proposed activities, at least four column inches in size, been published in a newspaper with local circulation (including the municipality) and in a newspaper with regional circulation (including the county)? ☐ Yes ☐ No

If "**Yes**," did you attach a copy of the published newspaper notices, the dates of publication, and the names of the newspapers to this form? ☐ Yes ☐ No

SECTION D. PINELANDS

This section only applies to applications where the proposed activity or project is located within the Pinelands Area as designated under the Pinelands Protection Act at N.J.S.A. 13:18A-11.a.

1. Does the application include a flood hazard general permit or individual permit? ☐ Yes ☐ No

If "**Yes**," has a description of the project, including the lot and block, municipality, county, and specific permit(s)/authorization(s) being sought, been sent to the New Jersey Pinelands Commission? ☐ Yes ☐ No

If "**Yes**," did you attach a copy of the certified United States Postal Service white mailing receipt or other written receipt and a copy of any letter provided with the project description to this form? ☐ Yes ☐ No

2. Does the application include a coastal general permit or individual permit? ☐ Yes ☐ No

If "**Yes**," has a copy of the entire application been sent to the New Jersey Pinelands Commission? ☐ Yes ☐ No

Note: For electronic submissions, the application consists of a description of the project, which must include the lot and block, municipality, and county, the specific permit(s)/authorization(s) being sought, and all items that will be uploaded to the submission service, including all required items on the applicable application checklist(s).

If "**Yes**," did you attach a copy of the certified United States Postal Service white mailing receipt or other written receipt and a copy of any letter provided with the application to this form? ☐ Yes ☐ No

3. Is the application solely for a freshwater wetlands general permit(s)? ☐ Yes ☐ No

If "Yes," do not submit the application to the Department. Submit the application to the New Jersey Pinelands Commission.

Appendix I2. Public Municipal and County Agencies to be Notified

Municipal and County Agencies to be Notified

Bayonne City, Hudson County

Municipal Administrator/Clerk:
(One Complete Application)

Madelene C. Medina, City Clerk
City Hall
630 Avenue C
Bayonne, NJ 07002
Phone: 201-858-6029
Email: mmedina@baynj.org

Municipal Planning Board:

Alicia K. Losonczy, Land Use Administrator
City Hall
630 Avenue C
Bayonne, NJ 07002
Phone: 201-856-6182
Email: alosonczy@baynj.org

Municipal Construction Official:

Joseph Benkert, Acting Construction Official & Building Sub-Code Official
City Hall
630 Avenue C
Bayonne, NJ 07002
Phone: 201-856-6334

Municipal Environmental Commission:

Division of Forestry
City Hall
630 Avenue C
Bayonne, NJ 07002
Phone: 201-856-6152

Jersey City, Hudson County

Municipal Administrator/Clerk:
(One Complete Application)

Sean J. Gallagher, City Clerk
280 Grove Street
Jersey City, NJ 07302
Phone: 201-547-5150
Email: seang@jcnj.org

Municipal Planning Board:

Tanya Marione, PP, AICP, Director of Division of City Planning
One Jackson Square, (364 MLK Drive) 2nd floor
Jersey City, NJ 07305
Phone: 201-547-5010

Municipal Construction Official:

Raymond Meyer, Construction Code Official
City Hall Annex
One Jackson Square (364 MLK Drive)
Jersey City, NJ 07305
Phone: 201-547-5055

Municipal Environmental Commission:

Michael DiCiancia, Sr. Forester
13-15 Linden Ave. East
Jersey City NJ 07305
Phone: 201-547-5964

Middletown Township, Monmouth County

Municipal Administrator/Clerk: (One Complete Application)	**Heidi R. Brunt RMC/MMC, CPM, Township Clerk** 1 Kings Highway Middletown, NJ 07748 Phone: 732-615-2015 Email: townclerk@middletownnj.org
Municipal Planning Board:	**Amy H. Citrano, Director of Planning** 1 Kings Highway Middletown, NJ 07748 Phone: 732-615-2098
Municipal Construction Official:	**Joseph Kachinsky, Construction Official** 1 Kings Highway Middletown, NJ 07748 Phone: 732-615-2104
Municipal Environmental Commission:	**Amy Sarrinikolaou, Planning Department Green Team Advisory Committee** 1 Kings Highway Middletown, NJ 07748 Phone: 732-615-2000

