

MARINE ARCHAEOLOGICAL RESOURCES ASSESSMENT FOR THE  
MARYLAND OFFSHORE WIND PROJECT  
LOCATED ON THE OUTER CONTINENTAL SHELF BLOCK OCS-A-0490  
AND OFFSHORE MARYLAND AND DELAWARE

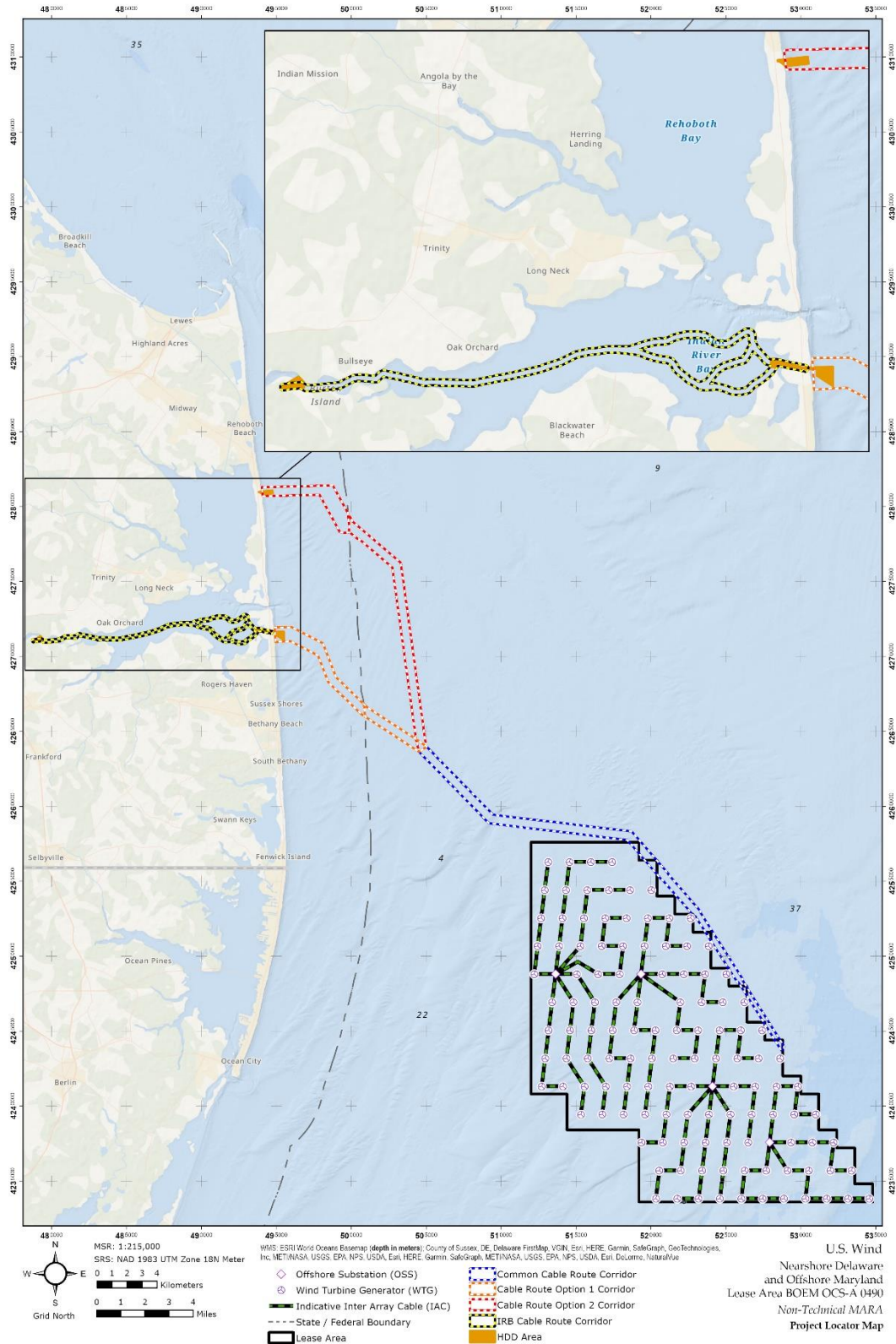
Non-Technical Summary

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**INTRODUCTION**

R. Christopher Goodwin and Associates, Inc. (RCG&A) completed Phase I submerged cultural resources analyses and interpretation of high-resolution geophysical (HRG) survey and geotechnical data to support the development of the Maryland Offshore Wind Project (Project). This work was performed on behalf of U.S. Wind, Inc. (US Wind), which is majority owned by Renexia. The Project is located in the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS) Offshore Maryland (MD) (Lease No. OCS-A-0490) (Lease). The Lease area encompasses approximately 32,356 hectares (ha) (79,706.31 acres [ac]) off the MD coastline (Figure 1). The Offshore Export Cable Corridor (OECC) area encompass a total area of 4,178.37 ha (10,324.98 ac); the federal portion of the OECC comprises 3,009.63 ha (7,436.95 ac); the state portion of the OECC beginning at the Three Nautical Mile Limit until reaching the barrier islands comprises 1,168.74 ha (2,888.02 ac); and an additional 679.1 ha (1,677.9 ac) were surveyed inshore of the barrier island in Indian River Bay. The Project's Offshore Export Cable will reach a maximum length of 235 kilometers (km) (146.02 miles [mi]) across four cables and will connect to onshore landing locations at 3R's Beach or Tower Road.



**Figure 1: Maryland Offshore Wind Project Locator Map**

The offshore component of the proposed Project will consist of up to 126 structures: up to 121 Wind Turbine Generators (WTGs), up to four Offshore Substations (OSSs), and one fixed platform Meteorological Tower. The generation capacity from the Lease area could be up to 2.2 gigawatts. Up to 245 km (152 mi) of inter-array cables (IACs) will connect the WTGs, running in a north-south direction with four to six WTGs connected by individual cables. The WTGs will be installed with monopile foundations, which will be driven into the seafloor using an impact hammer. Additional design details will be provided in the Facility Design Report/Facility Installation Report. The Project proposes to install four OSSs, which will utilize either a monopile foundation or jacket foundations with modular topside facilities. The OSS monopile foundations, if selected, will consist of two pieces connected by a transition piece with several J-tubes to install the cabling; the OSS jacket, if selected, consist of a multi-leg lattice structure connected to the seabed via either piling or suction buckets. Presently, water depths in the Lease area range from 19.81 meters (m) (65 feet [ft]) at the western boundary to over 28.96 m (95 ft) at the eastern extent.

