VINEYARD NORTHEAST

CONSTRUCTION AND OPERATIONS PLAN

VOLUME II APPENDIX

MARCH 2024

PREPARED BY:

Epsilon ASSOCIATES INC.

SUBMITTED BY:

VINEYARD NORTHEAST LLC

VINEYARD OFFSHORE

PUBLIC VERSION

Vineyard Northeast COP

Appendix II-H Aviation Impact Assessment

Prepared by:
Capitol Airspace Group and Westslope Consulting

Prepared for:
Vineyard Northeast LLC

March 2024

Vineyard Northeast COP

Appendix II-H1 Obstruction Evaluation & Airspace Analysis

Prepared by:
Capitol Airspace Group

Prepared for:
Vineyard Northeast LLC

March 2024

Revision	Date	Description
0	July 2022	Initial submission.
0	March 2024	Resubmitted without revisions.

Vineyard Northeast

Epsilon Associates, Inc.

Offshore Nantucket, Massachusetts

Obstruction Evaluation & Airspace Analysis

May 12, 2022

Capitol Airspace Group
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Summary

Vineyard Northeast LLC (the "Proponent") proposes to develop, construct, and operate offshore renewable wind energy facilities in Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0522 (the "Lease Area"; study area) along with associated offshore and onshore transmission systems. This proposed development is referred to as "Vineyard Northeast." Vineyard Northeast includes up to 160 total wind turbine generator (WTG) and electrical service platform (ESP) positions within the Lease Area. Offshore export cables installed within offshore export cable corridors (OECCs) will connect the renewable wind energy facilities to onshore transmission systems in Massachusetts and/or Connecticut.

Capitol Airspace conducted an obstruction evaluation and airspace analysis for Vineyard Northeast off the shore of Nantucket, Massachusetts. The purpose for this analysis was to identify obstacle clearance surfaces established by the Federal Aviation Administration (FAA) that could limit the placement of 1,312-foot (ft) (400 meters [m]) tall WTGs. At the time of this analysis, 160 WTG locations had been identified (black points, ***Figure 1***). This analysis assessed height constraints overlying each location as well as an approximately 206-square-mile (sq mi) study area (black outline, ***Figure 1***) to aid in identifying optimal WTG locations.

The BOEM is responsible for regulating renewable energy activities on the outer continental shelf in accordance with 30 CFR Part 585. As part of the application process for leases, grants, and easements, BOEM may require the inclusion of an aeronautical study to determine the proposal's impact on airspace use and safety. If a project is determined to have an unacceptable impact on civil aviation or military activities, it could result in denial of the application.

14 CFR Part 77 applies to all structures within US territorial airspace. 14 CFR Part 77.9 requires that that all structures exceeding 200 ft AGL (61.0 meters [m]) be submitted to the FAA so that an aeronautical study can be conducted. The FAA's objective in conducting aeronautical studies is to ensure that proposed structures do not affect the safety of air navigation or the efficient utilization of navigable airspace by aircraft. The result of an aeronautical study is the issuance of a determination of 'hazard' or 'no hazard' that can be used by the proponent to obtain necessary local construction permits. It should be noted that the FAA has no control over land use in the United States and cannot enforce the findings of its studies. For the portions of the project that lie outside of U.S. territorial airspace and in BOEM jurisdiction, BOEM will consult with the FAA for airspace impacts.

The lowest obstacle clearance surfaces overlying Vineyard Northeast range from 1,049 to 4,549 ft (319.7 to 1,386.5 m) above mean sea level (AMSL) and are associated with multiple minimum vectoring altitude (MVA) sectors. Proposed wind turbines that exceed these surfaces would require an increase to MVAs. If the FAA determines that these impacts would affect as few as one radar vectoring operation per week, it could result in determinations of hazard.

A warning area overlies Vineyard Northeast and could result in military objections to proposed wind development.

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This study did not consider electromagnetic interference on FAA communication or surveillance radar systems. Impact on these systems could be used as the basis for determinations of hazard regardless of the lack of impact on the physical airspace surfaces described in this report.

Methodology

Capitol Airspace studied the proposed project based on location information provided by Epsilon Associates, Inc. Using this information, Capitol Airspace generated graphical overlays to determine proximity to airports (***Figure 1***), published instrument procedures, enroute airways, FAA minimum vectoring altitude and minimum instrument flight rules (IFR) altitude charts, as well as military airspace and training routes.

Capitol Airspace evaluated all 14 CFR Part 77 imaginary surfaces, published instrument approach and departure procedures, visual flight rules operations, FAA minimum vectoring altitudes, minimum IFR altitudes, and enroute operations. All formulas, headings, altitudes, bearings and coordinates used during this study were derived from the following documents and data sources:

- 14 CFR Part 77 Safe, Efficient Use, and Preservation of the Navigable Airspace
- FAA Order 7400.2N Procedures for Handling Airspace Matters
- FAA Order 8260.3E United States Standard for Terminal Instrument Procedures
- FAA Order 8260.58B United States Standard for Performance Based Navigation (PBN) Instrument Procedure Design
- Technical Operations Evaluation Desk Guide for Obstruction Evaluation/Airport Airspace Analysis (1.6.1)
- United States Government Flight Information Publication, US Terminal Procedures
- National Airspace System Resource Aeronautical Data

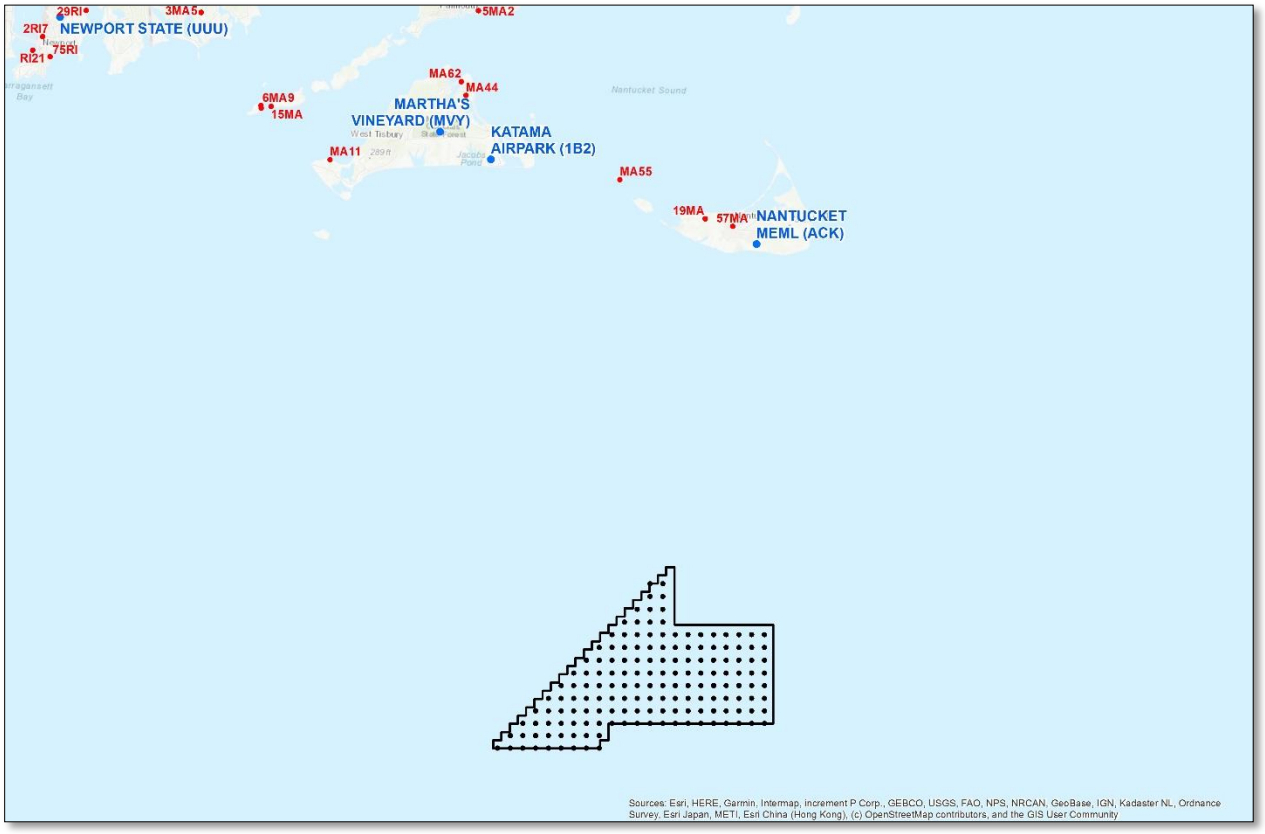


Figure 1: Public-use (blue) and private-use (red) airports in proximity to Vineyard Northeast

Study Findings

Territorial Airspace

The FAA conducts aeronautical studies for structures proposed within any state, territory, or possession of the United States, within the District of Columbia, or within territorial waters[1] surrounding the United States.[2] Although an offshore wind project may be located outside of territorial waters, BOEM may require an aeronautical study as part of the application process.

Vineyard Northeast is not located within territorial waters (shaded purple, ***Figure 2***). Therefore, the FAA does not have a mandate to conduct aeronautical studies for WTGs proposed within the defined study area. Regardless, BOEM may require consultation with the FAA as part of the application process. Providing an aeronautical study is useful to these consultations.

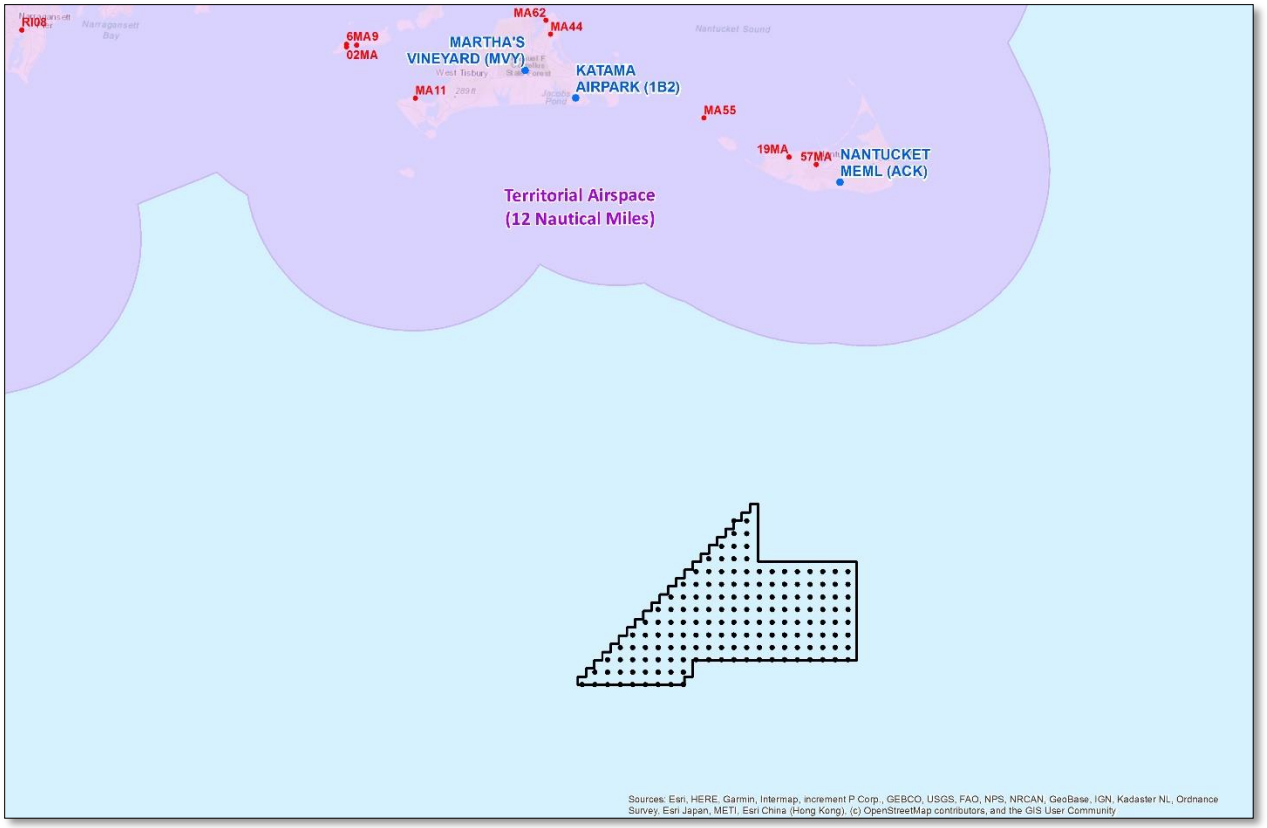


Figure 2: Territorial airspace in proximity to Vineyard Northeast

[1] The National Oceanic and Atmospheric Administration (NOAA) defines territorial waters as 12 nautical miles (NM) measured from the official U.S. baseline – a recognized low water line along the coast. NOAA publishes this boundary in a publicly available ***Web Map Service***.

[2] As described in FAA Order 7400.2N 5-1-4(a) "Scope."

14 CFR Part 77.17(a)(2) Obstruction Standard and 77.19/21/23 Imaginary Surfaces

The FAA uses level and sloping imaginary surfaces to determine if a proposed structure is an obstruction to air navigation. Structures that are identified as obstructions are then subject to a full aeronautical study and increased scrutiny. However, exceeding a Part 77 imaginary surface does not automatically result in the issuance of a determination of hazard. Proposed structures must have airspace impacts that constitute a substantial adverse effect in order to warrant the issuance of determinations of hazard.

Military and public-use airport 14 CFR Part 77.17(a)(2) and 77.19/21/23 imaginary surfaces do not overlie Vineyard Northeast (e.g., ***Figure 3***). However, at 1,312 feet (ft) (400 meters [m]) tall, wind turbines will exceed 77.17(a)(1) - a height of 499 ft (152.1 m) AGL at the site of the object - and could be identified as obstructions regardless of location.

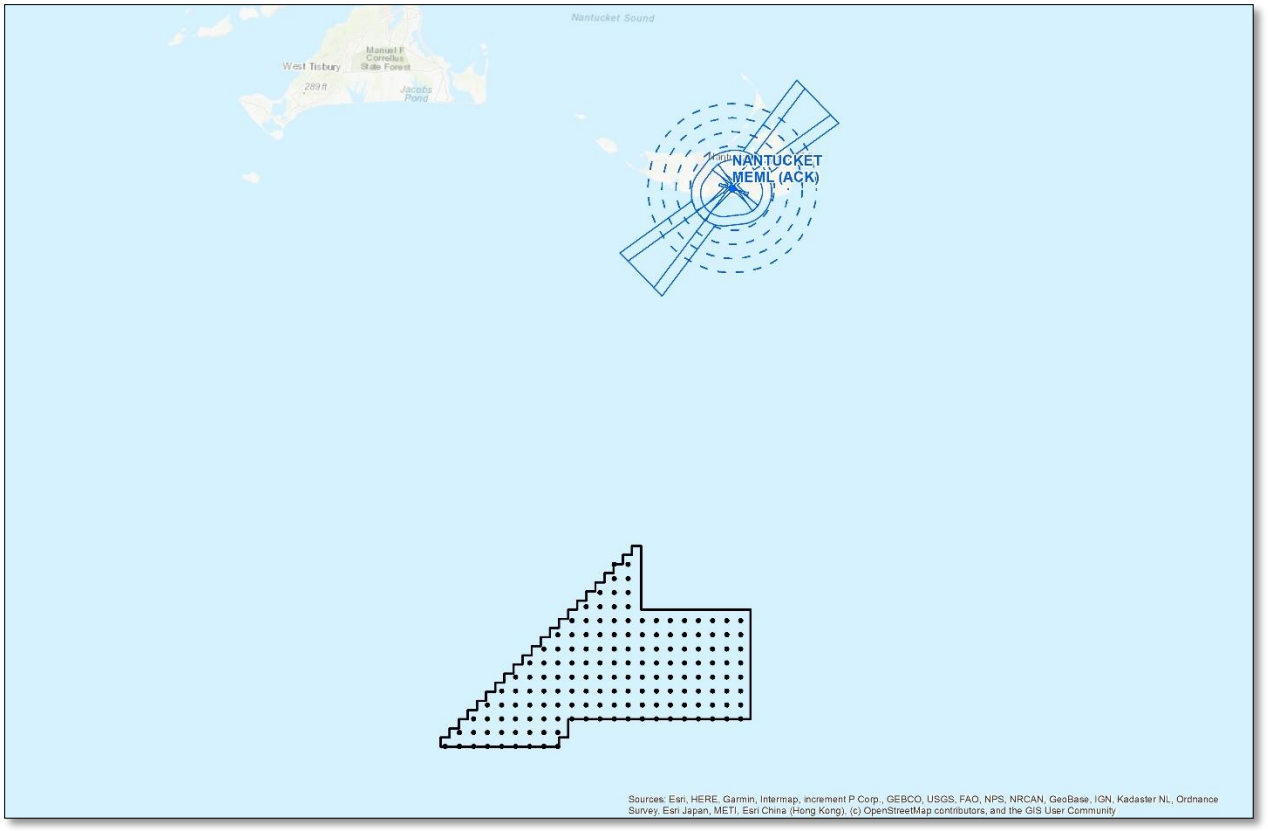


Figure 3: 77.17(a)(2) obstruction standard (dashed blue) and 77.19 imaginary surfaces (solid blue)

Visual Flight Rules (VFR) Traffic Pattern Airspace

VFR traffic pattern airspace is used by pilots operating during visual meteorological conditions (VMC). The airspace dimensions are based upon the category of aircraft which, in turn, is based upon the approach speed of the aircraft. 14 CFR Part 77.17(a)(2) and 77.19 (as applied to a *visual* runway) imaginary surfaces establish the obstacle clearance surface heights within VFR traffic pattern airspace.

VFR traffic pattern airspace does not overlie Vineyard Northeast and should not limit 1,312-foot (ft) (400 meters [m]) tall WTGs at any of the proposed locations (***Figure 4***).