Sea Girt Borough, Monmouth County

Municipal Administrator/Clerk: (One Complete Application)	**Dawn Harriman, RMC, CMR, Borough Clerk** Borough Hall 321 Baltimore Boulevard Sea Girt, NJ 08750 Phone: 732-449-9433 ext. 111
Municipal Planning Board:	**Karen Brisben, Planning Board Secretary** Borough Hall 321 Baltimore Boulevard PO Box 296 Sea Girt, NJ 08750
Municipal Construction Official:	**Edward Mack, Construction Official** 423 Warren Avenue, PO Box 638 Spring Lake, NJ 07762 Phone: 732-449-0800 ext. 609
Municipal Environmental Commission:	**N/A**

Manasquan Borough, Monmouth County

Municipal Administrator/Clerk:
(One Complete Application)

Barbara Ilaria, Borough Clerk
201 East Main Street
Manasquan, NJ 08736
Phone: 732-223-0544 ext. 235
Email: bilaria@manasquan-nj.gov

Municipal Planning Board:

Neil B. Hamilton, Chairman Planning Board
201 East Main Street
Manasquan, NJ 08736
Phone: 732-223-0544 ext. 245

Municipal Construction Official:

Frank DiRoma, Construction and Building Official
201 East Main Street
Manasquan, NJ 08736
Phone: 732-223-0544 ext. 243

Municipal Environmental Commission:

Gregory Love, Chairman
201 East Main Street
Manasquan, NJ 08736
Phone: 732-722-8533

Hudson County

County Planning Board:

Francis A. Kenny, Chairman
Bergen Square Center
830 Bergen Avenue, Suite 6A
Jersey City, NJ 07306
Phone: 201-217-5137

Monmouth County

County Planning Board:

Joe Barris, PP, AICP, CFM, Director of Planning
Office of Planning
Monmouth County Hall of Records
One East Main Street
Freehold, NJ 07728

Appendix I3. Notification Letters

VIA CERTIFIED MAIL

Madelene C. Medina, Bayonne City Clerk
City Hall
630 Avenue C
Bayonne, NJ 07002

September 29, 2023

Re **Invenergy Leading Light Wind (OCS-A-0542) – Geotechnical and Geochemical Surveys**
NJDEP Waterfront Development Individual Permit (In-Water)
Bayonne City and Jersey City, Hudson County and Middletown Township, Boroughs of Sea Girt and Manasquan, Monmouth County

Dear Ms. Medina:

This letter is to provide you with legal notification that an application for a Waterfront Development Individual Permit has been submitted to the New Jersey Department of Environmental Protection, Division of Land Resource Protection by Invenergy Wind Offshore LLC (Invenergy). Invenergy is planning to conduct a geotechnical and geochemical survey program during 2023-2024 to collect data for characterization of the seafloor and subsurface conditions along export cable corridors in the Upper New York Bay, Lower New York Bay and Atlantic Ocean.

Invenergy executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) east of Atlantic City and 150 km south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore.

Within New Jersey, Invenergy proposes to conduct up to 65 geotechnical borings (vibracore and cone penetration testing ([CPT]) and 59 geochemical borings (vibracore) for the Project. Nearshore geotechnical and geochemical borings are associated with the in-water horizontal directional drilling (HDD) exit pit necessary for the proposed landfall sites. For the New Jersey landfall site, five (5) geotechnical borings and CPT and six (6) geochemical will be conducted within the vicinity of the proposed Sea Girt landfall. Nearshore borings will be drilled to a nominal depth of 30 m (approximately 98 feet [ft]). Invenergy proposes to conduct up to 60 geotechnical sampling locations and 53 geochemical sampling locations along the export cable corridors. At each geotechnical sampling location, vibracore sampling and CPT in-situ testing will be conducted to a nominal target depth of 5 m (16 ft) below the seafloor. Geochemical testing will be conducted to a nominal target depth of 2.5 m (8 ft) below the seafloor for sampling locations in the Atlantic Ocean/Sea Girt and Lower New York Bay and a target depth of 4.8 to 6.4 m (16 to 21 ft) in the Upper New York Bay. Vibracore borings will range in width from 10 to 18 centimeter (cm) (4 to 7 inches) diameter, while CPT have an approximate diameter of 4 cm (1.4 inches). Impacts associated with geotechnical and geochemical surveys are minimal.