The Project's OECCs, consisting of a northern and southern branch, was surveyed at a width of 600 m (1,968 ft), and will make landfall at 3R's Beach (southern corridor) or Tower Road (northern corridor). The Project Design Envelope (PDE) for the Project considers up to four offshore export cables, running in parallel, spaced at three times the water depth in accordance with International Cable Protection Committee recommendations. Each cable will be installed following a pre-lay grapnel run, via jet-plow. Target burial depths for the OECCs will be between 1 to 3 m (3.3 to 9.8 ft), not to exceed 4 m (13.1 ft). The cable will be pulled into the OSS, and protected with concrete mattresses sufficient to cover the cable at the outset, and will terminate at landfall locations in Sussex County, Delaware (DE) via cable ducts connected to subterranean vaults under the beach.

## **ARCHAEOLOGICAL ASSESSMENT**

The HRG and geotechnical campaigns were carried out in the Lease area, and both state and federal portions of the OECC; separate campaigns surveyed inshore of the barrier islands in Indian River Bay. The Lease area surveys encompassed 32,256 ha (79,706.31 ac), while the OECC survey covered 3,009.63 ha (7,436.95 ac) in federal waters, and 1,168.74 ha (2,888.02 ac) in state waters excluding 679.1 ha (1,677.9 ac) in Indian River Bay. RCG&A conducted detailed cultural resources analyses of HRG survey datasets including side scan sonar (SSS), magnetometer, and seismic data collected on behalf of US Wind. Geophysical and geotechnical data products were submitted to the Qualified Marine Archaeologist (QMA) in accordance with data transfer protocols established between RCG&A and US Wind in the survey plan submitted February 17, 2021. All data were analyzed and interpreted by the QMA using currently accepted scientific methodologies. This included correlation with a variety of inhouse, public, and restricted shipwreck databases, geomorphic and historical research results, nautical charts, and the Project survey

logs. US Wind has committed to avoidance through micro-siting, except for Target 8, which will be avoided through construction planning.