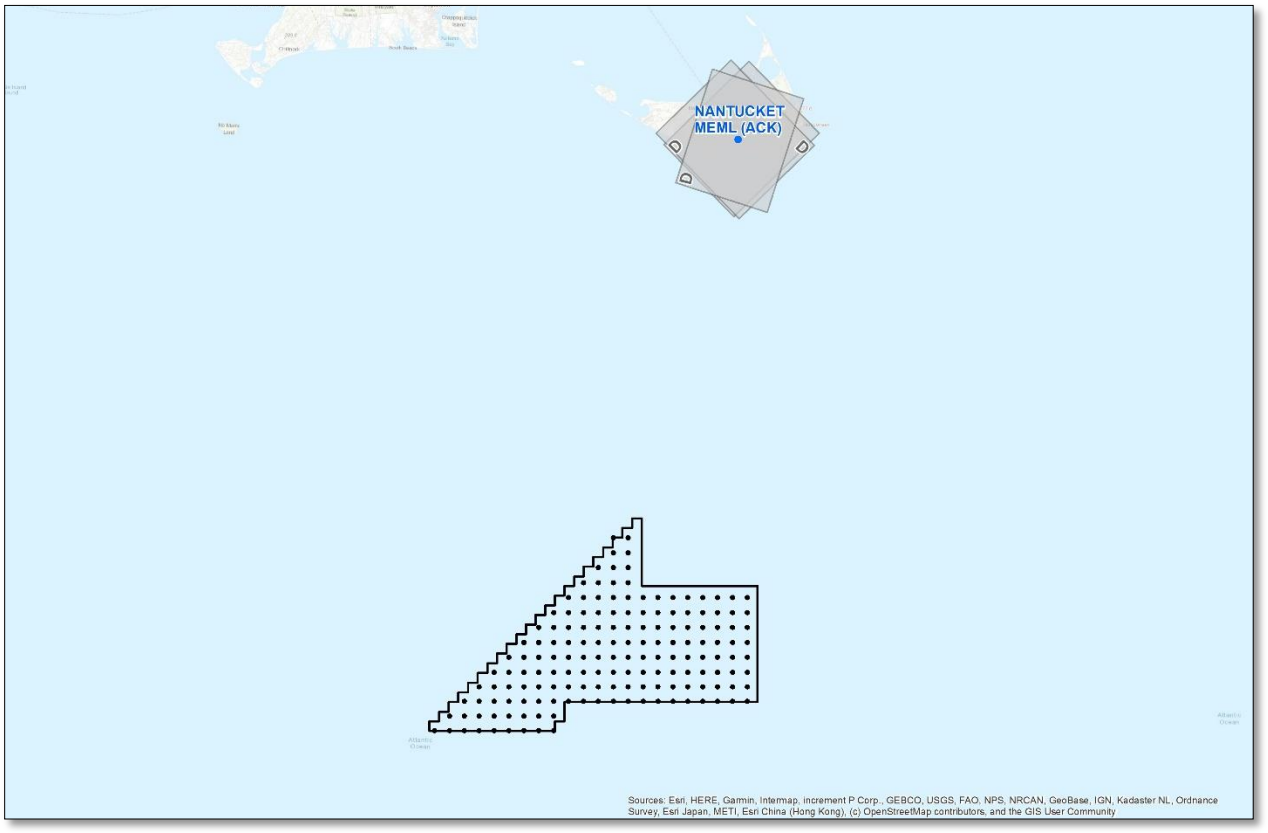


Figure 4: VFR traffic pattern airspace in proximity to Vineyard Northeast

Visual Flight Rules (VFR) Routes

During periods of marginal VMC - low cloud ceilings and one statute mile (1.6 kilometers [km]) visibility - pilots often operate below the floor of controlled airspace. Operating under these weather conditions requires pilots to remain within one statute mile (1.6 km) of recognizable landmarks such as roads, rivers, and railroad tracks. The FAA protects for known and regularly used[3] VFR routes by limiting structure heights within two statute miles (3.2 km) of these routes to no greater than 14 CFR Part 77.17(a)(1) - a height of 499 feet (ft) (152.1 meters [m]) AGL at the site of the object.

There is no dataset that identifies VFR routes or their utilization. However, Vineyard Northeast is not located within two statute miles (3.2 km) of landmarks that could be used as VFR routes (hatched orange, ***Figure 5***). Therefore, VFR routes should not limit wind development within the defined study area.

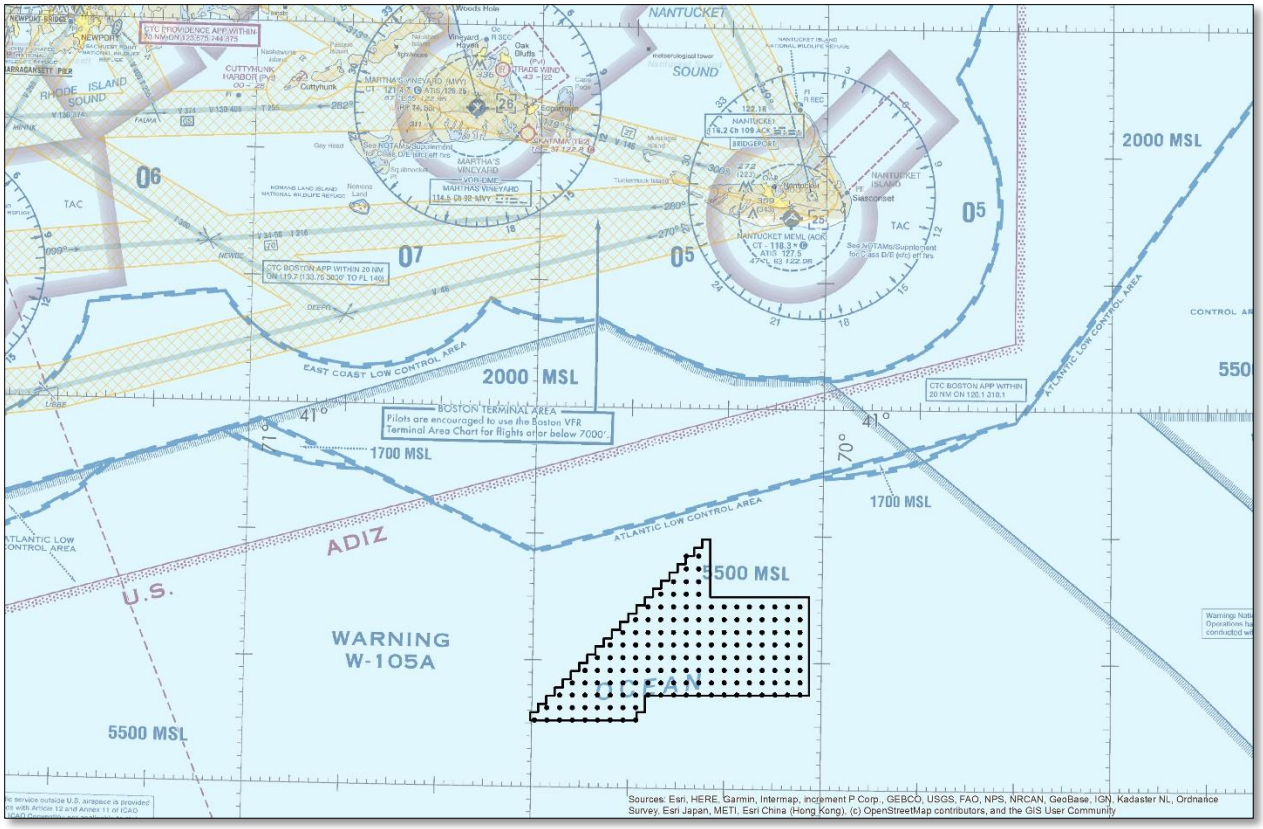


Figure 5: Potential VFR routes in proximity to Vineyard Northeast

[3] As few as one flight per day.

Instrument Departures

In order to ensure that aircraft departing during marginal weather conditions do not fly into terrain or obstacles, the FAA publishes instrument departure procedures that provide obstacle clearance to pilots as they transition between the terminal and enroute environments. These procedures contain specific routing and minimum climb gradients to ensure clearance from terrain and obstacles.

Proposed structures that exceed instrument departure procedure obstacle clearance surfaces would require an increase to instrument departure procedure minimum climb gradients. If the FAA determines that this impact would affect as few as one operation per week, it could be used as the basis for determinations of hazard.

Instrument departure procedure obstacle clearance surfaces (e.g., ***Figure 6***) do not overlie the study area and should not limit 1,312-foot (400 meters [m]) tall WTGs at any of the proposed locations.

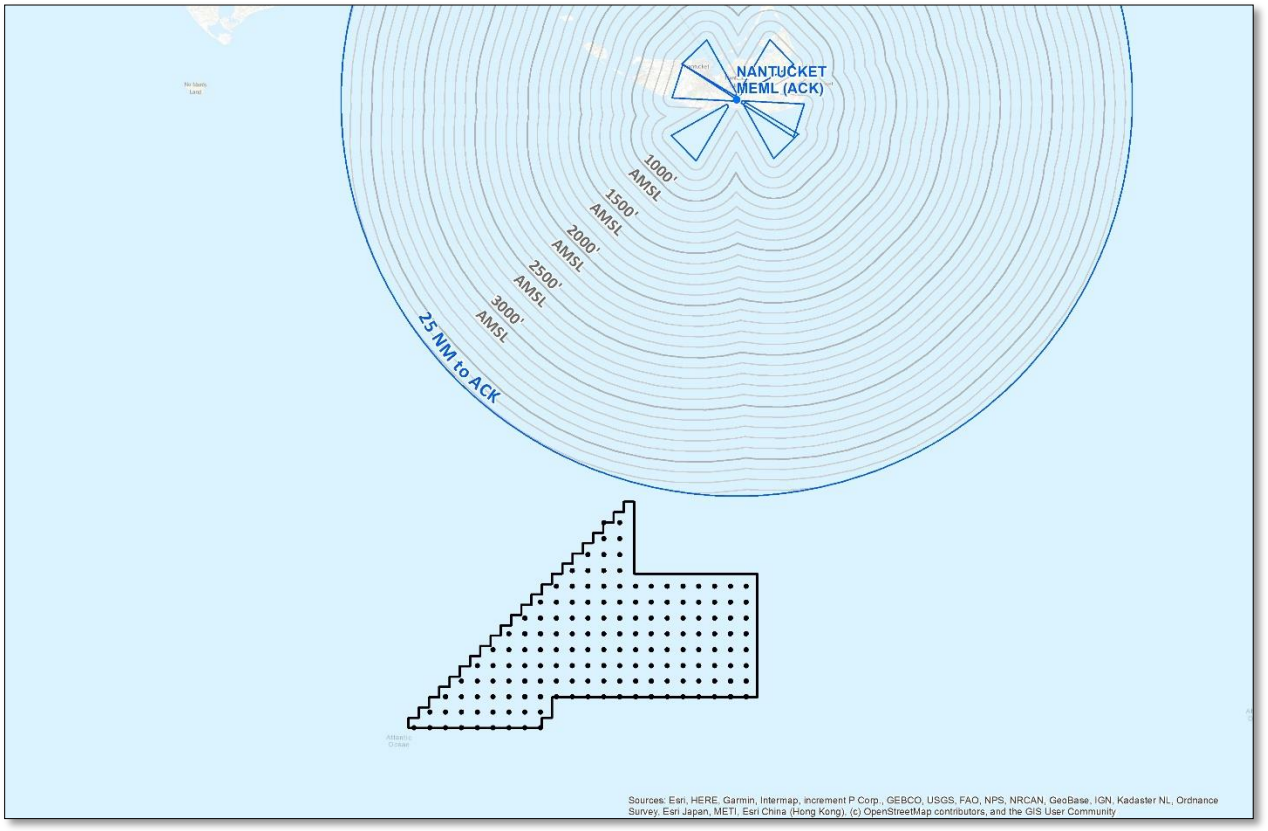


Figure 6: Nantucket Memorial (ACK) obstacle departure procedure

Instrument Approaches

Pilots operating during periods of reduced visibility and low cloud ceilings rely on terrestrial and satellite based navigational aids (NAVAIDS) in order to navigate from one point to another and to locate runways. The FAA publishes instrument approach procedures that provide course guidance to on-board avionics that aid the pilot in locating the runway. Capitol Airspace assessed nine published instrument approach procedures at one public-use airport in proximity to Vineyard Northeast:[4, 5]

Nantucket Memorial (ACK)
ILS or Localizer Approach to Runway 06
ILS or Localizer Approach to Runway 24
RNAV (GPS) Approach to Runway 06
RNAV (GPS) Approach to Runway 15
RNAV (GPS) Approach to Runway 24
RNAV (GPS) Approach to Runway 33
VOR Approach to Runway 24
Great Point Visual Approach to Runway 24
Tuckernuck Visual Approach to Runway 06

Proposed structures that exceed instrument approach procedure obstacle clearance surfaces would require an increase to their minimum altitudes. Increases to these altitudes, especially critical *decision altitudes (DA)* and *minimum descent altitudes (MDA)*, can directly impact the efficiency of instrument approach procedures. If the FAA determines this impact would affect as few as one operation per week, it could be used as the basis for determinations of hazard.

Instrument approach procedure obstacle clearance surfaces (e.g., ***Figure 7***) are in excess of other, lower surfaces and should not limit 1,312-foot (400 meters [m]) tall WTGs within the defined study area.

[4] Capitol Airspace assessed instrument approach procedures within 30 nautical miles (NM) of the study area. Although approach surfaces – including terminal arrival areas (TAA), feeder segments, and initial segments – from airports further than 30 NM may overlie the study area, the obstacle clearance surfaces present a lower risk to projects than the surfaces identified in this report. Therefore, height constraints associated with instrument approach surfaces for airports beyond 30 NM were not considered and are not included in the ***Composite Map***.

[5] Multiple minimum safe altitude (MSA) sectors overlie the study area. However, MSAs are for emergency use only and cannot be used as the basis for determinations of hazard in accordance with FAA Order 7400.2N Paragraph 6-3-9(e)(5). Therefore, height constraints associated with MSAs were not considered and are not included in the ***Composite Map***.

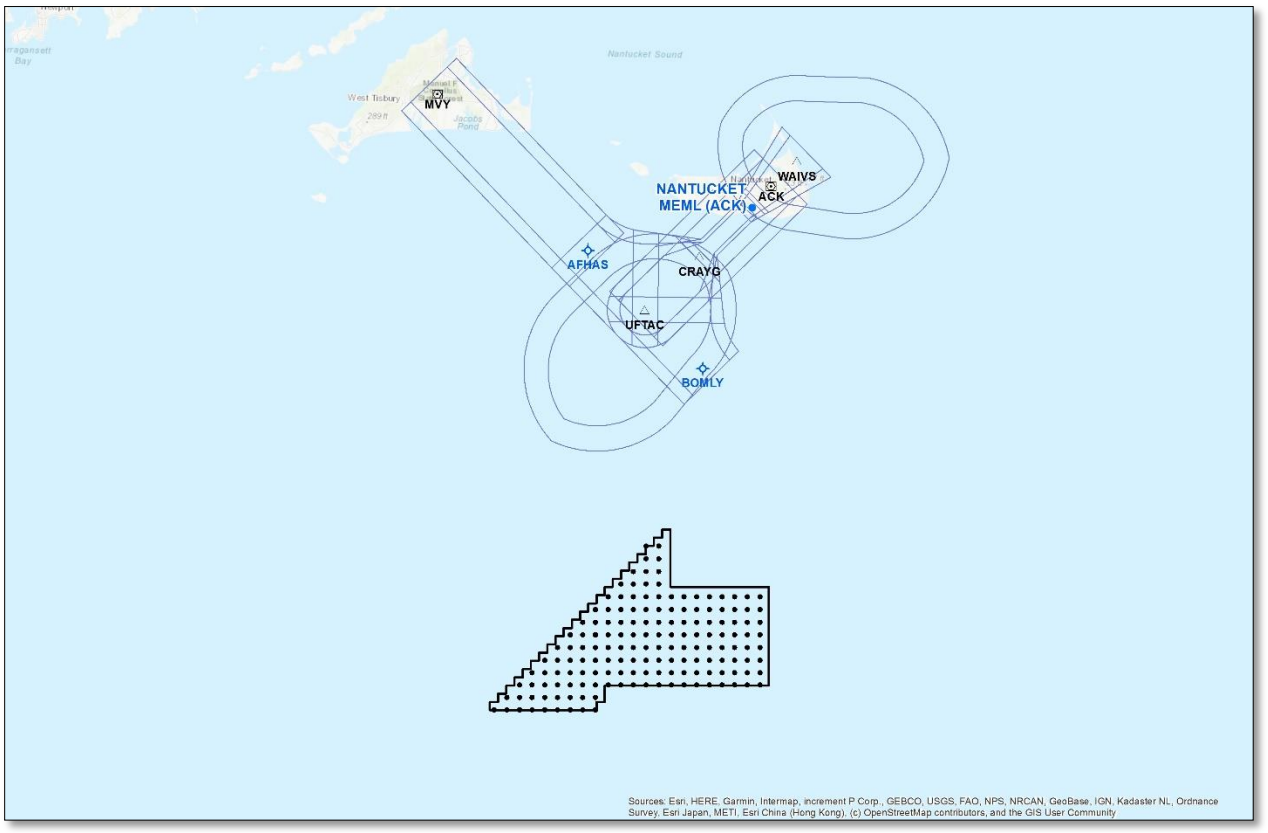


Figure 7: Nantucket Memorial (ACK) RNAV (GPS) Approach to Runway 06

Enroute Airways

Enroute airways provide pilots a means of navigation when flying from airport to airport and are defined by radials between VHF omni-directional ranges (VORs). The FAA publishes minimum altitudes for airways to ensure clearance from obstacles and terrain. The FAA requires that each airway have a minimum obstacle clearance of 1,000 feet (ft) (304.8 meters [m]) in non-mountainous areas and normally 2,000 ft (609.6 m) in mountainous areas.

Proposed structures that exceed enroute airway obstacle clearance surfaces would require an increase to their minimum obstruction clearance altitudes (MOCA) and/or minimum enroute altitudes (MEA). If the FAA determines that this impact would affect as few as one operation per week, it could be used as the basis for determinations of hazard.

Low altitude enroute airways (e.g., ***Figure 8***) do not overlie Vineyard Northeast and should not limit 1,312-ft (400 m) tall WTGs within the defined study area.

