

APPENDIX

Marine Archaeological
Resources Assessment
Nontechnical Summary

X

Prepared for

equinor



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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
BOEM	Bureau of Ocean Energy Management
COP	Construction and Operations Plan
Empire	Empire Offshore Wind LLC
EW 1	Empire Wind 1
EW 2	Empire Wind 2
Ft	foot
HRG	high-resolution geophysical
km	kilometer
Lease Area	Renewable Energy Lease Area OCS-A 0512
M	meter
MARA	Marine Archaeological Resources Assessment
mi	mile
nm	nautical mile
NRHP	National Register of Historic Places
PAPE	preliminary area of potential effects
Project	the Empire Offshore Wind Project (EW 1 and EW 2)
QMA	Qualified Marine Archaeologist
U.S.C.	United States Code

1.0 INTRODUCTION

A Marine Archaeological Resources Assessment (MARA) was conducted for Empire Offshore Wind LLC (Empire) by SEARCH, an archaeology firm that implements deep water archaeology. The MARA consists of high-resolution geophysical (HRG) and geotechnical survey data collected during multiple non-intrusive survey campaigns conducted by third-party marine survey contractors within the preliminary area of potential effects (PAPE). The PAPE evaluated for the MARA represents the extent of anticipated seabed impacts associated with the proposed Empire Offshore Wind Project.

The results of SEARCH's marine archaeological investigations are presented in detailed technical reports included as Appendix X Marine Archaeological Resources Assessment to the Construction and Operations Plan (COP) submitted to the Bureau of Ocean Energy Management (BOEM) for the Empire Offshore Wind Project. The methods and results detailed in these reports are summarized below.

2.0 PROJECT OVERVIEW

Empire Offshore Wind LLC (Empire) proposes to construct and operate the Empire Offshore Wind Project: Empire Wind 1 (EW 1) and Empire Wind 2 (EW 2) (Project), located in the BOEM Renewable Energy Lease Area OCS-A 0512 (Lease Area). Each wind farm will be connected by submarine export cables set in a corridor to transmit power to onshore facilities that will be connected to the electric grid. Empire's COP for the Project supports the development, operation, and eventual decommissioning of Project infrastructure, including offshore wind turbines, offshore substations, interarray cables, and submarine export cables. The Lease Area is located approximately 12 nautical miles (nm) (14 miles [mi], 22 kilometers [km]) south of Long Island, New York, and 16.5 nm (19 mi, 31 km) east of Long Branch, New Jersey, on the Atlantic Outer Continental Shelf (**Figure 1**). The Project will include the following offshore components: up to 147 wind turbine generators connected by a network of interarray cables, two offshore substations, and up to five submarine export cables to bring power to shore. The closest proposed wind turbine generator is approximately 12.2 (14 mi, 22 km) from the coast of New York. Two submarine export cables will be located within the EW 1 submarine export cable corridor and up to three within the EW 2 submarine export cable corridor.

3.0 PURPOSE

The Project constitutes a federal undertaking with the potential to affect submerged historic properties and is therefore subject to consultation under Section 106 of the National Historic Preservation Act (Title 54 United States Code [U.S.C.] § 306108). SEARCH provided technical expertise to Empire as the Qualified Marine Archaeologist (QMA), pursuant to 30 Code of Federal Regulations Part 585, which established BOEM procedures for the issuance and administration of offshore renewable energy leases. The MARA was created and a report written to assist BOEM in complying with Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108) and its implementing regulations (36 Code of Federal Regulations Part 800); the National Environmental Policy Act (42 U.S.C. §§ 4321 *et seq.*); and other applicable laws and regulations. The MARA identifies potential submerged cultural resources that could represent historic properties within the Lease Area and submarine export cable corridors for EW 1 and EW 2.