### **Archival Research**

Research included a wide range of primary and secondary sources obtained both electronically and as a result of onsite visits to relevant repositories, which were utilized to provide the data in support of the conclusions presented in the Maritime Archaeological Resources Assessment (MARA). The National Oceanic and Atmospheric Administrations (NOAA's) Wrecks and Obstructions Database, the Archaeological Resource Information (ARI) database maintained by the Bureau of Ocean Energy Management (BOEM), and additional published wreck databases of MD and DE, provided baseline data about previously identified submerged cultural resources in the Lease area and OECCs (BOEM 2013; NOAA 2023). These data were elaborated by reviewing additional sources and reports generated by state and federal agencies, including NOAA's National Centers for Environmental Information and Office of Coast Survey, the United States Army Corps of Engineers, and the DE Department of Natural Resources and Environmental Control. Despite the high potential for vessel loss, few have been reliably identified within the Project Area, which may be a function of the relatively few surveys that have physically crossed the Project Area. The aggregate of these data facilitated the construction of a cultural context, which elaborated the nature and scope of maritime activity over the last four centuries in addition to the elucidating the potential for pre-contact remains dating back to the Paleoindian period (between 16,000 years before present [BP] and 11,500 BP).

Relevant NOAA hydrographic surveys were consulted in conjunction with various scholarly articles and government reports to inform the Project Area physiography, geology, and geomorphology. This research was focused on coastline and sea level changes that occurred due to ice sheet melting. The elaboration of baseline geology, geomorphology, and ecology of the Preliminary Area of Potential Effects (PAPE) informs the potential for the presence and state of preservation of archaeological remains. The natural settings of the area, its geological history, and the evolution of the landscape, with specific attention to the formative processes, has been constructed for the intervening period between now and the Last Glacial Maximum.

### **Geophysical Survey**

HRG surveys in the Offshore Project Area were performed during 2021 and 2022 by Fugro Marine, Inc. (Fugro) and TDI-Brooks, International (TDI), and in Indian River Bay during 2022 by S.T. Hudson Engineers, Inc. (Hudson). In addition, the Project utilized HRG and geotechnical data from Coastal Planning & Engineering, Inc, Alpine Ocean Seismic Survey (Alpine), and Gardline, Ltd. (Gardline),

collected for a previous iteration of The Project, to develop the geologic ground model, seabed characterization, geohazard evaluation, and geotechnical design evaluation.

The HRG surveys met the guidelines and requirements of the PDE, as well as the Construction and Operations Plan ((§582.626 (a) (1-6)) and BOEM 30 CFR Part 585 and pursuant to 30 CFR Part 585. Pre-survey coordination, as required by Lease stipulations, included the development of a survey plan as well as details of planned activities for each survey. The survey plan was submitted to BOEM and to DE SHPO for the portions of the OECC that traverse state bottoms, for review and approval. Tribal representatives from 14 tribes were invited to consult on the survey plan, and the Delaware Tribe of Indians, The Delaware Nation, Pamunkey Indian Tribe and the Upper Mattaponi Indian Tribe, participated in pre-survey meetings. In addition, US Wind also consulted with the Eastern Shawnee Tribe of Oklahoma who confirmed there was no adverse effect regarding the Project.

#### Lease Area

Surveys within the Lease area were performed by Fugro and TDI, in two separate campaigns, and were primarily designed to acquire data on the IACs. The instrument array aboard the survey vessels run by TDI included: SSS, magnetometer arranged in a dual-headed transverse gradiometer (TVG) array, sub-bottom profiler (SBP), mid-penetration multi-channel seismic, and single channel seismic reflection. The Fugro vessels were similarly arrayed, only lacking the mid-penetration multi-channel seismic system. The data from these surveys assisted in characterizing the seafloor bathymetry, seabed classification, morphology, buried sediment profiles, and was ultimately instrumental in creating the geologic ground model. The 2021 and 2022 campaigns carried out by Fugro were designed with a 30 m (98.43 ft) line spacing in federal waters, with 500 m (1,640.42 ft) tielines. The surveys carried out by TDI in 2021 operated in a tartan pattern, with 25 primary corridors spaced at 30 m (98.43 ft), resulting in 720 m (2,362.2 ft) wide corridors spaced 712 m (2,335.96 ft) apart. Five secondary lines were run spaced at 60 m (196.85 ft) resulting in 240 m (787.40 ft) wide corridors.