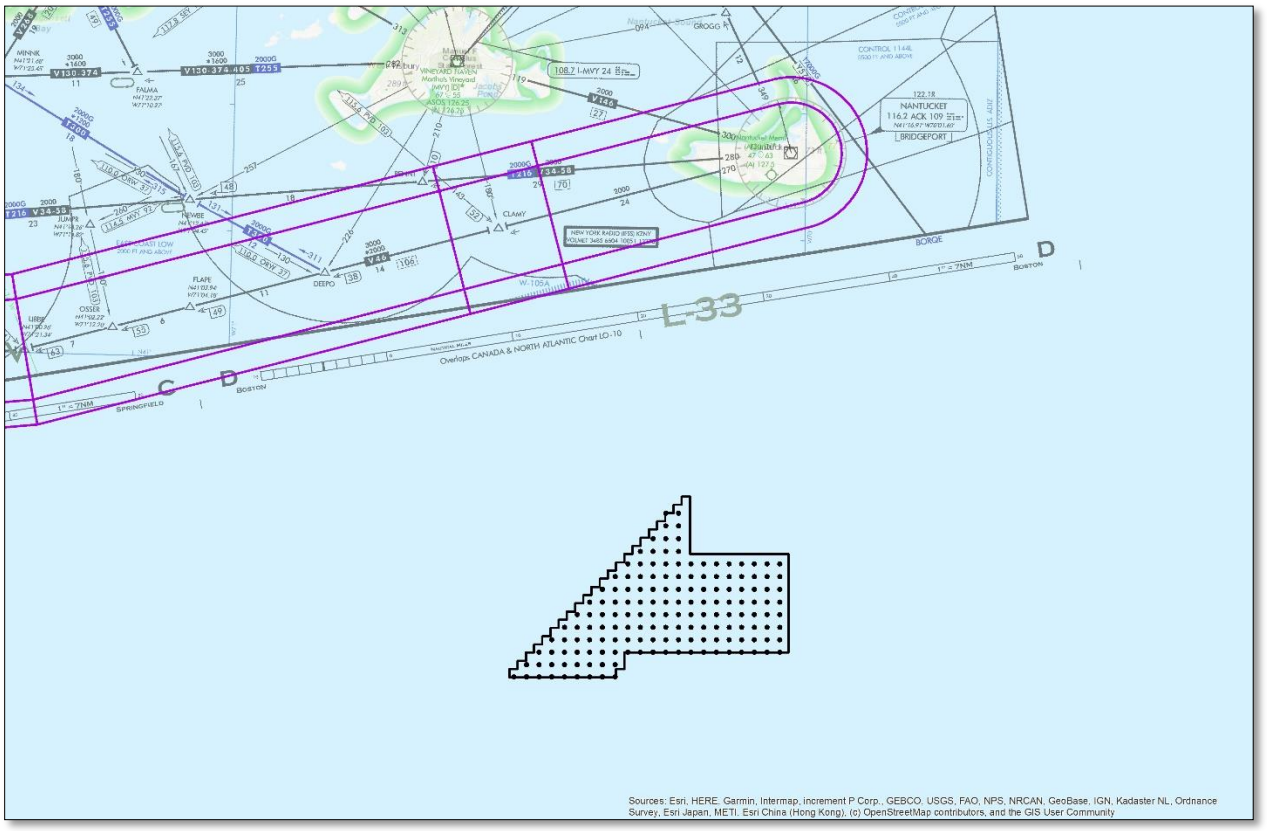


Figure 8: Low altitude chart L-33 with V-46 obstacle evaluation areas (purple outline)

Minimum Vectoring/IFR Altitudes

The FAA publishes minimum vectoring altitude (MVA) and minimum instrument flight rules (IFR) altitude (MIA) charts that define sectors with the lowest altitudes at which air traffic controllers can issue radar vectors to aircraft based on obstacle clearance. The FAA requires that sectors have a minimum obstacle clearance of 1,000 feet (ft) (304.8 meters [m]) in non-mountainous areas and normally 2,000 ft (609.6 m) in mountainous areas.

Proposed structures that exceed MVA/MIA sector obstacle clearance surfaces would require an increase to the altitudes usable by air traffic control for vectoring aircraft. If the FAA determines that this impact would affect as few as one operation per week, it could result in determinations of hazard.

Boston Consolidated (A90) Terminal Radar Approach Control (TRACON)

Sector HH (A90_MVA_FUS_5_2022)

The MVA is 2,300 ft (701.0 m) AMSL. The obstacle clearance surface (hatched blue, ***Figure 9***) is 1,349 ft (411.2 m) AMSL and is one of the lowest height constraints overlying the northern section of the study area. However, this surface should not limit 1,312 ft (400 m) tall WTGs in this area (green area, ***Figure 9***).

Sector EE (A90_MVA_FUS_5_2022)

The MVA is 5,800 ft (1,767.8 m) AMSL. The obstacle clearance surface is 4,849 ft (1,478.0 m) AMSL and is in excess of other, lower surfaces. This surface should not limit 1,312 ft (400 m) WTGs at any of the proposed locations (green area, ***Figure 9***).

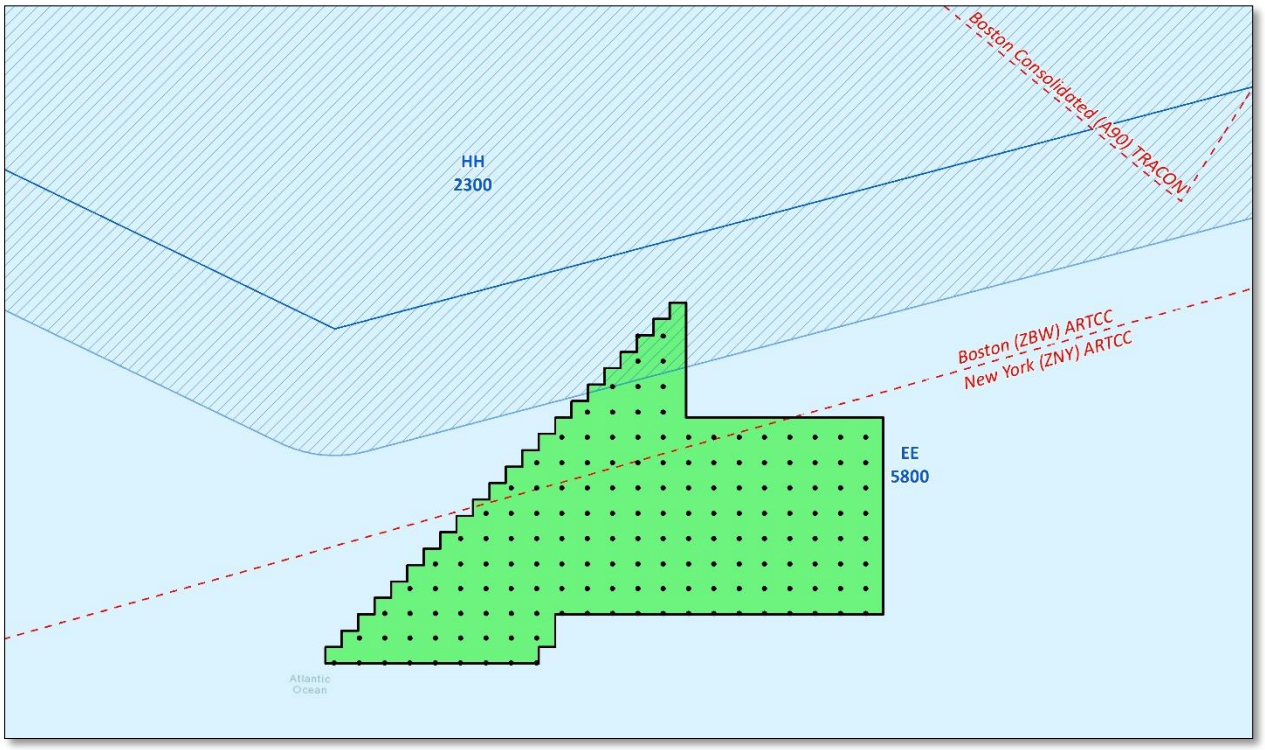


Figure 9: Boston Consolidated (A90) TRACON FUSION 5 MVA sectors (blue) with Sector HH obstacle evaluation area (hatched blue)

Boston Consolidated (A90) TRACON *(A90_MVA_FUS_3_2022)*

Sector U

The MVA is 2,000 ft (609.6 m) AMSL. The obstacle clearance surface (hatched blue, ***Figure 10***) is 1,049 ft (319.7 m) AMSL and is one of the lowest height constraints overlying a small northern section of the study area. This surface could limit 1,312 ft (400 m) tall WTGs in this area (red area, ***Figure 10***). However, no proposed WTGs are located in this area. Additionally, Vineyard Northeast is located more than 12 NM outside of Boston Consolidated (A90) TRACON airspace. Therefore, Boston Consolidated (A90) TRACON may be willing to raise the Sector U MVA where it overlies the study area. This mitigation option is subject to FAA approval.

Sector T

The MVA is 5,500 ft (1,676.4 m) AMSL. The obstacle clearance surface is 4,549 ft (1,386.5 m) AMSL and is one of the lowest height constraints overlying the most of the study area. However, this surface should not limit 1,312 ft (400 m) tall WTGs at any of the proposed locations (green area, ***Figure 10***).

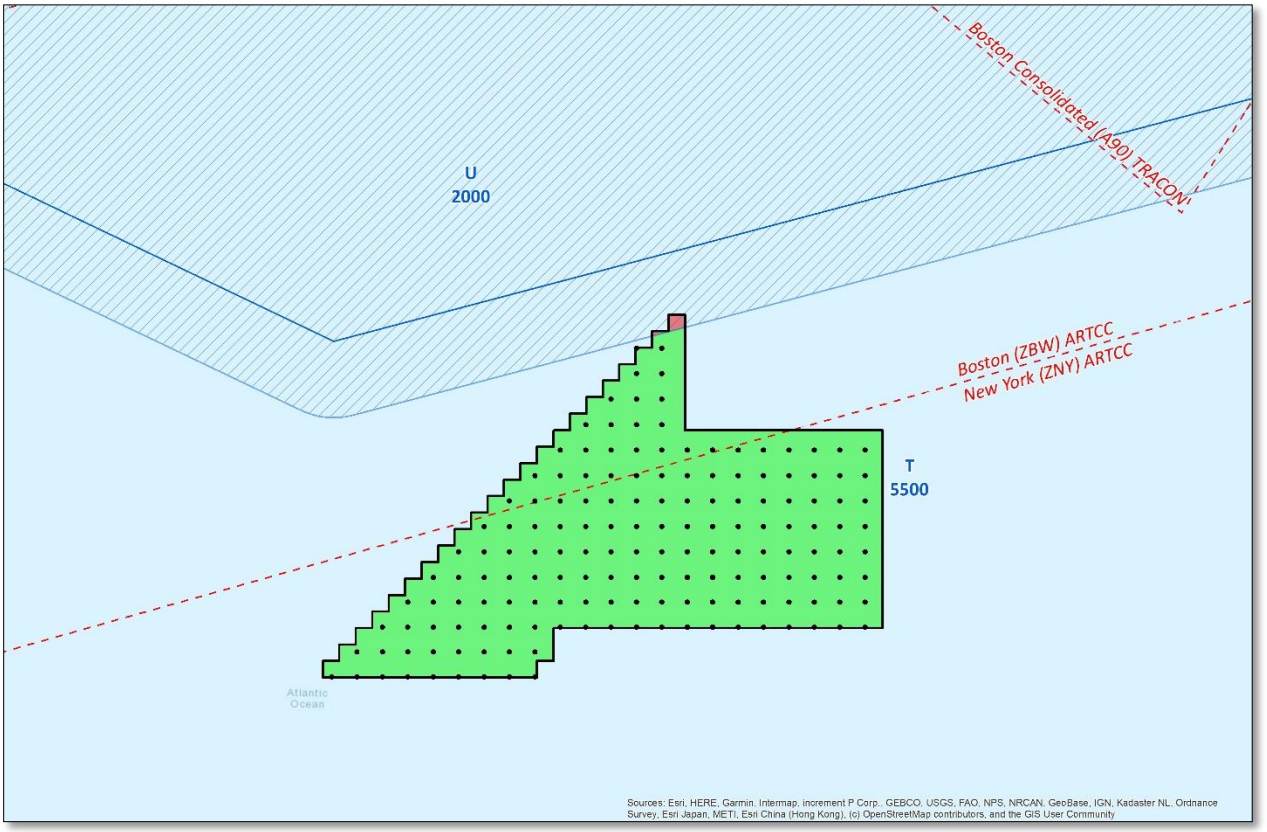


Figure 10: Boston Consolidated (A90) TRACON FUSION 3 MVA sectors (blue) with Sector U obstacle evaluation area (hatched blue)

Terminal and Enroute Navigational Aids

The FAA has established protection areas in order to identify proposed structures that may have a physical and/or electromagnetic effect on navigational aids (NAVAIDs). The protection area dimensions vary based on the proposed structure type as well as the NAVAID type. Proposed structures located within these areas may interfere with NAVAID services and will require further review by FAA Technical Operations. If further review determines that proposed structures would have a significant physical and/or electromagnetic effect on NAVAIDs, it could result in determinations of hazard.

NAVAID protection areas do not overlie Vineyard Northeast (***Figure 11***). As a result, it is unlikely that proposed WTGs would have a physical or electromagnetic effect on terminal or enroute NAVAIDs.

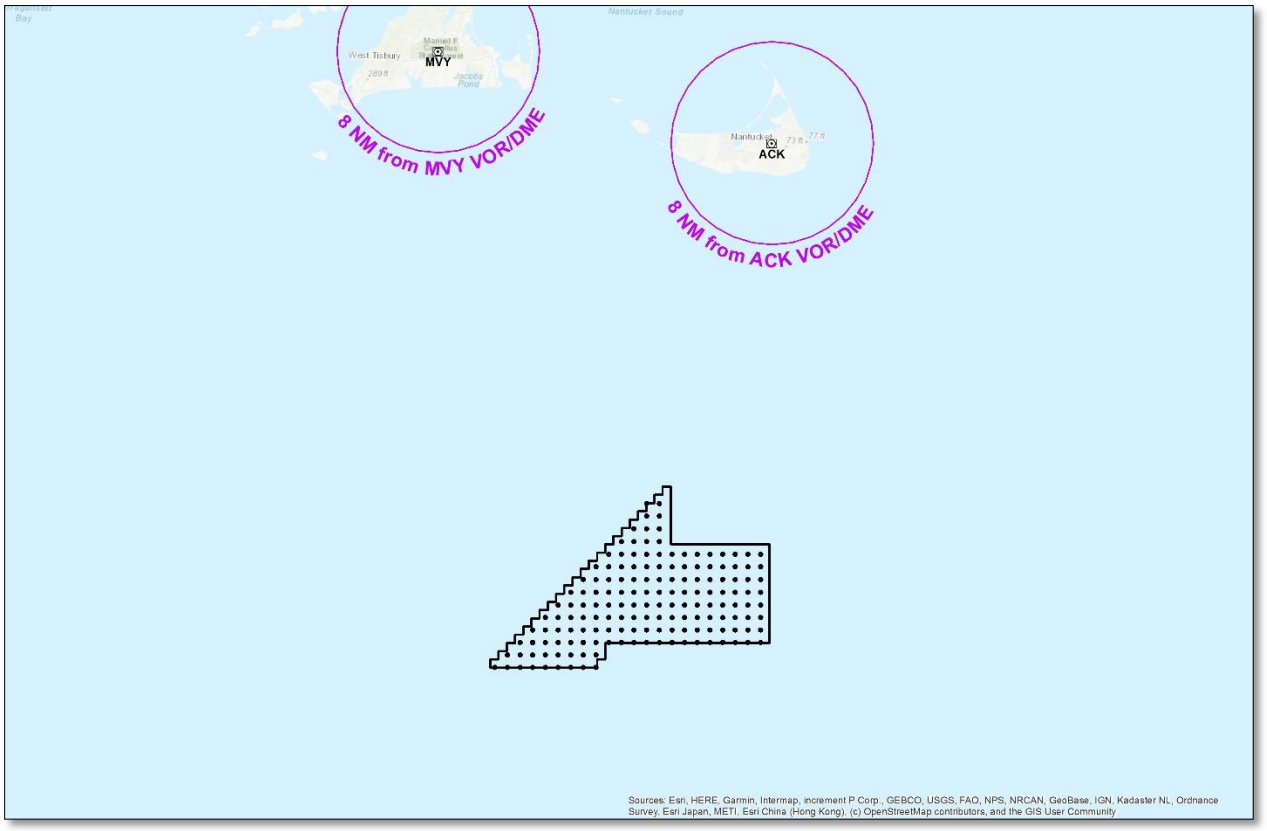


Figure 11: NAVAID protection areas in proximity to Vineyard Northeast

Military Airspace and Training Routes

Although the FAA does not consider impact on military airspace or training routes, they will notify the military of proposed structures located within these segments of airspace. Impact on these segments of airspace can result in military objections to the proposed development. If the planned development area is located on federal land, impact on military airspace or training routes may result in the denial of permits by BOEM.

Warning area (W) overlying Vineyard Northeast (***Figure 12***):

U.S. Navy, Fleet Area Control and Surveillance Facility, Virginia Capes (FACSFAC VACAPES)

Route/Airspace	*Minimum Altitude*
W-105A	Surface

Due to the low altitudes associated with this segment of airspace, wind development could have an impact on its operations. If FACSFAC or other nearby units use this segment of airspace regularly, they may object to proposed wind development within the boundaries.

Under the provisions of the 2018 National Defense Authorization Act (NDAA), the Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse) may issue a Notice of Presumed Risk to National Security (NPR) letter to initiate mitigation discussions. These discussions are facilitated through the Clearinghouse and with the affected bases or organizations with operational interests. Per the legislative directive, NPR letters are provided to the Governor of the State(s). The Clearinghouse typically attempts to notify developers shortly before the issuance of an NPR letter.

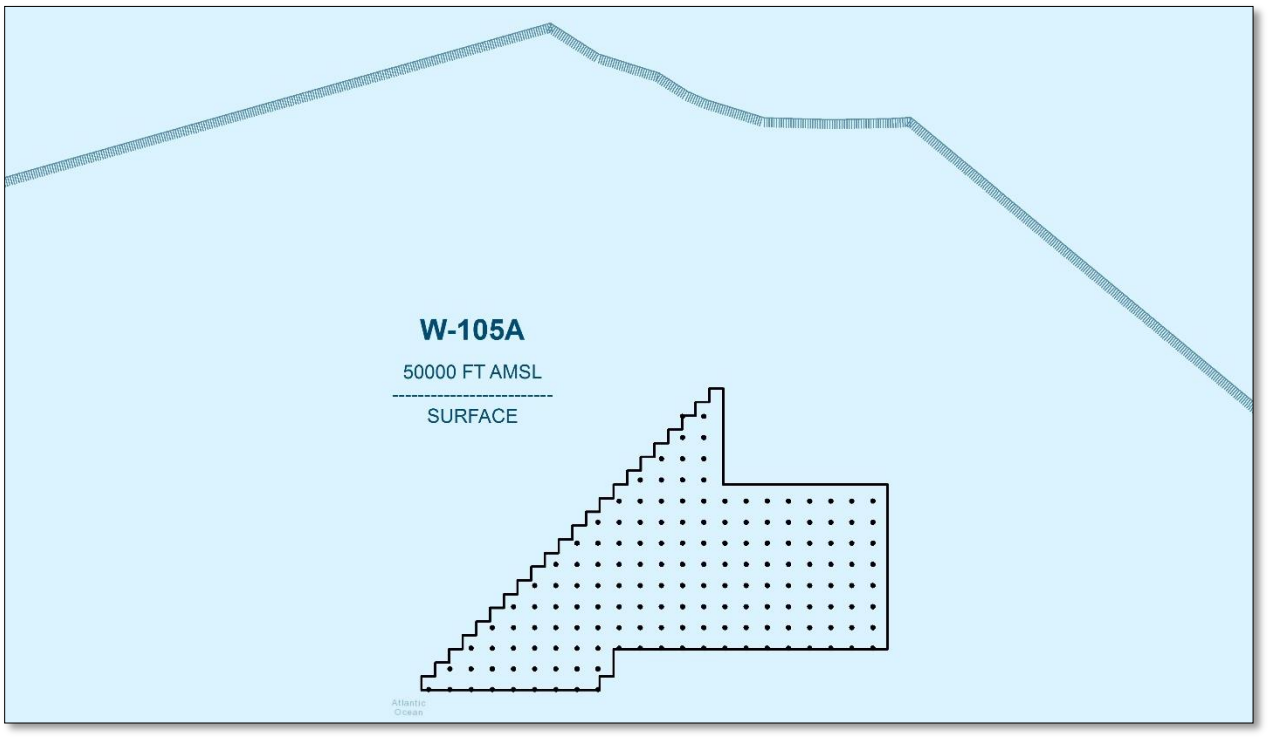


Figure 12: Military airspace overlying Vineyard Northeast

Conclusion

At 1,312 feet (ft) (400 meter [m]) tall, WTGs throughout the proposed study area will exceed 14 CFR Part 77.17(a)(1) - a height of 499 ft (152.1 m) AGL at the site of the object - and could be identified as obstructions regardless of their location. However, heights in excess of 499 ft (152.1 m) AGL are feasible provided proposed WTGs do not exceed FAA obstacle clearance surfaces.