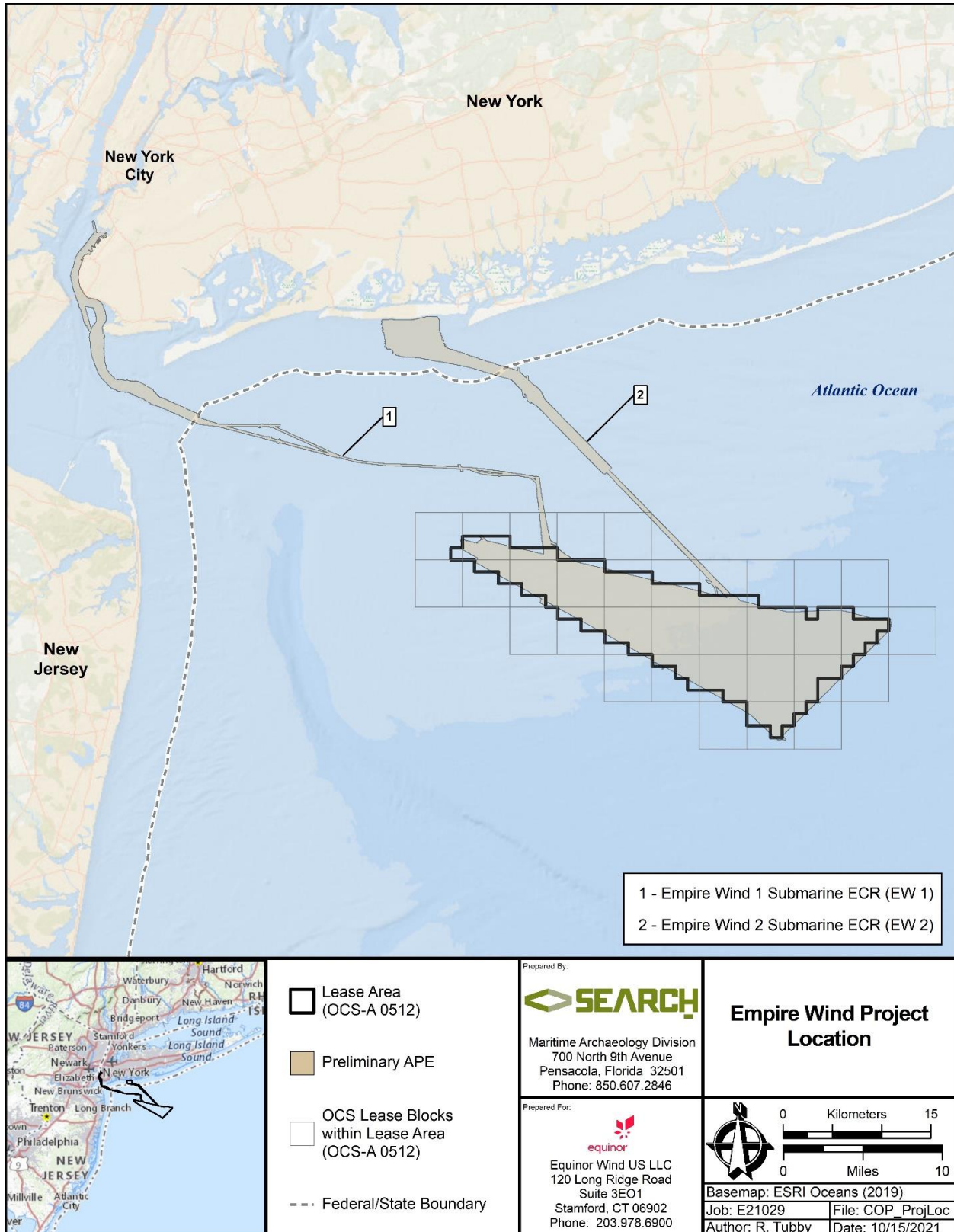


Figure 1 Project Location

4.0 ARCHAEOLOGICAL ASSESSMENT

At this time, Empire is defining and presenting a PAPE. The final APE will be determined through BOEM consultation with the State Historic Preservation Office(s). The MARA presents information regarding potential submerged cultural resources that may be adversely affected by seabed-disturbing (horizontal and vertical) activities within the PAPE. The PAPE extends 49 feet (ft, 15 meters [m]) outside of recorded gradiometer data and to the edge of recorded acoustic imagery in areas where navigational hazards, such as shallow water or existing structures, limited collection of magnetic data with a gradiometer. HRG data for the MARA was reviewed to its full extent, including areas beyond the PAPE; however, recommended targets are limited only to those targets or their avoidance buffers that overlap with the PAPE.

SEARCH, as the QMA, assisted with the development of four survey plans to ensure that the technologies and methodologies employed during the HRG and geotechnical surveys met BOEM 2020 archaeological guidelines¹. Activities corresponding to the 2018 Survey Plan included the completion of an HRG survey and shallow geotechnical investigation of the Lease Area and submarine export cable corridors. Activities corresponding to the 2019 Survey Plan included completion of cone penetration testing and boreholes throughout the Lease Area. Activities corresponding to the 2020 Survey Plan included additional HRG survey and geotechnical survey activities of the Lease Area and submarine export cable corridors. Activities corresponding to the 2021 Geotech Survey Plan included additional geotechnical survey activities of the Lease Area.