One complete copy of the NJDEP DLRP permit application is enclosed as required by the Coastal Zone Management Rules. The copy is being provided to you for public review. The NJDEP welcomes comments and any information that you may provide concerning the Project. Please submit your written comments along with a copy of this letter within 15 calendar days of receiving this letter to:

New Jersey Department of Environmental Protection, Division of Land Resource Protection
P.O. Box 420, Code 501-02A
Trenton, New Jersey 08625
Attn: Sea Girt Borough Supervisor

VIA CERTIFIED MAIL

Sean J. Gallagher, Jersey City Clerk
280 Grove Street
Jersey City, NJ 07302

September 29, 2023

Re **Invenergy Leading Light Wind (OCS-A-0542) – Geotechnical and Geochemical Surveys**
NJDEP Waterfront Development Individual Permit (In-Water)
Bayonne City and Jersey City, Hudson County and Middletown Township, Boroughs of Sea Girt and Manasquan, Monmouth County

Dear Mr. Gallagher:

This letter is to provide you with legal notification that an application for a Waterfront Development Individual Permit has been submitted to the New Jersey Department of Environmental Protection, Division of Land Resource Protection by Invenergy Wind Offshore LLC (Invenergy). Invenergy is planning to conduct a geotechnical and geochemical survey program during 2023-2024 to collect data for characterization of the seafloor and subsurface conditions along export cable corridors in the Upper New York Bay, Lower New York Bay and Atlantic Ocean.

Invenergy executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) east of Atlantic City and 150 km south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore.

Within New Jersey, Invenergy proposes to conduct up to 65 geotechnical borings (vibracore and cone penetration testing ([CPT]) and 59 geochemical borings (vibracore) for the Project. Nearshore geotechnical and geochemical borings are associated with the in-water horizontal directional drilling (HDD) exit pit necessary for the proposed landfall sites. For the New Jersey landfall site, five (5) geotechnical borings and CPT and six (6) geochemical will be conducted within the vicinity of the proposed Sea Girt landfall. Nearshore borings will be drilled to a nominal depth of 30 m (approximately 98 feet [ft]). Invenergy proposes to conduct up to 60 geotechnical sampling locations and 53 geochemical sampling locations along the export cable corridors. At each geotechnical sampling location, vibracore sampling and CPT in-situ testing will be conducted to a nominal target depth of 5 m (16 ft) below the seafloor. Geochemical testing will be conducted to a nominal target depth of 2.5 m (8 ft) below the seafloor for sampling locations in the Atlantic Ocean/Sea Girt and Lower New York Bay and a target depth of 4.8 to 6.4 m (16 to 21 ft) in the Upper New York Bay. Vibracore borings will range in width from 10 to 18 centimeter (cm) (4 to 7 inches) diameter, while CPT have an approximate diameter of 4 cm (1.4 inches). Impacts associated with geotechnical and geochemical surveys are minimal.

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New Jersey Department of Environmental Protection, Division of Land Resource Protection
P.O. Box 420, Code 501-02A
Trenton, New Jersey 08625
Attn: Sea Girt Borough Supervisor

VIA CERTIFIED MAIL

Heidi R. Brunt RMC/MMC, CPM,
Middletown Township Clerk
1 Kings Highway
Middletown, NJ 07748

September 29, 2023

Re Geophysical & Geotechnical Program Survey Plan for OCS-A-0542 Leading Light Wind
NJDEP Waterfront Development Individual Permit (In-Water)
Bayonne City and Jersey City, Hudson County and Middletown Township, Boroughs of Sea Girt and Manasquan, Monmouth County

Dear Ms. Brunt:

This letter is to provide you with legal notification that an application for a Waterfront Development Individual Permit has been submitted to the New Jersey Department of Environmental Protection, Division of Land Resource Protection by Invenergy Wind Offshore LLC (Invenergy). Invenergy is planning to conduct a geotechnical and geochemical survey program during 2023-2024 to collect data for characterization of the seafloor and subsurface conditions along export cable corridors in the Upper New York Bay, Lower New York Bay and Atlantic Ocean.