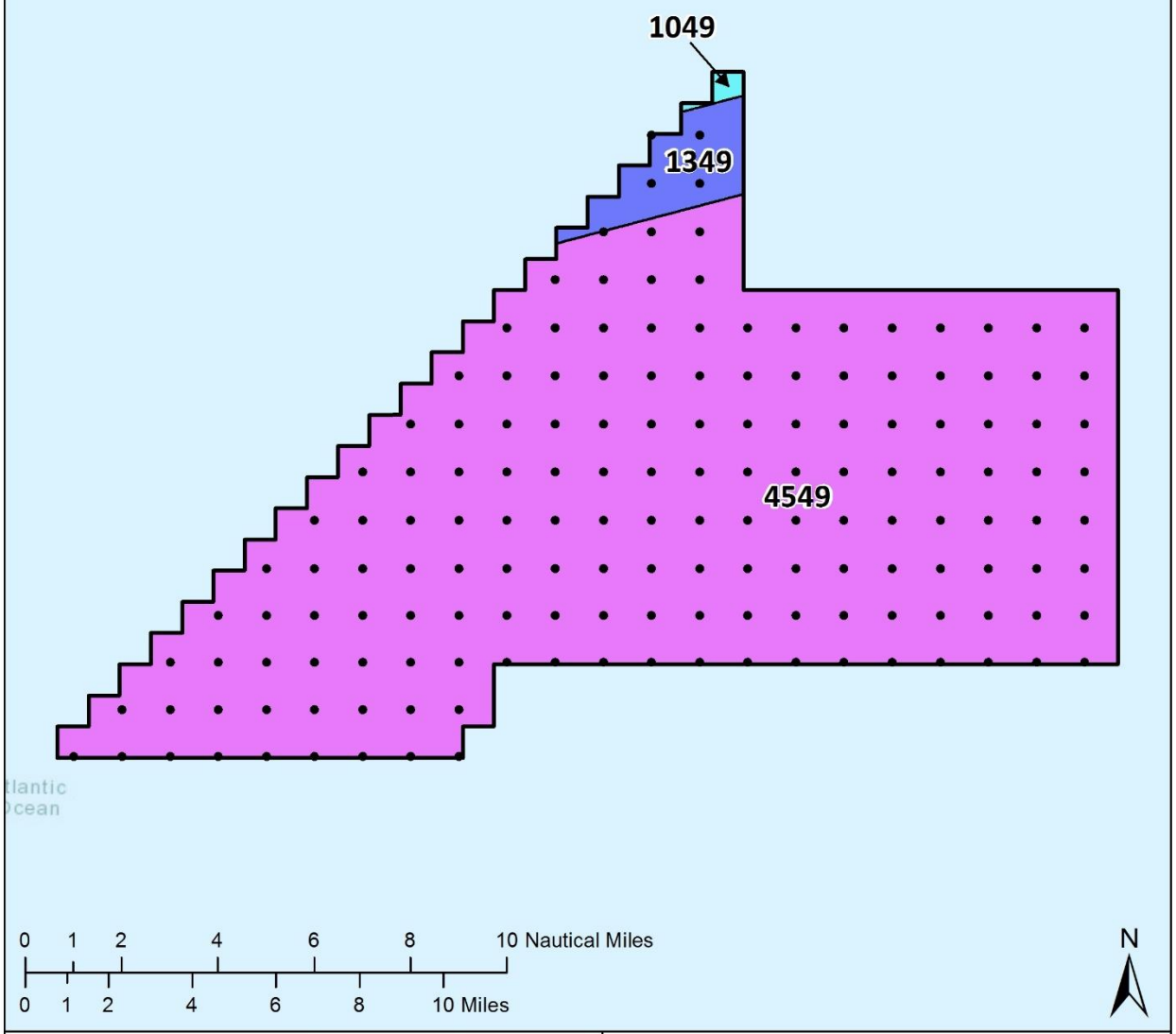
The lowest obstacle clearance surfaces overlying Vineyard Northeast range from 1,049 to 4,549 ft (319.7 to 1,386.5 m) AMSL (***Figure 13***) and are associated with multiple MVAs. These surfaces could limit 1,312 ft (400 m) tall WTGs in a small northern section of the study area (red area, ***Figure 14***). However, no proposed WTGs are located in this area (green area, ***Figure 14***).

At 1,312 ft (400 m) tall, proposed WTGs in the northern section of the study area would require an increase to Boston Consolidated (A90) TRACON MVA sector. However, Vineyard Northeast is located more than 12 NM outside Boston Consolidated (A90) TRACON airspace. Therefore, this facility may be willing to raise their sector MVA where it overlies the study area. These mitigation options are subject to FAA approval.

A warning area overlies Vineyard Northeast (***Figure 12***) and could result in military objections to proposed wind development.

If you have any questions regarding the findings of this study, please contact ***Dan Underwood*** or ***Alison Kennedy*** at (703) 256-2485.

Proposed structures that exceed 14 CFR Part 77.17(a)(1) - a height of 499 feet AGL at the site of the object - will be identified as obstructions regardless of location.



Obstacle Clearance Surface
Height - AMSL Feet
- 1,049
- 1,349
- 4,549
- Lease Area OCS-A 0522
- Proposed WTG Locations

All heights above mean sea level (AMSL)

Vineyard Northeast
Composite Height Constraint Map

Plot Date:
12 May 2022

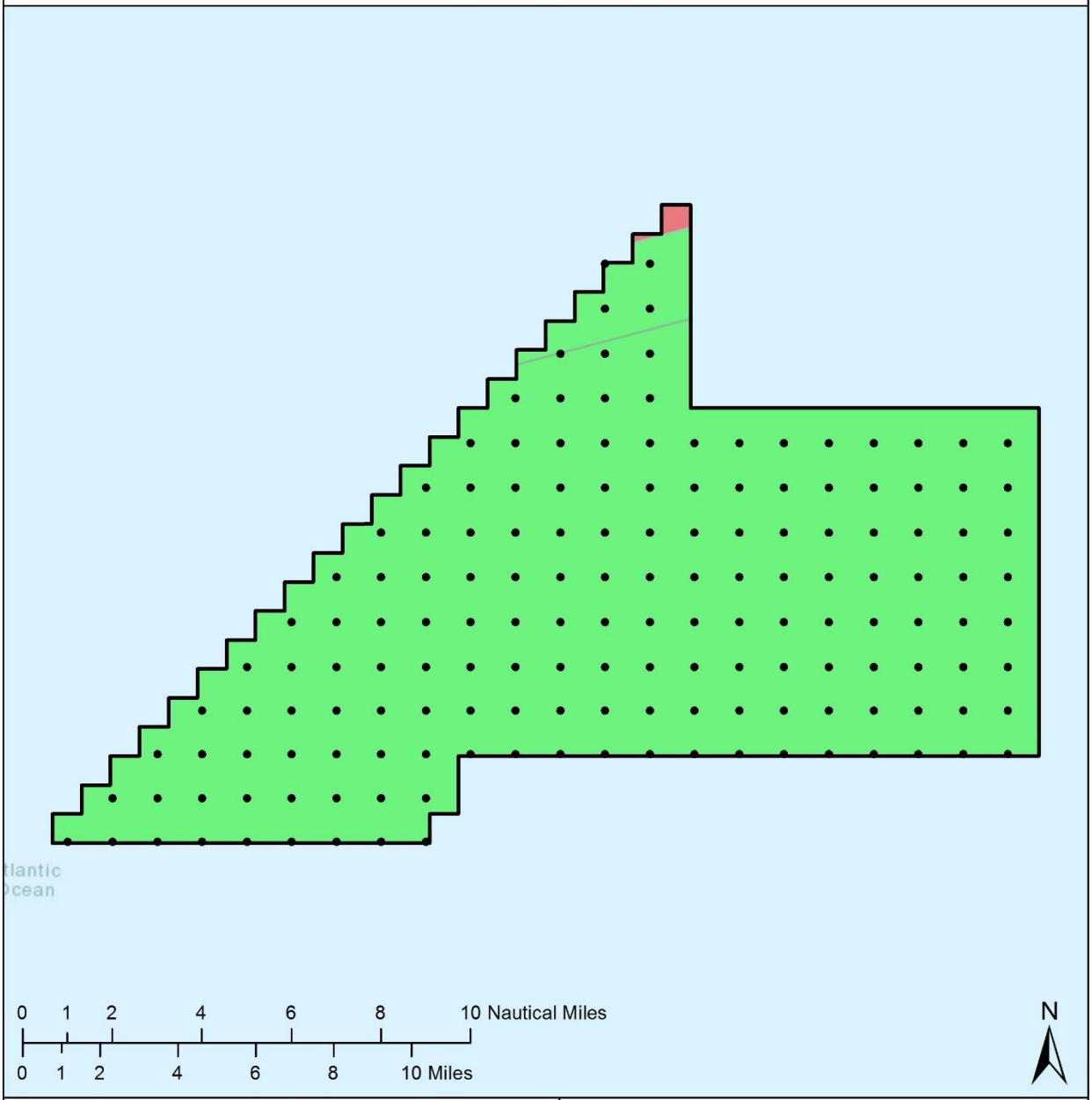
Coordinate System:
NAD 1983 UTM Zone 19N

Alison Kennedy

Figure 13

Capitol Airspace Group

Proposed structures that exceed 14 CFR Part 77.17(a)(1) - a height of 499 feet AGL at the site of the object - will be identified as obstructions regardless of location.



Clearance

Height - AMSL Feet

- < 1,312
- ≥ 1,312
- Lease Area OCS-A 0522
- Proposed WTG Locations

All heights above mean sea level (AMSL)

Vineyard Northeast
Above Mean Sea Level (AMSL) Clearance Map

Plot Date:
12 May 2022

Coordinate System:
NAD 1983 UTM Zone 19N

Alison Kennedy

Figure 14

Capitol Airspace Group

Vineyard Northeast COP

Appendix II-H2 Air Traffic Flow Analysis

Prepared by:
Capitol Airspace Group

Prepared for:
Vineyard Northeast LLC

March 2024

Revision	Date	Description
0	July 2022	Initial submission.
0	March 2024	Resubmitted without revisions.

Vineyard Northeast

Epsilon Associates

Offshore Nantucket, Massachusetts

Air Traffic Flow Analysis

May 19, 2022

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Introduction

The Federal Aviation Administration (FAA) conducts aeronautical studies to ensure that proposed structures do not affect the safety of air navigation and the efficient utilization of navigable airspace by aircraft. Proposed structures undergoing aeronautical study that exceed obstacle clearance surfaces will be identified as having an adverse effect. If the FAA determines that the adverse effect would impact a significant volume of operations, it could be used as the basis for determinations of hazard. For visual flight rules (VFR) operations the threshold for a significant volume of operations is one flight per day. For instrument flight rules (IFR) operations the threshold is one flight per week.

Vineyard Northeast LLC (the "Proponent") proposes to develop, construct, and operate offshore renewable wind energy facilities in Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0522 (the "Lease Area") along with associated offshore and onshore transmission systems. This proposed development is referred to as "Vineyard Northeast." Vineyard Northeast includes up to 160 total wind turbine generator (WTG) and electrical service platform (ESP) positions within the Lease Area. Offshore export cables installed within offshore export cable corridors (OECCs) will connect the renewable wind energy facilities to onshore transmission systems in Massachusetts and/or Connecticut.

Capitol Airspace previously conducted an obstruction evaluation and airspace analysis for Vineyard Northeast (black outline, ***Figure 1***). At the time of this analysis, 160 WTG locations had been identified (black points, ***Figure 1***). This analysis determined that 1,312-foot (400-meter) tall WTGs would require an increase to Boston Consolidated (A90) Terminal Radar Approach Control (TRACON) minimum vectoring altitudes (MVA). If this IFR impact would affect as few as one operation per week, it could be used as the basis for determinations of hazard.

In order to determine the number of IFR operations potentially affected by proposed WTGs, Capitol Airspace conducted an air traffic flow analysis for Vineyard Northeast. This analysis is an assessment of historical flight tracks that can be used to determine the likelihood of airspace impacts affecting a significant volume of future operations.

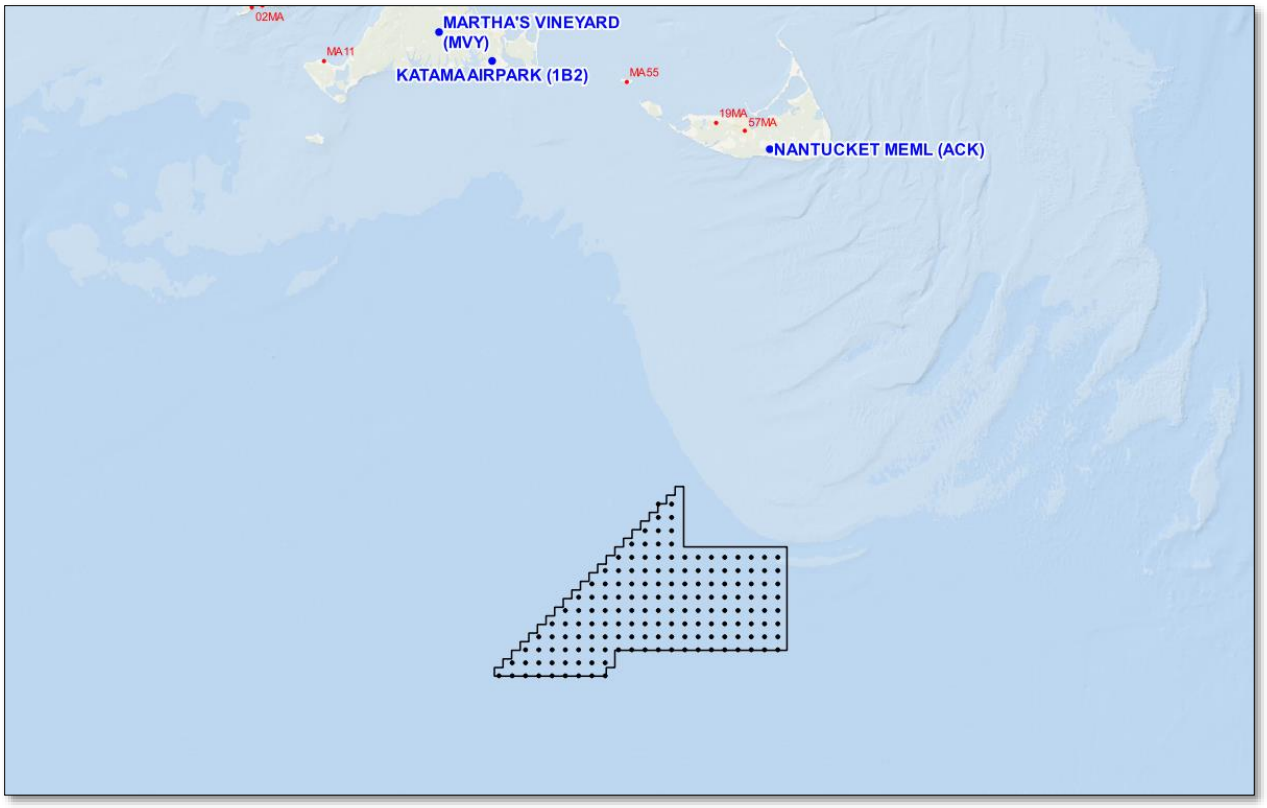

Figure 1: Public-use (blue) and private-use (red) airports in proximity to Vineyard Northeast (black outline)

Methodology

Capitol Airspace evaluated FAA National Offload Program (NOP) flight tracks in proximity to Vineyard Northeast for the 2019 calendar year. Flight tracks from the 2019 dataset were assessed since it contained a greater number of flights in the affected airspace than the 2020 dataset. The FAA NOP data contained radar returns associated with flights receiving air traffic control services.[1] Each flight that had at least one radar return within the affected airspace was analyzed for altitude and direction trends to determine its likely operation.

Minimum Vectoring Altitudes

In order to accommodate proposed WTGs, the FAA must modify MVA sector boundaries or establish isolation areas with an increased MVA. Depending on the type of MVA chart, the modifications would implement either a three- or five-nautical mile (NM) (5,556- or 9,260-meter) buffer around WTGs exceeding the MVA sector's obstacle clearance surface. Flights that maintained one or more specific headings within the affected volume of airspace operated in a manner consistent with receiving radar vectoring services. These flights also maintained or climbed/descended to maintain an altitude within the affected airspace. The historical presence of these flights is an indicator that the required MVA sector modifications could affect future air traffic control operations.

[1] NOP data excludes certain military flights due to the sensitive nature of some operations.

Findings

Boston Consolidated (A90) TRACON

FUSION 3 (A90_MVA_FUS_3_2022)

Sector U

The Sector U MVA is 2,000 feet (609.6 meters) above mean sea level (AMSL) and the associated obstacle clearance surface is 1,049 feet (319.7 meters) AMSL. At 1,312 feet (400 meters) tall, proposed WTGs in a small northern section of the study area (red area, ***Figure 2***) would exceed this surface. Proposed WTGs in this area would require an increase to the Sector U MVA from 2,000 to 2,300 feet (609.6 - 701.0 meters) AMSL.

However, flight track data indicates that no flights operated within the affected airspace (dashed red outline, ***Figure 2***). This flight total represents an average of *0.00 flights per week* which is below the FAA's threshold for a significant volume of operations. Additionally, Vineyard Northeast is located more than 12 NM (22.2 kilometers) outside of Boston Consolidated (A90) TRACON airspace.

As a result of these findings, it is possible that Boston Consolidated (A90) TRACON would not object to modifying Sector U in order to accommodate wind development up to 1,312 feet (400 meters) tall. This mitigation option is subject to FAA approval.

