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Historic Properties Cumulative Visual Effects Assessment

for the Vineyard Wind 1 Project under Section 106 of the National Historic Preservation Act

9 March 2021

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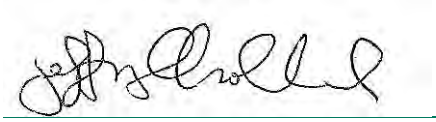

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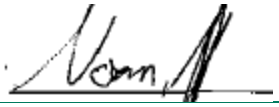

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CONTENTS

1. INTRODUCTION AND PURPOSE 1

2. METHODS 4
2.1 Models and Analysis 4
2.2 Outputs 9

3. ANALYSIS 12
3.1 Overview 12
3.2 Gay Head Light 17
3.3 Chappaquiddick Island TCP 21
3.4 Nantucket NHL 27
3.5 Vineyard Sound and Moshup's Bridge TCP 32

4. CONCLUSION 37

5. REFERENCES 38

APPENDIX A INTERVISIBILITY MAPS

APPENDIX B VIEW ANGLE MAPS

List of Tables

Table 2-1: WTG Capacity and Height Assumptions 5
Table 2-2: Detailed Analysis Points 9
Table 2-3: Cumulative Viewshed Analysis, WTG Blade Tip (Daytime Analysis) [a] 10
Table 2-4: WTG Nacelle Tops Theoretically Visible (Nighttime Analysis) [a] 11
Table 3-1: Number of WTGs Theoretically Visible by Distance Zone, Maximum-case Visual Impact Scenario (FEIS Preferred Alternative Layout) 15
Table 3-2: Visibility Conditions at the Nantucket and Martha's Vineyard Airports, 2017 16
Table 3-3: Factors Contributing to Visual Effects of WTGs on Gay Head Light 19
Table 3-4: Factors Contributing to Visual Effects of WTGs on the Chappaquiddick Island TCP 25
Table 3-5: Factors Contributing to Visual Effects of WTGs on the Nantucket NHL 30
Table 3-6: Factors Contributing to Visual Effects of WTGs on the Vineyard Sound and Moshup's Bridge TCP 34

List of Figures

Figure 1-1: Location of Offshore Wind Energy Projects in the Geographic Analysis Area 2
Figure 2-1: Potential Layout of All WTGs 6
Figure 2-2: Theoretically Visible WTGs in Maximum Visual Impact Scenario 7
Figure 3-1: Visibility Rating Form and Instructions (Sullivan 2012) 14
Figure 3-2: Gay Head Light, View Southeast toward the Proposed Project 18
Figure 3-3: Katama Point Public Launch, View South toward Proposed Project 22
Figure 3-4: Wasque Reservation, End of Wasque Avenue, View toward Proposed Project 23
Figure 3-5: Tom Nevers Field, Nantucket Island. View Southwest Toward the Proposed Project 28
Figure 3-6: Eel Point, Nantucket Island. View Southwest Toward the Proposed Project 28
Figure 3-7: Squibnocket Beach, View toward Proposed Project 33

Acronyms and Abbreviations

Name	Description
ADLS	Aircraft Detection Lighting System
AMSL	above mean sea level
Assessment	Historic Properties Cumulative Visual Effects Assessment
BOEM	Bureau of Ocean Energy Management
COP	Construction and Operations Plan
Draft EIS	Draft Environmental Impact Statement
DEM	digital elevation model
DSM	digital surface model
MHC	Massachusetts Historical Commission
MW	megawatt
Nantucket NHL	Nantucket Historic District National Historic Landmark
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NHL	National Historic Landmark
NRHP	National Register of Historic Places
Project	Vineyard Wind 1 Offshore Wind Energy Project
RI and MA Lease Areas	Wind lease areas offshore of Rhode Island and Massachusetts
SEIS	Supplemental Environmental Impact Statement
TCP	Traditional Cultural Property
USGS	U.S. Geological Survey
VIA	Historic Properties Visual Impact Assessment for the proposed Project
Vineyard Wind	Vineyard Wind LLC
WTG	wind turbine generator

1. INTRODUCTION AND PURPOSE

Vineyard Wind LLC (Vineyard Wind) is proposing to construct, operate, and eventually decommission an 800-megawatt (MW) wind energy project (the Vineyard Wind 1 Offshore Wind Energy Project [proposed Project]) within Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0501 off the coasts of Martha's Vineyard and Nantucket, Massachusetts. The proposed Project involves the construction of wind turbine generators (WTGs) on foundation support structures, up to two electrical service platforms, offshore and onshore cabling, an onshore substation, and onshore operations and maintenance facilities. As currently designed, the proposed Project would consist of up to 100 8-MW WTGs; however, the proposed Project design allows for flexibility in using up to 14-MW WTGs, in which case only 57 total WTGs would be installed to achieve the 800-MW Project capacity. The portion of Lease Area OCS-A 0501, as well as other lease areas offshore of Rhode Island and Massachusetts (the RI and MA Lease Areas), are depicted in Figure 1-1.

This Historic Properties Cumulative Visual Effects Assessment (Assessment) for the proposed Project is intended to assist BOEM and the Massachusetts Historical Commission (MHC), in its role as State Historic Preservation Office, in their responsibilities to review the proposed Project under Section 106 of the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA). Cumulative effects are the incremental effects of a proposed action on the environment when added to other past, present, or reasonably foreseeable activities taking place within the region, regardless of which agency or person undertakes the actions (Title 40, Code of Federal Regulations, Section 1508.7). Cumulative effects can result from individually minor but collectively significant actions taking place over a given period.

BOEM conducted a thorough process to identify the possible extent of future offshore wind development on the Atlantic Outer Continental Shelf to determine what is likely or reasonably foreseeable for the purpose of assessing cumulative effects (BOEM 2019b). The scope of a previous cumulative effects analysis in the Draft Environmental Impact Statement (Draft EIS) for the proposed Project only considered Construction and Operations Plans (COPs) that had been approved or submitted (totaling 902 MW) to be reasonably foreseeable. While BOEM considers the scope of the analysis in the Draft EIS to be NEPA-compliant, BOEM decided to adjust the approach for the cumulative effects analysis in the Supplemental EIS (SEIS), considering that wind energy is a growing industry.

As a result, BOEM expanded the scope of the cumulative effect analysis beyond that performed in the Draft EIS, stipulating that approximately 22 gigawatts of offshore wind generating capacity is reasonably foreseeable within 17 active wind energy lease areas (16 commercial and 1 research) along the East Coast, including approximately 9 gigawatts from 12 projects in the RI and MA Lease Areas. This potential capacity includes named projects and assumed future development outside of named project boundaries, as described in Appendix A of the SEIS. Levels of assumed future development are based on state commitments to renewable energy development, available WTG technology, and the size of potential development areas (BOEM 2019b). Based on these parameters, BOEM determined that a total of 775 WTGs—each with a generating capacity of 12 to 14 MW—built within the RI and MA Lease Areas would represent the maximum-case cumulative scenario for visual resources. For purposes of analyzing effects on cultural resources, the Draft EIS, SEIS, and this Analysis assume that the proposed Project would consist of 57 14-MW WTGs (the model with the tallest vertical extent, and thus the greatest potential visibility). These assumptions form the basis for analyzing potential resource-specific cumulative effects.

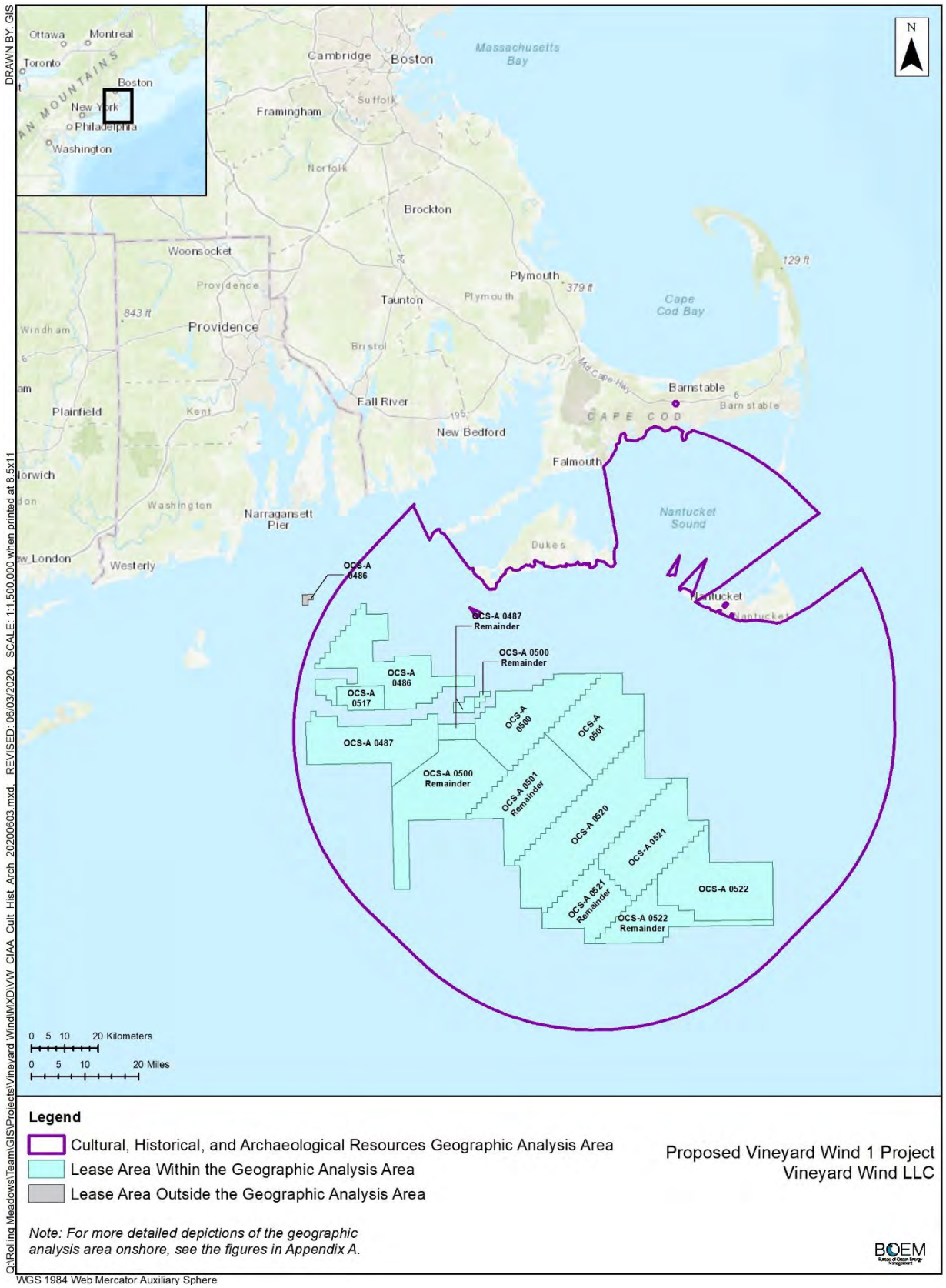

Figure 1-1: Location of Offshore Wind Energy Projects in the Geographic Analysis Area

Vineyard Wind prepared a Historic Properties Visual Impact Assessment (VIA) (COP Volume III, Appendix III-H.b; Epsilon 2020), which determined that the proposed Project would adversely affect three historic properties on Martha's Vineyard, Nantucket, and adjacent islands due to the introduction of new, modern, and intrusive visual elements: the Gay Head Light, the Chappaquiddick Island Traditional Cultural Property (Chappaquiddick Island TCP), and the Nantucket Historic District National Historic Landmark (Nantucket NHL). The VIA also determined that the scale, extent, and intensity of these effects would be partially mitigated by environmental and atmospheric factors, as well as by Vineyard Wind's voluntary actions to reduce the extent, scale, and magnitude of visual effects.

The SEIS cumulative visual effects assessment determined that, due to the limited number of historic properties affected and environmental and geographic mitigating factors, overall cumulative visual effects on historic properties would be geographically limited and low intensity, although effects on individual cultural resources would vary. Historic properties for which a sea view to the horizon is a contributing element to the property's National Register of Historic Places (NRHP) eligibility would be impacted more than resources for which a sea view is not a contributing element. Vineyard Wind's VIA recommended that the sea view to the horizon and maritime setting are contributing elements to the NRHP eligibility of the Gay Head Light, the Chappaquiddick Island TCP, and Nantucket NHL. As a result, construction of the proposed Project would introduce new, modern visual elements out of character with the historic setting, which would have adverse effects on these three cultural resources within the project's viewshed Area of Potential Effects (APE).

In February 2021, Vineyard Wind prepared an Addendum to the VIA (VIA Addendum; Vineyard Wind 2021a) in response to BOEM's identification of the Vineyard Sound and Moshup's Bridge TCP, and the determination of adverse effect from the Project on this new TCP. The VIA Addendum found (and BOEM concurred) that the maritime setting of the TCP and its viewshed would be altered through the introduction of new elements. The VIA Addendum found that the Project would be visible in open-ocean views from the southwestern tip of Martha's Vineyard, but that topography and vegetation would prevent views of the Project from the "vast majority" of the inland areas of the TCP (Vineyard Wind 2021a).

This Assessment presents an analysis of the cumulative visual effects of the proposed Project and other reasonably foreseeable offshore wind projects on the above-listed historic properties using BOEM's updated determination of what constitutes reasonably foreseeable offshore wind development (BOEM 2019b). Thus, by definition, this Assessment is limited to analyzing cumulative effects on the historic properties that would be adversely affected by the proposed project: The Gay Head Light, the Chappaquiddick Island TCP, Nantucket NHL, and the Vineyard Sound and Moshup's Bridge TCP.

2. METHODS

This section summarizes the models used to evaluate cumulative visual effects of the proposed Project and other offshore wind projects in the RI and MA Lease Areas on historic properties, as well as the outputs of those models.

2.1 Models and Analysis

Models of the cumulative viewshed were developed to inform how the presence of WTGs associated with the proposed Project and other offshore wind projects would affect views from the above-listed historic properties on Martha's Vineyard and Nantucket. One set of models was based on the height of the WTG blade tip at the maximum vertical extension of the blade to calculate the theoretical viewshed for any part of the WTG. Another set of models used the height of the top of the WTG nacelle to calculate the theoretical viewshed for the aviation hazard lights required by Federal Aviation Administration regulations, in order to assess potential nighttime impacts. The theoretical viewshed is the area from which at least part of the WTG could be visible, based on the height of the WTG, topography, and the curvature of the earth. The models do not account for (and this Analysis does not evaluate) other variables, including but not limited to atmospheric and weather conditions, visual acuity of the observer, lighting angle, and wave/sea spray, all of which could interact to decrease actual visibility of WTGs and lighting from the historic property analyzed. In short, the models assume completely clear weather and atmospheric conditions, and the nacelle (nighttime) model is specifically intended to replicate cloudless nighttime conditions—i.e., the maximum-case for direct visibility of WTG lighting. Other viewing conditions (i.e., the presence of clouds) could produce different visual effects; however, BOEM determined that completely unobstructed viewing conditions would be the most impactful for the resources evaluated in this Analysis.

As described below, two types of model (an initial quantitative viewshed model and a cumulative viewshed model) were prepared to quantify the total number of WTGs theoretically visible from the four historic properties that would be adversely affected by the project—the Gay Head Light on Martha's Vineyard, the Chappaquiddick Island TCP, the Nantucket NHL, and the Vineyard Sound and Moshup's Bridge TCP—and to identify the specific WTGs theoretically visible from points within those properties. The models are based on a maximum-case visual impact scenario that places 775 WTGs in a 1 x 1 nautical mile (nm) grid (with rows of WTGs oriented north-south and east-west) across the RI and MA Lease Areas, in positions located closest to shore.[1] As stated above, the cumulative viewshed models quantify the number of WTGs theoretically visible based on the height of the WTG, topography, and the curvature of the earth. The cumulative viewshed models do not determine the level of impact, or whether the presence of structures would result in a cumulative adverse effect on historic properties; however, viewshed models can be used to help interpret the potential visual impact on historic properties.

Viewshed models were developed using ESRI ArcGIS10.7 (ESRI 2019) and were corrected for curvature of the earth and a default 0.13 refractivity coefficient, based on the Gaussian refraction coefficient (Brunner 1984). The cumulative viewshed models were developed using the steps described below.

2.1.1 Step 1: Determine Locations and Heights of WTGs

The locations and heights of the WTGs were based on the maximum-case visual impact scenario described above—i.e., 775 WTGs in the RI and MA Lease Areas, in a 1 x 1 nm, north-south/east-west grid, and constructed in locations within each lease area that would be closest to the historic resources (see Appendix A). Each lease area has more potential WTG placements than necessary, to ensure

[1] Modeling specifically incorporates BOEM's recommended Preferred Alternative, which eliminates the six WTG positions closest to shore from the locations shown for Alternative D2 in the SEIS, and instead assumes construction of those six WTGs in the next-closest WTG positions, which would be at the back of the proposed Project's array.

construction flexibility and a reasonable maximum-case impact. Actual development within each individual lease area could thus differ from this scenario, and WTGs would be distributed based on the design considerations of each project and the respective COPs that would be submitted to BOEM.

For this Assessment, 40 nm (46 miles, 74 km) was set as the limit for seaward views, and only WTG positions within 40 nm of the above-referenced historic properties were used for this Assessment (761 out of 775 WTG positions). Only the blade tips of WTGs located beyond 40 nm (46 miles, 74 km) would be theoretically visible from the highest elevated location analyzed in this Assessment, positioned behind other WTGs, and likely obscured by atmospheric conditions, weather, sea spray, and other factors. For these reasons, WTGs beyond 40 nm (46 miles, 74 km) are not anticipated to contribute to visual effects. Studies of onshore and offshore visibility suggest that the extinction point for views of WTGs and other structures is much less than 40 nm (e.g., Sullivan et. al. 2012, 2013). Out of an abundance of caution, given the effect of views on the four historic properties being evaluated, 40 nm is used here as an intentionally conservative outer limit for visibility.

Table 2-1 provides assumptions for WTG characteristics. As stated in Section 1, this Assessment assumes that the proposed Project would consist of 57 14-MW WTGs (Epsilon 2020), and that other projects would install a total of 718 12-MW WTGs (of which 704 would be within 40 nm of the historic properties).[2]

On January 22, 2021, Vineyard Wind informed BOEM that it had selected the General Electric (GE) Haliade-X as the WTG to be installed as part of the Project (Vineyard Wind 2021b). The elevation of the GE Haliade-X nacelle top and maximum vertical blade tip extension would be lower than the theoretical 14-MW WTG show in Table 2-1 (Vineyard Wind 2021b). Each GE Haliade-X for this Project has a nameplate capacity of 13MW, and the Project would consist of 62 GE Haliade-X WTGs (Vineyard Wind 2021b). The maximum-case for the Project's visual effects involves the tallest theoretical WTGs; therefore, the WTG dimensions used in this Assessment conservatively overestimates the visibility of the actual Project WTGs, and remain valid for analytical purposes. This Assessment also assumes that all WTGs would be painted non-reflective white or light gray to reduce contrast against the sky (Epsilon 2020).

Table 2-1: WTG Capacity and Height Assumptions

WTG Capacity	Projects	Blade Tip Height (feet) [a]	Top of Nacelle Height (feet) [a]	Number of WTGs [b]
14 MW	Vineyard Wind 1	837	496	57
12 MW	All other projects	853	514	718

Source: Vineyard Wind SEIS, Appendix A
MW = megawatt; WTG = wind turbine generator
[a] Elevation above mean sea level with blade at its maximum vertical extension
[b] Includes only WTGs within 40 nm (46 miles, 74 km) of the historic properties evaluated in this Assessment.

Figure 2-1 shows all possible WTG locations, including locations over 40 nm from the above-referenced historic properties ("removed due to placement" indicates WTG positions not included in modeling for this Assessment, because closer WTG positions were available within the same lease area). Figure 2-2 shows the maximum-case visual impact scenario, with WTGs constructed in the closest possible location to each of the four resources analyzed and excluding WTGs over 40 nm away from the historic properties.

[2] Of the WTG designs considered, the 12-MW WTGs would be an estimated 853 feet at maximum height, which is 16 feet taller than 14-MW WTGs proposed for the Project.