The 2021 and 2022 HRG campaigns in the Lease area identified 2,070 magnetic anomalies and 2,114 SSS contacts. The QMA performed line by line analyses of the magnetic data and high-resolution georeferenced sonar transects. Archival research identified 23 wrecks or obstructions within the offshore turbine field, inclusive of the construction buffer zone and the immediately adjacent waters (encompassing approximately 1.61 km [1 mi]). However, only four targets found were correlated with charted wrecks. The HRG survey data, reviewed by the QMA, identified 27 potential cultural resources in the Lease area, with 13 of these resources being shipwrecks; the remaining 14 are all Ancient Submerged Landforms (ASLFs). The dimensions of these targets, their spatial layout, and magnetic characteristics are representative of cultural resources, and all are considered historical properties potentially eligible for listing to the National

Register of Historic Places (NRHP). However, under current design parameters, all potential cultural resources in the Lease area have been assigned minimum avoidance zones. US Wind has committed to avoidance through micro-siting for all cultural resources, except for Target 8 which will be avoided through constructing planning around its avoidance area.

#### Offshore Export Cable Corridor

During the Lease area surveys in 2021 and 2022, both Fugro and TDI also collected data within both OECCs (northern route to Towers Rd; southern route to 3Rs). These surveys obtained coverage in the OECC inclusive of both state and federal bottoms. The equipment array for the survey vessels remained the same in the OECCs as it did in the Lease area. The Fugro survey covered portions of the submarine cable corridor, and observed a 30 m (98.43 ft) line spacing within the federal portions of the OECC, with 500 m (1,640.42 ft) tielines. The TDI surveys covered all of the OECC, and was designed with line spacing of 30 m (98.43 ft) with tielines spaced at 500 m (1,640.42 ft) in federal waters. Fugro surveyed the state portions of the OECC (falling between the Three Nautical Mile limit and the barrier islands), observing a line spacing of 15 m (49.21 ft) with tielines spaced at 500 m (1,640.42 ft). TDI's surveys were designed with a 15 m (49.21 ft) line spacing within state waters, with tielines not to exceed 500 m (1640.42 ft) and did not survey areas shallower than 10 m (32.8 ft) to reduce risk to the vessel, equipment and crew.

The 2021 and 2022 surveys in the federal portions of the OECC identified 687 magnetic anomalies within the OECC, as well as 2,934 SSS contacts. State portions of the OECC contained 1,518 magnetic anomalies and 817 SSS contacts. The magnetic data were reviewed by the QMA with particular attention paid to anomalies that exhibited complex magnetic signatures, clustered together, and possessed high amplitude and duration. Sonar contacts were reviewed by the QMA on a line-by-line basis of the high-resolution georeferenced targets. There were four wrecks identified near the OECCs in state waters; and all four fell outside of the PAPE. Target 17 had been previously charted on NOAA Electronic Navigation Chart US5DE10M.

Archival research identified 18 charted wrecks within the OECC PAPE or in the immediate vicinity, although several of these appear to be duplicates charted as a result of multiple surveys. However, only one wreck was identified within the OECC PAPE based on the HRG data, in federal waters, and it does not conform to the descriptions of any of the lost vessels identified during archival research. This and the four wrecks outside the PAPE identified during survey campaigns in state bottoms are the only cultural resources in the OECC; all potential ASLFs located within the OECC were too eroded to produce a high potential for cultural remains. All wrecks have been given an avoidance zone, as is US Wind's preference for addressing cultural resources within the Offshore Development Area.

## Indian River Bay

In 2022, Hudson surveyed Indian River Bay between May 11 and June 11. The equipment array onboard the Hudson vessels included multi-beam echo-sounder (MBES), SSS, SBP and TVG. Indian River Bay is located entirely within state waters, therefore the survey design Hudson employed established a 15 m (49.21 ft) primary line spacing with tielines not to exceed 500 m (1640.42 ft). The shallow depths of Indian River Bay necessitated careful design in order to obtain full coverage; targets were a minimum of 120 percent MBES coverage and a minimum of 200 percent SSS coverage.