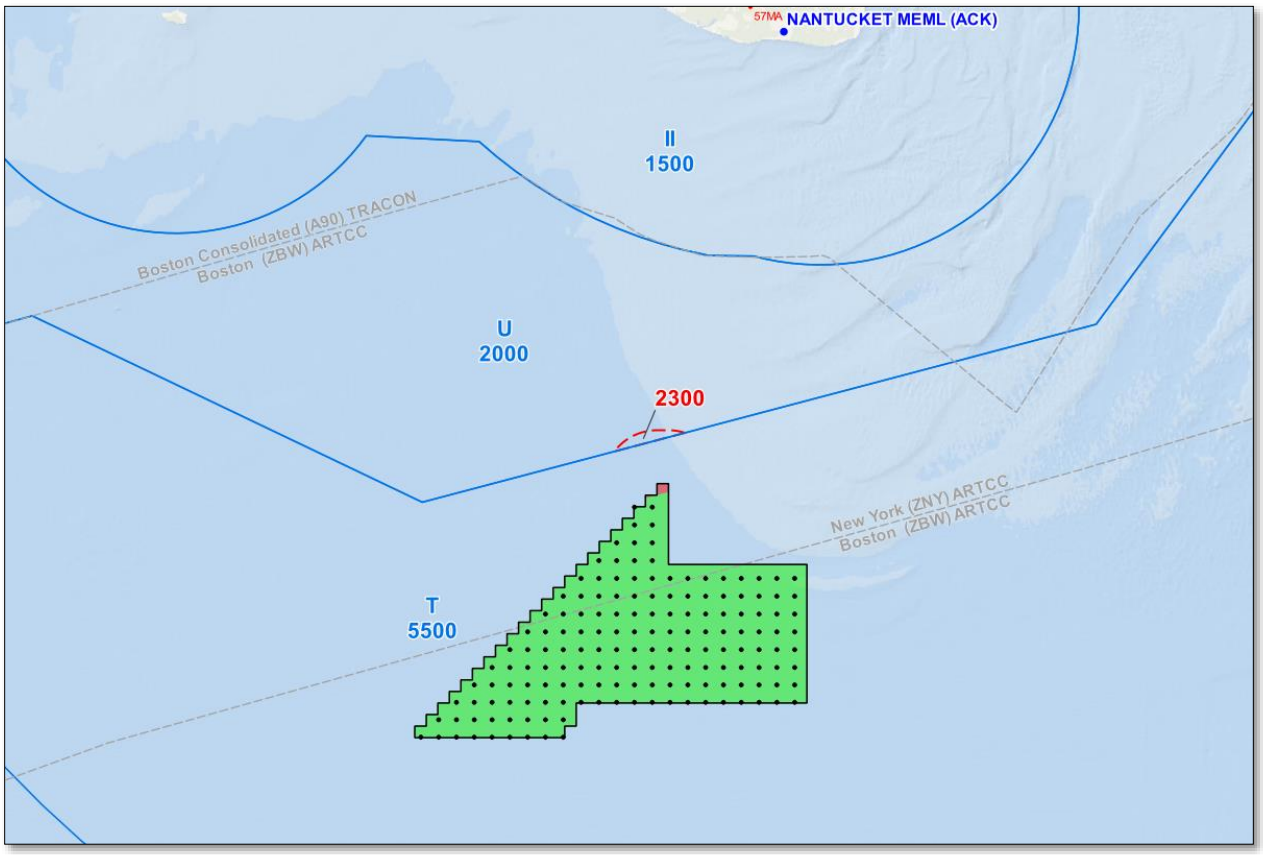

Figure 2: Boston Consolidated (A90) TRACON FUSION 3 MVA sectors (black) and affected airspace (dashed red outline)

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Conclusion

Capitol Airspace assessed historical FAA radar track data covering the period of one year to determine the number of operations that could be affected by increasing the Boston Consolidated (A90) TRACON Sector U MVA. In order to accommodate 1,312-foot (400-meter) tall WTGs, the MVA must be increased from 2,000 to 2,300 feet (609.6 - 701.0 meters) AMSL.

Historical radar track data indicates that the proposed WTGs should not affect a significant volume of Boston Consolidated (A90) TRACON radar vectoring operations. Additionally, Vineyard Northeast is located more than 12 NM (22.2 kilometers) outside of Boston Consolidated (A90) TRACON airspace. As a result of these findings, it is possible that Boston Consolidated (A90) TRACON would not object to modifying Sector U in order to accommodate 1,312-foot (400-meter) tall WTGs. This mitigation option is subject to FAA approval prior to receiving favorable Determinations of No Hazard.

Please contact ***Dan Underwood*** or ***Candace Childress*** at (703) 256-2485 with any questions regarding the findings of this analysis.

Vineyard Northeast COP

Appendix II-H3 Radar and Navigational Aid Screening Study

Prepared by:
Westslope Consulting

Prepared for:
Vineyard Northeast LLC

March 2024

Revision	Date	Description
0	July 2022	Initial submission.
0	March 2024	Resubmitted without revisions.

VINEYARD NORTHEAST WIND PROJECT

RADAR AND NAVIGATIONAL AID SCREENING STUDY

MAY 20, 2022

Westslope Consulting, LLC
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Norman, Oklahoma 73072
(405) 310-6058

INTRODUCTION

Vineyard Northeast LLC (the "Proponent") proposes to develop, construct, and operate offshore renewable wind energy facilities in Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0522 (the "Lease Area") along with associated offshore and onshore transmission systems. This proposed development is referred to as "Vineyard Northeast." Vineyard Northeast includes up to 160 total wind turbine generator (WTG) and electrical service platform positions (proposed locations) within the Lease Area.[1] Offshore export cables installed within offshore export cable corridors will connect the renewable wind energy facilities to onshore transmission systems in Massachusetts and/or Connecticut. This report provides the results of a radar and navigational aid screening study conducted by Westslope Consulting, LLC (Westslope) for the proposed locations and the Lease Area using a blade-tip height of 1,312 feet above ground level (AGL).

This study includes the following:

- Research into radar sites and Very High Frequency Omnidirectional Range (VOR) navigational aid sites near Vineyard Northeast.
- An Air Route Surveillance Radar (ARSR) and Airport Surveillance Radar (ASR) line-of-sight (LOS) analysis.
- An Early Warning Radar (EWR) LOS analysis.
- A Terminal Doppler Weather Radar (TDWR) screening analysis.
- A VOR screening analysis.
- A Next Generation Radar (NEXRAD) weather radar screening analysis.
- A coastal High Frequency (HF) radar LOS analysis.

RESEARCH

ARSR and ASR Sites

Research conducted by Westslope identified the following six ARSR and ASR sites near Vineyard Northeast:

- Boston Airport Surveillance Radar-9 (ASR-9)
- Falmouth Airport Surveillance Radar-8 (ASR-8)
- Nantucket ASR-9
- North Truro Air Route Surveillance Radar-4 (ARSR-4)
- Providence ASR-9
- Riverhead ARSR-4

In addition to the Department of Defense (DoD) and Department of Homeland Security (DHS) using these radar sites for air defense and homeland security, the Federal Aviation Administration (FAA) uses these radar sites for air traffic control at multiple facilities, including the Boston Consolidated Terminal Radar Approach Control (TRACON), Nantucket Air Traffic Control Tower, Boston Air Route Traffic Control Center (ARTCC), Providence TRACON, and the New York ARTCC.

Co-Located Secondary Surveillance Radar

Research conducted by Westslope identified the following secondary surveillance radar systems co-located with the ARSR and ASR systems:

- An Air Traffic Control Beacon Interrogator-5 is co-located with the Falmouth ASR-8.
- An Air Traffic Control Beacon Interrogator-6 is co-located with the North Truro ARSR-4 and the Riverhead ARSR-4.
- A Mode S is co-located with the Boston ASR-9, Nantucket ASR-9, and the Providence ASR-9.

In general, secondary surveillance radar systems are less susceptible to interference from WTGs than primary surveillance radar systems, such as the ARSR and ASR systems.

EWR Sites

Research conducted by Westslope identified the Cape Cod Space Force Station (SFS) EWR near Vineyard Northeast.

The DoD uses this radar site for ballistic missile defense and space surveillance.

TDWR Sites

Research conducted by Westslope identified the Boston TDWR near Vineyard Northeast.

The FAA uses this radar site for air traffic control at the Boston TRACON. In addition, the National Weather Service (NWS) uses this radar site for weather operations at the Boston/Norton Weather Forecast Office (WFO).

VOR Sites

Research conducted by Westslope identified the following two navigational aid sites near Vineyard Northeast:

- Martha's Vineyard VOR and co-located Distance Measuring Equipment (VOR/DME)
- Nantucket VOR/DME

Correspondence with the FAA indicates that these VORs are conventional VORs as of March 3, 2022. In general, conventional VORs are more susceptible than Doppler VORs to interference from WTGs.

NEXRAD Weather Radar Sites

Research conducted by Westslope identified the following two NEXRAD weather radar sites near Vineyard Northeast:

- Boston Weather Surveillance Radar-1988 Doppler (WSR-88D)
- Brookhaven WSR-88D

Research conducted by Westslope shows that the lowest elevation angle scanned by these radar sites is 0.5 degrees.

The NWS uses these radar sites for weather operations at multiple facilities, including the Boston/Norton WFO and the New York WFO.

HF Radar Sites

Research conducted by Westslope identified the following eight HF radar sites near Vineyard Northeast:

- Amagansett HF radar
- Block Island Long Range HF radar
- Long Point Wildlife Refuge HF radar
- Martha's Vineyard HF radar
- Moriches HF radar
- Nantucket HF radar
- Nantucket Island HF radar
- Nauset HF radar

The Amagansett HF radar, Block Island Long Range HF radar, Martha's Vineyard HF radar, Moriches HF radar, and the Nantucket Island HF radar are operated by Rutgers University. The Long Point Wildlife Refuge HF radar and the Nantucket HF radar are operated by the Woods Hole Oceanographic Institution. The Nauset HF radar is operated by the University of Massachusetts Dartmouth.

In partnership with the National Oceanic and Atmospheric Administration (NOAA) Integrated Ocean Observing System (IOOS), various federal agencies use the ocean surface current and wave data provided by these HF radar sites in support of multiple missions.

ANALYSIS

ARSR and ASR LOS Analysis

Westslope conducted an ARSR and ASR LOS analysis using United States Geological Survey (USGS) 3-Dimensional Elevation Program (3DEP) data. This analysis shows whether WTGs at a blade-tip height of 1,312 feet AGL will be within line-of-sight of one or more ARSR or ASR sites.

Westslope conducted the LOS analysis for the following six ARSR and ASR sites:

- Boston ASR-9
- Falmouth ASR-8
- Nantucket ASR-9
- North Truro ARSR-4
- Providence ASR-9
- Riverhead ARSR-4

Vineyard Northeast is beyond the instrumented range of the Boston ASR-9 and the Providence ASR-9. As such, no additional analysis was considered necessary for these radar sites.

Falmouth ASR-8

The LOS analysis results show that WTGs at 47 of the 160 proposed locations will be within line-of-sight of and will interfere with the Falmouth ASR-8 at a blade-tip height of 1,312 feet AGL. See Figure 1. The radar effects will include unwanted radar returns (clutter) resulting in a partial loss of primary target detection and a number of false primary targets over and in the immediate vicinity of WTGs at the proposed locations within line-of-sight. Other radar effects include a partial loss of weather detection and false weather indications over and in the immediate vicinity of WTGs at the proposed locations within line-of-sight.

Nantucket ASR-9

The LOS analysis results show that WTGs at all 160 proposed locations will be within line-of-sight of and will interfere with the Nantucket ASR-9 at a blade-tip height of 1,312 feet AGL. See Figure 2. The radar effects will include clutter resulting in a partial loss of primary target detection and a number of false primary targets over and in the immediate vicinity of WTGs at the proposed locations. Other radar effects include a partial loss of weather detection and false weather indications over and in the immediate vicinity of WTGs at the proposed locations.

North Truro ARSR-4

The LOS analysis results show that WTGs at the 160 proposed locations will not be within line-of-sight of and will not interfere with the North Truro ARSR-4 at a blade-tip height of 1,312 feet AGL. As a result, Westslope does not expect any radar effects at or below this blade-tip height.

Riverhead ARSR-4

The LOS analysis results show that WTGs at the 160 proposed locations will not be within line-of-sight of and will not interfere with the Riverhead ARSR-4 at a blade-tip height of 1,312 feet AGL. As a result, Westslope does not expect any radar effects at or below this blade-tip height.

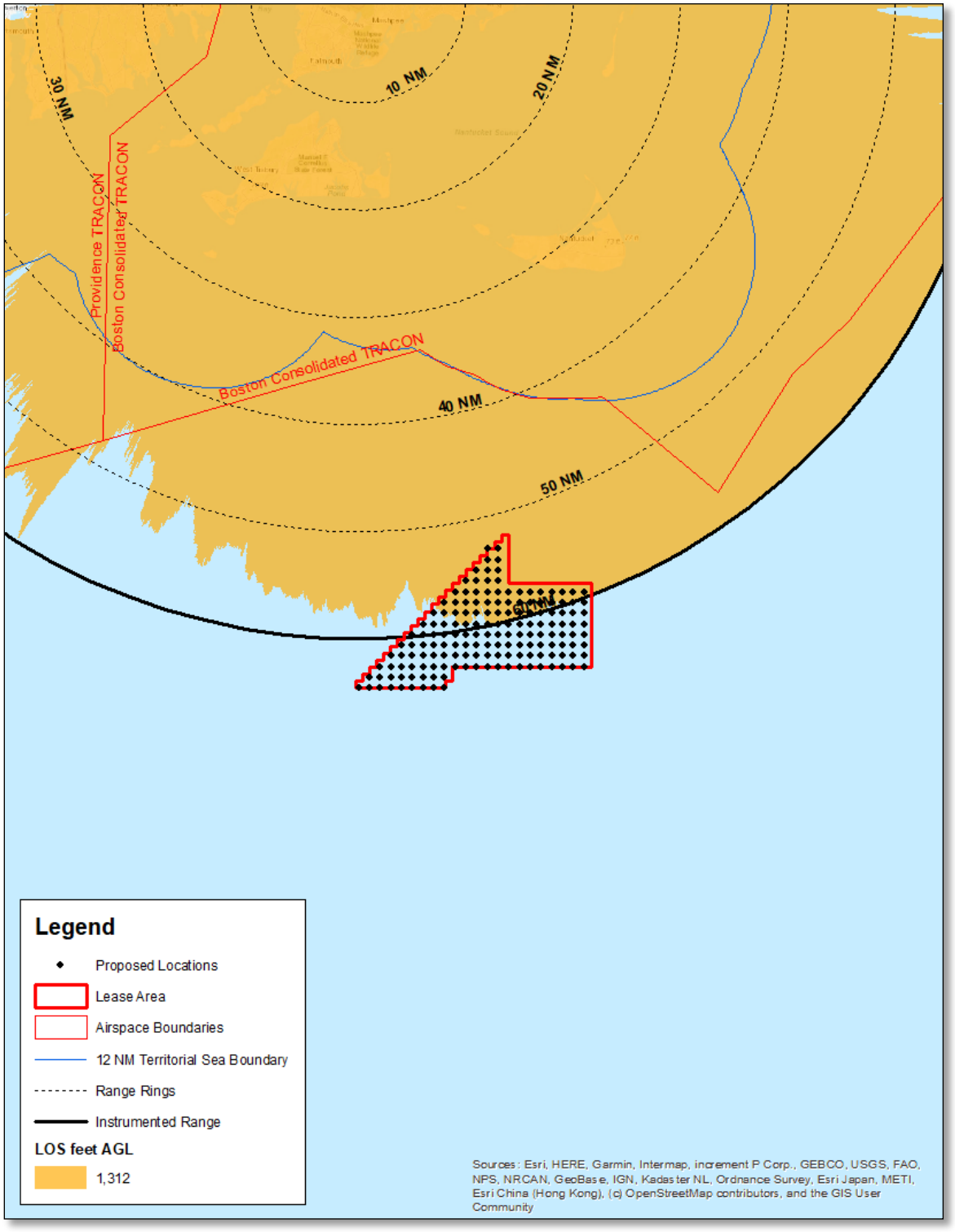

Figure 1 LOS Analysis Results for the Falmouth ASR-8 using 3DEP Data

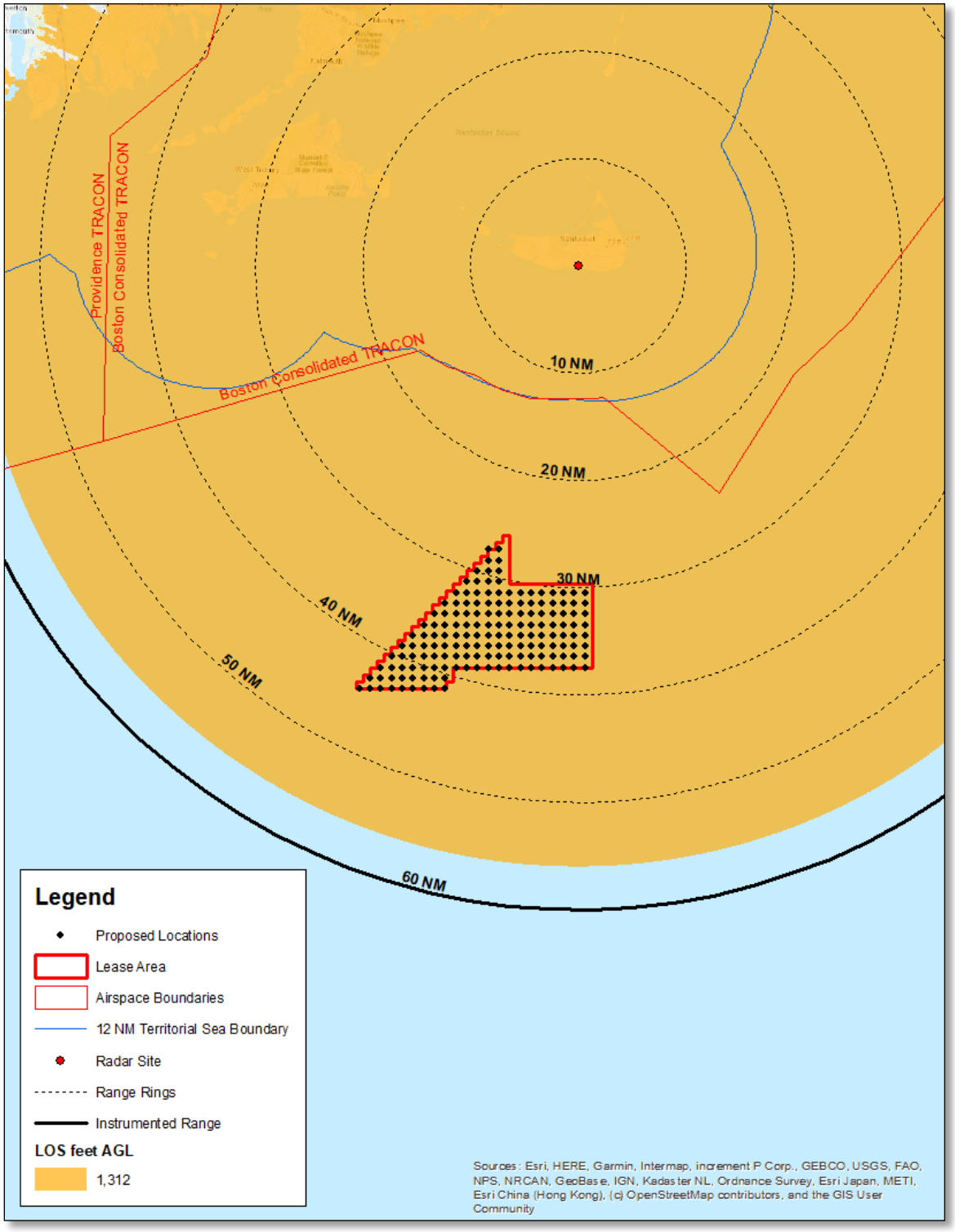

Figure 2 LOS Analysis Results for the Nantucket ASR-9 using 3DEP Data

EWR LOS Analysis

Westslope conducted an EWR LOS analysis for the Cape Cod SFS EWR using USGS 3DEP data. This analysis shows whether WTGs at a blade-tip height of 1,312 feet AGL will be within line-of-sight of this EWR site.