Cultural, environmental, and geological contexts of the region were developed and previous archaeological investigations and submerged cultural resources reported in the vicinity of the PAPE were reviewed to supplement and guide data analysis. HRG survey data was also reviewed prior to geotechnical investigations to ensure that associated seabed impacts would not affect potential submerged cultural resources. In addition, certain geotechnical samples were collected for the purpose of assessing archaeological potential. SEARCH utilized these geotechnical investigations and selected additional geotechnical locations for archaeological analyses to inform the MARA and verify the geologic ground model. Results were combined from the HRG surveys and geotechnical campaigns, including archaeological laboratory analyses and QMA interpretation, with the cultural, environmental, and geological contexts to develop a paleolandscape reconstruction.

SEARCH maritime archaeologists, submerged pre-contact archaeologists, and historians created a pre-contact and historical context for the region, assembled a geological and paleoenvironmental background, generated a paleolandscape reconstruction, reviewed previous archaeological investigations conducted in the vicinity, and identified submerged cultural resources (for example, known shipwrecks) reported in the vicinity of the Project to supplement and guide data analysis. The MARA report presents this research and data review, a discussion of survey and data processing technologies and methodologies, and the archaeological findings and recommendations in support of the Project COP. The intent is to assess the presence/absence of potential submerged cultural resources that may be adversely affected by seabed-disturbing activities associated with Project installation, operation, and decommissioning. Since identification of a target's source(s) is not always possible through HRG survey data, nor is the assessment of a target's integrity, significance, or eligibility for listing in the National Register of Historic Places (NRHP), SEARCH initially recommends avoidance buffers in lieu of additional archaeological investigation.

¹ BOEM. 2020 Guidelines for Providing Archaeological and Historical Property Information Pursuant to 30 CFR Part 585. United States Department of the Interior, Office of Renewable Energy Programs.

SEARCH identified 30 potential submerged cultural resources within the PAPE (Targets 01–30). Targets 01–06 and 19 are located within the Lease Area; Targets 07–13, 15–18, 20–27, and 29–30 are located within EW 1 submarine export cable corridor; and Targets 14 and 28 are located within EW 2 submarine export cable corridor (**Table 1**).

Table 1 HRG Survey Targets Representing Potential Submerged Cultural Resources

Target	Seabed Impact Area	Recommended Avoidance Buffer (ft)
Target 01	Lease Area	164
Target 02	Lease Area	164
Target 03	Lease Area	164
Target 04	Lease Area	164
Target 05	Lease Area	164
Target 06	Lease Area	164
Target 19	Lease Area	164
Target 07	EW 1 submarine export cable corridor	164
Target 08	EW 1 submarine export cable corridor	164
Target 09	EW 1 submarine export cable corridor	164
Target 10	EW 1 submarine export cable corridor	164
Target 11	EW 1 submarine export cable corridor	164
Target 12	EW 1 submarine export cable corridor	0
Target 13	EW 1 submarine export cable corridor	0
Target 15	EW 1 submarine export cable corridor	164
Target 16	EW 1 submarine export cable corridor	164
Target 17	EW 1 submarine export cable corridor	65.6
Target 18	EW 1 submarine export cable corridor	164
Target 20	EW 1 submarine export cable corridor	164
Target 21	EW 1 submarine export cable corridor	164
Target 22	EW 1 submarine export cable corridor	98
Target 23	EW 1 submarine export cable corridor	164
Target 24	EW 1 submarine export cable corridor	0
Target 25	EW 1 submarine export cable corridor	0
Target 26	EW 1 submarine export cable corridor	164
Target 27	EW 1 submarine export cable corridor	98
Target 29	EW 1 submarine export cable corridor	164
Target 30	EW 1 submarine export cable corridor	164
Target 14	EW 2 submarine export cable corridor	164
Target 28	EW 2 submarine export cable corridor	164

A Phase Ib target investigation involving remotely operated vehicle operations and diver investigation, occurred for six potential submerged cultural resources identified during the MARA, namely Targets 12, 13, 17, 23, 24 and 25. The effort. Target 17 was identified as being potentially eligible for inclusion in the NRHP.

Targets 31–52 within the PAPE were identified as ancient submerged landform features. Ancient submerged landform features are locations that may contain evidence of previously terrestrial landscape features (for example, riverbanks) that have been submerged by rising seas following the last glacial period. An archaeological coring campaign conducted in 2020 collected geotechnical samples at select locations within the Lease Area to assess their archaeological potential. Pedogenesis and organic material suitable for radiocarbon dating were observed during initial laboratory processing. In coordination with Empire, SEARCH collected samples for additional third-party laboratory analyses (i.e., radiocarbon dating, pollen analysis, and grain size) to inform the paleolandscape reconstruction and refine the spatial extent of Targets 31–52. This campaign did not result in the identification of archaeological sites for which to assess NRHP eligibility, but rather this was a due diligence effort to identify archaeological potential and determine whether or not Project impacts can avoid areas of interest.