Invenergy executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) east of Atlantic City and 150 km south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore.

Within New Jersey, Invenergy proposes to conduct up to 65 geotechnical borings (vibracore and cone penetration testing ([CPT]) and 59 geochemical borings (vibracore) for the Project. Nearshore geotechnical and geochemical borings are associated with the in-water horizontal directional drilling (HDD) exit pit necessary for the proposed landfall sites. For the New Jersey landfall site, five (5) geotechnical borings and CPT and six (6) geochemical will be conducted within the vicinity of the proposed Sea Girt landfall. Nearshore borings will be drilled to a nominal depth of 30 m (approximately 98 feet [ft]). Invenergy proposes to conduct up to 60 geotechnical sampling locations and 53 geochemical sampling locations along the export cable corridors. At each geotechnical sampling location, vibracore sampling and CPT in-situ testing will be conducted to a nominal target depth of 5 m (16 ft) below the seafloor. Geochemical testing will be conducted to a nominal target depth of 2.5 m (8 ft) below the seafloor for sampling locations in the Atlantic Ocean/Sea Girt and Lower New York Bay and a target depth of 4.8 to 6.4 m (16 to 21 ft) in the Upper New York Bay. Vibracore borings will range in width from 10 to 18 centimeter (cm) (4 to 7 inches) diameter, while CPT have an approximate diameter of 4 cm (1.4 inches). Impacts associated with geotechnical and geochemical surveys are minimal.

One complete copy of the NJDEP DLRP permit application is enclosed as required by the Coastal Zone Management Rules. The copy is being provided to you for public review. The NJDEP welcomes comments and any information that you may provide concerning the Project. Please submit your written comments along with a copy of this letter within 15 calendar days of receiving this letter to:

New Jersey Department of Environmental Protection, Division of Land Resource Protection
P.O. Box 420, Code 501-02A
Trenton, New Jersey 08625
Attn: Sea Girt Borough Supervisor

VIA CERTIFIED MAIL

Dawn Harriman, RMC, CMR
Sea Girt Borough Clerk
Borough Hall
321 Baltimore Boulevard
PO Box 296
Sea Girt, NJ 08750

September 29, 2023

Re **Invenergy Leading Light Wind (OCS-A-0542) – Geotechnical and Geochemical Surveys**
NJDEP Waterfront Development Individual Permit (In-Water)
Bayonne City and Jersey City, Hudson County and Middletown Township, Boroughs of Sea Girt and Manasquan, Monmouth County

Dear Ms. Harriman:

This letter is to provide you with legal notification that an application for a Waterfront Development Individual Permit has been submitted to the New Jersey Department of Environmental Protection, Division of Land Resource Protection by Invenergy Wind Offshore LLC (Invenergy). Invenergy is planning to conduct a geotechnical and geochemical survey program during 2023-2024 to collect data for characterization of the seafloor and subsurface conditions along export cable corridors in the Upper New York Bay, Lower New York Bay and Atlantic Ocean.

Invenergy executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) east of Atlantic City and 150 km south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore.

Within New Jersey, Invenergy proposes to conduct up to 65 geotechnical borings (vibracore and cone penetration testing ([CPT]) and 59 geochemical borings (vibracore) for the Project. Nearshore geotechnical and geochemical borings are associated with the in-water horizontal directional drilling (HDD) exit pit necessary for the proposed landfall sites. For the New Jersey landfall site, five (5) geotechnical borings and CPT and six (6) geochemical will be conducted within the vicinity of the proposed Sea Girt landfall. Nearshore borings will be drilled to a nominal depth of 30 m (approximately 98 feet [ft]). Invenergy proposes to conduct up to 60 geotechnical sampling locations and 53 geochemical sampling locations along the export cable corridors. At each geotechnical sampling location, vibracore sampling and CPT in-situ testing will be conducted to a nominal target depth of 5 m (16 ft) below the seafloor. Geochemical testing will be conducted to a nominal target depth of 2.5 m (8 ft) below the seafloor for sampling locations in the Atlantic Ocean/Sea Girt and Lower New York Bay and a target depth of 4.8 to 6.4 m (16 to 21 ft) in the Upper New York Bay. Vibracore borings will range in width from 10 to 18 centimeter (cm) (4 to 7 inches) diameter, while CPT have an approximate diameter of 4 cm (1.4 inches). Impacts associated with geotechnical and geochemical surveys are minimal.