Cape Cod SFS EWR

The LOS analysis results show that WTGs at 58 of the 160 proposed locations will be within line-of-sight of the Cape Cod SFS EWR at a blade-tip height of 1,312 feet AGL. See Figure 3.

Research conducted by Westslope suggests that WTGs at the proposed locations within line-of-sight of the Cape Cod SFS EWR could have a significant impact on this early warning radar. [1] As such, Westslope recommends early consultation with the DoD Siting Clearinghouse.

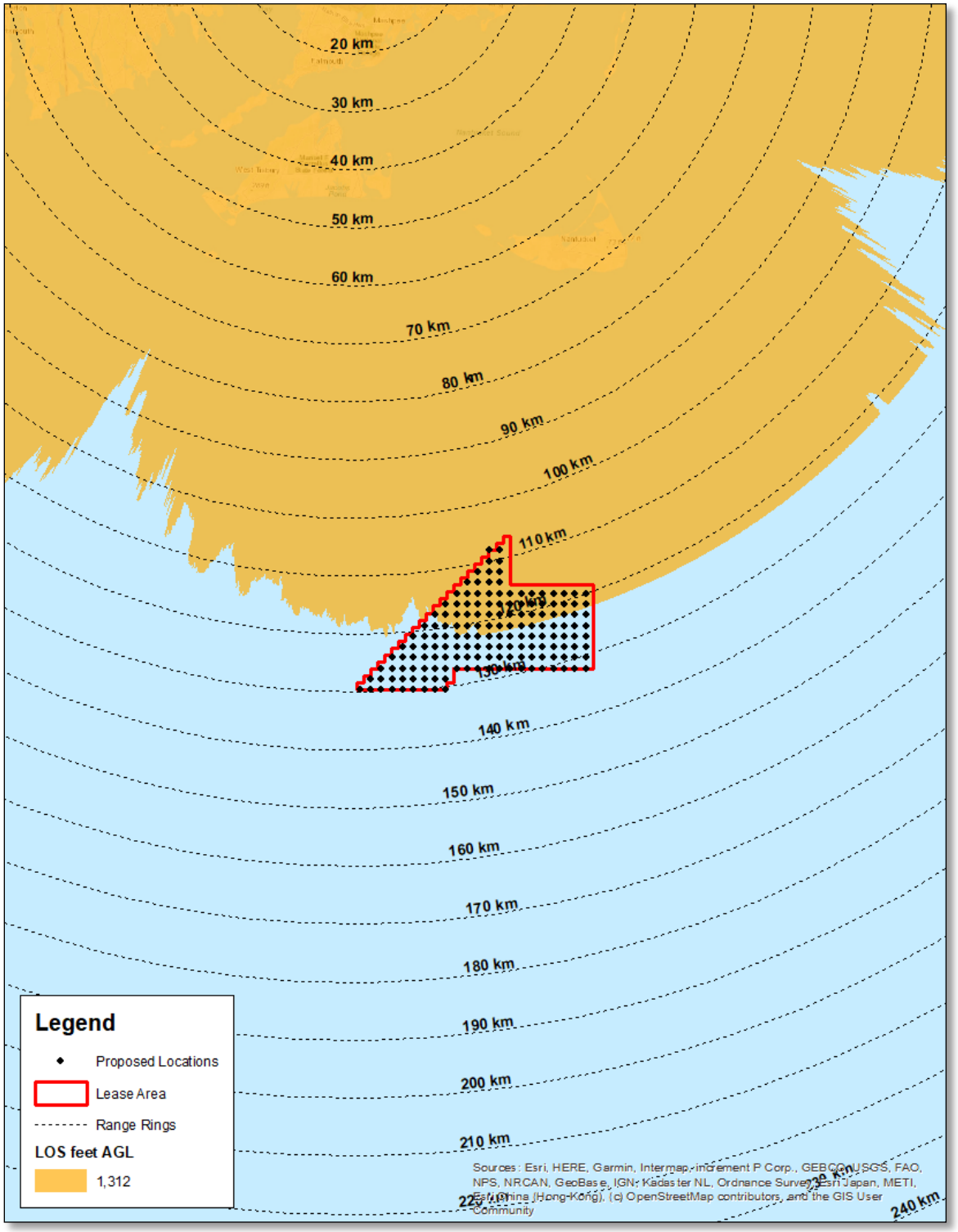

Figure 3 LOS Analysis Results for the Cape Cod SFS EWR using 3DEP Data

TDWR Screening Analysis

Westslope conducted a TDWR screening analysis for the Boston TDWR using USGS 3DEP data. This analysis shows whether WTGs at a blade-tip height of 1,312 feet AGL will be within line-of-sight of this TDWR site and determines the number of elevation angles penetrated and potentially affected.

Vineyard Northeast is beyond the instrumented range of the Boston TDWR. As such, no additional analysis was considered necessary for this radar site.

VOR Screening Analysis

Westslope conducted a VOR screening analysis using USGS 3DEP data. This analysis shows whether WTGs will fall within eight nautical miles (NM) of and will be within line-of-sight of one or more VOR sites at a blade-tip height of 1,312 feet AGL. This screening analysis provides a cursory indication of whether WTGs may affect VOR performance and is similar to the FAA's analysis approach for VOR sites. The same criteria will also protect for DMEs.

Westslope conducted the VOR screening analysis for the following two navigational aid sites:

- Martha's Vineyard VOR/DME
- Nantucket VOR/DME

Vineyard Northeast is greater than 8 NM from the Martha's Vineyard VOR/DME and the Nantucket VOR/DME. As such, no additional analysis was considered necessary for these navigational aid sites.

NEXRAD Weather Radar Screening Analysis

Westslope conducted a NEXRAD weather radar screening analysis using USGS 3DEP data. This analysis shows whether WTGs at a blade-tip height of 1,312 feet AGL will be within line-of-sight of one or more WSR-88D sites and incorporates the NOAA Radar Operations Center (ROC) wind farm impact zone scheme.

Westslope conducted the NEXRAD weather radar screening analysis for the following two radar sites:

- Boston WSR-88D
- Brookhaven WSR-88D

Boston WSR-88D

Westslope's NEXRAD weather radar screening analysis shows that WTGs at the 160 proposed locations will not be within line-of-sight of and will not interfere with the Boston WSR-88D at a blade-tip height of 1,312 feet AGL. The results also show that WTGs at the 160 proposed locations at a blade-tip height of 1,312 feet AGL will fall within a NOAA green area for this radar site. A green area, or "No Impact Zone," indicates that impacts are not likely to WSR-88D operations. See Figure 4.

Brookhaven WSR-88D

Westslope's NEXRAD weather radar screening analysis shows that WTGs at the 160 proposed locations will not be within line-of-sight of and will not interfere with the Brookhaven WSR-88D at a blade-tip height of 1,312 feet AGL. The results also show that WTGs at the 160 proposed locations at a blade-tip height of 1,312 feet AGL will fall within a NOAA green No Impact Zone for this radar site. See Figure 5.

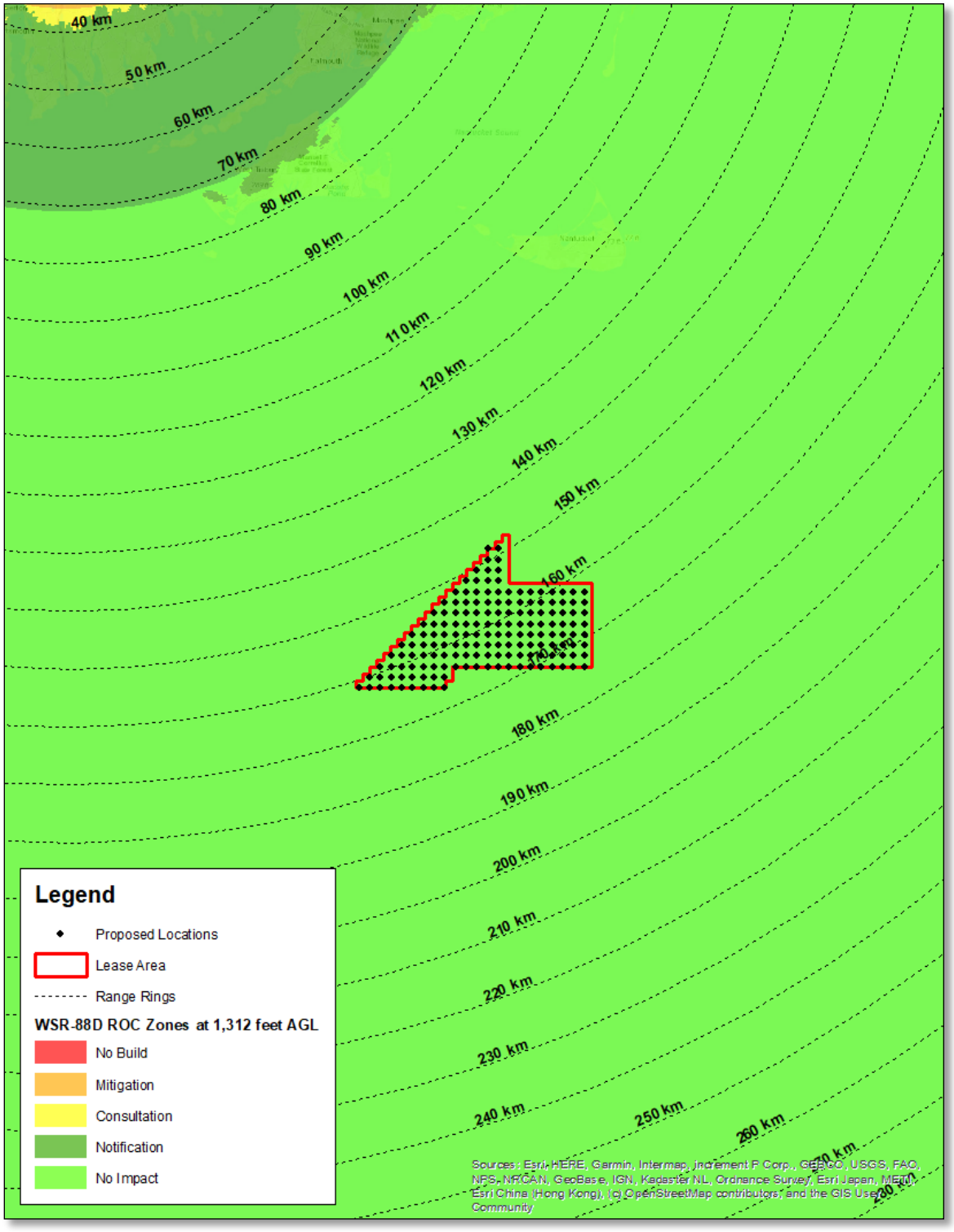

Figure 4 WSR-88D ROC Zone Results at 1,312 feet AGL for the Boston WSR-88D using 3DEP Data

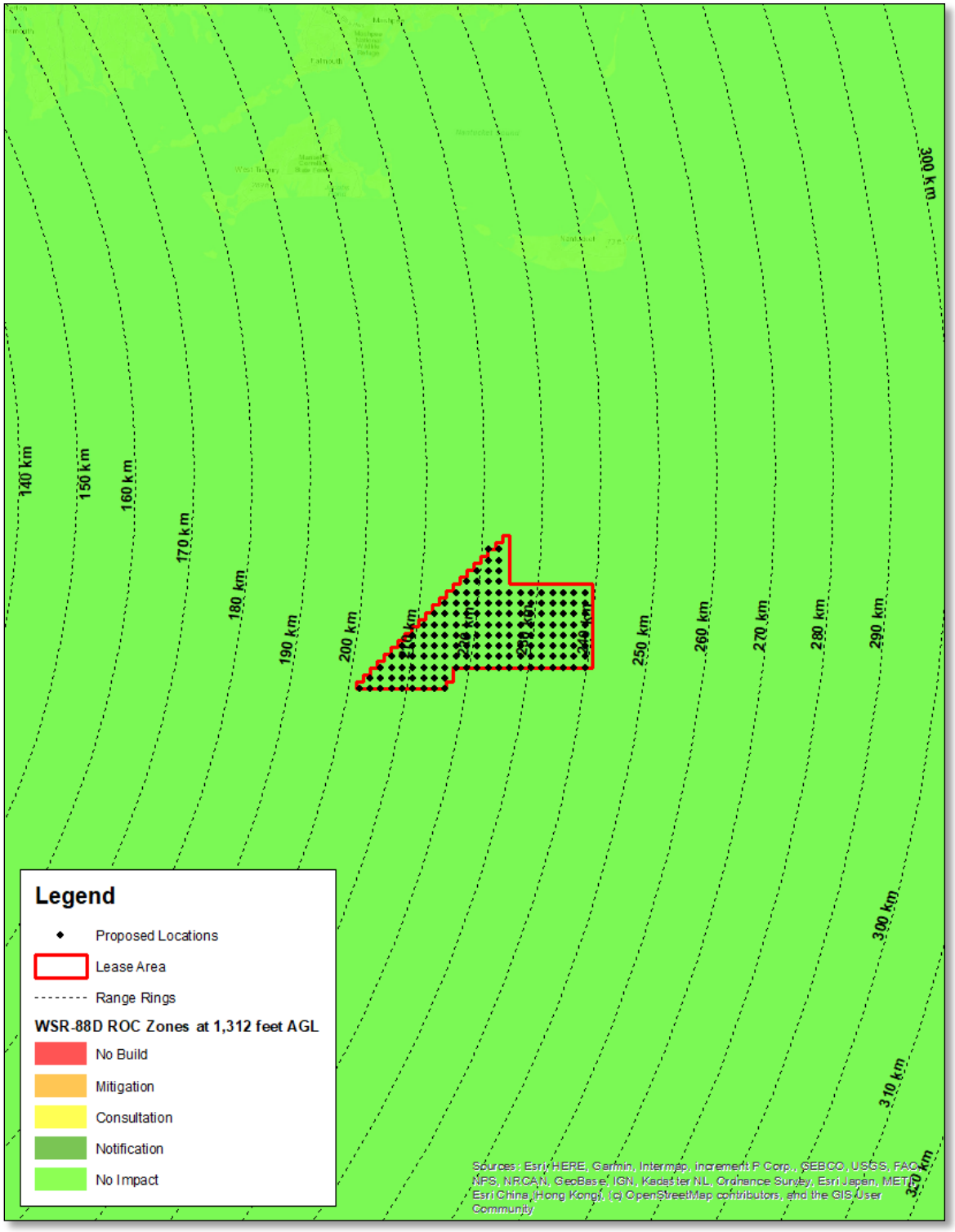

Figure 5 WSR-88D ROC Zone Results at 1,312 feet AGL for the Brookhaven WSR-88D using 3DEP Data

HF Radar LOS Analysis

Westslope conducted an HF radar LOS analysis using USGS 3DEP data. This analysis shows whether WTGs at a blade-tip height of 1,312 feet AGL will be within line-of-sight of one or more HF radar sites.

Westslope conducted the LOS analysis for the following eight HF radar sites:

- Amagansett HF radar
- Block Island Long Range HF radar
- Long Point Wildlife Refuge HF radar
- Martha's Vineyard HF radar
- Moriches HF radar
- Nantucket HF radar
- Nantucket Island HF radar
- Nauset HF radar

Amagansett HF Radar

The LOS analysis results show that WTGs at the 160 proposed locations will not be within line-of-sight of the Amagansett HF radar at a blade-tip height of 1,312 feet AGL. See Figure 6. Although WTGs at the proposed locations will not be within line-of-sight of this radar site, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

Block Island Long Range HF Radar

The LOS analysis results show that WTGs at three of the 160 proposed locations will be within line-of-sight of the Block Island Long Range HF radar at a blade-tip height of 1,312 feet AGL. See Figure 7. The radar effects will include clutter in the vicinity of WTGs at the proposed locations within line-of-sight and possibly in the vicinity of WTGs at the proposed locations beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface. As a result, impacts to Block Island Long Range HF radar operations are possible.

Long Point Wildlife Refuge HF Radar

The LOS analysis results show that WTGs at 146 of the 160 proposed locations will be within line-of-sight of the Long Point Wildlife Refuge HF radar at a blade-tip height of 1,312 feet AGL. See Figure 8. The radar effects will include clutter in the vicinity of WTGs at the proposed locations within line-of-sight. As a result, impacts to Long Point Wildlife Refuge HF radar operations are possible.

Martha's Vineyard HF Radar

The LOS analysis results show that WTGs at all 160 proposed locations will be within line-of-sight of the Martha's Vineyard HF radar at a blade-tip height of 1,312 feet AGL. See Figure 9. The radar effects will include clutter in the vicinity of WTGs at the proposed locations. As a result, impacts to Martha's Vineyard HF radar operations are possible.

Moriches HF Radar

The LOS analysis results show that WTGs at the 160 proposed locations will not be within line-of-sight of the Moriches HF radar at a blade-tip height of 1,312 feet AGL. See Figure 10. Although WTGs at the proposed locations will not be within line-of-sight of this radar site, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

Nantucket HF Radar

The LOS analysis results show that WTGs at all 160 proposed locations will be within line-of-sight of the Nantucket HF radar at a blade-tip height of 1,312 feet AGL. See Figure 11. The radar effects will include clutter in the vicinity of WTGs at the proposed locations. As a result, impacts to Nantucket HF radar operations are possible.

Nantucket Island HF Radar

The LOS analysis results show that WTGs at all 160 proposed locations will be within line-of-sight of the Nantucket Island HF radar at a blade-tip height of 1,312 feet AGL. See Figure 12. The radar effects will include clutter in the vicinity of WTGs at the proposed locations. As a result, impacts to Nantucket Island HF radar operations are possible.