Surveys in Indian River Bay identified 237 magnetic anomalies and 270 sonar contacts. The magnetic data were reviewed by the QMA with particular attention paid to anomalies that exhibited complex magnetic signatures, clustered together, and possessed high amplitude and duration. Sonar contacts were reviewed by the QMA on a line-by-line basis of the high-resolution georeferenced targets. No cultural resources were found within Indian River Bay. Analysis of geotechnical cores collected are pending.

## **Geotechnical Campaigns**

The HRG data also facilitated planning of the geotechnical campaign, the aims of which were to ground-truth the HRG data as well as inform the ground model and construction planning. HRG survey data were acquired within analytical areas (the area subject to seabed impacts) established at each proposed geotechnical sampling location. The campaigns were carried out in 2021 and 2022, during the same survey dates as the HRG surveys. They were also carried out by Fugro and TDI; the former campaign included downhole sampling, select sampling, in situ downhole Cone Penetrometer Tests (CPTs), and P-S logging; the latter took only vibracores (VCs) and CPTs. In addition, Alpine also conducted geotechnical surveys in the nearshore Atlantic waters during 2022 for data associated with the OECC and landing locations at 3Rs Beach and Tower Road. Previous data collected by Alpine and Gardline during an earlier iteration of the project were also incorporated into the formation of ground model and construction planning. In total, TDI took eight CPTs and 61 VCs, while Fugro took 86 boreholes, not including 30 bump-overs/retests and 16 downhole samples. Further geotechnical campaigns were carried out in Indian River Bay by Gregg Drilling, LLC., subcontracted by Sealaska Engineering & Applied Sciences on behalf of US Wind. The aims of the campaign were to obtain geotechnical data on the IRB East South HDD alignment, IRB West South alignment and the IRB South HDD alignment. To obtain data, US Wind proposed 37 geotechnical locations along with 18 boreholes, taken between January and March 2023. In addition, Ocean Surveys, Inc. previously took 12 VCs in Indian River Bay during September 2022. Due to the shallow nature of Indian River Bay, subsurface clearances could not be completed using geophysical data, and therefore a QMA was on-board the research vessel for each proposed geotechnical location as an archaeological monitor.

### Seismic Stratigraphy

Geotechnical campaigns in the Lease area identified three seismic stratigraphic units (Q1a – Unit Q3c) through seismic data, along with 12 bounding horizons (H10 – H130). The sedimentary units that coincide with human occupations are Unit Q2d, Unit Q3a, and Unit Q3b, with Q3b being the most surficial. The underlying units exhibit a depositional environment consistent with sea level transgression, however Unit Q3b is consistent with Holocene era depositions in an environment dominated by sand dunes.

Geotechnical campaigns in the OECCs identified only one surficial sedimentary unit, Unit Q3c, bounded by horizon H10 from -11.1 to -43 m (-36.4 to -141.1 ft). This unit was only found in the OECC, and exhibited extensive channel cutting in areas where subsurface penetration was limited. The unit is interpreted as a transgressive sand sheet deposited during the most recent sea level rise. The underlying sedimentary units all exhibited chaotic reflectors, rendering the paleochannel infill unmappable. Unit Q3c was present in both federal and state portions of the OECC.

### Geochronology

There were 40 borehole samples taken from the Lease area based on the presence of organic materials or shallow marine invertebrate remains, such as *Mercenaria* or *Crassostrea* shells. No samples were taken from the OECC due to the intensive sediment reworking that was observed in the sub-bottom profile. A total of 18 samples were taken in Indian River Bay, but these all possessed too small a quantity of carbon to be dated. Of the samples taken from the Lease area, 18 returned a calibrated radiocarbon date greater than 43,500 BP, which results in a determination that the sample is carbon dead, meaning that the carbon in the sample was too old to provide accurate dating. Seventeen of the samples returned dates within acceptable ranges for carbon dating, and 13 of these samples pre-date the Paleoindian Period and are therefore unlikely to be associated with human occupations. The remaining four samples date to the Paleoindian Period; the various depths at which these dates were obtained are evidence of significant sediment reworking.