One complete copy of the NJDEP DLRP permit application is enclosed as required by the Coastal Zone Management Rules. The copy is being provided to you for public review. The NJDEP welcomes comments and any information that you may provide concerning the Project. Please submit your written comments along with a copy of this letter within 15 calendar days of receiving this letter to:

New Jersey Department of Environmental Protection, Division of Land Resource Protection
P.O. Box 420, Code 501-02A
Trenton, New Jersey 08625
Attn: Sea Girt Borough Supervisor

VIA CERTIFIED MAIL

Barbara Ilaria, Manasquan Borough Clerk
201 East Main Street
Manasquan, NJ 08736

September 29, 2023

Re Geophysical & Geotechnical Program Survey Plan for OCS-A-0542 Leading Light Wind
NJDEP Waterfront Development Individual Permit (In-Water)
Bayonne City and Jersey City, Hudson County and Middletown Township, Boroughs of Sea Girt and Manasquan, Monmouth County

Dear Ms. Ilaria:

This letter is to provide you with legal notification that an application for a Waterfront Development Individual Permit has been submitted to the New Jersey Department of Environmental Protection, Division of Land Resource Protection by Invenergy Wind Offshore LLC (Invenergy). Invenergy is planning to conduct a geotechnical and geochemical survey program during 2023-2024 to collect data for characterization of the seafloor and subsurface conditions along export cable corridors in the Upper New York Bay, Lower New York Bay and Atlantic Ocean.

Invenergy executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) east of Atlantic City and 150 km south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore.

Within New Jersey, Invenergy proposes to conduct up to 65 geotechnical borings (vibracore and cone penetration testing ([CPT]) and 59 geochemical borings (vibracore) for the Project. Nearshore geotechnical and geochemical borings are associated with the in-water horizontal directional drilling (HDD) exit pit necessary for the proposed landfall sites. For the New Jersey landfall site, five (5) geotechnical borings and CPT and six (6) geochemical will be conducted within the vicinity of the proposed Sea Girt landfall. Nearshore borings will be drilled to a nominal depth of 30 m (approximately 98 feet [ft]). Invenergy proposes to conduct up to 60 geotechnical sampling locations and 53 geochemical sampling locations along the export cable corridors. At each geotechnical sampling location, vibracore sampling and CPT in-situ testing will be conducted to a nominal target depth of 5 m (16 ft) below the seafloor. Geochemical testing will be conducted to a nominal target depth of 2.5 m (8 ft) below the seafloor for sampling locations in the Atlantic Ocean/Sea Girt and Lower New York Bay and a target depth of 4.8 to 6.4 m (16 to 21 ft) in the Upper New York Bay. Vibracore borings will range in width from 10 to 18 centimeter (cm) (4 to 7 inches) diameter, while CPT have an approximate diameter of 4 cm (1.4 inches). Impacts associated with geotechnical and geochemical surveys are minimal.

One complete copy of the NJDEP DLRP permit application is enclosed as required by the Coastal Zone Management Rules. The copy is being provided to you for public review. The NJDEP welcomes comments and any information that you may provide concerning the Project. Please submit your written comments along with a copy of this letter within 15 calendar days of receiving this letter to:

New Jersey Department of Environmental Protection, Division of Land Resource Protection
P.O. Box 420, Code 501-02A
Trenton, New Jersey 08625
Attn: Sea Girt Borough Supervisor

VIA CERTIFIED MAIL
September 29, 2023

Re Geophysical & Geotechnical Program Survey Plan for OCS-A-0542 Leading Light Wind
NJDEP Waterfront Development Individual Permit (In-Water)
Bayonne City and Jersey City, Hudson County and Middletown Township, Boroughs of Sea Girt and Manasquan, Monmouth County

This letter is to provide you with legal notification that an application for a Waterfront Development Individual Permit has been submitted to the New Jersey Department of Environmental Protection, Division of Land Resource Protection by Invenergy Wind Offshore LLC (Invenergy). Invenergy is planning to conduct a geotechnical and geochemical survey program during 2023-2024 to collect data for characterization of the seafloor and subsurface conditions along export cable corridors in the Upper New York Bay, Lower New York Bay and Atlantic Ocean. The Survey Area is shown on the enclosed plans.