Nauset HF Radar

The LOS analysis results show that WTGs at the 160 proposed locations will not be within line-of-sight of the Nauset HF radar at a blade-tip height of 1,312 feet AGL. See Figure 13. Although WTGs at the proposed locations will not be within line-of-sight of this radar site, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

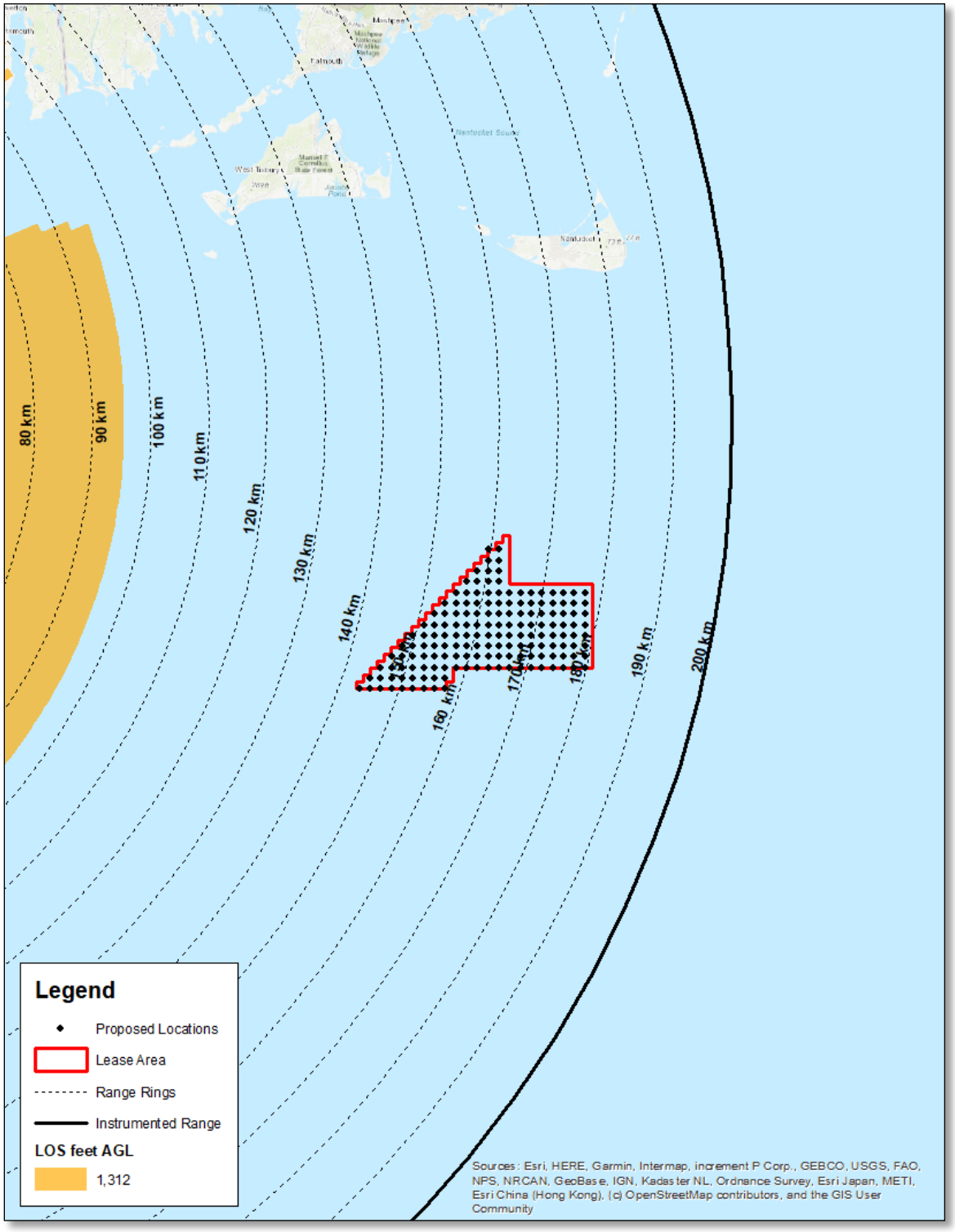

Figure 6 LOS Analysis Results for the Amagansett HF Radar using 3DEP Data

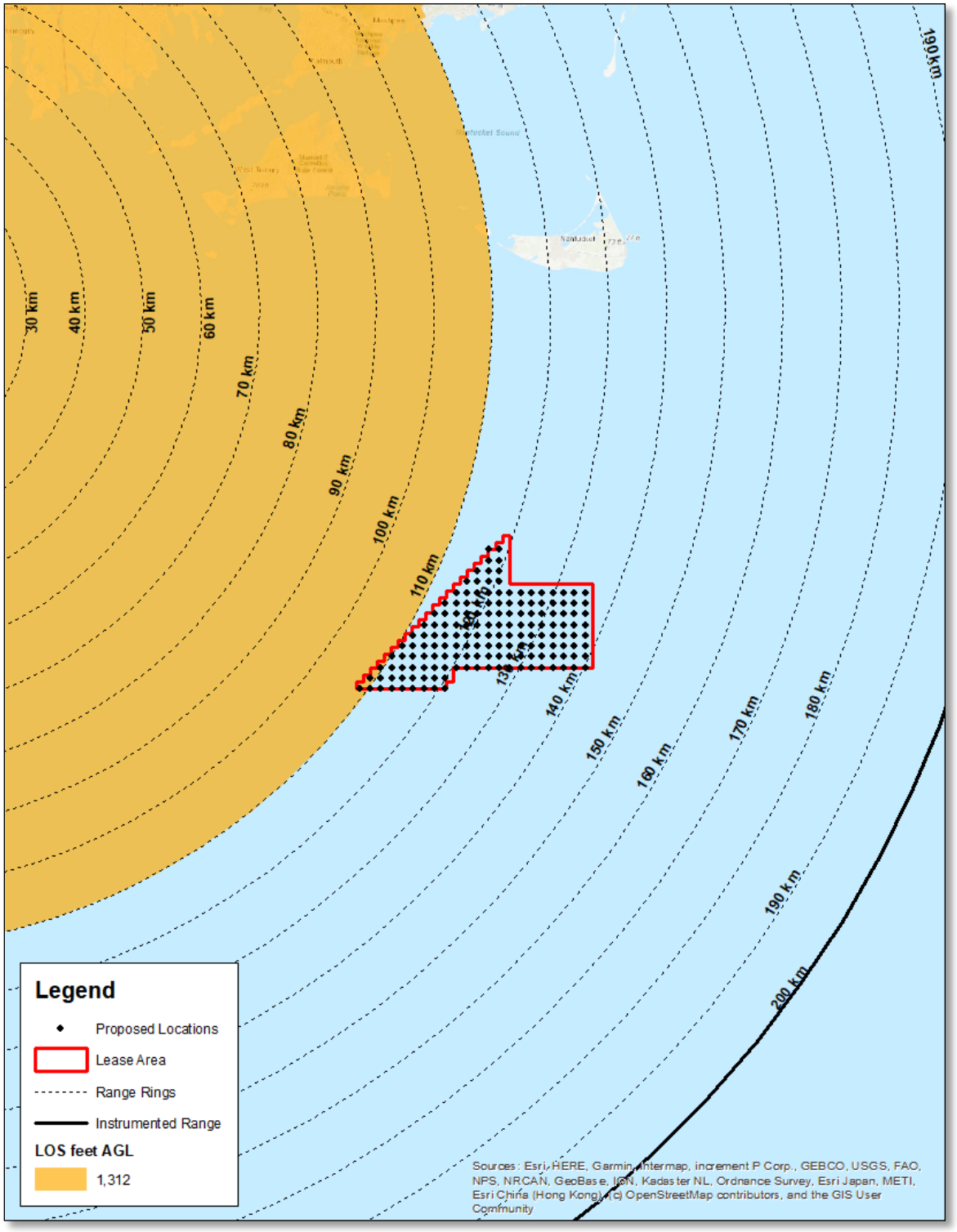

Figure 7 LOS Analysis Results for the Block Island Long Range HF Radar using 3DEP Data

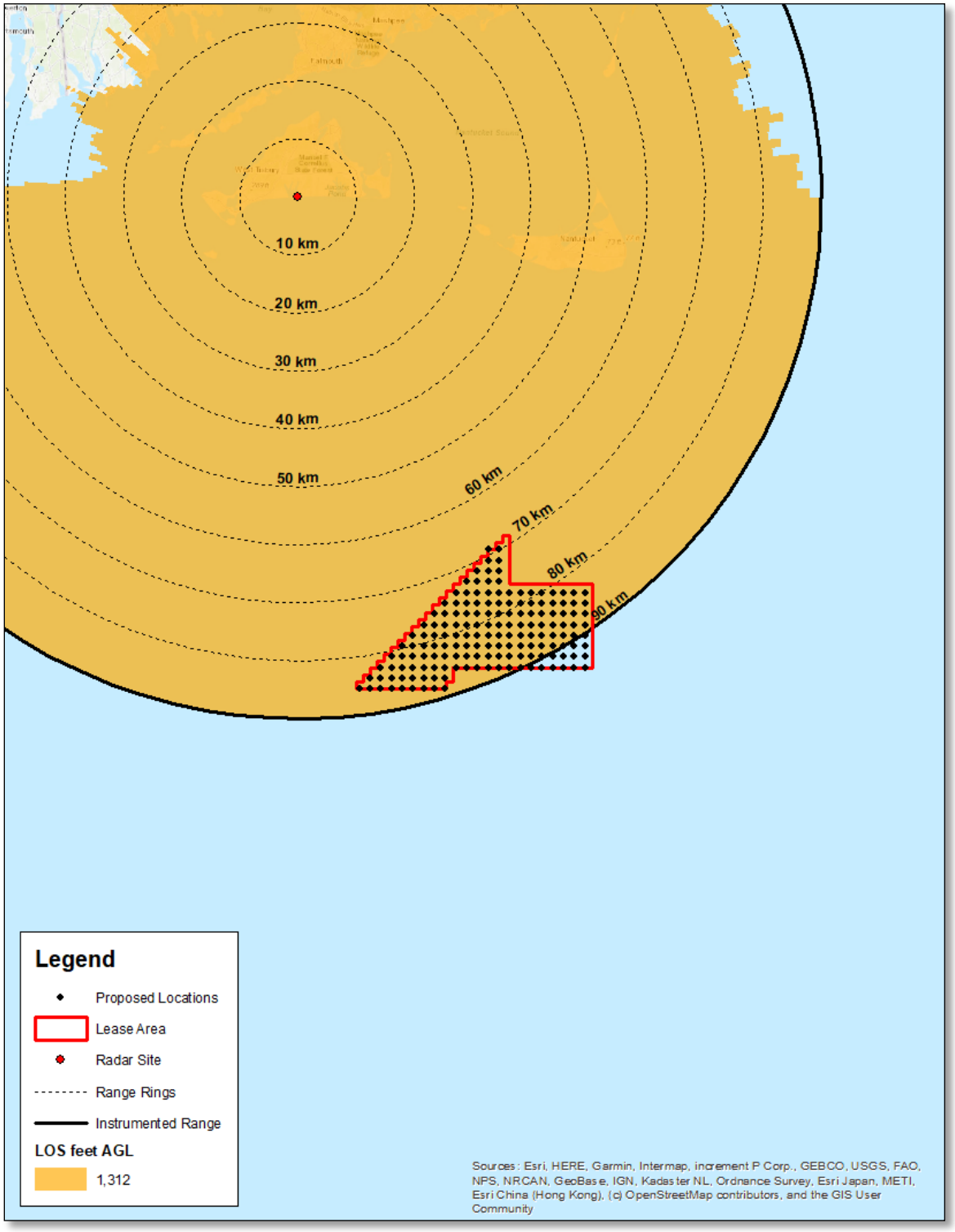

Figure 8 LOS Analysis Results for the Long Point Wildlife Refuge HF Radar using 3DEP Data