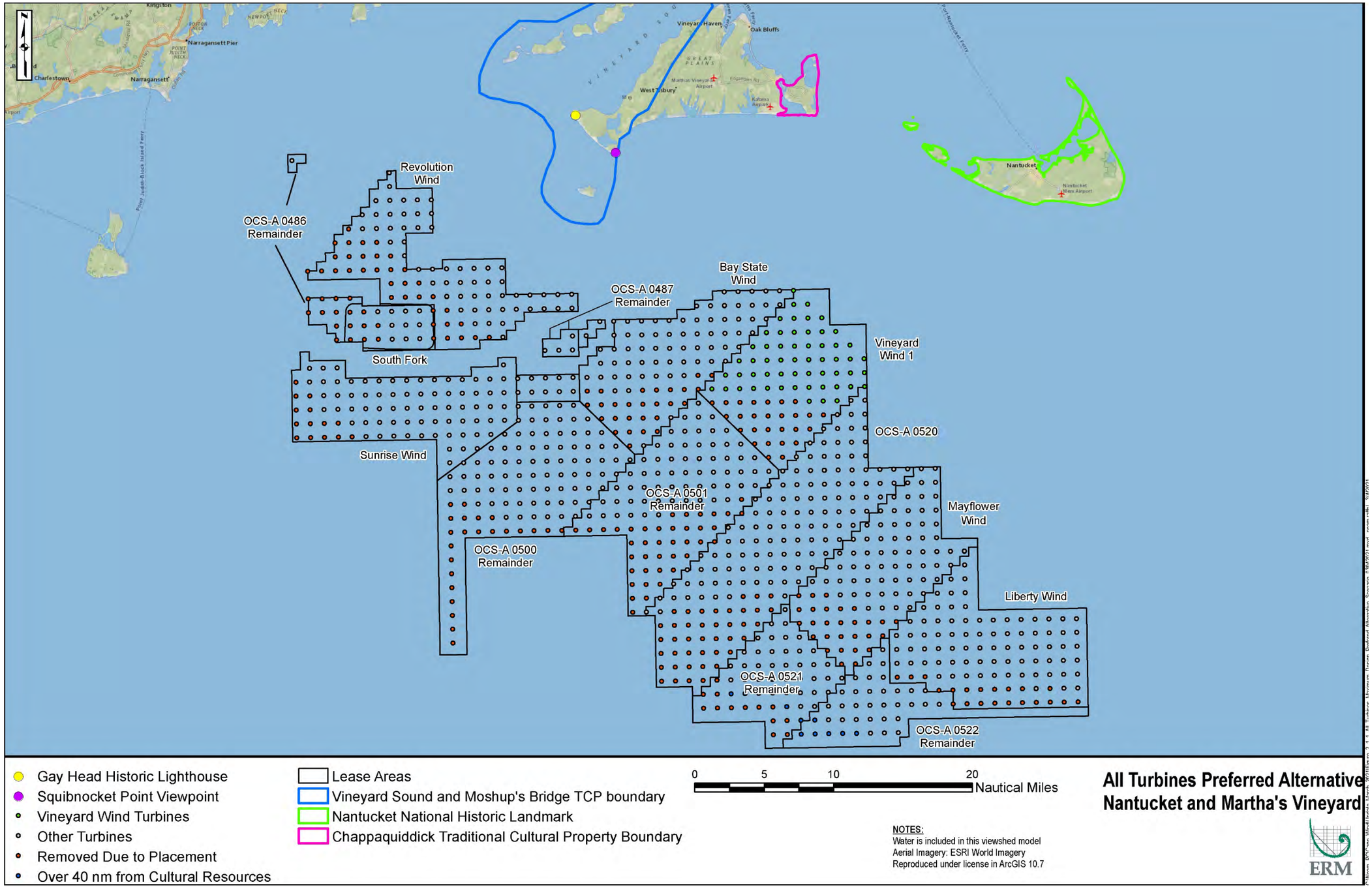

Figure 2-1: Potential Layout of All WTGs

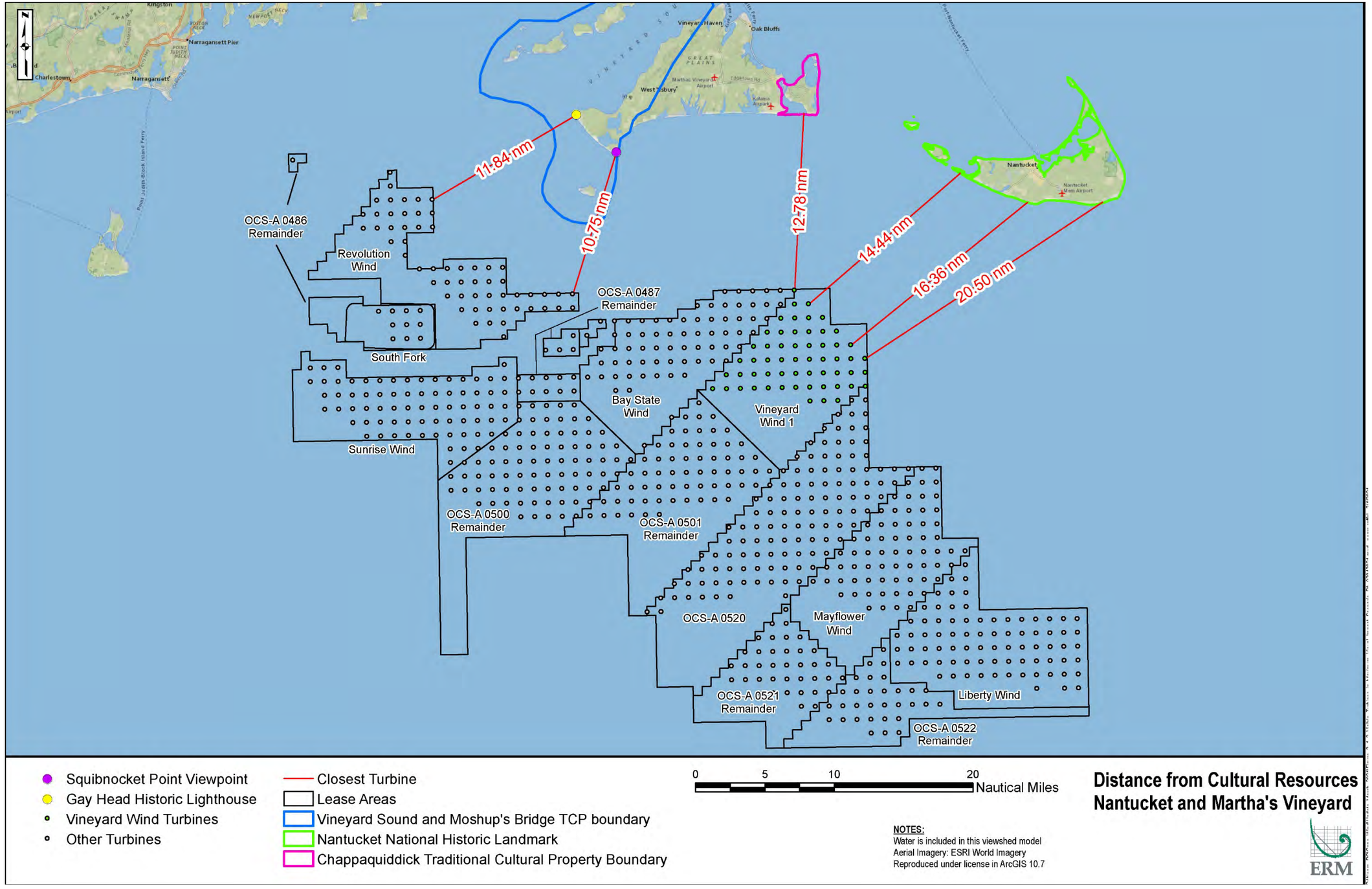

Figure 2-2: Theoretically Visible WTGs in Maximum Visual Impact Scenario

2.1.2 Step 2: Develop Initial Quantitative Viewshed Model

A raster-based digital elevation model (DEM) was paired with digital surface models (DSMs) to create an initial quantitative viewshed model, to show the visibility of WTGs from the four historic properties considered in this Assessment. The DEM is a model of ground elevation, excluding vegetation and structures, while a DSM is a model of the surface of elevation that includes objects extruded from the ground such as buildings and vegetation.[3] The DEMs were acquired from the U.S. Geological Survey (USGS) and National Oceanic and Atmospheric Administration. Two light-detection and ranging DSM models were used: the 2013–2014 Post Hurricane Sandy Survey (OCM Partners 2014) and the 2016 USGS Coastal National Elevation Database Topobathymetric Model New England (USGS 2016).

The WTGs from the proposed Project and other offshore wind projects were added directly to the DSM as extruded height pixels. This required two input DSMs—one with heights extruded to the nacelle heights and other extruded to the tip of blade heights. DSMs and DEMs are typically applied to land areas. In this case, the areas of ocean in the model were assumed to be at sea level (a DSM value of 0). To accelerate processing, the viewshed excluded areas less than 60,000 feet from the WTGs (open ocean areas where no WTGs are proposed). All inputs were projected using the North American Datum of 1983, State Plane coordinate system for Massachusetts Islands (feet)[4], and were fit to the 9 x 9 pixels of the DSM.

The viewshed model provided outputs in a grid, with each grid square represented by a single pixel that covered a 9 x 9 foot area of the earth's surface. One run of this model calculated the number of WTGs blade tips that had a theoretical line of sight to each pixel within the historic properties, based solely on WTG characteristics, topography, and the curvature of the earth. A second run provided the same calculations for WTG nacelle tops to assess theoretical nighttime visibility. Model output was in the form of a "heat map" showing the number of WTGs theoretically visible from each pixel within each historic property. Based on this information, areas within each historic property were coded in terms of the number of WTGs theoretically visible. The initial model did not identify the specific WTGs with line of sight to each pixel.

2.1.3 Step 3: Select Points for Detailed Analysis

The historic properties included in this Assessment were identified based on the VIA and VIA Addendum for the proposed Project, described in Section 1 (COP Volume III, Appendix III-H.b; Epsilon 2020 and Vineyard Wind 2021a) and the identification of the "area of intervisibility" between the proposed Project and the other offshore wind projects.[5] The Gay Head Light, Chappaquiddick Island TCP, Nantucket NHL, and Vineyard Sound and Moshup's Bridge TCP are located within the area of intervisibility; therefore, the cumulative effects analysis evaluates cumulative visual effects to these four resources.

Vineyard Wind's cultural resource consultants obtained the location of the four historic properties in GIS format, as points and polygons, from the MHC's Massachusetts Cultural Resource Information System. The Gay Head Light was provided as points (the lighthouse itself) with a boundary of the property polygons, while the Chappaquiddick Island TCP, Nantucket NHL, and Vineyard Sound and Moshup's Bridge TCP sites were provided as polygons. Using the cumulative viewshed model developed in Step 2,

[3] Using the DSM alone would generate results for the highest part of an existing surface such as treetops or roofs that no viewer could reasonably access. Combination of the DSM with the DEM corrects this error, eliminating most buildings and trees from the model. The Gay Head Light is exempt from this correction as the viewer is assumed to be standing on the highest part of the lighthouse.
[4] Complete projection identification: NAD_1983_NSRS2007_StatePlane_Massachusetts_Isl_FIPS_2002
[5] The area of "intervisibility" is defined as the geographic intersection of the viewshed from which structures from the proposed Project would be theoretically visible and the viewshed from which structures would be theoretically visible from other offshore wind projects. The cumulative viewshed analysis was performed only on those historic properties within the area of intervisibility that would be adversely affected by the proposed Project.

points within these polygons selected for analysis were those with the largest number of theoretically visible WTGs. These points, shown in Appendix A, are listed in Table 2-2.

Table 2-2: Detailed Analysis Points

Historic Property	Analysis Points
Gay Head Light	■ Top of the lighthouse ■ Ground adjacent to lighthouse
Chappaquiddick Island TCP	■ South Beach ■ Hill in the south ■ Hill north of the beach ■ East Beach ■ Bay ■ North Point
Nantucket NHL	■ Muskeget Beach ■ Tuckernuck Beach ■ South Beach west ■ South Beach center ■ South Beach east ■ Hill west ■ Hill center ■ Hill center north ■ Hill northeast ■ North isthmus ■ Golf course
Vineyard Sound and Moshup's Bridge TCP	■ Edge of cliffs near Squibnocket Point

2.1.4 Step 4: Develop Final Cumulative Viewshed Model

A second set of viewshed models, or reverse viewshed model, was developed to calculate the number of WTGs, and the list of discrete WTG positions, theoretically visible from pixels within the boundaries of the observation points listed in Step 3, again based solely on WTG characteristics, topography, and curvature of the earth. This model assumed a viewing height of 6 feet off the ground. The output of this second model is a "heat map" showing the number of WTG blade tips and nacelle tops with a theoretical line-of-sight from each pixel, as well as a list of the discrete WTGs theoretically visible. These heat maps are provided in Appendix A.[6]

2.2 Outputs

The first viewshed model (Step 2 in Section 2.1.2) enabled the calculation of outputs to assess potential daytime and nighttime impacts including the total affected area of the historic property; the areas within each historic property with at least one theoretically visible WTG; the percentage of total area within the historic properties where at least one WTG would be theoretically visible; the minimum, maximum, and average number of WTGs theoretically visible across each historic property; and the average number of WTGs theoretically visible in areas with at least one theoretically visible WTG. This model was used to identify individual points within each property with a large number of theoretically visible WTGs, to be carried forward for further analysis.

[6] The heat maps in Appendix A were prepared prior to identification of the Preferred Alternative, and thus reflect the Alternative D2 layout, with use of the six WTG positions closest to land. The removal of these six positions would only incrementally change the data underlying the heat maps (6 positions out 761 total within 40 nm); therefore, the heat map exercise was not updated for the Preferred Alternative.

The viewshed models generated the following metrics from each point listed in Table 2-2:

- The list of discrete WTG positions theoretically visible;
- Total number of WTGs theoretically visible; and
- Total proposed Project WTGs theoretically visible.

The latter two metrics enabled calculation of the ratio of theoretically visible proposed Project WTGs to all theoretically visible WTGs (including those from the proposed Project and other offshore wind projects). Tables 2-3 and 2-4 provide these outputs for WTG blade tips (daytime visibility) and nacelle tops (nighttime visibility), respectively. While nacelles would be visible during daytime, the nacelle-top lights would be the primary source of nighttime visual impacts; therefore, the visibility of nacelle tops is incorporated here as the indicator for nighttime visibility analysis.

Table 2-3: Cumulative Viewshed Analysis, WTG Blade Tip (Daytime Analysis) [a]

Analysis Point	WTG Blade Tips Theoretically Visible During Daytime [a]			Proposed Project Contribution [b]
	Total	Proposed Project	Other Projects	
Gay Head Light				
Top of Lighthouse	688	57	528	8.3%
Ground next to Lighthouse	572	57	515	10.0%
Chappaquiddick Island TCP				
South Beach	592	57	535	9.6%
Hill South	627	57	570	9.1%
Hill North of Beach	636	57	579	9.0%
East Beach	188	50	138	26.6%
Bay	97	35	62	36.1%
North Point	131	57	74	43.5%
Nantucket NHL				
Muskeget Beach	493	56	437	11.4%
Tuckernuck Beach	645	57	588	8.8%
South Beach West	543	57	486	10.5%
South Beach Center	504	57	447	11.3%
South Beach East	405	57	348	14.1%
Hill West	593	56	537	9.4%
Hill Center	304	30	274	9.9%
Hill Center North	285	42	243	14.7%
Hill Northeast	380	56	324	14.7%
North Isthmus	136	56	80	41.2%
Golf Course	184	50	134	27.2%
Vineyard Sound and Moshup's Bridge TCP [c]				
Squibnocket Point	608	55	553	9.0%

[a] Theoretical visibility based on topography, and the curvature of the earth only.
[b] Indicates the ratio of theoretically visible proposed Project WTGs to all theoretically visible WTGs.
[c] While all 57 proposed Project WTGs would be within 10-30 nm of the Squibnocket Point viewpoint, 2 would be directly behind other WTGs, and would thus not be distinguishable.

Table 2-4: WTG Nacelle Tops Theoretically Visible (Nighttime Analysis) [a]

Analysis Point	WTG Nacelle Tops Theoretically Visible at Night [a]			Proposed Project Contribution [b]
	Total	Proposed Project	Other Projects	
Gay Head Light				
Top of Lighthouse	589	57	532	9.7%
Ground next to Lighthouse	557	57	500	10.2%
Chappaquiddick Island TCP				
South Beach	341	57	284	16.7%
Hill South	424	57	367	13.4%
Hill North of Beach	438	57	381	13.0%
East Beach	84	37	47	44.1%
Bay	22	14	8	63.9%
North Point	23	21	2	91.3%
Nantucket NHL				
Muskeget Beach	239	56	183	23.4%
Tuckernuck Beach	358	57	301	15.9%
South Beach West	282	57	225	20.2%
South Beach Center	262	57	205	21.8%
South Beach East	171	55	116	32.2%
Hill West	377	56	321	14.9%
Hill Center	165	23	142	13.9%
Hill Center North	135	31	104	23.0%
Hill Northeast	283	55	228	19.4%
North Isthmus	31	14	17	45.2%
Golf Course	44	11	33	25.0%
Vineyard Sound and Moshup's Bridge TCP [c]				
Squibnocket Point	530	55	475	10.4%

[a] Theoretical visibility based on topography, and the curvature of the earth only.
[b] Indicates the ratio of theoretically visible proposed Project WTGs to all theoretically visible WTGs.
[c] While all 57 proposed Project WTGs would be within 10-30 nm of the Squibnocket Point viewpoint, 2 would be directly behind other WTGs, and would thus not be distinguishable.

3. ANALYSIS

This section describes each of the affected historic properties and discusses the cumulative visual effects of the proposed Project and other offshore wind projects on those properties, including effects on NRHP eligibility.

3.1 Overview

3.1.1 Analysis Methodology

The primary visual effects of offshore wind development on the four historic properties evaluated in this Assessment would occur because of the construction of offshore WTGs within the properties' viewsheds. Any new visible WTGs in the RI and MA Lease Areas would introduce new, modern, manmade structures into unobstructed sea views where no such structures previously or currently exist. Based on current applications submitted to BOEM, the proposed Project is anticipated to be the first offshore wind project in the RI and MA Lease Areas; however, the proposed Project is expected to be part of a nearly continuous offshore wind project construction period (one of approximately 12 projects) between 2021 and 2030.

WTGs from the proposed Project and other offshore wind projects would be similar in appearance and generally visible within the same view; thus, observers would be unable to easily distinguish WTGs from the proposed Project from those of other offshore wind projects. Observed from 14 miles (12 nm, 23 km) away, the width of a WTG base would be equivalent to the width of a pencil viewed from 100 feet, while the WTG blade width would be equivalent to the width of a coffee stirrer at the same distance. In many cases, the additional WTGs from successive individual offshore wind projects installed during the 2021–2030 construction period would increase the density of WTGs theoretically visible from each historic property, rather than the extent of the affected viewshed. This increased density would be mitigated by distance from the historic property as well as by environmental and meteorological conditions such as clouds, fog, haze, and sea spray. Although viewshed modeling for this Assessment assumed the clearest viewing conditions, atmospheric conditions would at times limit the visibility of WTGs.

Based on these considerations, this section focuses on the share of cumulative effects attributable to the proposed Project, as compared to the proportion attributable to other offshore wind projects. For purposes of this Assessment, the share of cumulative effects is assumed to be proportional to the share of theoretically visible WTG blade tips and nacelle tops. Other factors influencing the share of cumulative effects include the percent of horizon line occupied by proposed Project WTGs versus other offshore wind project WTGs, and the proximity of proposed Project or other project WTGs to the resource under typical visibility conditions.

3.1.2 Cumulative Visual Simulations

Saratoga Associates developed cumulative visual simulations as additional input into the COP for the proposed Project.[7] These simulations included views from the Aquinnah Cultural Center near the Gay Head Light, South Beach on Martha's Vineyard (about 3 miles west of Wasque Point on Chappaquiddick Island), and Madaket Beach, on the west end of Nantucket. For each of the viewpoints listed above, Saratoga Associates provided panoramic simulations covering a 124-degree horizontal field of view and a 55-degree vertical field of view:

[7] Cumulative simulations are available online at: https://www.boem.gov/vineyard-wind-cumulative-visual-assessment.

- The current view from each location;
- Simulated views with WTGs from the proposed Project alone;
- Simulated views with WTGs from other offshore wind projects alone; and
- Simulated views with WTGs from the proposed Project and the other offshore wind projects.[8]

Panoramic simulations are tools used to inform the cumulative visual effects assessment. When viewed at the appropriate size and viewing distance specified by Saratoga Associates (2020), the simulations allow a view of the overall landscape, providing a visual context similar to that which an observer would experience. This context can be used to help compare the share of effect from the proposed Project and the other offshore wind projects. It is important to note that static visual simulations cannot depict blade motion, which can attract attention, and has shown to be a significant factor in the visibility of onshore and offshore wind farms at certain distances (Sullivan et. al. 2012, 2013). For WTGs approximately half the height of those associated with the proposed Project and other projects, blade motion for offshore wind farms has been observed up to distances of 23 nautical miles (26 miles, 43 km) and is routinely visible at distances of 18 nm (21 miles, 33 km) or less (Sullivan et. al. 2013).

While the Saratoga Associates simulations did not include all of the observation points identified in Section 2.2, the simulated views listed above would be similar to views available from the Gay Head Light, Chappaquiddick Island TCP, and Nantucket NHL resources. The Aquinnah cultural center is within the Vineyard Sound and Moshup's Bridge TCP, although views of the Project and other WTGs from Squibnocket Point would be closer than those simulated from Aquinnah. These simulations can thus contribute to the cumulative visual effects assessment. To support the analysis, three ERM visual resource subject matter experts reviewed the simulations and applied a visibility rating system (Sullivan 2012—see Figure 3-1) to assess the visibility of the proposed Project alone, other projects alone, and the cumulative scenario, based on simulations that assumed clear conditions and did not show blade motion. The raters reviewed each simulation, assigned a rating, and reviewed as a group to reach consensus. Ratings were not used to determine the proportion of visual effect attributable to the proposed Project versus other projects, but are reported and discussed as support for these conclusions.

[8] These simulations are based on the proposed Project as described in the SEIS and later evaluated as Alternative A in the FEIS. The Preferred Alternative in the FEIS would avoid constructing WTGs in the six WTG positions located closest to the shoreline, and would instead construct WTGs in positions in the southern portion of the WDA. This change in WTG location would marginally reduce visual impacts, but would not materially change impact ratings, compared to Alternative A.

Visibility Rating	Description
VISIBILITY LEVEL 1: *Visible only after extended, close viewing; otherwise invisible.*	An object/phenomenon that is near the extreme limit of visibility. It could not be seen by a person who was not aware of it in advance, and looking for it. Even under those circumstances, the object can only be seen after looking at it closely for an extended period of time.
VISIBILITY LEVEL 2: *Visible when scanning in general direction of study subject; otherwise likely to be missed by casual observer.*	An object/phenomenon that is very small and/or faint, but when the observer is scanning the horizon or looking more closely at an area, can be detected without extended viewing. It could sometimes be noticed by a casual observer; however, most people would not notice it without some active looking.
VISIBILITY LEVEL 3: *Visible after brief glance in general direction of study subject and unlikely to be missed by casual observer.*	An object/phenomenon that can be easily detected after a brief look and would be visible to most casual observers, but without sufficient size or contrast to compete with major landscape elements.
VISIBILITY LEVEL 4: *Plainly visible, could not be missed by casual observer, but does not strongly attract visual attention, or dominate view because of apparent size, for views in general direction of study subject.*	An object/phenomenon that is obvious and with sufficient size or contrast to compete with other landscape elements, but with insufficient visual contrast to strongly attract visual attention and insufficient size to occupy most of the observer's visual field.
VISIBILITY LEVEL 5: *Strongly attracts visual attention of views in general direction of study subject. Attention may be drawn by strong contrast in form, line, color, or texture, luminance, or motion.*	An object/phenomenon that is not of large size, but that contrasts with the surrounding landscape elements so strongly that it is a major focus of visual attention, drawing viewer attention immediately, and tending to hold viewer attention. In addition to strong contrasts in form, line, color, and texture, bright light sources (such as lighting and reflections) and moving objects associated with the study subject may contribute substantially to drawing viewer attention. The visual prominence of the study subject interferes noticeably with views of nearby landscape elements.
VISIBILITY LEVEL 6: *Dominates view because study subject fills most of visual field for views in its general direction. Strong contrasts in form, line, color, texture, luminance, or motion may contribute to view dominance.*	An object/phenomenon with strong visual contrasts that is of such large size that it occupies most of the visual field, and views of it cannot be avoided except by turning the head more than 45 degrees from a direct view of the object. The object/phenomenon is the major focus of visual attention, and its large apparent size is a major factor in its view dominance. In addition to size, contrasts in form, line, color, and texture, bright light sources and moving objects associated with the study subject may contribute substantially to drawing viewer attention. The visual prominence of the study subject detracts noticeably from views of other landscape elements.

Figure 3-1: Visibility Rating Form and Instructions (Sullivan 2012)

3.1.3 Distance Zones

Visual impact analyses frequently use the concept of distance zones—ranges of distances based on the landscape or seascape, viewing conditions, and the characteristics of human vision—to help characterize the visual effects of proposed projects (e.g., Sullivan, et. al. 2012, 2013). In evaluating the effects of meteorological conditions on visual simulations of offshore wind projects in the MA and RI Lease Areas, BOEM used three distance zones: 0-10 nm (0-11.5 miles, 0-18.5 km); 10-20 nm (11.5-23.0 miles, 18.5-37.0 km); and 20-30 nm (23.0-34.5 miles, 37.0-55.6 km) (BOEM 2017). This Assessment incorporates those three distance zones, and also considers visibility beyond 30 nm, out to the 40 nm (46 mile, 74 km) limit for seaward views described in Section 2.1.1. Table 3-1 summarizes the number of WTGs from the proposed Project (using the Preferred Alternative, described in Section 2.1) and other projects theoretically visible from selected viewpoints within each of the four historic resources, within each zone between 10 and 40 nm (there would be no WTGs within 10 nm of any of the resources). Data provided in Table 3-1 are based on the maximum-case visual impact scenario layout identified in Figure 2-2.