Invenergy executed an offshore wind lease in the New York Bight for Lease Area OCS-A-0542 approximately 70 kilometers (km) east of Atlantic City and 150 km south of Long Island. Invenergy's offshore wind project in Lease Area OCS-A-0542 is the Leading Light Wind Project, which is anticipated to include approximately 90+ wind turbine generators within 84,000 acres of the U.S. Outer Continental Shelf, in water depths of 34-52 meters (m), as well approximately 93+ km of export cables to either a point of interconnection in the New York Metropolitan area or along the New Jersey shore.

Within New Jersey, Invenergy proposes to conduct up to 65 geotechnical borings (vibracore and cone penetration testing ([CPT]) and 59 geochemical borings (vibracore) for the Project. Nearshore geotechnical and geochemical borings are associated with the in-water horizontal directional drilling (HDD) exit pit necessary for the proposed landfall sites. For the New Jersey landfall site, five (5) geotechnical borings and CPT and six (6) geochemical will be conducted within the vicinity of the proposed Sea Girt landfall. Nearshore borings will be drilled to a nominal depth of 30 m (approximately 98 feet [ft]). Invenergy proposes to conduct up to 60 geotechnical sampling locations and 53 geochemical sampling locations along the export cable corridors. At each geotechnical sampling location, vibracore sampling and CPT in-situ testing will be conducted to a nominal target depth of 5 m (16 ft) below the seafloor. Geochemical testing will be conducted to a nominal target depth of 2.5 m (8 ft) below the seafloor for sampling locations in the Atlantic Ocean/Sea Girt and Lower New York Bay and a target depth of 4.8 to 6.4 m (16 to 21 ft) in the Upper New York Bay. Vibracore borings will range in width from 10 to 18 centimeter (cm) (4 to 7 inches) diameter, while CPT have an approximate diameter of 4 cm (1.4 inches). Impacts associated with geotechnical and geochemical surveys are minimal.

The complete permit application package can be reviewed at the municipal clerk's office or by appointment at the NJDEP's Trenton Office. The NJDEP welcomes comments and any information that you may provide concerning the Project. Please submit your written comments along with a copy of this letter within 15 calendar days of receiving this letter to:

New Jersey Department of Environmental Protection, Division of Land Resource Protection
P.O. Box 420, Code 501-02A
Trenton, New Jersey 08625
Attn: Sea Girt Borough Supervisor

PUBLIC NEWSPAPER NOTICE

In accordance with guidance provided by the NJDEP, a public notice has been published in a newspaper with regional circulation in the region of the Survey Area. This newspaper notice shall be published as a display advertisement of at least four inches in width.

Newspaper with regional circulation for the Upper New Yor Bay (Hudson County) is The Jersey Journal. Newspaper with regional circulation for the Lower New York Bay and Atlantic Ocean/Sea Girt (Monmouth County) is the Asbury Park Press.

Affidavits of publication will be provided to the NJDEP LRP once received from the newspaper.