5.0 RESULTS AND INTERPRETATION

SEARCH was supplied with a complete HRG dataset for the Project, which included bathymetry, gradiometer, multi-beam echosounder, side-scan sonar, and sub-bottom profiler data from the 2018, 2019, 2020, and 2021 survey campaigns. HRG data were processed and knowledge gained from the historical and pre-contact research was applied when interpreting the survey results. Raw and processed acoustic and magnetic data were reviewed, as was a geologic ground model for the PAPE. For the magnetic anomalies with a signal-to-noise ratio meeting BOEM's guidelines, SEARCH analyzed the characteristics of each and made comparisons to verified examples of shipwreck magnetic signatures. Side-scan sonar imagery was reviewed via georeferenced mosaics and layered acoustic contacts with other Project data for analysis. For additional interpretation, raw side-scan sonar imagery was reviewed when warranted. SEARCH also reviewed third-party interpreted sub-bottom profiler imagery and a geologic ground model to identify potential paleolandscapes that could hold possible evidence of pre-contact use or occupation within the PAPE.

HRG data review revealed areas with navigational hazards, such as shallow water or existing structures, which had limited the collection of magnetic data with a gradiometer; however, coverage with the other instruments was achieved. Other areas exist within the data where fidelity to the 30-m (98-ft) line spacing could not be maintained, which limited the density of magnetic data.

There were two areas where data were sparse: one in the Lease Area and one in the EW 1 submarine export cable corridor. The latter exists within the Ambrose Channel, which has been previously disturbed by dredging as recently as 2004–2016; therefore, it is not necessary for the Project to avoid this gap and it was confirmed that the proposed submarine export cable will be located well east of this gap. SEARCH confirmed that the current Project design, including wind turbines, submarine export cables, offshore substations, or anchoring, avoids these locations. Although the final interarray cable layout is currently not available, the Project will micro-site to avoid these gaps as practicable and technically feasible.

The HRG data record displays an abundance of natural seabed features (e.g., boulders and hard bottom) and features of anthropogenic origin (e.g., tires, navigation buoys, commercial fishing equipment, and trawling scours). There exist numerous submerged cable crossings within the PAPE that are denoted in the National Oceanic and Atmospheric Administration's 2012 submarine cables database and/or NOAA Navigation Chart

12326 (NOAA 2019)². Many of these cables were observed in the magnetic and acoustic record, while others may have been removed. The majority of remaining acoustic contacts and magnetic anomalies likely represent small debris objects. Many are located within or adjacent to highly trafficked navigation channels or within New York Harbor, areas notorious for attracting modern flotsam and jetsam. SEARCH identified eight targets within the Ambrose Channel that consist of magnetic anomalies and/or acoustic contacts that share characteristics with potential submerged cultural resources. The Ambrose Channel, as stated above, is a previously disturbed area of the seabed. Based on the recent dredging history of this channel, the earliest possible origin for the sources of these targets is likely 2004.

HRG survey occurred at the locations of previously identified potential submerged cultural resources or documented submerged archaeological sites offshore from Long Beach. Current side-scan sonar coverage extended outside of the PAPE to the location of Contact S108, originally documented in 2008 121 ft (37 m) outside of the PAPE. This contact, which was recommended for further archaeological investigation, was not detected in the current HRG sonar imagery, indicating that it is no longer extant or is now buried. Current HRG survey captured USN 05901.001367 (originally designated Long Beach Underwater Anomaly 29) in the magnetic record associated with the EW 2 submarine export cable corridor. This anomaly was recommended in 2015 as ineligible for listing in the NRHP, and SEARCH concurs based upon the current HRG data. Anomaly 18 likely represents a single-source debris item.

SEARCH identified 30 potential submerged cultural resources within the PAPE that could represent historic properties (Targets 01–30). Targets 01–06 and 19 are located within the Lease Area; Targets 07–13, 15–18, 20–27, and 29–30 are located within the EW 1 submarine export cable corridor; and Targets 14 and 28 are located within the EW 2 submarine export cable corridor. Targets 01–30 are interpreted from the gradiometer, multi-beam echosounder, and side-scan sonar datasets. Further interpretation was presented in detailed technical reports included as Appendix X Marine Archaeological Resources Assessment to the COP submitted to BOEM for the Empire Wind Project.

All targets that may represent potential historic properties (Targets 01–30) will be avoided by the current Project design. Targets 31–52 were interpreted as buried, ancient submerged landform features. Equinor has agreed to avoidance of Targets 32, 34, 37–38, 40, 43–44, 46, and 50. SEARCH recommends further discussion among the consulting parties regarding targets that might not be avoided, namely Targets 31, 33, 35, 36, 39, 41–42, 45, and 51–52.

² NOAA Nautical Chart 12326: Approaches to New York Fire Island Light to Sea Girt, New York, 2016-01-01.