Table 3-1: Number of WTGs Theoretically Visible by Distance Zone, Maximum-case Visual Impact Scenario (FEIS Preferred Alternative Layout)

Distance Zone	Total WTGs	Proposed Project WTGs		Other Project WTGs	
		Number	% of Total	Number	% of Total
Gay Head Light Viewpoint					
10-20 nm	133	0	0%	133	100%
20-30 nm	305	57	19%	248	81%
Subtotal for 10-30 nm	*438*	*57*	*13%*	*381*	*87%*
30-40 nm	146	0	0%	146	100%
Chappaquiddick Island TCP Viewpoint at South Beach					
10-20 nm	90	49	54%	41	46%
20-30 nm	252	8	3%	244	97%
Subtotal for 10-30 nm	*342*	*57*	*17%*	*285*	*83%*
30-40 nm	250	0	0%	250	100%
Nantucket NHL Viewpoint at South Beach					
10-20 nm	68	45	66%	23	34%
20-30 nm	227	12	5%	215	95%
Subtotal for 10-30 nm	*295*	*57*	*19%*	*238*	*81%*
30-40 nm	248	0	0%	248	100%
Vineyard Sound and Moshup's Bridge TCP Viewpoint at Squibnocket Point [a]					
10-20 nm	171	30	18%	141	82%
20-30 nm	283	25	9%	258	91%
Subtotal for 10-30 nm	*454*	*55*	*12%*	*399*	*88%*
30-40 nm	154	0	0%	154	100%

[a] While all 57 proposed Project WTGs would be within 10-30 nm of the Squibnocket Point viewpoint, 2 would be directly behind other WTGs, and would thus not be distinguishable.

3.1.4 Weather and Atmospheric Conditions

Visibility of WTGs would be highly influenced by weather and other atmospheric conditions such as visibility, haze, fog, precipitation, clouds, and sun angle, among other considerations. In general, WTGs that are located closer to affected resources would be visible more frequently and would be visually dominant in panoramic views during clear conditions due to proximity and extent of horizon occupied. BOEM conducted a meteorological study in 2017 to assess typical visibility conditions near the RI and MA Lease Areas (BOEM 2017) at varying distances. In addition, Vineyard Wind utilized the approaches recommended by BOEM to estimate the frequency with which proposed Project WTGs would be visible. Table 3-2 summarizes the results of these assessments at the Nantucket and Martha's Vineyard airports.

Table 3-2: Visibility Conditions at the Nantucket and Martha's Vineyard Airports, 2017

Measure of Visibility	Martha's Vineyard Airport	Nantucket Airport
Average Visibility Distance in Clear conditions	20 nm (23 miles, 37 km)	17 nm (20 miles, 31 km)
Number of days when visibility extends to 20 nm (23 miles, 27 km) for 50% or more of daylight hours	113 days/year	80 days/year
Days when visibility extends to 30 nm (35 miles, 56 km) for 50% or more of daylight hours	32 days/year	14 days/year

Source: BOEM 2017

As shown in Table 3-2, average visibility is slightly lower at Nantucket, conditions allowing for visibility to 20 nm are generally limited, and visibility to 30 nm is rare. Frequency of visibility conditions beyond 30 nm (35 nm, 56 km) was not reported, but is anticipated to be very rare. As a result, WTGs in the 10-20 nm distance zone from each of the affected historic properties would be theoretically visible more frequently, and would be more visually prominent in panoramic views during clear conditions due to proximity. It is important to note, however, that the number of proposed Project WTGs actually visible or noticeable to the casual observer would vary based on actual visibility on a given day, which would generally decrease as distance increases.

3.1.5 Nighttime Lighting

Vineyard Wind has proposed to use an aircraft detection lighting system (ADLS) for the proposed Project, which would activate the FAA-required nacelle-top warning lights only when aircraft are detected approaching the Project area. This system is anticipated to reduce the proposed Project's use of nighttime lighting to less than four hours per year (0.1 percent of annual nighttime hours).[9] During those hours, assuming favorable nighttime visibility, activated ADLS lighting would be a noticeable change to a nighttime seascape that is largely unlit except for transiting vessels. Activated WTG lights would be higher on the horizon than, and likely noticeably brighter than lights on vessels at similar distances. These effects notwithstanding, the proposed Project's potential nighttime visual effects on historic properties would be limited by visibility conditions and mitigated by the rare use of ADLS. The use of ADLS by other offshore wind projects (a commitment that has not been made) would likely result in similar limits on the frequency of WTG aviation warning lighting use on offshore wind facilities. USCG warning lights would be mounted on the WTG and ESP foundations approximately 62 to 75 feet above mean low water. USCG navigation warning lights would be obscured by the curvature of the earth beyond approximately 14 nm (16 miles, 30 km) from vantage points along the shoreline (Epsilon 2020).

[9] Detailed specifications for the ADLS are provided in Vineyard Wind's Visual Impact Assessment Addendum 1 (Saratoga 2020).

3.2 Gay Head Light

3.2.1 Contributing Elements for NRHP Eligibility

The Gay Head Light is located at the westernmost tip of Martha's Vineyard. The lighthouse was constructed in 1855–1856 to mark Devil's Bridge Rocks and the shoals of the south shore of the island. The passage between Gay Head and Cuttyhunk into Vineyard Sound was a major approach to Boston Harbor for ships traveling northward along the coast. The Gay Head Light is considered one of the ten most important lighthouse resources on the East Coast and was originally equipped with one of the first Fresnel lenses. It was listed on the NRHP in 1987 as part of the Lighthouses of Massachusetts Thematic Resources Area and is significant under Criteria A and C as a historic maritime structure and aid to navigation (DiStefano and Salzman 1981a).

The original site of the Gay Head Light was 150 feet west of its current location. In 2015, the 45-foot-high brick structure was moved to the east to prevent it from collapsing due to erosion of the Gay Head Cliffs (Figure 3-2). An amendment to the NRHP nomination produced in 2015 determined that, although its setting and location had been partially compromised, the lighthouse retained sufficient integrity of design, material, workmanship, feeling, and association for NRHP listing. The NRHP boundary of the site as defined in the amendment described above includes 1.35 acres owned by the Town of Aquinnah, comprised of Lots 22 and 23. The property includes the foundation of the former lighthouse location, as well as archaeological remains of other buildings that supported the lighthouse, including a keeper's house. None of these ancillary buildings remain standing (MHC 2015).

In its Finding of Adverse Effect for Gay Head Light for the proposed Project, BOEM (2019a) found that unobstructed views to the ocean were integral to the property's historic setting, feeling, and association. The role of the light in monitoring and guiding maritime traffic from its high vantage point was a significant historic function. In addition, the light is part of a historic "seascape"—the area within which there is shared intervisibility between land and sea. The seascape is comprised of four components: an area of the sea (the seaward component), a length of coastline (the coastline component), and an area of land (the landward component). Only the seaward component of the Gay Head Light seascape would be affected by the proposed Project; modern elements such as power lines, buildings, and road improvements have previously affected the landward and coastline components. The proposed WTGs, however, would introduce new elements out of character with the historic seaward component of the property's viewshed. These elements affect the character of the seascape, which includes the "aesthetic, perceptual, and experiential aspects" of the property's setting (BOEM 2019a).

The contributing elements of Gay Head Light's character are valued as both aesthetic and perceptual, and are rooted in a deep cultural connection to the sea for the residents and visitors to the site. Whaling, fishing, and maritime trade played a central role in the history of Martha's Vineyard, and the safety of those at sea was a prominent concern. The lighthouse and its view to the sea represented an important point of interaction between the land and sea for sailors and fishermen, and their families on land. That character is further valued as experiential for the tourists that come to the area to visit the lighthouse in its historic setting.

Source: Epsilon 2020

Figure 3-2: Gay Head Light, View Southeast toward the Proposed Project

3.2.2 Summary of Cumulative Effects

Appendices A-1 and A-2 show the areas of intervisibility and total number of WTGs theoretically visible from the Gay Head Light property. The cumulative viewshed analysis model described in Section 2 determined that all or a portion of at least one WTG from either the proposed Project and/or other offshore wind projects could be visible from approximately 76 percent of the Gay Head Light property, and that at least one nacelle top could be visible from approximately 75 percent of the property. The theoretically visible WTG blade tips and nacelle lights attributable to the proposed Project would comprise approximately 10 percent of the total theoretically visible WTG blade tips and nacelle lights, at both the top of the lighthouse and on the ground next to the lighthouse (see Tables 2-3 and 2-4).

Vineyard Wind developed a visual simulation from the Aquinnah Cultural Center, which is approximately 0.2 mile (0.3 km) southwest of the Gay Head Light and approximately 20 feet (6 m) lower in elevation than the lighthouse base. As shown in the simulations, the proposed Project would be visible from the Aquinnah Cultural Center on clear days. The view from the Gay Head Light area would be similar, but ocean views would be more influenced by intervening land and development. Compared to views from the Cultural Center, views of the open ocean would constitute a smaller proportion of the overall viewshed. An observer can experience panoramic views of the ocean and adjacent islands from the property and can also experience sequential views of multiple projects as they move around the property

and to related locations nearby (such as the observation deck near the adjacent shopping area, or the Aquinnah Cultural Center).

In clear weather, proposed Project WTGs would be visible from the Gay Head Light and the surrounding property in views to the southeast. In views to the south, proposed Project WTGs would be theoretically visible in the extreme far left of the observer's field-of-view, and would be less noticeable to the casual observer than WTGs associated with other projects located in closer proximity to the Gay Head Light. The proposed Project WTGs would disappear from the field of view as the observer turns to the west. Table 3-2 in Section 3.1.4 summarizes visibility considerations for Martha's Vineyard (based on data reported for Martha's Vineyard Airport), and shows that visibility is greater than 21 nm for 39 percent of daylight hours (BOEM 2017). Table 3-3 summarizes some of the key considerations for evaluating the visual effects of all theoretically visible WTGs on the Gay Head Light.

Table 3-3: Factors Contributing to Visual Effects of WTGs on Gay Head Light

Factor	Proposed Project	Other Projects	Notes
Distance to closest WTG	20.3 nm (23.4 miles, 37.6 km)	11.8 nm (13.6 miles, 21.9 km)	Closest proposed Project WTGs would only be minimally visible over land; other project WTGs would be more prominent and visible more frequently due to their closer proximity.
WTG Distribution By Distance [a]	Percent of all proposed WTGs within: 10-20 nm: 0% 20-30 nm: 19%. 30-40 nm: 0% Total for 10-30 nm: 13%	Percent of all proposed WTGs within: 10-20 nm: 100% 20-30 nm: 81% 30-40 nm: 100% Total for 10-30 nm: 87%	See Table 3-2. No WTGs would be within 10 nm. WTGs from other projects would be located closer to the Gay Head Light than proposed Project WTGs.
Percent of total theoretically visible WTG blade tips and nacelles	10%	90%	See Section 2.2. Accounts for WTGs visible during both daytime and nighttime.
Percent of 124-degree view with theoretically visible WTGs	20% (24 degrees)	100% (124 degrees)	See Appendix B-1. Other project WTGs would occupy a greater extent of the horizon line in a 124 degree view towards the southeast. [b]
Successive Viewing: Percent of 180-degree view with theoretically visible WTGs	14% of horizon line (24 degrees).	73%of horizon line (124 degrees).	Indicative of a 180 degree field of view as observer turns their head (as opposed to 124-degree static field of view). No WTGs would be visible on 27% of horizon line in a 180-degree south-facing view

[a] Includes all 57 proposed Project WTGs and all 761 proposed Project and other project WTGs within 40 nm (46 miles, 74 km) of the historic properties evaluated in this Assessment.
[b] Percentages do not add to 100% due to overlap and positioning of proposed Project WTGs behind WTGs associated with other projects.

Potential nighttime visual impacts of the proposed Project would be limited by visibility (i.e., due to weather and atmospheric conditions) and mitigated by use of ADLS for the proposed Project, as

discussed in Section 3.1.4. ADLS would reduce the proposed Project's nighttime visual impacts on the Gay Head Light to approximately 0.1% of annual nighttime hours, especially on clear nights with high visibility. If other projects implement ADLS, similar limits on the frequency of WTG aviation warning lighting use would be anticipated.

In summary, other project WTGs would occupy the majority of the horizon line, and all of the open ocean horizon visible in 124-degree southerly views from the Gay Head Light. WTGs associated with other projects are situated in front of the proposed Project WTGs. While proposed Project WTGs would contribute to visual impacts on clear days by creating additional visual clutter on the southeast horizon, they would be visible less often due to weather conditions, and less visually prominent than other project WTGs due to distance.

These conclusions are supported by the cumulative visual simulation completed by Vineyard Wind from the Aquinnah Cultural Center. This simulation shows a view that would be similar to southeasterly views from the Gay Head Light property. Using the visibility rating system described in Section 3.1.2, the proposed Project was rated a Visibility Level 2 for the clear conditions depicted in the simulation: The WTGs associated with the proposed Project would be detectible to an observer scanning the horizon line to the southeast, but small and faint and viewed over land versus the open ocean. Visibility would be somewhat higher from the top of the lighthouse compared to the visual simulation from the Aquinnah Cultural Center due to increased elevation, but the ocean view would constitute a smaller proportion of the total viewshed, due to increased visibility of intervening land. Other projects and the cumulative scenario were both rated a Visibility Level 4: Other project WTGs are located as close as 14 miles (12 nm, 23 km) from the viewpoint, and would be plainly visible particularly when considering blade motion, but would not be a major focus of visual attention, and views would still be dominated by sea, sky, and coastal lands.

Avoiding use of the six proposed Project WTG positions closest to the shoreline in favor of positions in the southern portion of the WDA, as in the Preferred Alternative, would only minimally reduce the project's visibility, but not enough to materially change the visibility rating. Although the closest WTGs associated with the proposed Project may appear slightly smaller under the proposed Project, this change is unlikely to be noticed by the casual observer.

3.2.3 Assessment of Integrity

The historic setting of Gay Head Light on land has been affected by the construction of roads, modern utilities, private residences, and limited commercial properties, as well as the loss of associated historic structures and recent relocation of the lighthouse structure; however, the ocean view is relatively unencumbered. The elevated position and location of the lighthouse at the tip of the island allow unobstructed or partially obstructed views of the ocean horizon across a wide area of the viewshed. Those views are considered a part of the property's historic setting and contribute to its feeling and association. The introduction of elements not historically associated with the historic view from the property—specifically WTGs from the proposed Project or other offshore wind projects—diminishes the characteristics that convey the property's significance, but account for only a portion of the property's integrity with respect to those characteristics. Views to and from the lighthouse during the day would retain sufficient integrity of setting that the property can still be appreciated and understood in its historic context, even with the proposed Project. At night, the ADLS would greatly limit the amount of time the nacelle lights from the proposed Project would be visible. In addition, the proposed Project would have no effect on the property's integrity with respect to location, design, or workmanship.

Undeveloped ocean views are a qualifying characteristic of Gay Head Light's historic setting, relating directly to the function of the lighthouse and its value; however, the degree to which the characteristic of undeveloped ocean views is diminished by the visibility of WTGs offshore is small relative to the other

aspects of integrity that remain intact. BOEM (2019a) determined that the direct adverse visual effect of the proposed Project on Gay Head Light would not diminish the integrity of the property to the extent that it would disqualify it for NRHP eligibility. Although the cumulative effect of the other offshore wind projects would further adversely affect the setting of Gay Head Light, this effect would not increase proportionately with the number of theoretically visible WTGs installed, and would be moderated by the similar characteristics of the WTGs, the distance from the property, and environmental and meteorological conditions that limit visibility. While the proposed Project and other offshore wind projects would have long-term, cumulative effects on the Gay Head Light's overall historic setting and other aspects of the property's integrity, these projects would not diminish the resource's integrity to the extent that it would disqualify the Gay Head Light from NRHP eligibility.

3.3 Chappaquiddick Island TCP

3.3.1 Contributing Elements for NRHP Eligibility

Chappaquiddick Island is located to the east of Martha's Vineyard and is separated from that island by Katama Bay and Edgartown Harbor. The island has been recognized by BOEM as a TCP of the state-recognized Chappaquiddick Wampanoag Tribe. The entire island, as well as Norton Point on Martha's Vineyard and Katama Bay, are part of this TCP. The island is significant as a TCP under Criterion A for its role in maintaining the continuing cultural identity of the Wampanoag people (Epsilon 2020). The state-recognized Chappaquiddick Wampanoag Tribe uses the island for sunrise and sunset ceremonies with views to the sea, ceremonies related to hunting marine mammals and harvesting berries, herbs, and other plants on the island. Fishing, clamming, swimming, and ceremonial activities take place in Katama Bay.

In a letter to BOEM dated June 15, 2019, the state-recognized Chappaquiddick Wampanoag Tribe identified eight areas of the island that they consider contributing elements of the TCP (BOEM 2019a). No specific boundaries are provided for these places; however, collectively, and based on the tribe's assertion that the entire island of Chappaquiddick is an historic property, BOEM considers these places to comprise contributing elements of the Chappaquiddick Island TCP. Of these eight areas, six are considered to be within the area of potential effect of the proposed Project. The eight areas are:

- **The North Neck Chappaquiddick (Sliver) Lots** were utilized in the past and are still used today for a variety of purposes, including for burials, as a lookout, and for ceremonies. Although the area was not initially considered to be in the area of potential effect, current views toward the ocean that did not exist historically would be adversely affected by the introduction of manmade structures.
- **The Edgartown Chappaquiddick (Woodland Reservation) Lots** are located on a southeast-sloping hill on Martha's Vineyard with unobstructed views of Norton Point and the Atlantic Ocean beyond. The Edgartown area was used in the past and is still used today for farming, fishing, and recreating. Members of the state-recognized Chappaquiddick Wampanoag Tribe also stated there were possible burials in the area.
- **Katama Bay**, like the Edgartown lots, was utilized in the past and is still used today for ceremonies involving the sun, moon, and water, as well as for fishing, clamming, and canoeing (Figure 3-3).
- **Norton Point** is a strip of land that protects Katama Bay. It is attached to Martha's Vineyard, but is considered part of the Chappaquiddick Island TCP. Activities conducted on the point include hunting, fishing, clamming, and ritual ceremonies.
- **Poucha Pond** is a salt pond located on the southeast corner of the island. The pond was utilized in the past and is still used today for berry picking, clamming, animal processing, and recreation,

along with other activities. The proposed Project would be visible from the south end of the pond, introducing manmade elements to the viewshed that were not present historically.

- **Wasque Point** is a bluff and beach area at the southeast end of the island. The beach served as a launch point for marine mammal hunting and ceremonies related to that activity, including ritual ceremonies honoring the hunt and those that participated (Figure 3-4).
- **Cape Poge Light** is an NRHP-listed property that is significant for its role as an aid to navigation, its workmanship, and its setting. The Chappaquiddick Wampanoag utilized the grounds for birding and rabbit hunting. The area was previously excluded from the proposed Project APE, and the Chappaquiddick Wampanoag agreed with the exclusion in a letter of July 20, 2019 to BOEM. Based on input from the Massachusetts Historical Commission, specifically due to views from the Light's observation deck, the Cape Poge Light is now considered to be within the Project APE, although it will not be adversely affected by the project. As a result, the Cape Poge Light is not analyzed for cumulative visual effects in this Assessment.
- **Sampson Hill** is a high point used as a possible burial ground, lookout point, and ceremonial site. The area was excluded from the APE of the proposed undertaking, and the Chappaquiddick Wampanoag agreed with the exclusion in a letter of July 20, 2019 to BOEM.

These contributing elements to Chappaquiddick Island TCP hold importance to the state-recognized Chappaquiddick Wampanoag Tribe's cultural history, sense of place, and ongoing cultural identity and values. The state-recognized Chappaquiddick Wampanoag Tribe has an intimate connection to the coastal environment, which has provided food, shelter, clothing, medicine, and transportation. The environment also has been the basis of their spiritual beliefs, and ceremonial activities often centered on the ocean and views of the sunrise or sunset.

Source: Epsilon 2020

Figure 3-3: Katama Point Public Launch, View South toward Proposed Project

Source: Epsilon 2020

Figure 3-4: Wasque Reservation, End of Wasque Avenue, View toward Proposed Project

3.3.2 Summary of Cumulative Effects

Appendices A-3 and A-4 show the areas of intervisibility and total number of WTGs theoretically visible from the area within which the cumulative visual effects on the Chappaquiddick Island TCP are assessed. The cumulative viewshed analysis model described in Section 2 determined that all or a portion of at least one WTG from either the proposed Project and/or other offshore wind projects could be visible from approximately 41 percent of the Chappaquiddick Island TCP, and that at least one nacelle top could be visible from approximately 27 percent of the property. This includes large areas of open water in Katama Bay, Cape Poge Bay, and Pocha Pond from which WTGs would be theoretically visible. Most land away from these areas of open water or south-facing beaches would have no view of any WTGs. As shown in Tables 2-3 and 2-4, the theoretically visible WTG blade tips attributable to the proposed Project would comprise approximately 9 to 10 percent of total theoretically visible blade tips on the south side of the TCP (from the South Beach, Hill South, and Hill North of Beach locations), and approximately 27 to 44 percent of total blade tips theoretically visible from the north part of the TCP (from the East Beach, Bay, and North Point locations). A similar pattern is evident in the analysis of nacelle visibility. The proposed Project WTGs represent approximately 13 to 17 percent of total nacelle tops theoretically visible from southern locations, and 44 to 91 percent of theoretically visible nacelle tops from northern locations. The large percentage of proposed Project WTGs theoretically visible from the north sites is due in part to the relatively small number of WTGs visible overall.

Vineyard Wind developed a visual simulation from South Beach on Martha's Vineyard (also called Katama Beach), which is located at sea level approximately three miles west of the South Beach observation point analyzed in this Assessment for the Chappaquiddick Island TCP. The view from South Beach/Chappaquiddick TCP would not be materially different from the view shown on the simulation due to the proximity of the two points and because both analysis points are located on the beachfront.

An observer would be able to experience panoramic views of the ocean from the beachfront and some inland waters of the Chappaquiddick Island TCP. In clear weather, the proposed Project WTGs would be visible from portions of the Chappaquiddick Island TCP in views to the south. Views of Proposed Project and other project WTGs from the interior of the TCP would be rare, due to screening by topography and/or vegetation (Appendices A-3 and A-4). The proposed Project WTGs and other offshore wind project WTGs would appear similar as the observer moves between the east and west beachfront areas of the property. Table 3-2 in Section 3.1.4 summarizes visibility considerations for Martha's Vineyard (based on data reported for Martha's Vineyard Airport).Table 3-4 summarizes some of the key considerations for evaluating the visual effects of WTGs on the Chappaquiddick Island TCP.

Potential nighttime visual impacts of the proposed Project would be limited by visibility (i.e., due to weather and atmospheric conditions) and mitigated by use of ADLS, as discussed in Section 3.1.4. ADLS would reduce the proposed Project's nighttime visual impacts on the Chappaquiddick Island TCP to approximately 0.1 percent of annual nighttime hours, especially on clear nights with high visibility. If other projects implement ADLS, similar limits on the frequency of WTG aviation warning lighting use would be anticipated.