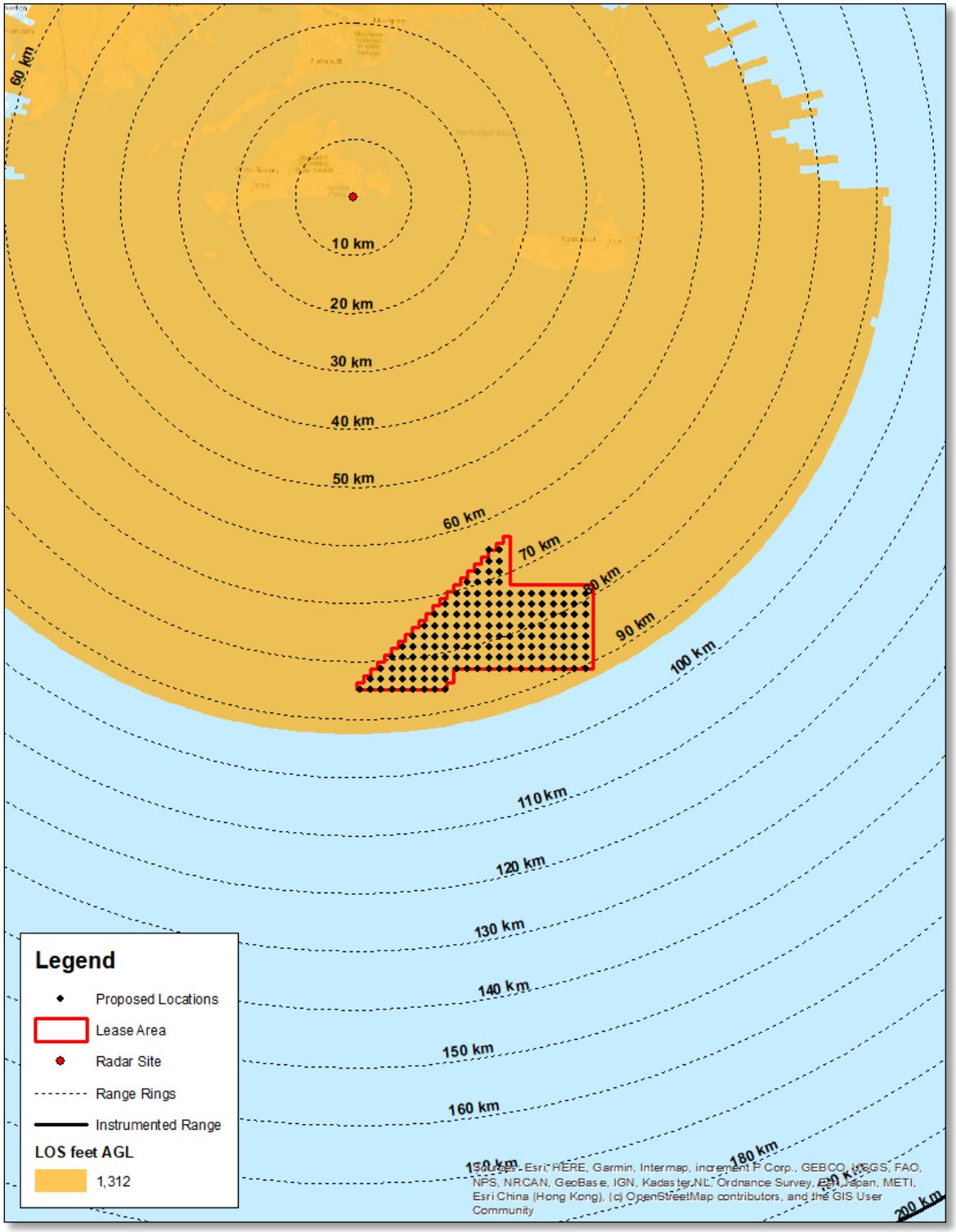

Figure 9 LOS Analysis Results for the Martha's Vineyard HF Radar using 3DEP Data

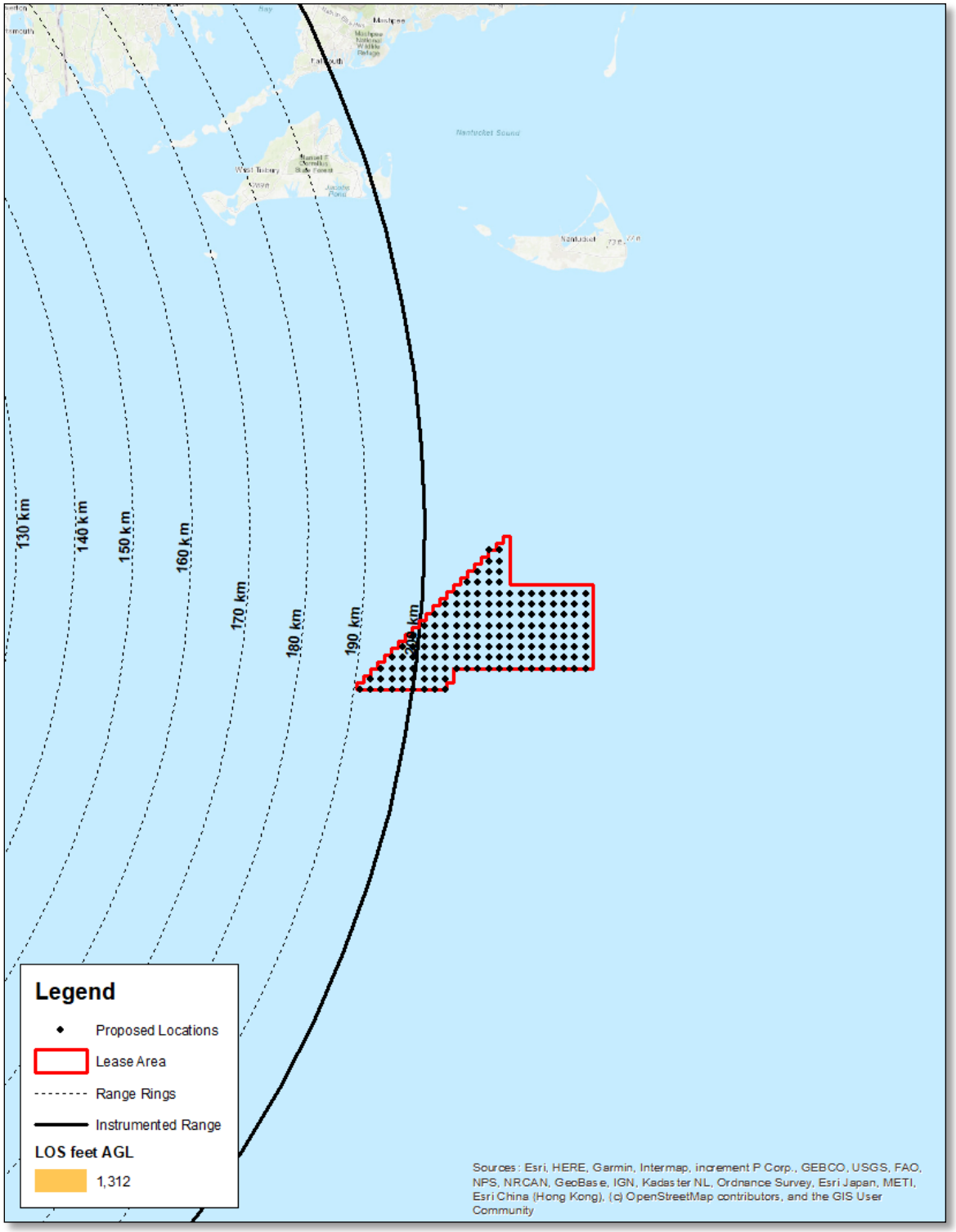

Figure 10 LOS Analysis Results for the Moriches HF Radar using 3DEP Data

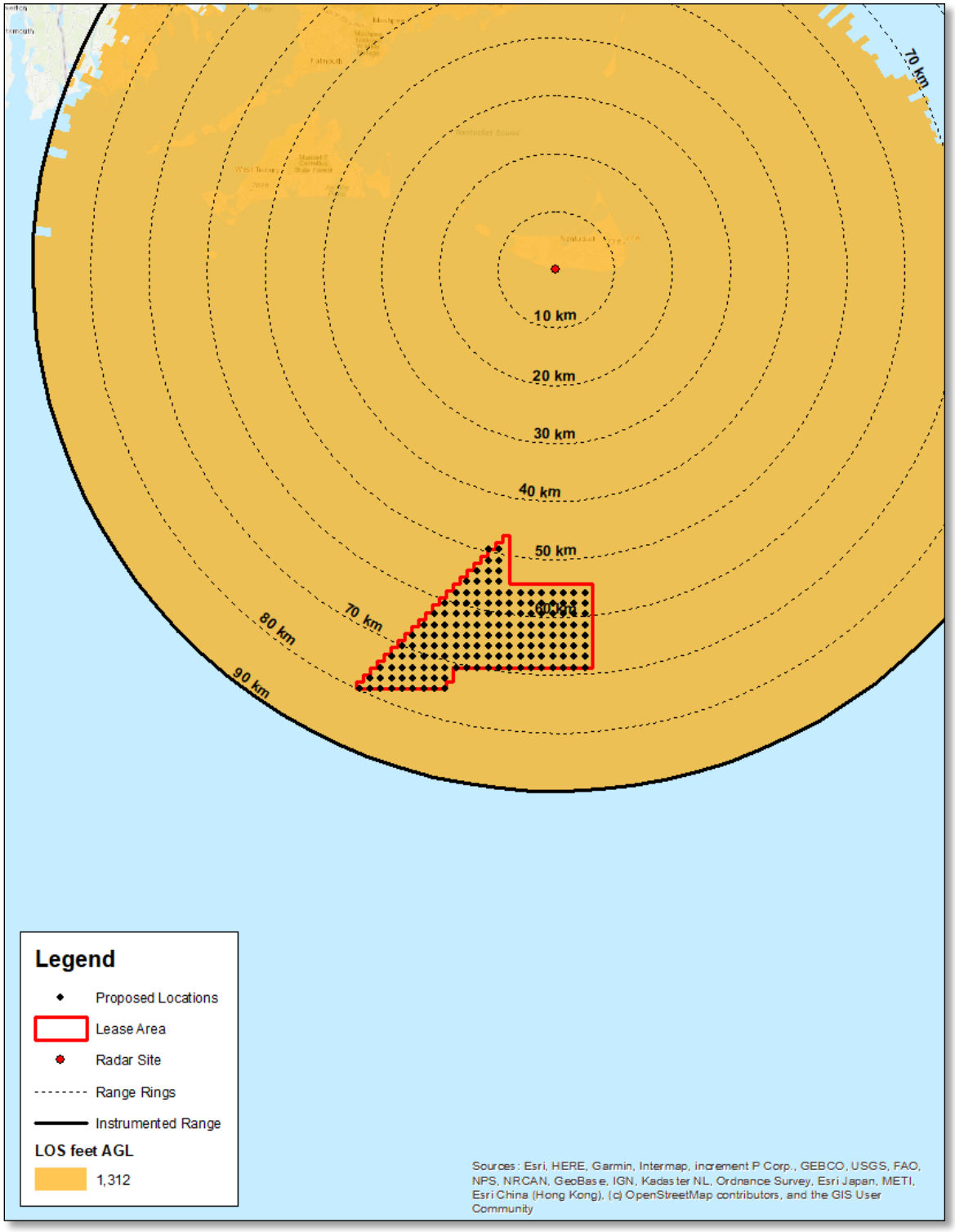

Figure 11 LOS Analysis Results for the Nantucket HF Radar using 3DEP Data

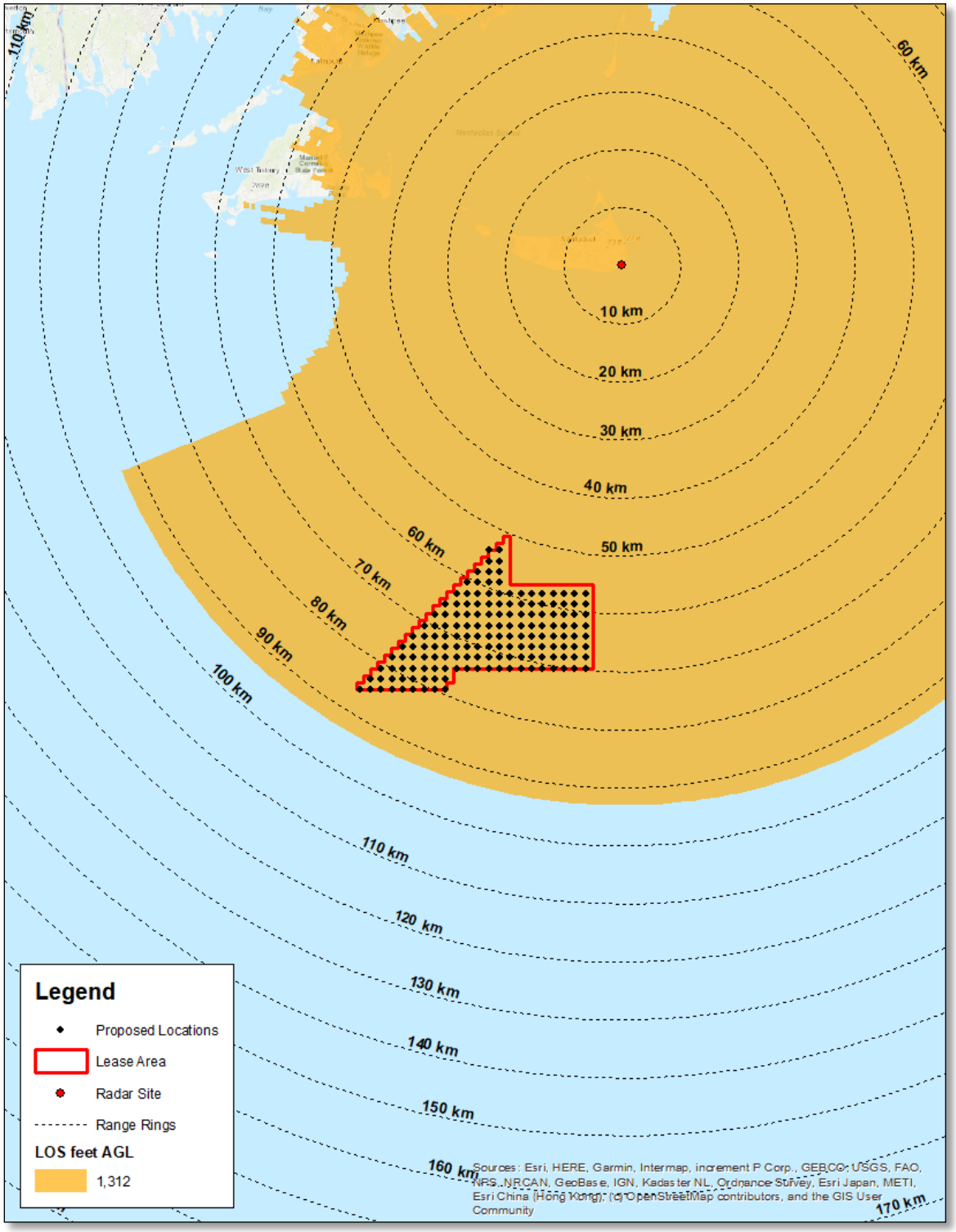

Figure 12 LOS Analysis Results for the Nantucket Island HF Radar using 3DEP Data

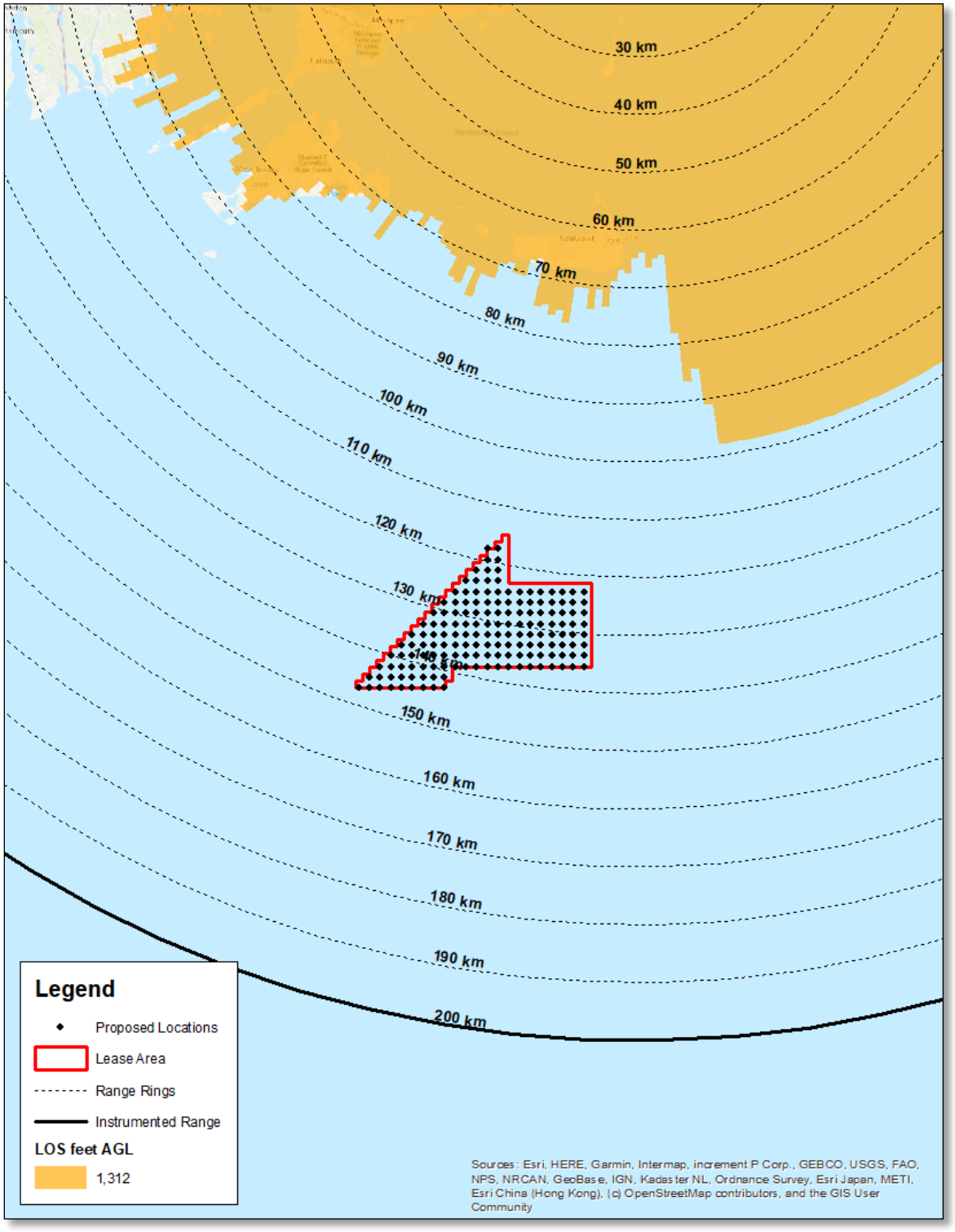

Figure 13 LOS Analysis Results for the Nauset HF Radar using 3DEP Data

CONCLUSIONS

Westslope conducted an ARSR and ASR LOS analysis for the following six radar sites:

- Boston ASR-9
- Falmouth ASR-8
- Nantucket ASR-9
- North Truro ARSR-4
- Providence ASR-9
- Riverhead ARSR-4

Vineyard Northeast is beyond the instrumented range of the Boston ASR-9 and the Providence ASR-9. As such, no additional analysis was considered necessary for these radar sites.

The ARSR and ASR LOS analyses conducted by Westslope show the following:

- For the Falmouth ASR-8, WTGs at 47 of the 160 proposed locations will be within line-of-sight of and will interfere with this radar site at a blade-tip height of 1,312 feet AGL.
- For the Nantucket ASR-9, WTGs at all 160 proposed locations will be within line-of-sight of and will interfere with this radar site at a blade-tip height of 1,312 feet AGL.
- For the North Truro ARSR-4 and the Riverhead ARSR-4, WTGs at the 160 proposed locations will not be within line-of-sight of and will not interfere with these radar sites at a blade-tip height of 1,312 feet AGL.

For the Falmouth ASR-8 and the Nantucket ASR-9, without mitigation, the radar effects due to clutter will include a partial loss of primary target detection and a number of false primary targets over and in the immediate vicinity of WTGs at the proposed locations within line-of-sight. Other radar effects include a partial loss of weather detection and false weather indications over and in the immediate vicinity of WTGs at the proposed locations within line-of-sight.

Because WTGs will be within line-of-sight of the Falmouth ASR-8 and the Nantucket ASR-9, Westslope expects that the DoD will have concerns with WTGs at the proposed locations within line-of-sight at a blade-tip height of 1,312 feet AGL based on electromagnetic interference to air navigation facilities. Please note that radar effects do not always translate into operational impacts. The DoD Siting Clearinghouse process will provide an official decision as to whether impacts are acceptable to operations.

Vineyard Northeast is not within the 12 NM territorial waters where the FAA conducts aeronautical studies.

Although possible, Westslope does not expect that the DHS will have concerns with WTGs at the proposed locations within line-of-sight at a blade-tip height of 1,312 feet AGL based on impacts to the Falmouth ASR-8 or the Nantucket ASR-9.

Mitigation options for the Falmouth ASR-8 and the Nantucket ASR-9 include, but are not limited to, the following:

- For the Falmouth ASR-8, optimization, referred to as Radar Adverse-impact Mitigation by the DoD, will be required to minimize false primary targets and maximize primary target detection.
- For the Nantucket ASR-9, this radar site uses adaptive processing techniques to self-optimize the radar settings to minimize false primary targets and maximize primary target detection. As such, it is unlikely that intervention will be required by FAA personnel to address primary radar performance. For the partial loss of weather detection and false weather indications, an update to the clear day map to minimize false weather indications may be required.
- The above two radar sites provide overlapping coverage over Vineyard Northeast. In addition, the North Truro ARSR-4 provides overlapping coverage over Vineyard Northeast down to approximately 3,800 feet AGL and the Riverhead ARSR-4 provides overlapping coverage over Vineyard Northeast down to approximately 6,600 feet AGL.

Westslope does not expect that WTGs at the 160 proposed locations will affect the secondary surveillance radar systems co-located with the Falmouth ASR-8 or the Nantucket ASR-9.

Westslope's EWR LOS analysis for the Cape Cod SFS EWR shows that WTGs at 58 of the 160 proposed locations will be within line-of-sight of and could have a significant impact on this early warning radar at a blade-tip height of 1,312 feet AGL. As such, Westslope recommends early consultation with the DoD Siting Clearinghouse.

Westslope's TDWR screening analysis for the Boston TDWR shows that Vineyard Northeast is beyond the instrumented range of this radar site. As such, no additional analysis was considered necessary for this radar site.

Westslope conducted a VOR screening analysis for the following two navigational aid sites:

- Martha's Vineyard VOR/DME
- Nantucket VOR/DME

Westslope's VOR screening analysis for the Martha's Vineyard VOR/DME and the Nantucket VOR/DME shows that Vineyard Northeast is greater than 8 NM from these navigational aid sites. Although possible, Westslope does not expect that the FAA will have concerns with WTGs at the proposed locations at a blade-tip height of 1,312 feet AGL based on impacts to these navigational aid sites.

Westslope conducted a NEXRAD weather radar screening analysis for the following two radar sites:

- Boston WSR-88D
- Brookhaven WSR-88D

Westslope's NEXRAD weather radar screening analysis for the Boston WSR-88D and the Brookhaven WSR-88D shows that WTGs at the 160 proposed locations will not be within line-of-sight of and will not interfere with these radar sites at a blade-tip height of 1,312 feet AGL. The results also show that WTGs at the 160 proposed locations at a blade-tip height of 1,312 feet AGL will fall within a NOAA green No Impact Zone for these radar sites.

Westslope conducted an HF radar LOS analysis for the following eight radar sites:

- Amagansett HF radar
- Block Island Long Range HF radar
- Long Point Wildlife Refuge HF radar
- Martha's Vineyard HF radar
- Moriches HF radar
- Nantucket HF radar
- Nantucket Island HF radar
- Nauset HF radar

The HF radar LOS analyses conducted by Westslope show the following:

- For the Block Island Long Range HF radar, WTGs at three of the 160 proposed locations will be within line-of-sight of this radar site at a blade-tip height of 1,312 feet AGL.
- For the Long Point Wildlife Refuge HF radar, WTGs at 146 of the 160 proposed locations will be within line-of-sight of this radar site at a blade-tip height of 1,312 feet AGL.
- For the Martha's Vineyard HF radar, Nantucket HF radar, and the Nantucket Island HF radar, WTGs at all 160 proposed locations will be within line-of-sight of these radar sites at a blade-tip height of 1,312 feet AGL.
- For the Amagansett HF radar, Moriches HF radar, and the Nauset HF radar, WTGs at the 160 proposed locations will not be within line-of-sight of these radar sites at a blade-tip height of 1,312 feet AGL. Although WTGs at the proposed locations will not be within line-of-sight of these radar sites, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

For the Block Island Long Range HF radar, Long Point Wildlife Refuge HF radar, Martha's Vineyard HF radar, Nantucket HF radar, and the Nantucket Island HF radar, without mitigation, the radar effects will include clutter in the vicinity of WTGs at the proposed locations within line-of-sight and possibly in the vicinity of WTGs at the proposed locations beyond line-of-sight due to the propagation of HF

electromagnetic waves over the ocean surface. Because WTGs will be within line-of-sight of these radar sites, Westslope expects that multiple federal agencies in partnership with NOAA's IOOS may have concerns with WTGs at the proposed locations within line-of-sight at a blade-tip height of 1,312 feet AGL based on potential interference to these HF radar sites.

Mitigation options for HF radar include, but are not limited, to the following:

- Implementation of a software package to address interference from WTGs in real-time, which is being researched by CODAR Ocean Sensors, Ltd. under funding from BOEM.
- Installation of other wave and current sensors in the Lease Area.

Westslope recommends that Vineyard Northeast be submitted to the DoD Siting Clearinghouse for an informal review and to the National Telecommunications and Information Administration (NTIA) for a detailed review. The NTIA is essentially a clearinghouse for other federal agencies, including NOAA. Additionally, Westslope recommends consultation with NOAA's IOOS Program Office.

If you have any questions regarding this analysis, please contact Geoff Blackman at (405) 816-2604 or via email at gnblackman@westslopeconsulting.com.

REFERENCES

[1] DoD, Missile Defense Agency, "*Wind Turbine Analysis for Cape Cod Air Force Station Early Warning Radar and Beale Air Force Base Upgraded Early Warning Radar*," Spring 2007.