PUBLIC NOTICE

Take notice that an application for an application for an authorization under a Waterfront Development Individual Permit has been submitted to the New Jersey Department of Environmental Protection, Division of Land Resource Protection (DLRP) for the development described below:

APPLICANT: Invenergy Wind Offshore LLC (Invenergy)

PROJECT NAME: Leading Light Wind (OCS-A-0542) – Geotechnical and Geochemical Surveys

PROJECT DESCRIPTION: Invenergy is planning to conduct a geotechnical and geochemical survey program during 2023-2024 to collect data for characterization of the seafloor and subsurface conditions along export cable corridors in the Upper New York Bay, Lower New York Bay and Atlantic Ocean. Within New Jersey, Invenergy proposes to conduct up to 65 geotechnical borings (vibracore and cone penetration testing ([CPT]) and 59 geochemical borings (vibracore) for the Project. Nearshore geotechnical and geochemical borings are associated with the in-water horizontal directional drilling (HDD) exit pit necessary for the proposed landfall site. For the New Jersey landfall site, five (5) geotechnical borings and CPT and six (6) geochemical will be conducted within the vicinity of the proposed Sea Girt landfall. Nearshore borings will be drilled to a nominal depth of 30 m (approximately 98 feet [ft]). Invenergy proposes to conduct up to 60 geotechnical sampling locations and 53 geochemical sampling locations along the export cable corridors. At each geotechnical sampling location, vibracore sampling and CPT in-situ testing will be conducted to a nominal target depth of 5 m (16 ft) below the seafloor. Geochemical testing will be conducted to a nominal target depth of 2.5 m (8 ft) below the seafloor for sampling locations in the Atlantic Ocean/Sea Girt and Lower New York Bay and a target depth of 4.8 to 6.4 m (16 to 21 ft) in the Upper New York Bay. Vibracore borings will range in width from 10 to 18 centimeter (cm) (4 to 7 inches) diameter, while CPT have an approximate diameter of 4 cm (1.4 inches). Impacts associated with geotechnical and geochemical surveys are minimal.

PROJECT LOCATION: Upper New York Bay, Lower New York Bay and Atlantic Ocean

ADJACENT MUNICIPALITIES: Bayonne City and Jersey City, Hudson County and Middletown Township, Boroughs of Sea Girt and Manasquan, Monmouth County

The complete permit application package can be reviewed at either the municipal clerk's office in the municipality in which the site subject to the application is located, or by appointment at the Department's Trenton Office. The Department of Environmental Protection welcomes comments and any information that you may provide concerning the proposed development and site. Please submit your written comments within 15 calendar days of receiving this letter to:

New Jersey Department of Environmental Protection, Division of Land Resource Protection
P.O. Box 420, Code 501-02A
Trenton, New Jersey 08625
Attn: Sea Girt Borough Supervisor

Appendix I4. Certified Mail Receipts

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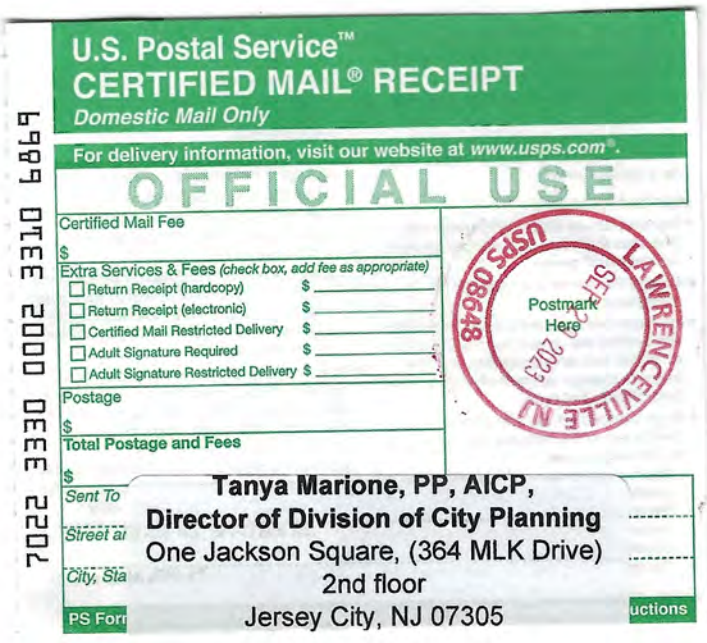

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Tanya Marione, PP, AICP,
Director of Division of City Planning
One Jackson Square, (364 MLK Drive)
2nd floor
Jersey City, NJ 07305

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Karen Brisben

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Planning Department
Green Team Advisory Committee
1 Kings Highway
Middletown, NJ 07748

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Manasquan Environmental
Commission
201 East Main Street
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Francis A. Kenny, Chairman
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