In summary, WTGs from other projects would occupy a greater extent of the horizon line, but many would be more distant and would not be visible as frequently as proposed Project WTGs due to weather and atmospheric conditions. WTGs associated with the proposed Project constitute just over half of the WTGs in the nearest distance zone (10-20 nm) and 17 percent of WTGs within 30 nm of the Chappaquiddick Island TCP. Where the closest proposed Project WTGs and other project WTGs overlap on the open ocean horizon line, they would create increased visual clutter due to additional clusters and lines of WTGs.

The conclusion that the proposed Project WTGs contribute to approximately half of the visual impact to the Chappaquiddick Island TCP is supported by the cumulative visual simulation completed by Vineyard Wind from South Beach/Katama Beach on Martha's Vineyard. This simulation shows a view that would be similar to southward views from the southern shore of the Chappaquiddick Island TCP. Using the visibility rating system described in Section 3.1.2, the proposed Project alone, other projects alone, and cumulative scenario each were rated a Visibility Level 3. The proposed Project's WTGs would occupy a smaller extent of the horizon line, but would be more or equally noticeable to other project WTGs in a similar distance zone due to proximity. Both proposed Project and other project WTGs are unlikely to be missed by the casual observer, but the overall view would still be dominated by sea and sky.

Avoiding use of the six proposed Project WTG positions closest to the shoreline in favor of positions in the southern portion of the WDA, as in the Preferred Alternative, would not materially change the visibility rating. The closest WTGs associated with the proposed Project may appear slightly smaller under the proposed Project, but this change is not likely to be noticed by the casual observer.

Table 3-4: Factors Contributing to Visual Effects of WTGs on the Chappaquiddick Island TCP

Factor	Proposed Project	Other Projects	Notes
Distance to closest WTG	12.8 nm (14.7 miles, 23.7 km)	12.9 nm (14.8 miles, 23.9 km)	Proposed Project and other project WTGs would be visible over open ocean from south-facing shorelines on Martha's Vineyard at approximately equal distances for the nearest WTGs.
WTG Distribution By Distance [a]	Percent of all proposed WTGs within: 10-20 nm: 56% 20-30 nm: 2%. 30-40 nm: 0% Total for 10-30 nm: 17%	Percent of all proposed WTGs within: 10-20 nm: 44% 20-30 nm: 98% 30-40 nm: 100% Total for 10-30 nm: 83%	See Table 3 -1. No WTGs would be within 10 nm. WTGs from the proposed Project would comprise a slightly larger percentage of all WTGs in the nearest distance zone.
Percent of total theoretically visible WTG blade tips and nacelles	Blade tips: 9-44% Nacelles: 13-91%	Blade tips: 56-91% Nacelles: 9-87%	See Section 2.2 for percent of theoretically visible WTG blade tips and nacelles from each viewpoint within the Chappaquiddick Island TCP.[b]
Percent of 124-degree view with theoretically visible WTGs	26% (32 degrees)	82% (102 degrees)	See Appendix B-2. Visibility depends on atmospheric and weather conditions. Other project WTGs would occupy a greater extent of the horizon line in a 124 degree view towards the southwest.[b c]
Successive Viewing: Percent of 180-degree view with theoretically visible WTGs	18% of horizon line (32 degrees)	82% of horizon line (102 degrees)	Indicative of a 180 degree field of view as observer turns their head (as opposed to 124-degree static field of view). No WTGs would occupy 18% of horizon line in a 180-degree south facing view.[b,c]

[a] Includes all 57 proposed Project WTGs and all 761 proposed Project and other project WTGs within 40 nm (46 miles, 74 km) of the historic properties evaluated in this Assessment.
[b] Exact percentage of theoretically visible blade tips and nacelles depends on the exact viewpoint within the Chappaquiddick Island TCP.
[c] Percentages do not add to 100% due to overlap and positioning of proposed Project WTGs behind WTGs associated with other projects.

3.3.3 Assessment of Integrity

The historic setting of Chappaquiddick Island TCP has been affected by the construction of roads, boat docks, private residences, limited commercial properties, and recreational and social facilities. Large natural areas remain, particularly around Wasque Point, Norton Point, and Pocha Pond, which are designated natural preserves managed by the Trustees of Reservations. A number of locations along the southern and eastern shores and on Pocha Pond and Katama Bay offer unobstructed or partially obstructed views of the ocean horizon. Those views are considered a part of the property's historic setting, and contribute to its feeling and association. The introduction of elements not historically associated with the historic view from these points—specifically WTGs from the proposed Project or other

offshore wind projects—diminishes the characteristics that convey the property's significance, but account for only a portion of the property's integrity with respect to those characteristics. In addition, the cumulative actions would have no effect on the property's integrity with respect to location.

Most of the land area away from the beaches has no view of any WTGs. As described in Section 3.3.2 and illustrated in Appendices A-3 and A-4, WTGs from either the proposed Project or other offshore wind projects would not be visible from 59 percent of the TCP. In these areas, the setting would remain intact. In the areas where WTGs are visible)—which includes large areas of open water in Katama Bay, Cape Poge Bay, and Pocha Pond—the setting would not be affected when the viewer is looking inland, away from the ocean, or when views of WTGs in the ocean view are obscured by clouds, haze, or other environmental or meteorological conditions. In addition, the WTGs would contribute to visual impacts along only 26 percent of the open ocean horizon line (a maximum of 32 degrees of the 124-degree view) to the south from the beachfront portions of the Chappaquiddick Island TCP. Other project WTGs would contribute to visual impacts along up to 82 percent of the ocean horizon line (approximately 102 degrees of the 124-degree view). The unobstructed view of the sea has cultural value to the state-recognized Chappaquiddick Wampanoag Tribe and is significant in the Tribe's cultural practices, traditions, beliefs, and lifeways. The level of effects on the cultural setting of the property from the proposed Project and the other offshore wind projects relates to sensitivity of the viewshed to change rather than the size or extent of the change caused by the proposed Project and other offshore wind projects. The cultural significance of some ceremonial sites stems from their relationship to the sea, as well as the positions of the sun and the moon relative to the horizon. As a result, the introduction of modern structures in these views, although small in scale and extent, creates adverse visual effects with respect to the resource's sensitivity to change as a potential TCP.

Nevertheless, the degree to which the characteristics of the property that convey its significance are diminished by the visibility of the proposed Project is small relative to the other aspects of integrity that remain intact. BOEM (2019a) determined that the direct adverse visual effect of the proposed Project on the Chappaquiddick Island TCP would not diminish the integrity of the property to the extent that it would disqualify it for NRHP eligibility. Based on the number of WTGs theoretically visible and the distance of the WTGs from the TCP (as described in Section 2.2), the proposed Project would contribute approximately 25 percent of the total cumulative visual effect on the Chappaquiddick Island TCP.

Although the cumulative effect of the proposed Project and other offshore wind projects would adversely affect the setting of Chappaquiddick Island TCP, this effect would not increase proportionately with the number of theoretically visible WTGs installed, and would be moderated by the similar characteristics of the WTGs, the distance from the property, and environmental and meteorological conditions that limit visibility. No formal NRHP nomination documentation has been produced that would provide guidance with respect to Chappaquiddick Island's areas of significance and level of integrity; however, it is not anticipated that the cumulative effect of the proposed Project and other offshore wind projects would diminish the property's integrity to the extent that it would disqualify it from NRHP eligibility.

3.4 Nantucket NHL

3.4.1 Contributing Elements for NRHP Eligibility

The islands of Nantucket, Tuckernuck, and Muskeget comprise the NRHP-listed Nantucket Historical District NHL. The island was developed by European colonists in the seventeenth and eighteenth centuries and still retains architectural resources from that period. It is significant under Criterion A for its association with the development of Nantucket and the whaling industry in the eighteenth century, under Criterion C for its exceptional collection of architecture from a variety of periods and representing a number of styles, and under Criterion D for its potential for well-preserved archaeological resources that would be important to the understanding of pre-contact and contact period Native American culture, as well as historic occupation by people of European and African origin.

Nantucket was designated a local historic district in 1955 under early historic preservation legislation established by the Commonwealth of Massachusetts. It was listed as an NHL in 1967, just one year after the passage of the National Historic Preservation Act. The local community was supportive of historic preservation, recognizing heritage tourism as an important aspect of the economy after the decline of whaling. The original NHL nomination written in 1966 emphasized the whaling industry as the qualifying characteristic of the property's significance. Subsequent updates to the NRHP listing in 1975 and 2012 expanded the boundaries to include the entire island, as well as the islands of Tuckernuck and Muskeget, and established tourism and historic preservation as areas of significance (Chase-Harrell and Pfeiffer 2012; Heintzelman 1975). The updates also added emphasis to the role of Native Americans and African Americans in the whaling industry (BOEM 2019a).

Although there are currently more than 5,000 contributing properties to the historic district, BOEM's (2019a) Finding of Adverse Effect found that the proposed Project's adverse effect on the district is not specific to these contributing resources, but is based on the maritime orientation of the island and its inhabitants, because the undeveloped ocean view is integral to the character, setting, feeling, and association of the historic property. Such unobstructed ocean views are located primarily along the island's southern coast and from the southward facing slopes beyond the beaches (Figures 3-5 and 3-6).

Source: Epsilon 2020

Figure 3-5: Tom Nevers Field, Nantucket Island. View Southwest Toward the Proposed Project

Source: Epsilon 2020

Figure 3-6: Eel Point, Nantucket Island. View Southwest Toward the Proposed Project

The view to the ocean is particularly associated with the first phase of whaling history on Nantucket, when elevated platforms were constructed along the south shore of the island to spot right whales and launch boats from the shore in pursuit (Oldham 2000). The contributing elements of Nantucket Island's character also are valued as aesthetic and perceptual, reflecting the cultural and spiritual connection to the sea for the residents and visitors to the site. The view to the open ocean represented an important point of interaction between the land and sea for sailors and fishermen and their families on land. That character is further valued as experiential for the tourists who come to the area to visit the island and take in its historic setting.

3.4.2 Summary of Cumulative Effects

Appendices A-5 and A-6 show the areas of intervisibility and total number of WTGs visible from the area within which the cumulative visual effects on the Nantucket NHL are assessed. The cumulative viewshed analysis model described in Section 2 determined that all or a portion of at least one WTG from either the proposed Project and/or other offshore wind projects could be visible from approximately 19 percent of the Nantucket NHL, and that at least one nacelle top could be visible from approximately 10 percent of the Nantucket NHL. Most of the land area away from the beaches would have no view of any WTGs. As shown in Tables 2-3 and 2-4, the theoretically visible WTG blade tips attributable to the proposed Project would comprise 9-41 percent of the total WTG blade tips theoretically visible from the Nantucket NHL, while theoretically visible nacelle-top lights from the proposed Project would comprise 14-45 percent of total theoretically visible nacelle-top lights, depending on viewer location (see Tables 2-3 and 2-4). Proposed Project blade tips would be more visible on the eastern end of the island (North Isthmus, Golf Course) than the eastern end (Tuckernuck, Muskeget, and South Beaches), while both the lowest (13.9 percent at Hill Center) and highest (45.2 percent at North Isthmus) percentages of proposed Project nacelle tops would be visible in the center of the island.

Vineyard Wind developed a visual simulation from Madaket Beach, which is located at sea level approximately 1 mile (0.87 nm, 1.6 km) southeast of the South Beach West point analyzed in this Assessment for Nantucket Island NHL. The view from South Beach West point would not be materially different from the view shown on the simulation due to proximity, and because both analysis points are located on the beachfront. In clear weather and where clear lines-of-sight occur, the proposed Project WTGs would be visible from the Nantucket NHP in views to the southwest. Views are mostly limited to beachfront areas as shown in Appendices A-6a through A-6r, and views from the interior portion of the NHL would be rare due to screening by topography and/or vegetation. An observer can experience panoramic views of the open ocean from the beachfront and would also potentially experience views of WTGs from more than one project as they travel between the northwest and southeast shoreline. Table 3-2 in Section 3.1.4 summarizes visibility considerations for Nantucket (based on data reported for Nantucket Airport). Table 3-5 summarizes some of the key considerations for evaluating the visual effects of WTGs on the Nantucket NHL.

Potential nighttime visual impacts of the proposed Project would be limited by visibility (i.e., due to weather and atmospheric conditions) and mitigated by use of ADLS, as discussed in Section 3.1.4. ADLS would reduce the proposed Project's nighttime visual impacts on the Nantucket NHL to approximately 0.1% of annual nighttime hours, especially clear nights with high visibility. If other projects implement ADLS, similar limits on the frequency of WTG aviation warning lighting use would be anticipated.

In summary, WTGs from other projects would occupy a greater extent of the horizon line, but would be more distant and would not be visible as frequently as proposed Project WTGs due to weather and atmospheric conditions. WTGs associated with the proposed Project make up 66 percent of the WTGs in the nearest distance zone (10 - 20 nm), and would be visible more frequently, and more noticeable to the casual observer in clear conditions compared to WTGs from other projects.

The conclusion that the proposed Project WTGs contribute slightly more than other projects to cumulative visual impacts from the Nantucket NHL is supported by the cumulative visual simulations completed by Vineyard Wind from Madaket Beach on the southwestern shore of Nantucket. Three visual resources subject matter experts used a visibility rating system (Sullivan 2012, provided in Figure 3-1) to assess the visibility of the proposed Project alone, other projects alone, and the cumulative scenario, based on the series of simulations completed by Saratoga which assumed clear conditions and does not show blade motion. The proposed Project, other projects alone, and the cumulative scenario were all rated a Visibility Level 3: The WTGs are unlikely to be missed by the casual observer, but the view would still be dominated by sea and sky. While other project WTGs would be located further away from the shoreline and appear smaller than proposed Project WTGs, the distance would not be anticipated to reduce other project WTGs to a visibility level 2.

Avoiding use of the six proposed Project WTG positions closest to the shoreline in favor of positions in the southern portion of the WDA, as in the Preferred Alternative, would not materially change the visibility rating. The closest WTGs associated with the proposed Project may appear slightly smaller under the proposed Project, but this change is not likely to be noticed by the casual observer.

Table 3-5: Factors Contributing to Visual Effects of WTGs on the Nantucket NHL

Factor	Proposed Project	Other Projects	Notes
Distance to closest WTG	14.4 nm (16.6 miles, 26.7 km)	14.7 nm (16.9 miles, 27.2 km)	Proposed Project and other project WTGs would be visible over open ocean from south-facing shorelines on Nantucket at similar distances.
WTG Distribution By Distance [a]	Percent of all WTGs within: 10-20 nm: 68% 20-30 nm: 4%. 30-40 nm: 0% Total for 10-30 nm: 19%	Percent of all WTGs within: 10-20 nm: 32% 20-30 nm: 96% 30-40 nm: 100% Total for 10-30 nm: 81%	See Table 3-1. No WTGs would be within 10 nm. WTGs from the proposed Project would comprise a larger percentage of all WTGs in the nearest distance zone.
Percent of total theoretically visible WTG blade tips and nacelles	Blade tips: 9-41% Nacelles: 14-45%	Blade tips: 56-91% Nacelles: 55-86%	See Section 2.2 for percent of theoretically visible WTG blade tips and nacelles from each viewpoint within the Nantucket NHL. [b]
Percent of 124-degree view with theoretically visible WTGs	25% (31 degrees)	78% (104 degrees)	See Appendix B-3. Visibility depends on atmospheric and weather conditions. Other project WTGs would occupy a greater extent of the horizon line in a 124 degree view towards the southwest. . [c]
Successive Viewing: Percent of 180-degree view with theoretically visible WTGs	17% of horizon line (31 degrees)	52% of horizon line (94 degrees)	Indicative of a 180 degree field of view as observer turns their head (as opposed to 124-degree static field of view).[b] No WTGs would occupy 48% of the horizon line in a 180-degree southwest facing view.

[a] Includes all 57 proposed Project WTGs and all 761 proposed Project and other project WTGs within 40 nm (46 miles, 74 km) of the historic properties evaluated in this Assessment.
[b] Percentages do not add to 100% due to overlap and positioning of proposed Project WTGs behind WTGs associated with other projects.

3.4.3 Assessment of Integrity

Nantucket Island and the adjacent Tuckernuck and Muskeget islands are significant for their contributions to seventeenth and eighteenth century architecture, nineteenth century whaling culture, and more recently, for contributions to historic preservation (Chase-Harrell and Pfieffer 2012). Despite modern intrusions and losses due to fires, decay, and development, the island retains integrity of location, design, setting, material, workmanship, feeling, and association. Views to the ocean from points along the south shore of the islands and from cleared south facing areas are unobstructed. Those views are considered a part of the property's historic setting, and contribute to its feeling and association. Additionally, according to stakeholders, the undeveloped ocean views have a significant role in forming and sustaining the cultural identity of community members (BOEM 2019a). The introduction of elements not historically associated with the historic view from these points—specifically WTGs from the proposed Project or other offshore wind projects—diminishes the characteristics that convey the property's significance, but account for only a portion of the property's integrity with respect to those characteristics.

Over 80 percent land within the NHL will have no views of WTGs, and in these areas, the setting would remain unaffected by the proposed Project or other projects. In the areas where WTGs are visible, the setting would not be affected when the view is away from the ocean or when the ocean view is obscured by clouds, haze, or other atmospheric conditions. In addition, the proposed Project would have no effect on the property's integrity with respect to the location, design, materials, or workmanship of its contributing properties. Based on the number of WTGs theoretically visible and the distance of the WTGs from the historic resource (as described in Section 2.2), the proposed Project would contribute approximately 25 percent of the total cumulative visual effect on the Nantucket NHL.

Thus, the degree to which the significant characteristic of an undeveloped ocean view is affected by the visibility of the proposed Project and other offshore wind projects would be small relative to the other aspects of the property's integrity that remain intact. BOEM (2019a) determined that the direct adverse visual effect of the proposed Project on the Nantucket NHL would not diminish the integrity of the property to the extent that it would disqualify it for NRHP eligibility. Although the cumulative effects of the other offshore wind projects would further adversely affect the setting of the Nantucket NHL, the effect would not increase proportionately with the number of theoretically visible WTGs installed, and would be moderated by the similar size (and potentially similar paint color and reflectivity) of the WTGs, the distance from the property, and environmental and meteorological conditions that limit visibility. While the proposed Project and other projects would have long-term, cumulative effects on the Nantucket NHL's overall historic setting and other aspects of the property's integrity, these projects would not diminish the resource's integrity to the extent that it would disqualify the Nantucket NHL from NRHP eligibility.

3.5 Vineyard Sound and Moshup's Bridge TCP

3.5.1 Contributing Elements for NRHP Eligibility

The Vineyard Sound and Moshup's Bridge TCP encompasses the Elizabeth Islands, Vineyard Sound, the western portion of Martha's Vineyard (from Vineyard Haven southwest to Chilmark and Aquinnah) as well as Nomans Island and surrounding waters (Figure 2-1). The TCP is tied to the Wampanoag Nation creation story of geographical features within the area including the islands, shoals, and Vineyard Sound. The TCP is named for Moshup: a giant, teacher and benevolent being responsible for the creation of the islands and waterways as well as Moshup's Bridge (aka Devil's Bridge), which are shoals that run from Aquinnah to Cuttyhunk. Moshup is also responsible for geological features on Martha's Vineyard including the Aquinnah Cliffs, which is a culturally significant location to the Aquinnah Tribe and the scene of continued cultural practices.

The landward portions of the TCP are archaeologically sensitive and include historic and pre-contact period sites associated with the Wampanoag occupation of the islands and later Euro-American use. The Vineyard Sound and Moshup's Bridge TCP is considered eligible for listing on the NRHP under:

- Criterion A for its association with ancient and historic Native American exploration and settlement of Aquinnah, central events in Moshup's and the Aquinnah tribe's history, and the character of the lands within;
- Criterion B for its association with Moshup;
- Criterion C as a distinguishable and significant component of Aquinnah lifeways, cosmology, economies, traditions, beliefs, and cultural practices; and
- Criterion D for its potential to yield information through archaeology, ethnography, and ethnohistory significant to understanding the Native American settlement, economies, land use and cultural practices prior to and after the inundation of Vineyard Sound.

Figure 3-7 shows a view toward the proposed Project from Squibnocket Beach, approximately 1 mile (0.87 nm, 1.6 km) north of the Squibnocket Point viewpoint used to evaluate effects on the TCP.

3.5.2 Summary of Cumulative Effects

Appendices A-7 and A-8 show the areas of intervisibility and total number of WTGs theoretically visible from the area around the Squibnocket Point viewpoint. Vineyard Wind determined that all or a portion of at least one WTG from the proposed Project could be visible from approximately four percent of the Vineyard Sound and Moshup's Bridge TCP, generally from southeast-facing shorelines of Martha's Vineyard and Noman's Island. No modeling was prepared to estimate the percentage of the TCP with a view of WTGs from other projects; however, based on the location of projects to the southwest of the TCP (specifically, Lease Areas OCS-A 0486, 0487, and 0500, as shown on Figure 1-1), BOEM expects that a substantially larger share of the overall TCP has views of other projects, particularly from coasts along Vineyard Sound, where the land mass of Martha's Vineyard prevents views of the proposed Project. As shown in Tables 2-3 and 2-4, the theoretically visible WTG blade tips attributable to the proposed Project would comprise approximately 9 percent of total blade tips and 10 percent of nacelle tops theoretically visible from Squibnocket Point.

No visual simulations were prepared specifically for the Vineyard Wind and Moshup's Bridge TCP. The Aquinnah Cultural Center is within the TCP, and the visual simulation from the Aquinnah Cultural Center described in Section 3.2 is thus applicable to this TCP. Views from Squibnocket Point would be approximately 4.5 miles closer to the Project than from the Aquinnah Cultural Center, and would have unobstructed ocean views of the Project. Project and other WTGs viewed from Squibnocket Point would be marginally larger and more prominent than as viewed from the Aquinnah Cultural Center.

An observer would be able to experience panoramic views of the ocean from the bluffs at Squibnocket Point. No images were available from Squibnocket Point; however, Figure 3-7 shows the view from Squibnocket Beach. The location in Figure 3-7 is approximately 1 mile (0.87 nm, 1.6 km) north of (and lower in elevation than) the Squibnocket Point viewpoint, but is generally representative of a viewer's perspective from this part of Martha's Vineyard. In clear weather, this view would include proposed Project WTGs to the southeast (although WTGs from other projects would be between the viewer and the Project). Views of proposed Project and other project WTGs from the interior of the TCP would be rare, due to screening by topography and/or vegetation (Appendices A-3 and A-4). The proposed Project WTGs and other offshore wind project WTGs would appear similar as the observer moves along the bluffs along Squibnocket Point. Table 3-2 in Section 3.1.4 summarizes visibility considerations for Martha's Vineyard (based on data reported for Martha's Vineyard Airport). Table 3-6 summarizes some of the key considerations for evaluating the visual effects of WTGs on the Vineyard Sound and Moshup's Bridge TCP.