### Mammalian Bone Fragment

During analyses, Beta Analytic discovered a bone fragment in core 22sb\_N13A, at a dept of 31 to 31.1 m (101.71 ft to 102.03 ft) downcore. The fragment was examined by three independent zooarchaeological analysts in order to attempt to determine species and depositional history. The consensus between the analysts was; (1) based on the thickness and morphology, the bone fragment is not human; (2) the bone is mammalian; (3) it is likely from a large terrestrial mammal despite its aquatic origin. Mineralization was also observed on the fragment, which further supports the identification of the fragment



as non-human mammalian, as this indicates a depositional date before the arrival of humans in the Western hemisphere. Beta Analytic attempted to date the bone based on retrievable collagen, however the fragment yielded insufficient separable collagen to perform carbon dating. Surrounding sediments dated between 25,925 – 13,438 BP, a wide-range that implies sediment reworking.

### **Paleolandscape Reconstruction**

Landscape reconstruction used seismic data and analysis of sediment cores to recognize potentially intact landforms present within the Project Area. The paleolandscape reconstructions suggest that deposits that could have supported human occupation from the terminal Pleistocene until submergence have a medium to high level of preservation, with greater preservation generally in the northwest portion of the Lease area. The OECC was found to have extensive sediment reworking, observable in sub-bottom data and from radiocarbon dating, and therefore was determined to possess low potential for preserved deposits from human occupations. The same conditions applied to Indian River Bay, which itself featured heavily incised paleochannels indicative of a low archaeological potential.

Seismic analysis observed evidence for 14 potential preserved ASLFs within the Lease area, and none within the OECC. All of the features were given an avoidance area up to 50 m (164 ft) from the observable extents of the feature, inclusive of all associated features such as channel beds and flood-plains which, if sub-aerially exposed, possess the potential for human habitation and preservation. Five ASLFs (P-03-A, P-03-B, P-03-C, P-040A and P-04-B) were located within the vertical PAPE for the IACs, and ASLF (P-02) is located within the vertical PAPE of WTG location C01; US Wind has committed to avoidance as its primary approach to mitigation, and has developed avoidance measures for P-01, P-02, and P-04-A. The avoidance buffers for two ASLFs within Row 1 (P-01 and P-02) intersect with WTG locations A01 and C01. The entire Row 1 will be moved an estimated 30 m (98.4 ft) to the north/northeast of the planned location and will entirely avoid the affected ASLFs. P-04-A intersects with WTG C04 would be moved an estimated 35 m (114.8 ft) to the east of the planned location, entirely avoiding P-04-A's buffer. The overlap of the paleo feature avoidance areas are within the 50-m buffer and US Wind would potentially seek to reduce the buffer based on the tight survey lines in those locations.

## CONCLUSIONS AND RECOMMENDATIONS

To date, HRG campaigns have surveyed all of the Project areas that fall within federal waters, inclusive of approximately 32,256 ha (79,706.31 ac) in the Lease area and 3,009.63 ha (7,436.95 ac) in the OECCs. The portions of the OECC that fall into state waters encompass 1,168.74 ha (2,888.02 ac) between the Three Nautical Mile limit and the Atlantic side of the barrier island, while Indian River Bay encompassed 679.1 ha (1,677.9 ac). The HRG survey revealed the presence of 2,756 magnetic anomalies in total and 5,048 SSS contacts within the federal waters of the Project PAPE, state waters contained 1,755 magnetic anomalies and 1,087 SSS contacts. From these data, 13 shipwrecks were identified in the Lease area, along with 14 ASLFs. Five shipwrecks were identified within the OECC, with four of these wrecks falling within state waters and outside of the PAPE. The evaluation of ASLFs was informed by the geotechnical campaigns, including CPTs, boreholes and VCs. Boreholes provided dateable samples to determine which landforms were likeliest to contain preserved archaeological materials.

US Wind has engaged with consulting parties, including Native American Tribes, to discuss the potential for seabed disturbance and associated effects to identified marine archaeological resources and options to avoid, minimize or mitigate any adverse effects to NRHP eligible resources. All potential resources have been assigned minimum avoidance zones as the principal measure of preservation. Avoidance will be achieved primarily through micro-siting, except in the case of Target 8, which will be avoided through construction planning around its avoidance area.

Disturbance to the seafloor during construction activities has the potential to encounter and cause significant, long-term and adverse effects to unidentified submerged cultural resources. Although remote sensing surveys conducted in accordance with current professional standards for cultural resource identification are expected to be highly effective in identifying submerged cultural resources, the possibility of encountering an unidentified and unanticipated submerged cultural resource is always present during dredging and construction activities. As a result, US Wind will implement an Unanticipated Discoveries Plan, including archaeological resource identification training.