Source: Epsilon 2020

Figure 3-7: Squibnocket Beach, View toward Proposed Project

Table 3-6: Factors Contributing to Visual Effects of WTGs on the Vineyard Sound and Moshup's Bridge TCP

Factor	Proposed Project	Other Projects	Notes
Distance to closest WTG	16.3 nm (18.8 miles, 30.3 km)	10.8 nm (12.4 miles, 20.0 km)	Proposed Project WTGs would be visible over open ocean from southeast-facing shorelines within the TCP, but would appear behind WTGs from other projects.
WTG Distribution By Distance [a]	Percent of all proposed WTGs within: 10-20 nm: 18% 20-30 nm: 9%. 30-40 nm: 0% Total for 10-30 nm: 12%	Percent of all proposed WTGs within: 10-20 nm: 82% 20-30 nm: 91% 30-40 nm: 100% Total for 10-30 nm: 88%	See Table 3 -1. No WTGs would be within 10 nm. WTGs from other projects would be located closer to the Vineyard Sound and Moshup's Bridge TCP than proposed Project WTGs.
Percent of total theoretically visible WTG blade tips and nacelles	Blade tips: 9% Nacelles: 10%	Blade tips: 91% Nacelles: 90%	See Section 2.2.[b]
Percent of 124-degree view with theoretically visible WTGs	24% (30 degrees)	87% (107 degrees)	See Appendix B-4. Visibility depends on atmospheric and weather conditions. Other project WTGs would occupy a greater extent of the horizon line in a 124 degree view towards the southeast.[b c]
Successive Viewing: Percent of 180-degree view with theoretically visible WTGs	17% of horizon line (30 degrees)	60% of horizon line (107 degrees)	Indicative of a 180 degree field of view as observer turns their head (as opposed to 124-degree static field of view). No WTGs would occupy 40% of horizon line in a 180-degree south facing view.[b,c]

[a] Includes all 57 proposed Project WTGs and all 761 proposed Project and other project WTGs within 40 nm (46 miles, 74 km) of the historic properties evaluated in this Assessment.
[b] Exact percentage of theoretically visible blade tips and nacelles depends on the exact viewpoint within the Vineyard Sound and Moshup's Bridge TCP.
[c] Percentages do not add to 100% due to overlap and positioning of proposed Project WTGs behind WTGs associated with other projects.

Potential nighttime visual impacts of the proposed Project would be limited by visibility (i.e., due to weather and atmospheric conditions) and mitigated by use of ADLS, as discussed in Section 3.1.4. ADLS would reduce the proposed Project's nighttime visual impacts on the Vineyard Sound and Moshup's Bridge TCP to approximately 0.1 percent of annual nighttime hours, especially on clear nights with high visibility. If other projects implement ADLS, similar limits on the frequency of WTG aviation warning lighting use would be anticipated.

In summary, WTGs from other projects would occupy a greater extent of the horizon line than those of the proposed Project, and would appear in front of and closer to the viewer than the proposed Project's WTGs. WTGs associated with the proposed Project constitute 18 percent of the WTGs in the nearest distance zone (10-20 nm) and 12 percent of WTGs within 30 nm of the Vineyard Sound and Moshup's

Bridge TCP. Where the closest proposed Project WTGs and other project WTGs overlap on the open ocean horizon line, they would create increased visual clutter due to additional clusters and lines of WTGs. In summary, other project WTGs would occupy the majority of the horizon line, and more than three-quarters all of the open ocean horizon visible in 124-degree southerly views from Squibnocket Point. WTGs associated with other projects would be situated in front of the proposed Project WTGs. While proposed Project WTGs would contribute to visual impacts on clear days by creating additional visual clutter on the southeast horizon, they would be visible less often due to weather conditions, and less visually prominent than other project WTGs due to distance and the proposed Project's location behind WTGs from other projects.

Using the visibility rating system described in Section 3.1.2, the proposed Project alone was rated a Visibility Level 3, while other projects alone and cumulative scenario each were rated a Visibility Level 4. The proposed Project's WTGs would occupy a smaller extent of the horizon line, and would be behind and thus less noticeable than other project WTGs in a similar distance zone. The proposed Project and other project WTGs together would be plainly visible and could not be missed by the casual observer, but the overall view would still be dominated by sea and sky.

Avoiding use of the six proposed Project WTG positions closest to the shoreline in favor of positions in the southern portion of the WDA, as in the Preferred Alternative, would not materially change the visibility rating. The closest WTGs associated with the proposed Project may appear slightly smaller under the proposed Project, but this change is not likely to be noticed by the casual observer.

3.5.3 Assessment of Integrity

The historic setting of the land portions of the Vineyard Sound and Moshup's Bridge TCP has been affected by the construction of roads, boat docks, private residences, limited commercial properties, and recreational and social facilities. Large natural or natural-appearing areas remain on Squibnocket Point and other locations on the southwestern portion of Martha's Vineyard. Much of the coast along Squibnocket Point offers unobstructed or partially obstructed views of the ocean horizon. Those views are considered a part of the property's historic setting, and contribute to its feeling and association. The introduction of elements not historically associated with the historic view from these points—specifically WTGs from the proposed Project or other offshore wind projects—diminishes the characteristics that convey the property's significance, but account for only a portion of the property's integrity with respect to those characteristics. In addition, the cumulative actions would have no effect on the property's integrity with respect to location.

Most of the land area away from the shoreline and bluffs has no view of any WTGs. As described above, only 4 percent of the TCP would have a view of one or more proposed Project WTG. It is expected that a substantially larger portion of the TCP would have views of one or more WTGs from other projects. In areas with no views of WTGs, the setting would remain intact. In the areas where WTGs are visible, the setting would not be affected when the viewer is looking inland, away from the ocean, or when views of WTGs in the ocean view are obscured by clouds, haze, or other environmental or meteorological conditions. The proposed Project WTGs would contribute to visual impacts along 17 percent of the open ocean horizon line (a maximum of 29 degrees of the 124-degree view) to the south from Squibnocket Point. Other project WTGs would contribute to visual impacts along up to 87 percent of the ocean horizon line (approximately 107 degrees of the 124-degree view). As viewed from Squibnocket Point, the proposed Project WTGs would be behind—and likely would be difficult to distinguish from—the WTGs from other projects.

The maritime setting of the Vineyard Sound and Moshup's Bridge TCP is "integral to its historical and cultural significance" (EDR 2020). While the Vineyard Sound and Moshup's Bridge TCP primarily focuses on the waters of and land surrounding Vineyard Sound, "Gay Head Cliffs, Nomans Island, and the

associated shallow water shoals along the southwestern and western shores of Martha's Vineyard are closely associated with Aquinnah traditional beliefs and practices and are of great importance to Aquinnah cultural identity" (EDR 2020). The level of effects on the cultural setting of the property from the proposed Project and the other offshore wind projects relates to sensitivity of the viewshed to change rather than the size or extent of the change caused by the proposed Project and other offshore wind projects. The introduction of modern structures in these views, although small in scale and extent, creates adverse visual effects with respect to the resource's sensitivity to change as a potential TCP.

Nevertheless, the degree to which the characteristics of the property that convey its significance are diminished by the visibility of the proposed Project is small relative to the other aspects of integrity that remain intact. The direct adverse visual effect of the proposed Project on the Vineyard Sound and Moshup's Bridge TCP would not diminish the integrity of the property to the extent that it would disqualify it for NRHP eligibility. Based on the number of WTGs theoretically visible, the distance of the WTGs from the TCP (as described in Section 2.2), and the location of proposed Project WTGs behind the WTGs of other projects, the proposed Project would contribute less than 25 percent of the total cumulative visual effect on the Vineyard Sound and Moshup's Bridge TCP. This finding is a conservative estimate based on the location of the Squibnocket Point viewpoint. The proposed Project would only contribute to cumulative visual effects from four percent of the TCP (Vineyard Wind 2021a).

Although the cumulative effect of the proposed Project and other offshore wind projects would adversely affect the setting of Vineyard Sound and Moshup's Bridge TCP, this effect would not increase proportionately with the number of theoretically visible WTGs installed, and would be moderated by the similar characteristics of the WTGs, the distance from the property, and environmental and meteorological conditions that limit visibility. Vineyard Wind has proposed to conduct an Ethnographic Study and NRHP Nomination for the TCP. If accepted, the NRHP nomination documentation is expected to provide guidance with respect to the TCP's areas of significance and level of integrity; however, it is not anticipated that the cumulative effect of the proposed Project and other offshore wind projects would diminish the property's integrity to the extent that it would disqualify it from NRHP eligibility.

4. CONCLUSION

A Cumulative Visual Effects Assessment for the proposed Project was conducted using cumulative viewshed models to help inform how the presence of WTGs associated with the proposed Project and other offshore wind projects would affect four historic properties on Martha's Vineyard and Nantucket. Cumulative viewshed models were created based on the height of the WTG at the maximum vertical extension of the blade tip (to calculate the theoretical viewshed for any part of the WTG) and the top of the WTG nacelle (to calculate the nighttime theoretical viewshed for the aviation hazard lights required by Federal Aviation Administration regulations). The cumulative viewshed models quantify the total number of WTGs that are theoretically visible from the historic properties, and were used to help determine the proportion of adverse effect attributable to the proposed Project or to the other offshore wind projects, along with other factors such as the percent of horizon line occupied by the proposed Project versus other offshore wind projects and proximity to the resource with consideration for typical visibility conditions. Based on these factors, the cumulative visual effects assessment assessed the level of effect on the historic properties, based on the NRHP integrity criteria.

The proportion of effect from the proposed Project and the other offshore wind projects varied among the four historic properties and from different viewpoints within the properties. Overall, the proposed Project would contribute minimally to cumulative adverse effects on Gay Head Light, approximately half of cumulative effects on the Chappaquiddick Island TCP, greater than half of cumulative effects on Nantucket NHL and less than one-quarter of the cumulative effects on the Vineyard Sound and Moshup's Bridge TCP. Within the Chappaquiddick Island TCP, the other offshore wind projects accounted for a greater proportion of the cumulative effects on the south part of the island than on the eastern and northern ends of the island. Within the Nantucket NHL, the cumulative effects of the proposed Project varied with larger effects from the other offshore wind projects occurring at the south and west ends of the island. Within the Vineyard Sound and Moshup's Bridge TCP, the other offshore wind projects would account for nearly all of the cumulative effects on land areas bordering Vineyard Sound (i.e., the northwest coast of Martha's Vineyard and the Elizabeth Islands), while the proposed Project would account for a portion of the effects on south-facing coastlines of Martha's Vineyard and Nomans Island.

The cumulative effects of the proposed Project and other offshore wind projects would further adversely affect the setting of the historic properties, particularly Gay Head Light; however, the degree to which offshore wind projects would affect the significant characteristic of the undeveloped ocean view is small relative to the other aspects of the properties' integrity that remain intact. Accordingly, development of offshore wind projects in the RI and MA Lease Areas would not affect the integrity of any of the historic properties to the extent that it would make them ineligible for the NRHP.

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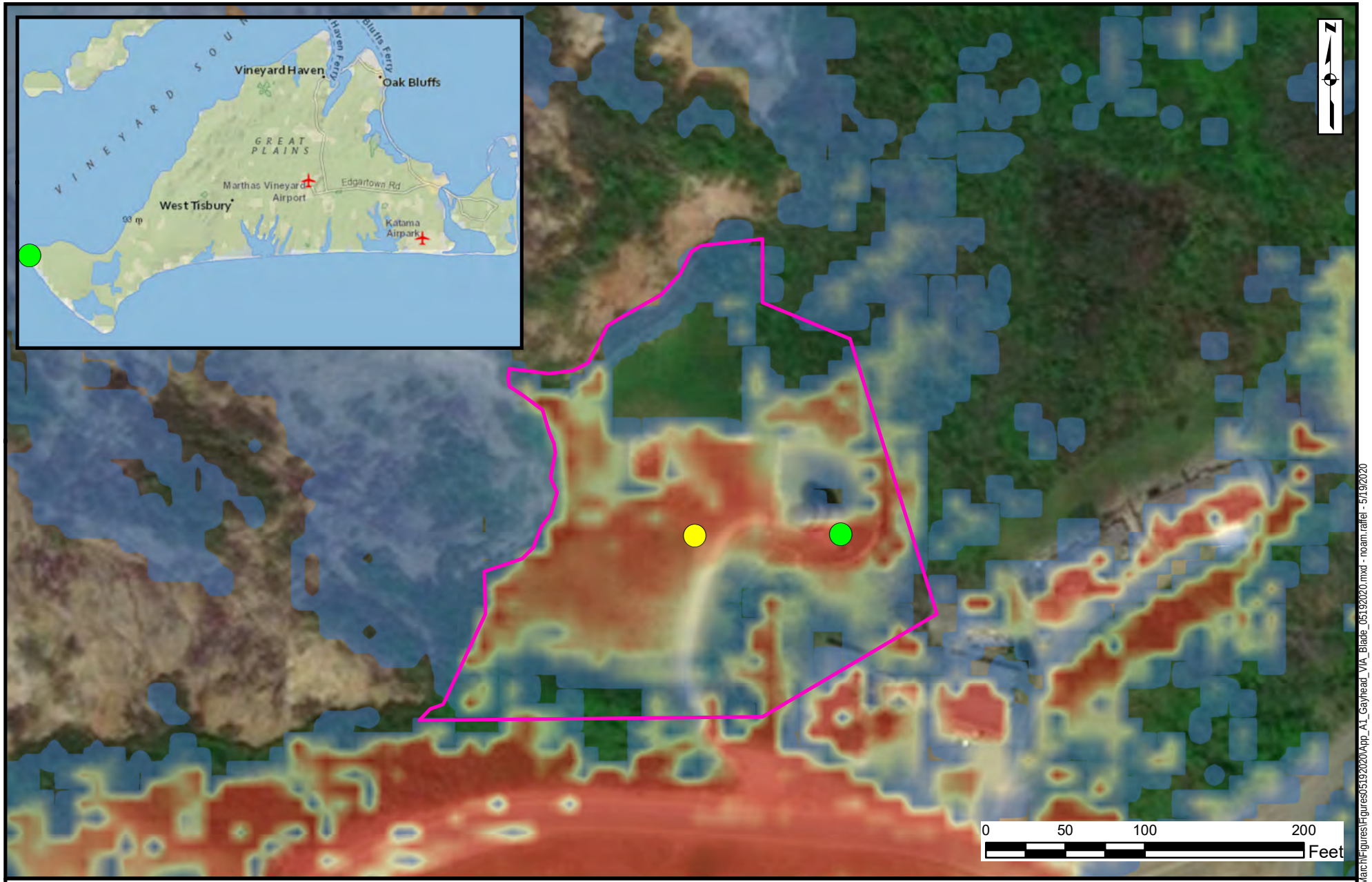
APPENDIX A INTERVISIBILITY MAPS



Gay head Historic Lighthouse

Field in Site

Gay Head Light Area

Number of Visible Turbines

High : 585

Low : 1

NOTES:
Aerial Imagery: ESRI World Imagery
Reproduced under license in ArcGIS 10.7

Cumulative Turbine Viewshed
Gay Head Light
Martha's Vineyard

Appendix A-1

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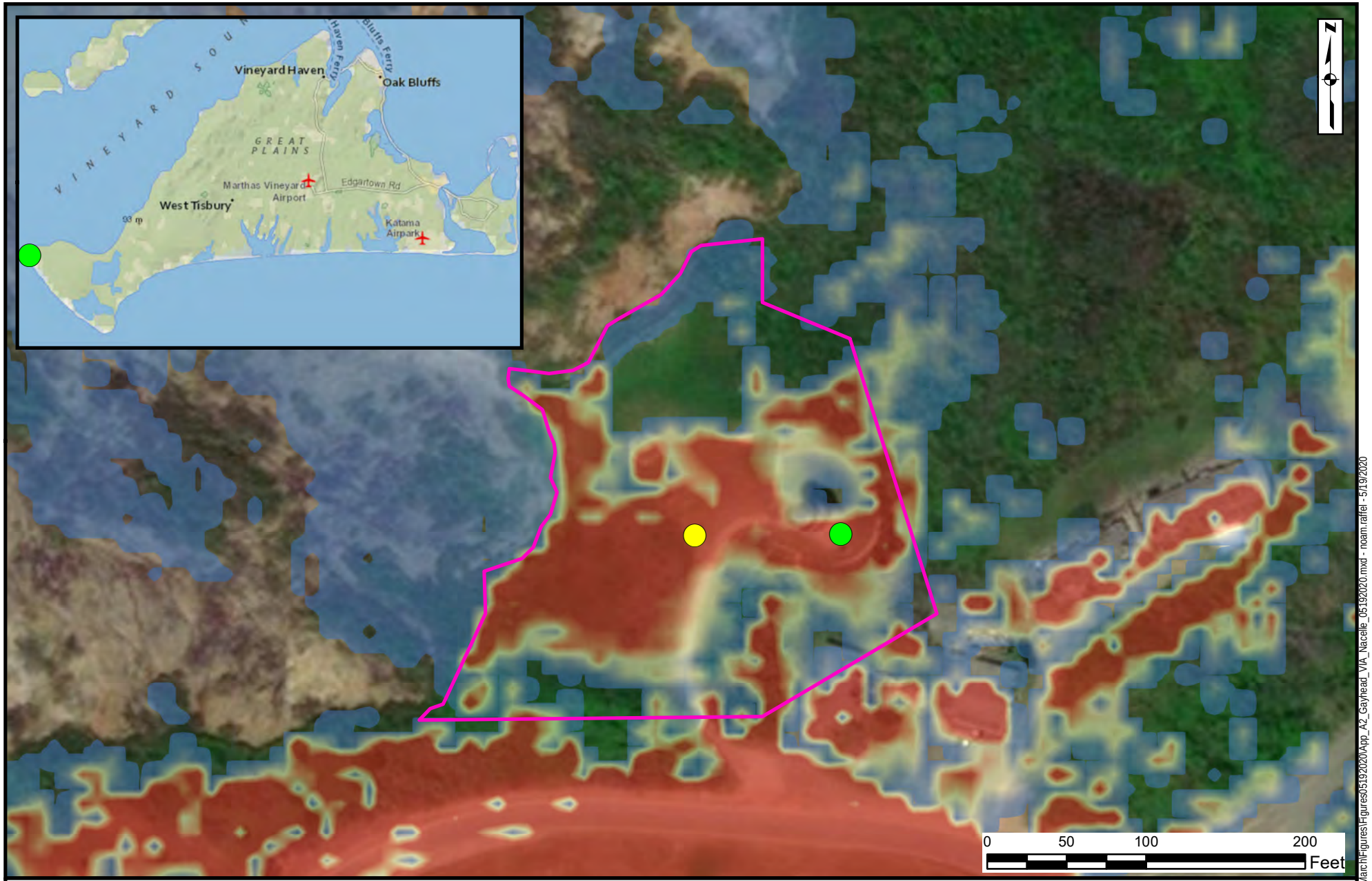

Gayhead Historic Lighthouse

Field in Site

Gay Head Historic Light Area

Number of Visible Turbines

High : 574

Low : 1

NOTES:
Aerial Imagery: ESRI World Imagery
Reproduced under license in ArcGIS 10.7

Cumulative Turbine Nacelle Viewshed
Gay Head Light
Martha's Vineyard

Appendix A-2

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NOTES:
Water is included in this viewshed model
Aerial Imagery: ESRI World Imagery
Reproduced under license in ArcGIS 10.7

Cumulative Turbine Viewshed
Chappaquiddick Island
Traditional Cultural Property
Martha's Vineyard

Appendix A-3

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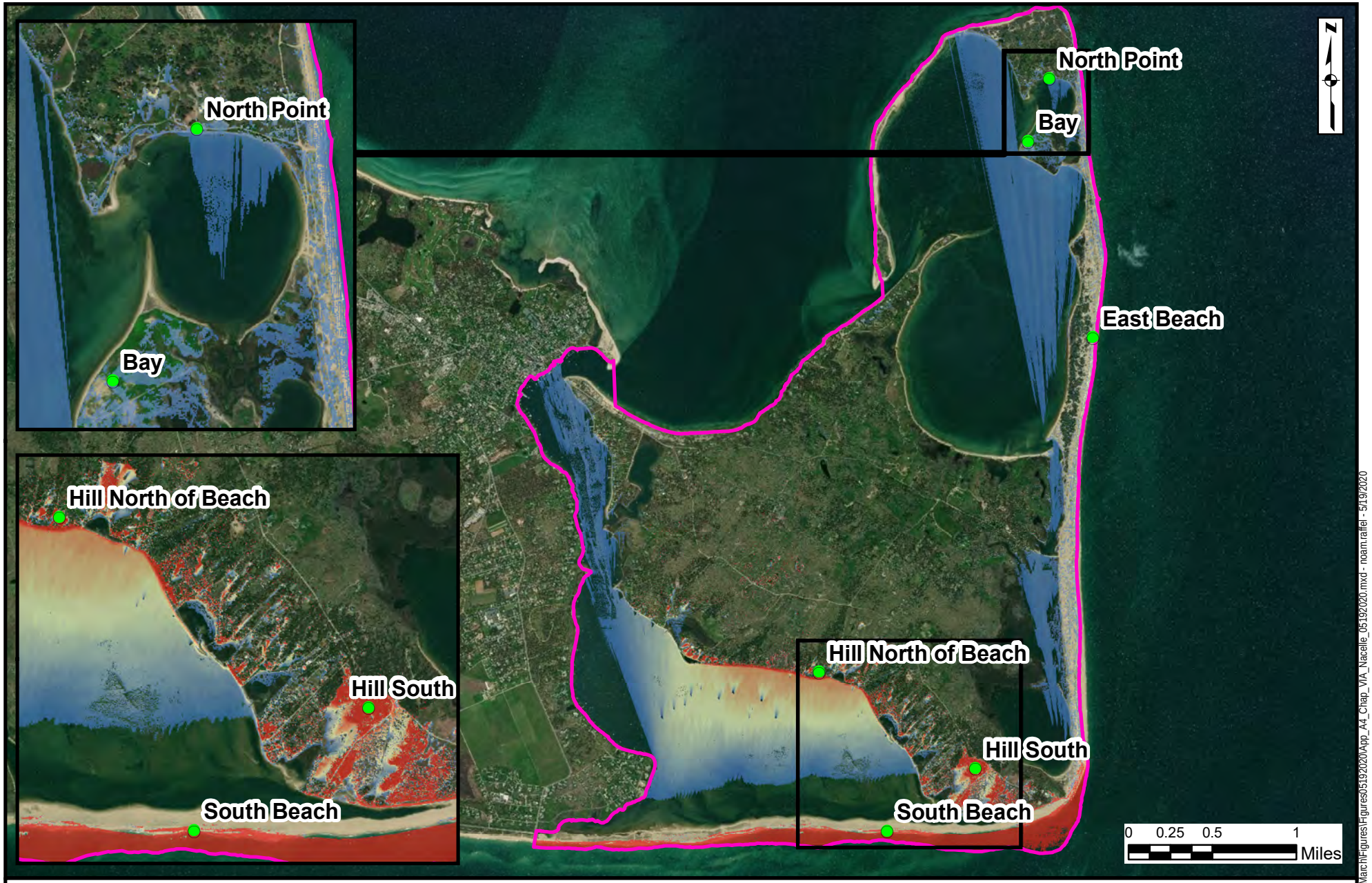

Analysis Points

Chappaquiddick Island Traditional Cultural Property

Number of Visible Turbines

High : 584

Low : 1

NOTES:
Water is included in this viewshed model
Aerial Imagery: ESRI World Imagery
Reproduced under license in ArcGIS 10.7

Cumulative Turbine Nacelle Viewshed
Chappaquiddick Island
Traditional Cultural Property
Martha's Vineyard

Appendix A-4

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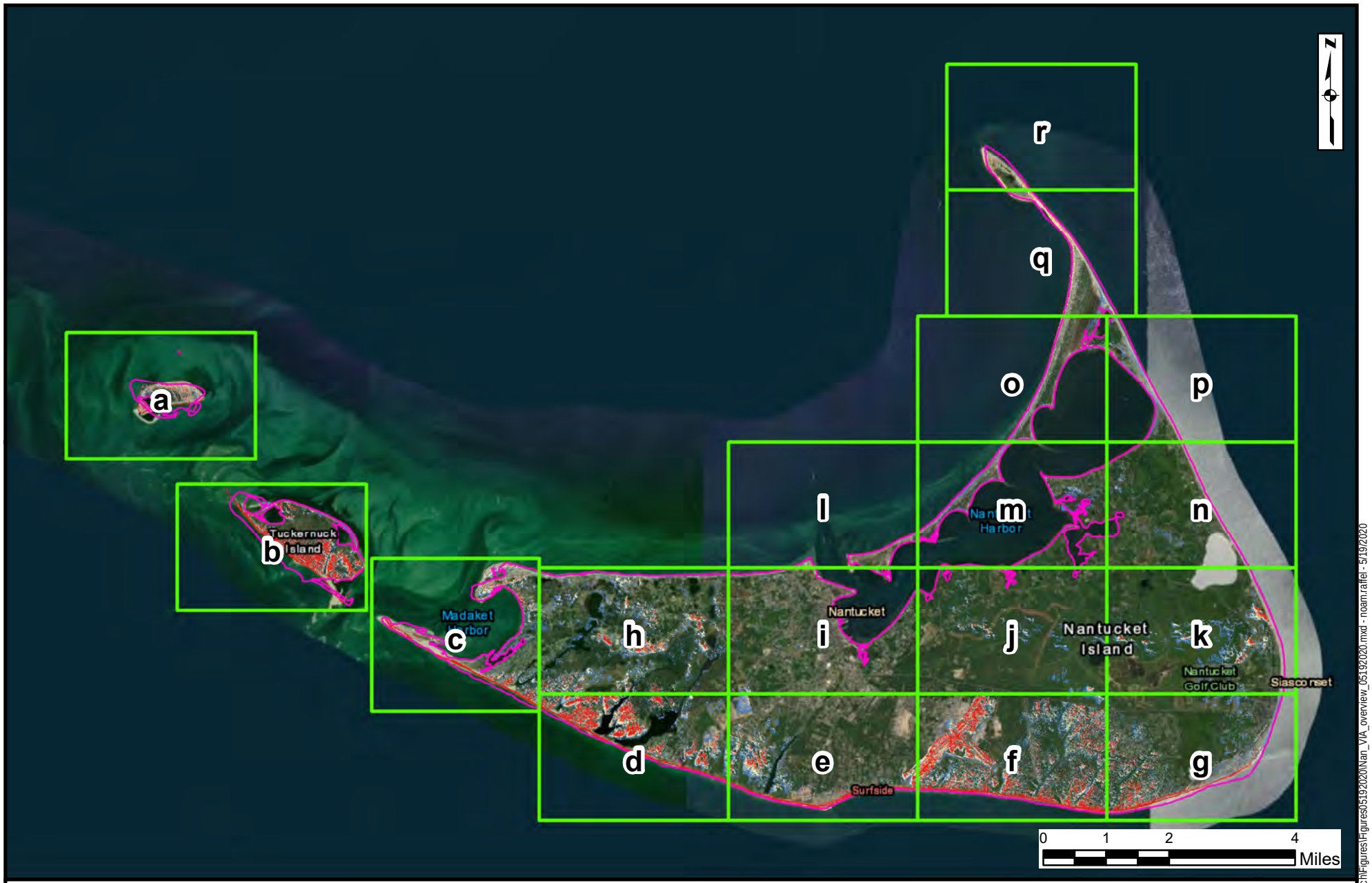


Mapbook Page

Nantucket National Historic Landmark

Number of Visible Turbines

High : 651

Low : 1

NOTES:
Water is included in this viewshed model
Aerial Imagery: ESRI World Imagery
Reproduced under license in ArcGIS 10.7

Cumulative Turbine Viewshed
Mapbook Overview
Nantucket National Historic Landmark

Appendix A-5

C:\Noam_PC\Cape_Wind\Update_March\Figures\Figures05192020\Nan_VIA_overview_05192020.mxd - noam.rafiel - 5/19/2020

Analysis Points

Number of Visible Turbines

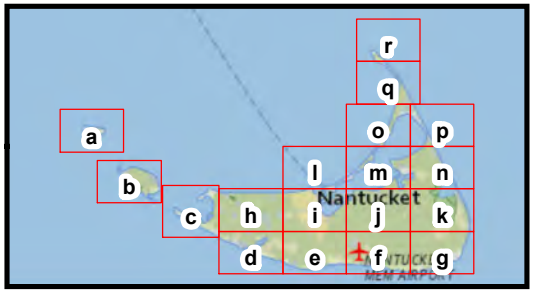
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5a

0 0.25 0.5 1 Miles



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Tuckernuck Beach
N
Analysis Points
Number of Visible Turbines
High : 651
Low : 1
Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark
Appendix A-5b
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Analysis Points

Number of Visible Turbines

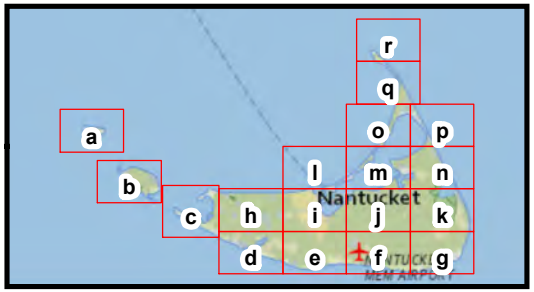
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5c

0 0.25 0.5 1 Miles



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Analysis Points

Number of Visible Turbines

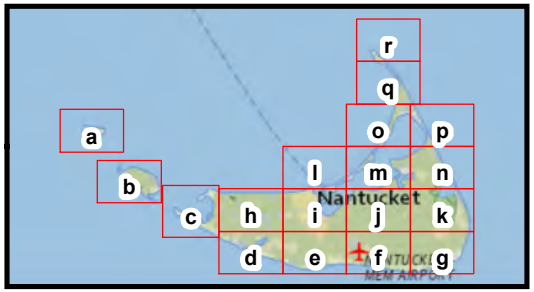
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5d

0 0.25 0.5 1 Miles



Analysis Points

Number of Visible Turbines

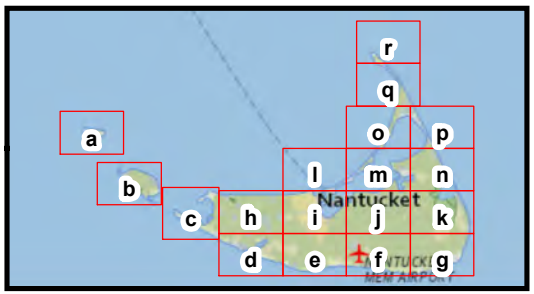
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5e

0 0.25 0.5 1 Miles



Analysis Points

Number of Visible Turbines

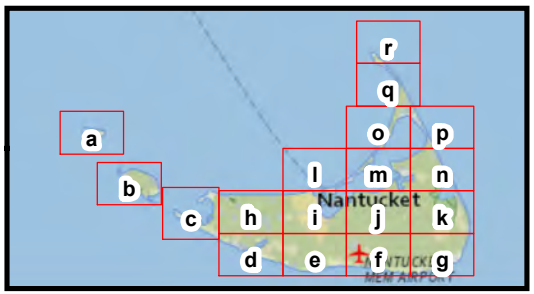
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5f

0 0.25 0.5 1 Miles



Analysis Points

Number of Visible Turbines

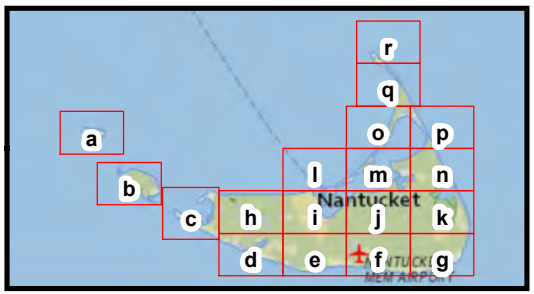
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5g

0 0.25 0.5 1 Miles



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Analysis Points

Number of Visible Turbines

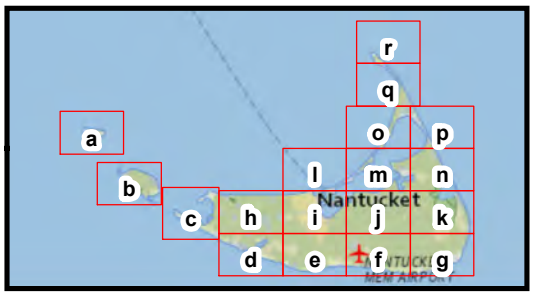
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5h

0 0.25 0.5 1 Miles



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Hill Center North
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Analysis Points
Number of Visible Turbines
High : 651
Low : 1
Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark
Appendix A-5i
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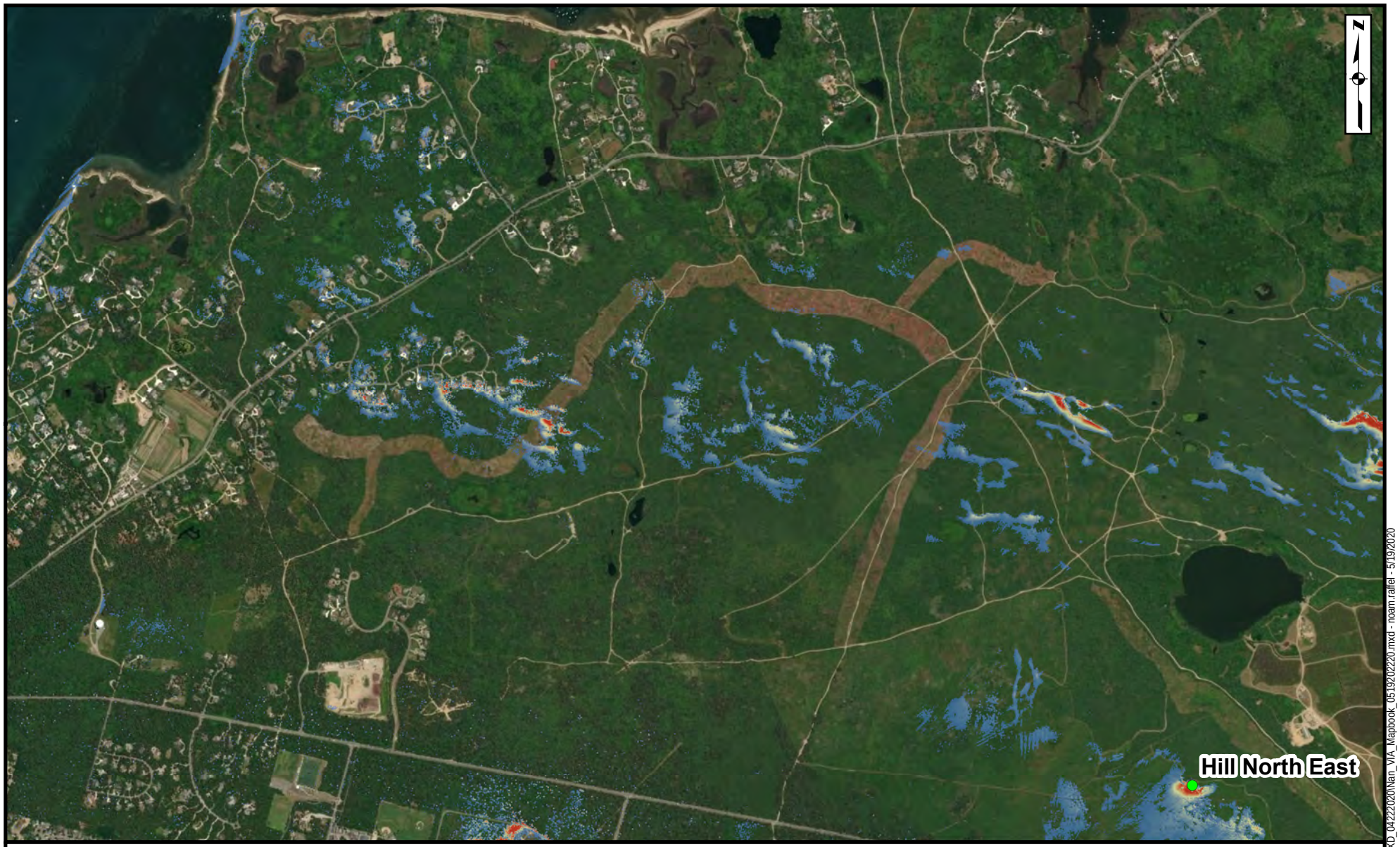

Analysis Points

Number of Visible Turbines

High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5j

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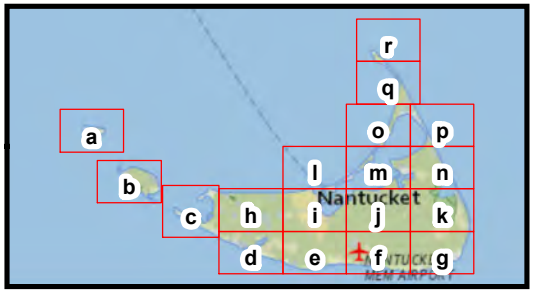

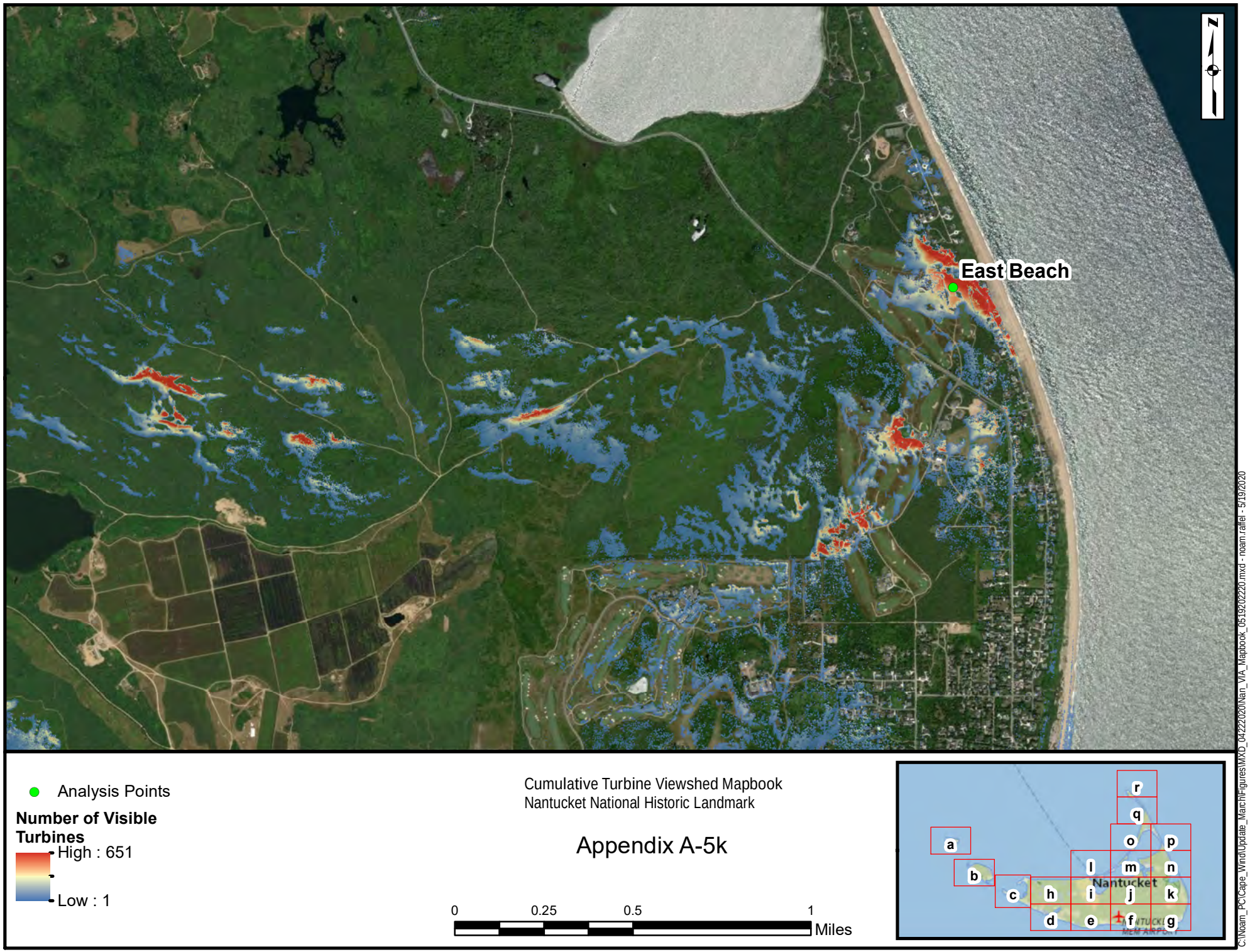
East Beach
N
Analysis Points
Number of Visible Turbines
High : 651
Low : 1
Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark
Appendix A-5k
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Analysis Points

Number of Visible Turbines

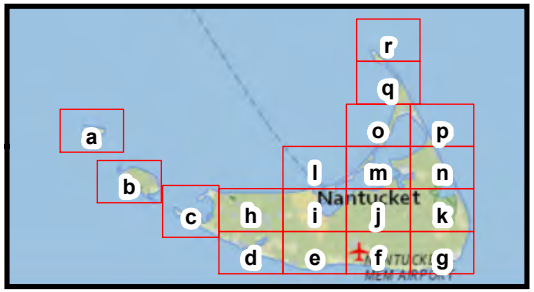
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5l

0 0.25 0.5 1 Miles



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Analysis Points

Number of Visible Turbines

High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5m

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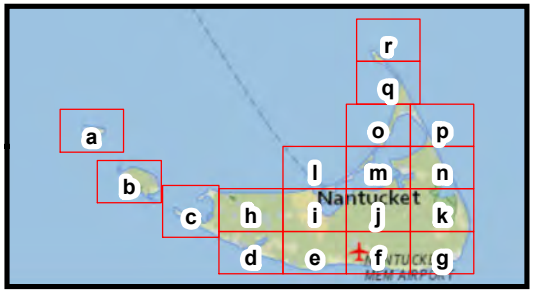

Analysis Points

Number of Visible Turbines

High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5n

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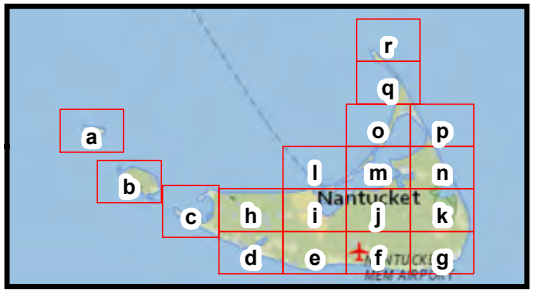

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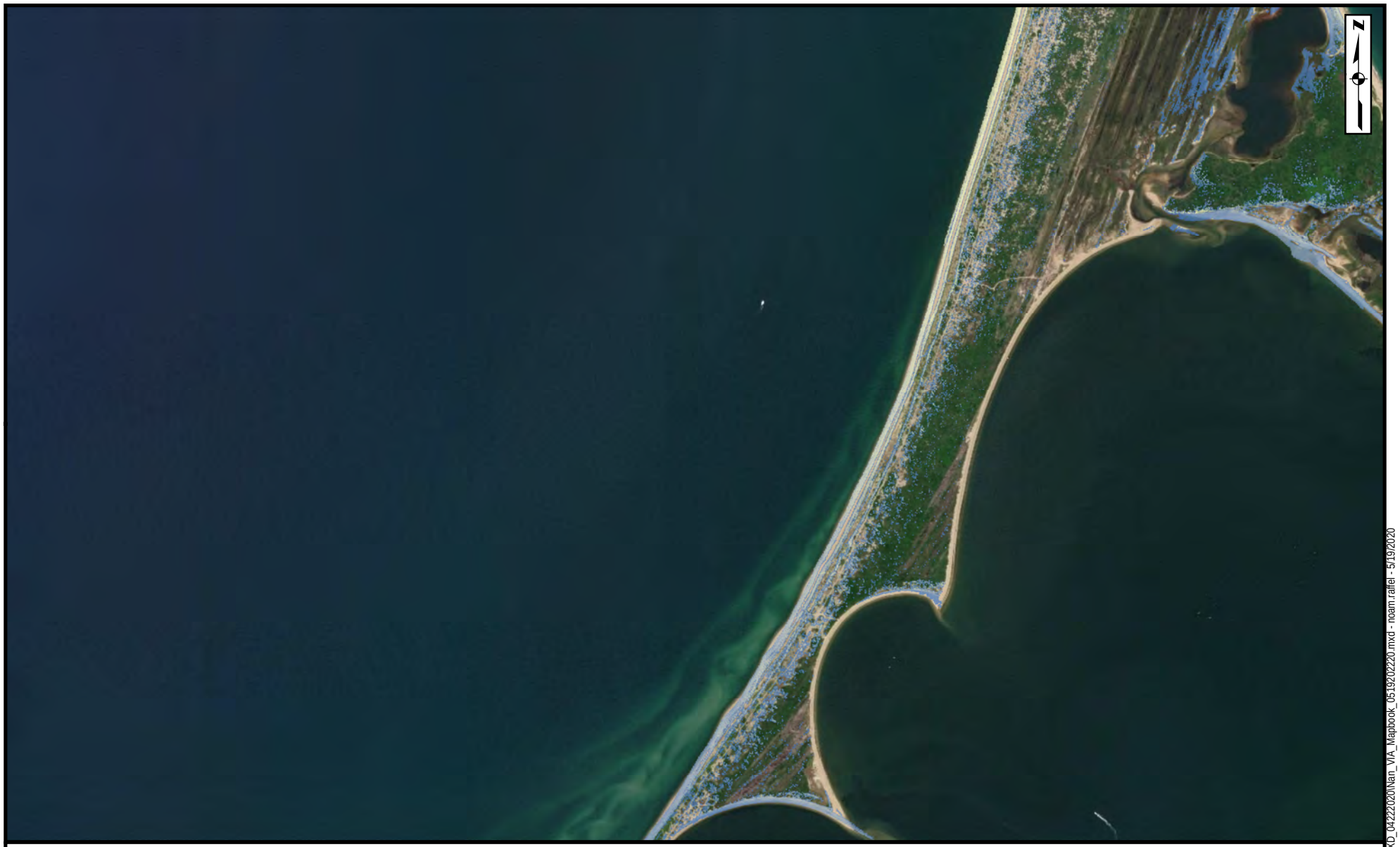


Analysis Points

Number of Visible Turbines

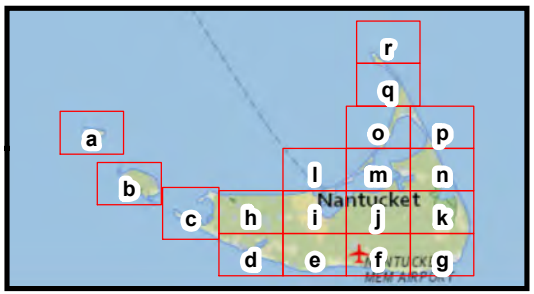
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5o

0 0.25 0.5 1 Miles



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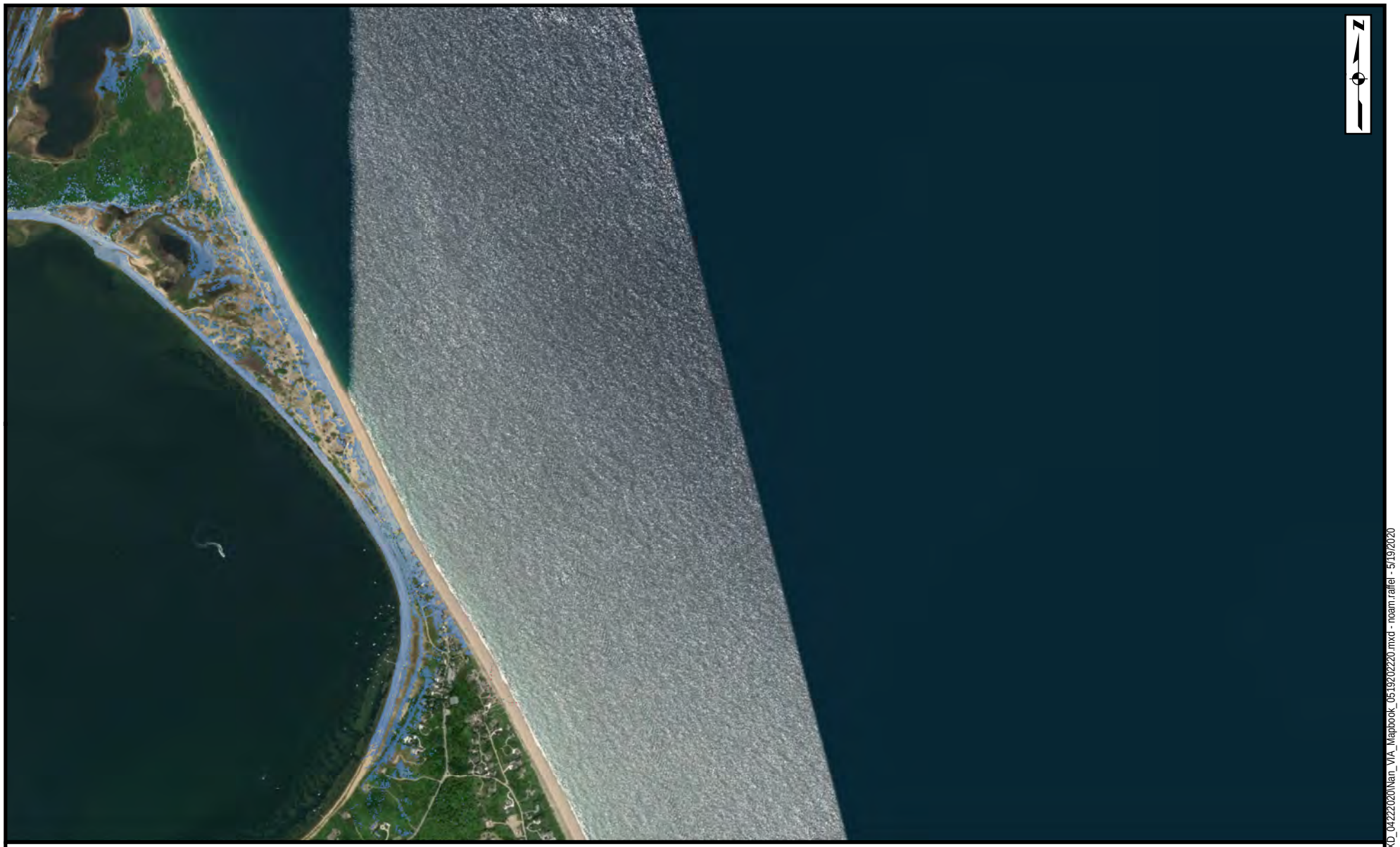


Analysis Points

Number of Visible Turbines

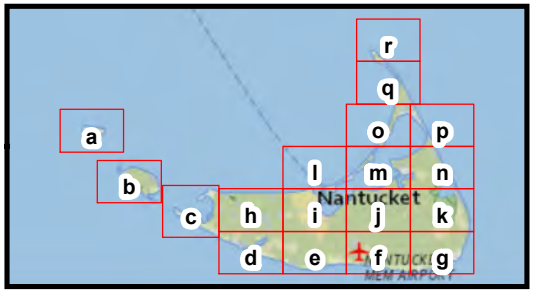
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-5p

0 0.25 0.5 1 Miles



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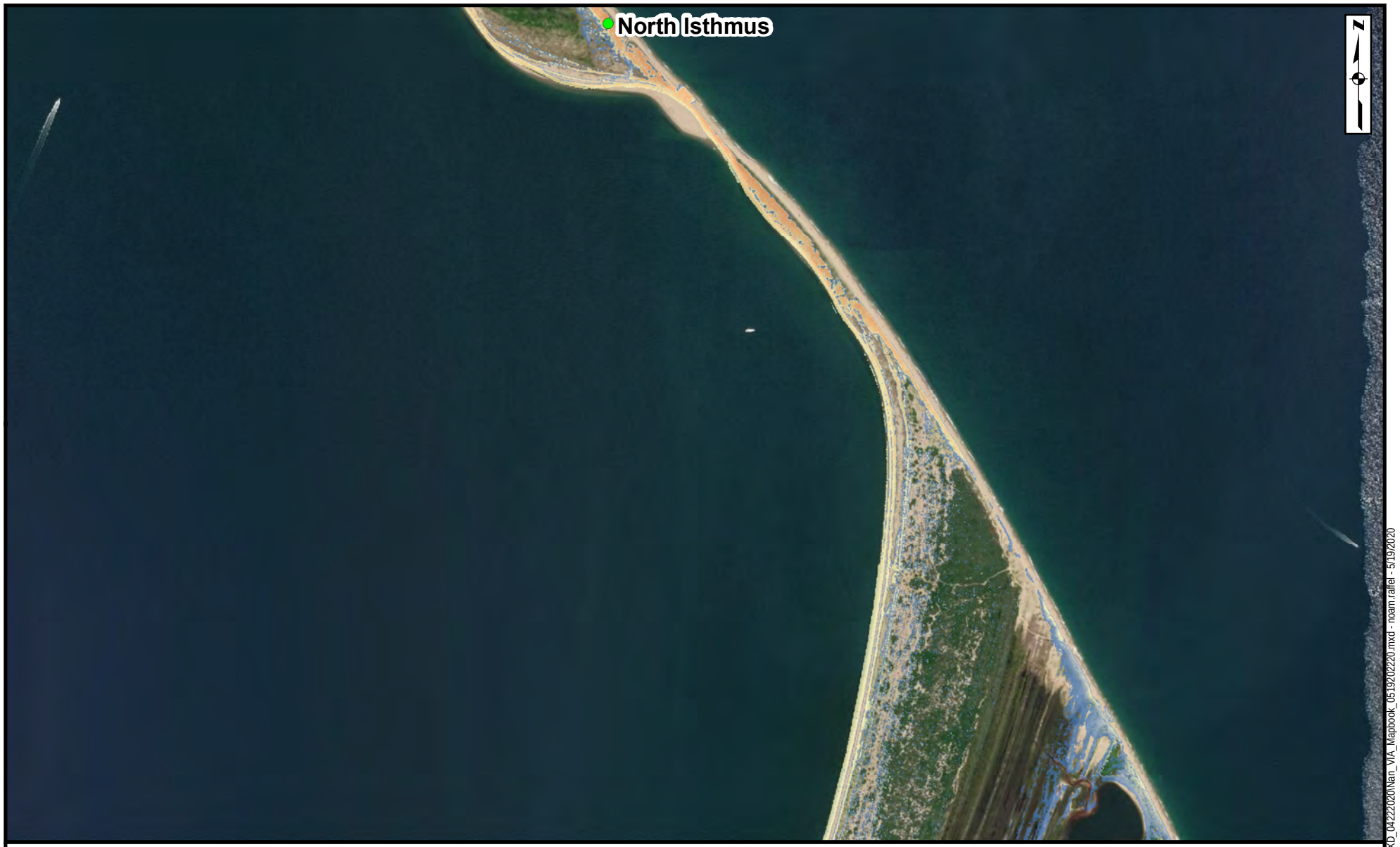


Analysis Points

Number of Visible Turbines

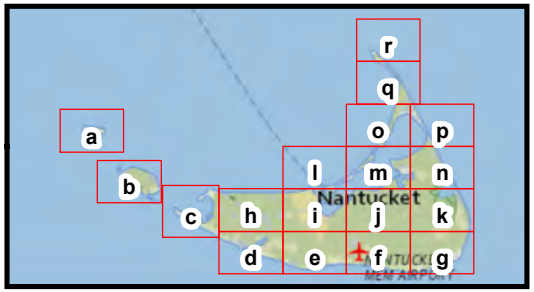
High : 651

Low : 1

Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark

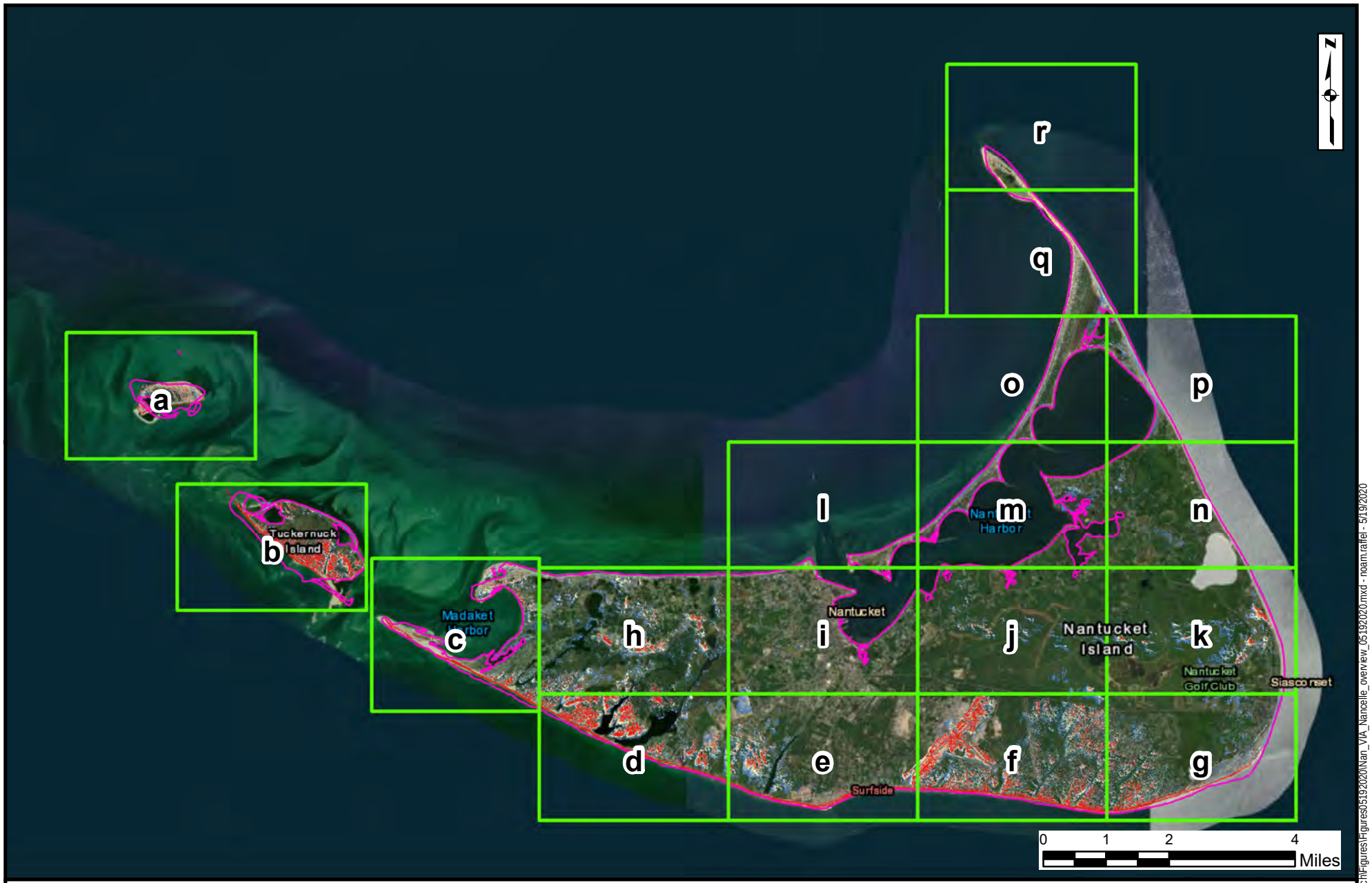
Appendix A-5q

0 0.25 0.5 1 Miles



C:\Noam_PC\Cape_Wind\Update_March\Figures\MXD_04222020\Nan_VIA_Mapbook_05192002220.mxd - noam.rafiel - 5/19/2020


N
North Isthmus
Analysis Points
Number of Visible Turbines
High : 651
Low : 1
Cumulative Turbine Viewshed Mapbook
Nantucket National Historic Landmark
Appendix A-5r
0
0.25
0.5
1
Miles
a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
Nantucket
C:\Noam_PC\Cape_Wind\Update_March\Figures\MXD_04222020\Nan_VIA_Mapbook_05192020220.mxd - noam.rafel - 5/19/2020



Mapbook Page

Nantucket National Historic Landmark

Number of Visible Turbines

High : 651

Low : 1

NOTES:
Water is included in this viewshed model
Aerial Imagery: ESRI World Imagery
Reproduced under license in ArcGIS 10.7

CumulativeTurbine Nacelle Viewshed
Mapbook Overview
Nantucket National Historic Landmark

Appendix A-6

C:\Noam_PC\Cape_Wind\Update_March\Figures\Figures05192020\Nan_VIA_Nancelle_overview_05192020.mxd - noam.raffel - 5/19/2020

Analysis Points

Number of Visible Turbines

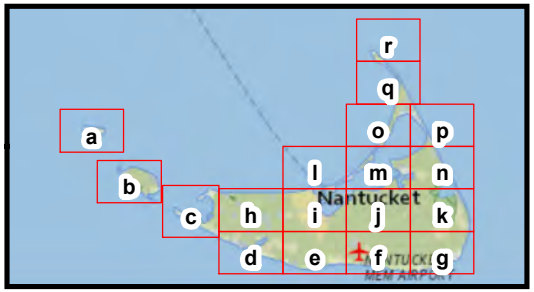
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6a

0 0.25 0.5 1 Miles



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Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6b

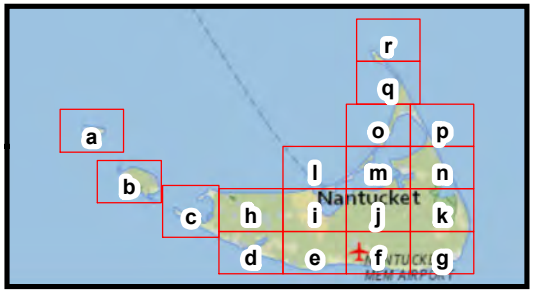
Analysis Points

Number of Visible Turbines

High : 564

Low : 1

0 0.25 0.5 1 Miles



C:\Noam_PC\Cape_Wind\Update_March\Figures\05192020\NAN_Mapbook_Nacelle_05192020.mxd - noam.rafel - 5/19/2020

Analysis Points

Number of Visible Turbines

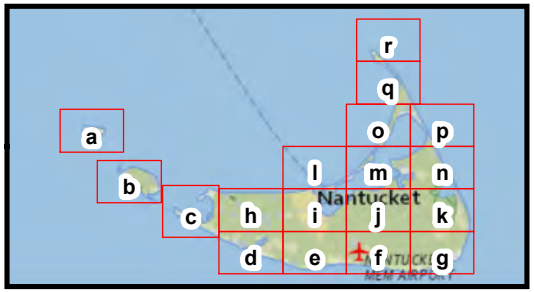
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6c

0 0.25 0.5 1 Miles



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Analysis Points

Number of Visible Turbines

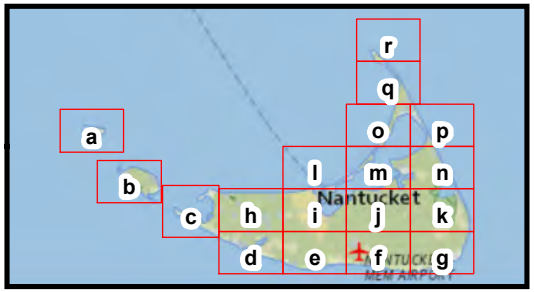
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6d

0 0.25 0.5 1 Miles



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Analysis Points

Number of Visible Turbines

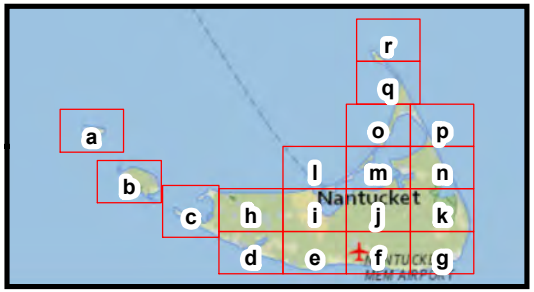
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6e

0 0.25 0.5 1 Miles



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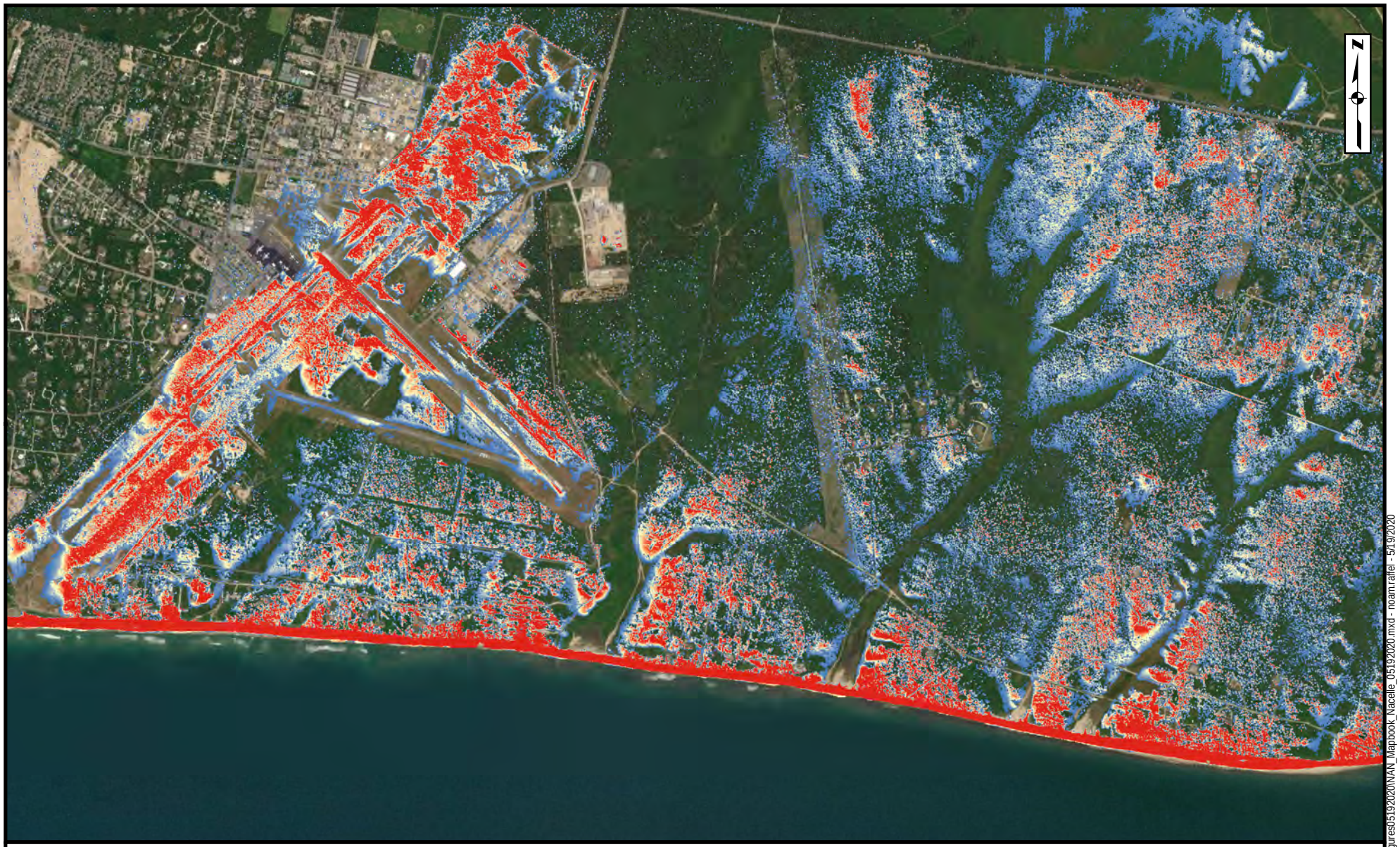


Analysis Points

Number of Visible Turbines

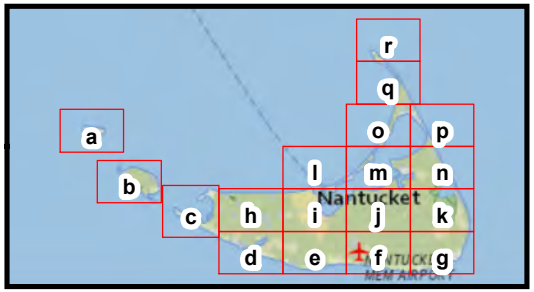
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6f

0 0.25 0.5 1 Miles



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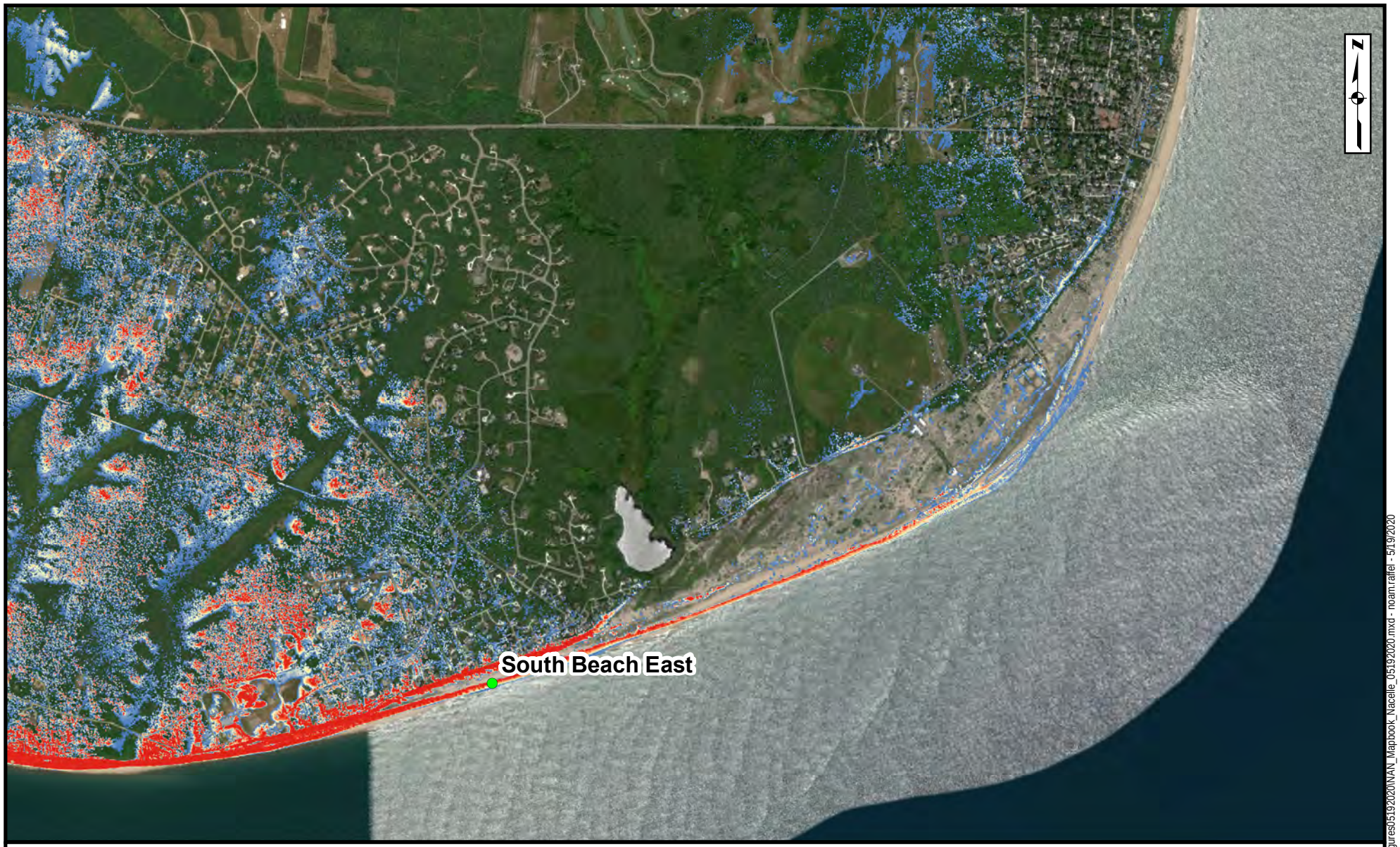


Analysis Points

Number of Visible Turbines

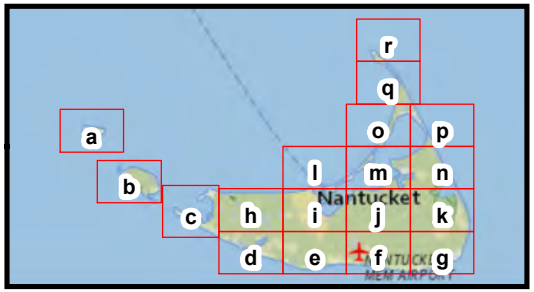
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6g

0 0.25 0.5 1 Miles



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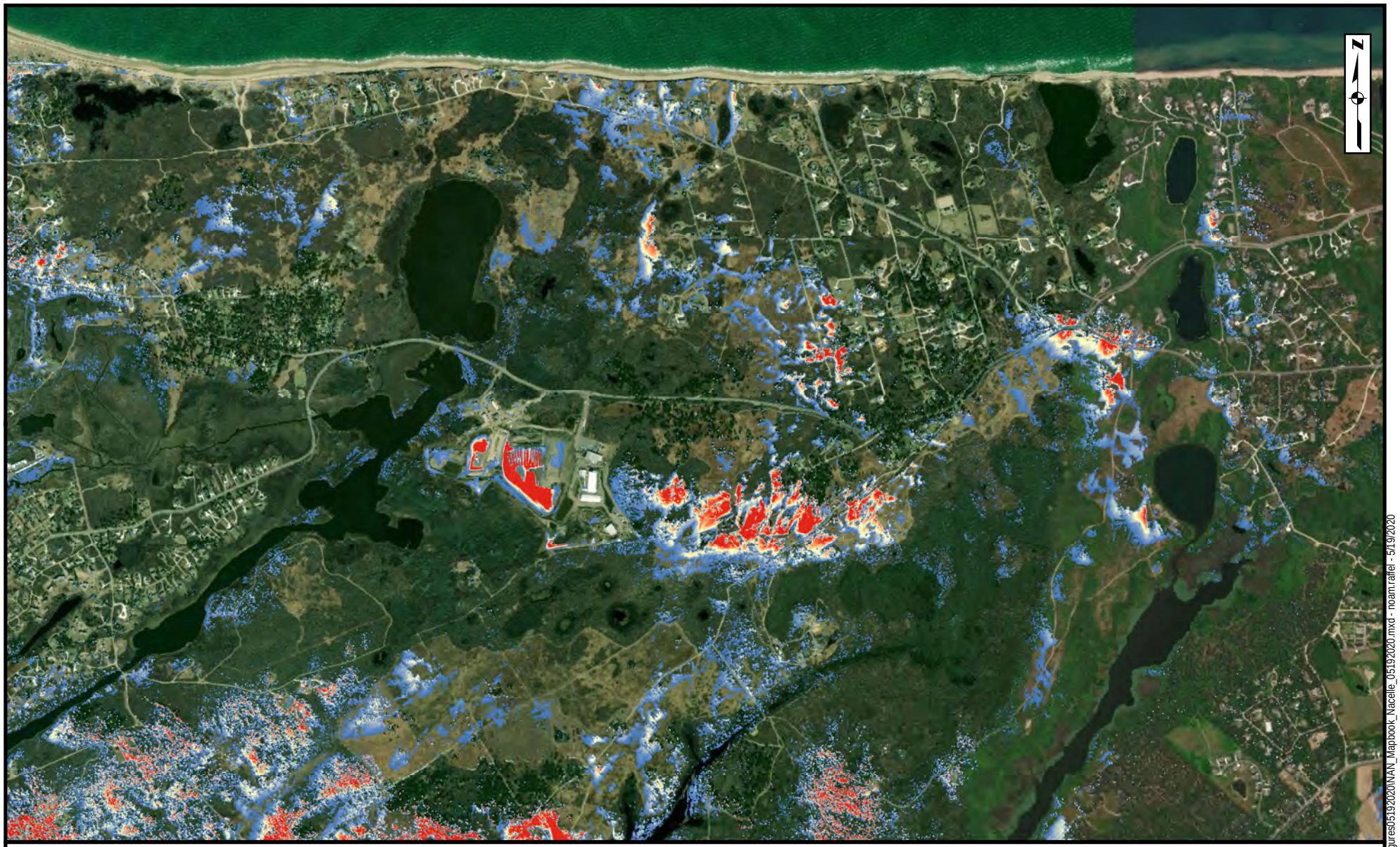


Analysis Points

Number of Visible Turbines

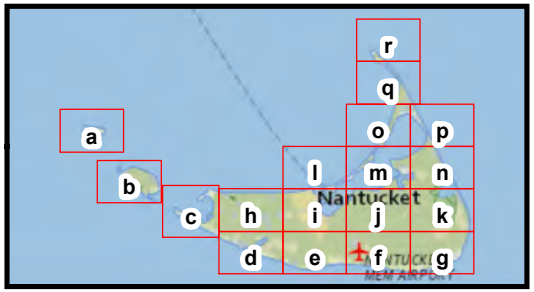
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6h

0 0.25 0.5 1 Miles



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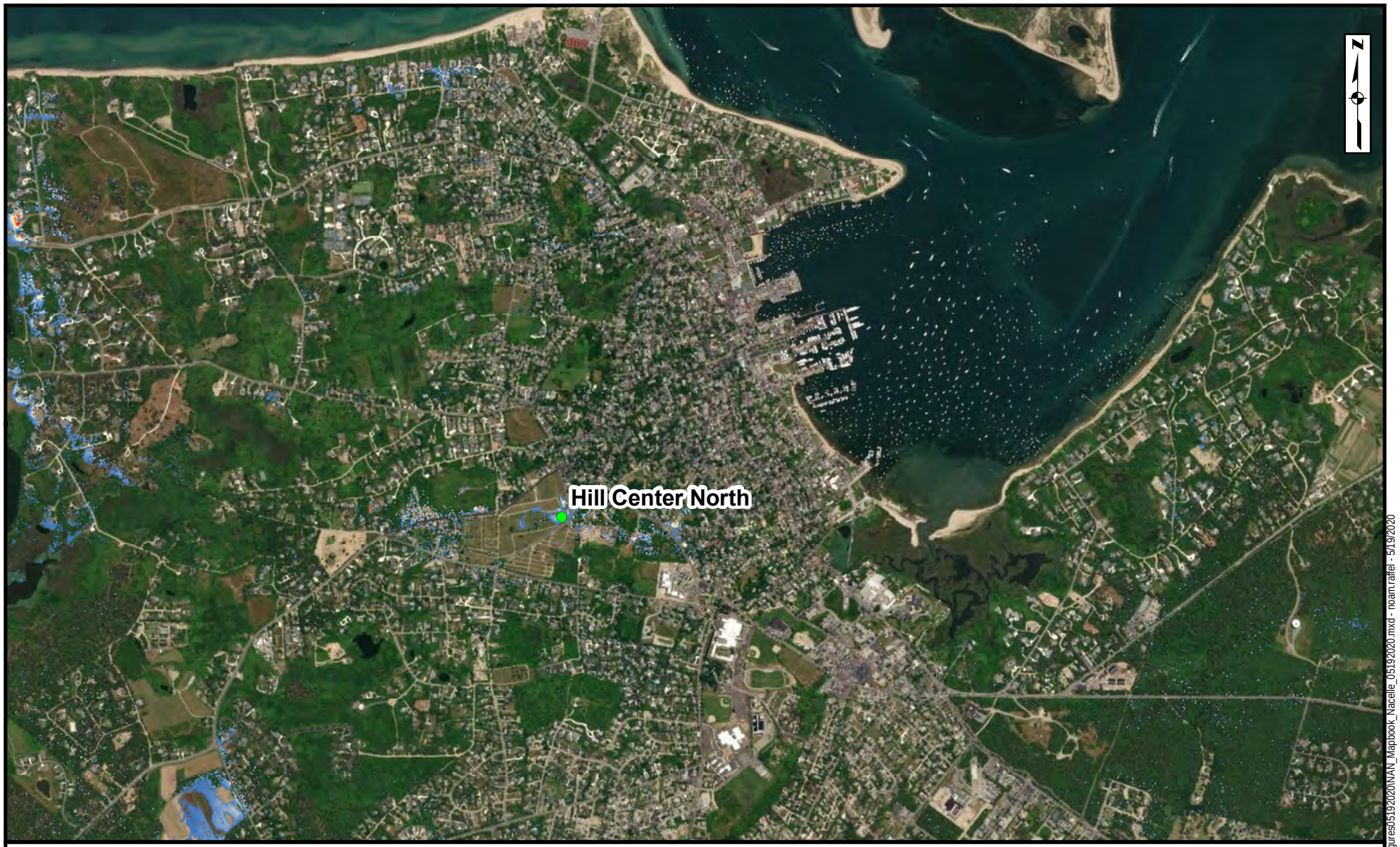


Analysis Points

Number of Visible Turbines

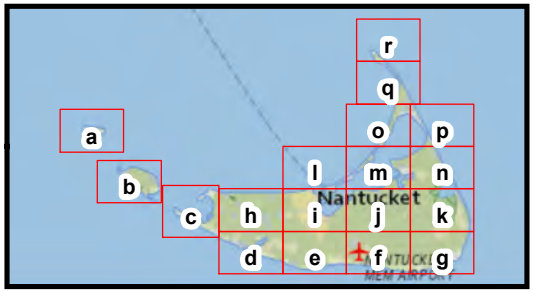
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6i

0 0.25 0.5 1 Miles



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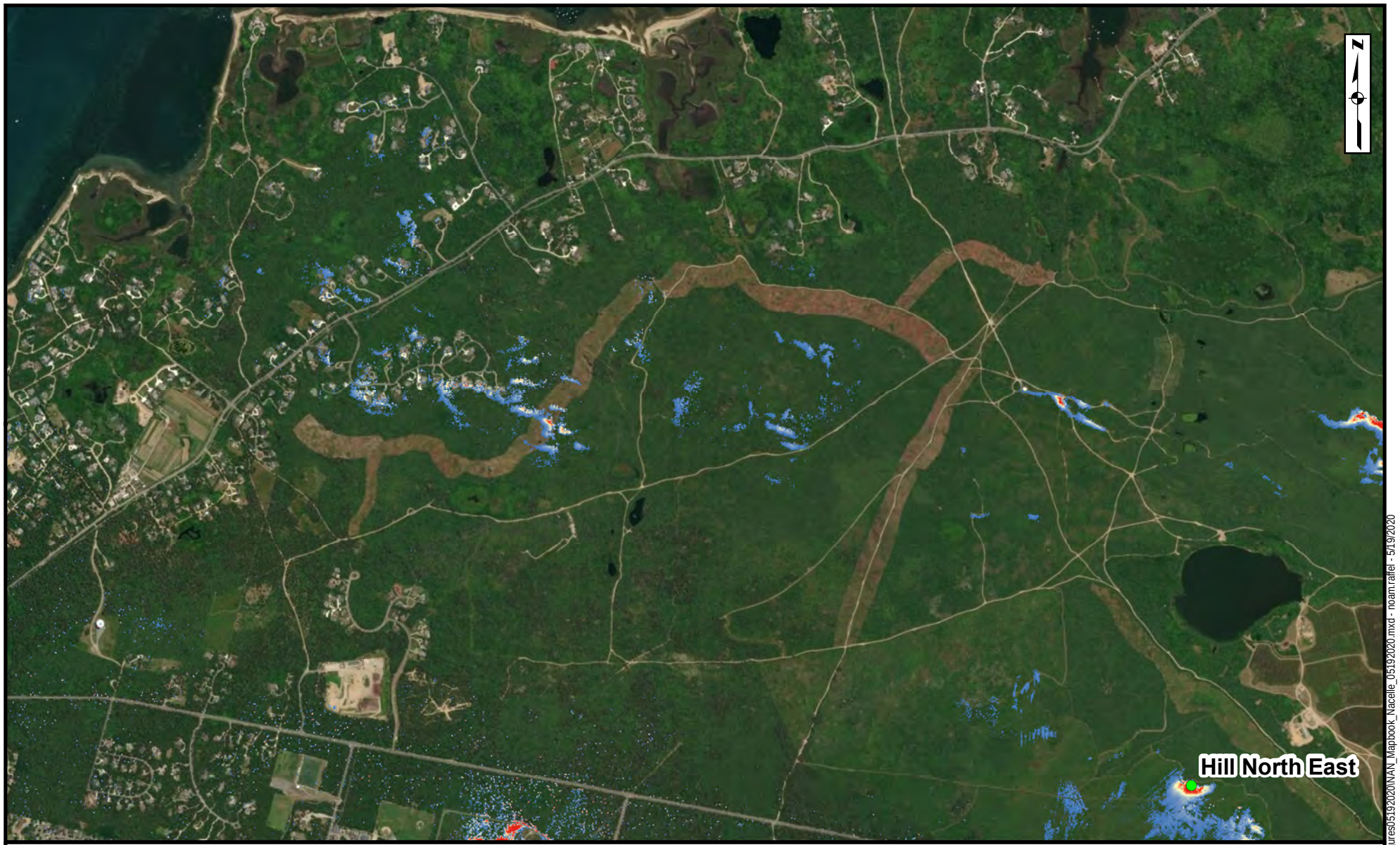


Analysis Points

Number of Visible Turbines

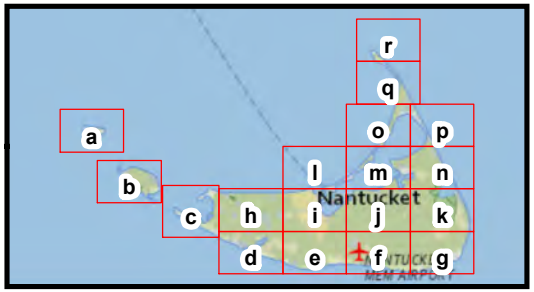
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6j

0 0.25 0.5 1 Miles



C:\Noam_PC\Cape_Wind\Update_March\Figures\Figures05192020\NAN_Mapbook_Nacelle_05192020.mxd - noam.rafel - 5/19/2020

Analysis Points

Number of Visible Turbines

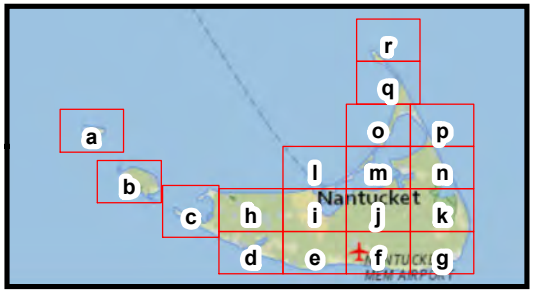
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6k

0 0.25 0.5 1 Miles



C:\Noam_PC\Cape_Wind\Update_March\Figures\Figures05192020\NAN_Mapbook_Nacelle_05192020.mxd - noam.rafiel - 5/19/2020

Analysis Points

Number of Visible Turbines

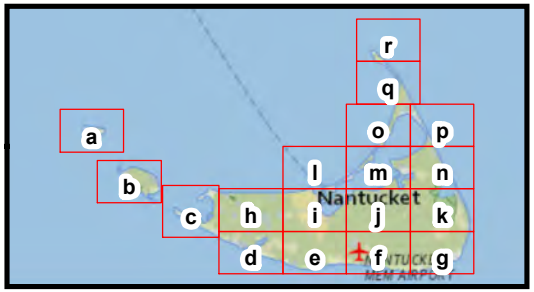
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6l

0 0.25 0.5 1 Miles



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Analysis Points

Number of Visible Turbines

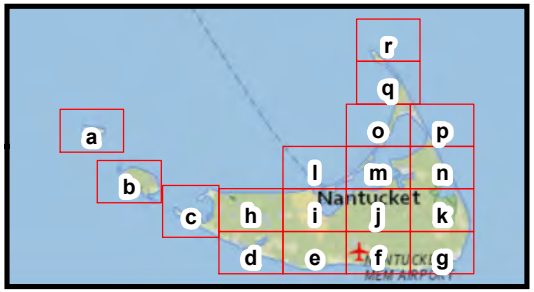
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6m

0 0.25 0.5 1 Miles



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Analysis Points

Number of Visible Turbines

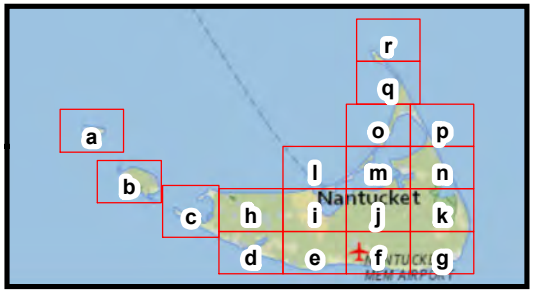
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6n

0 0.25 0.5 1 Miles



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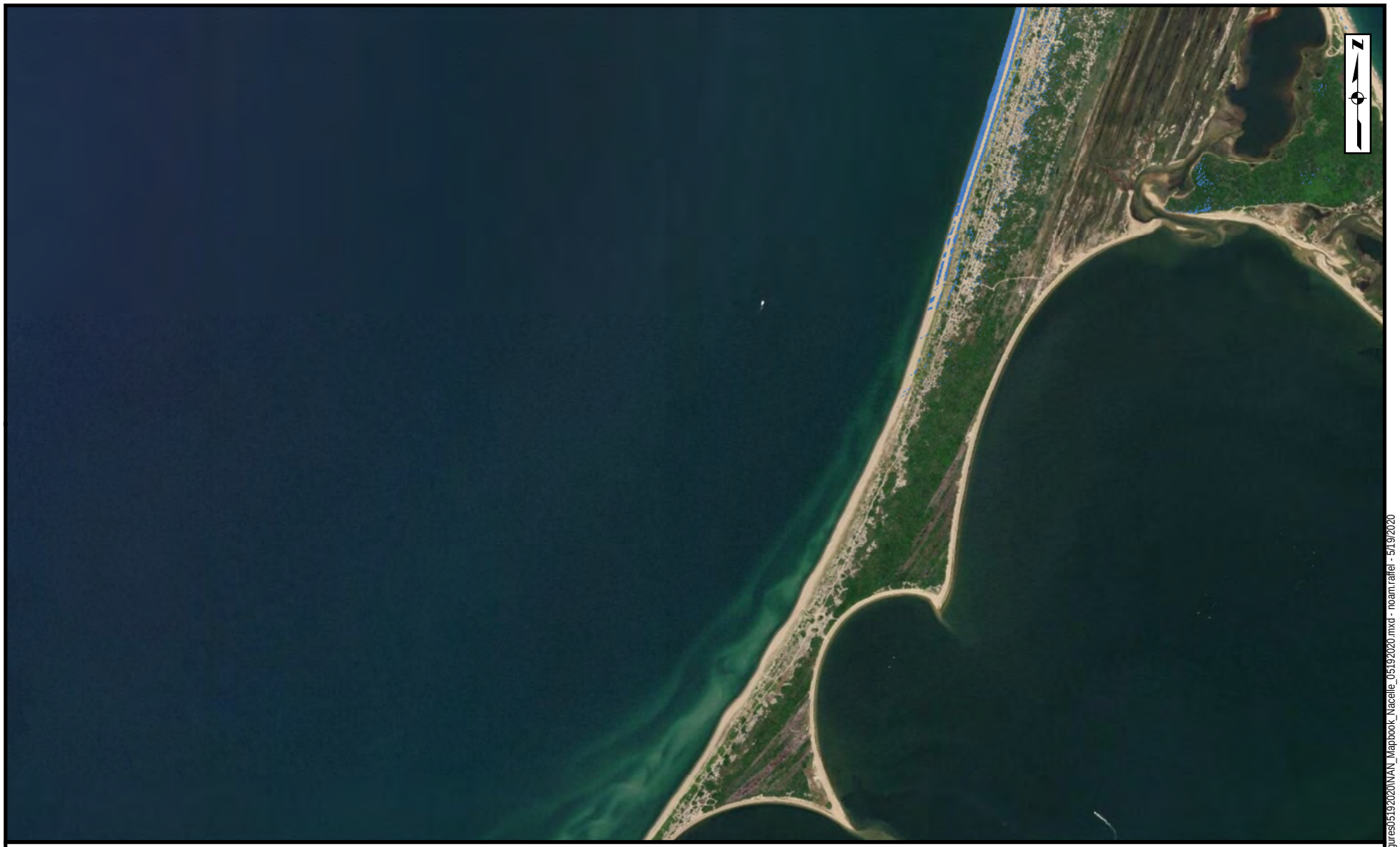


Analysis Points

Number of Visible Turbines

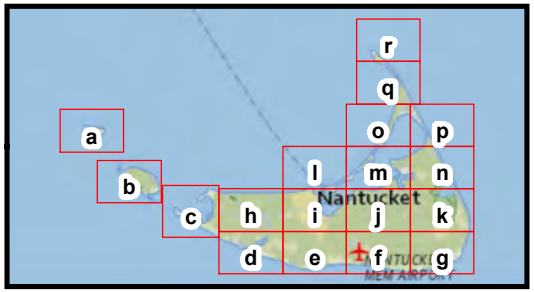
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6o

0 0.25 0.5 1 Miles



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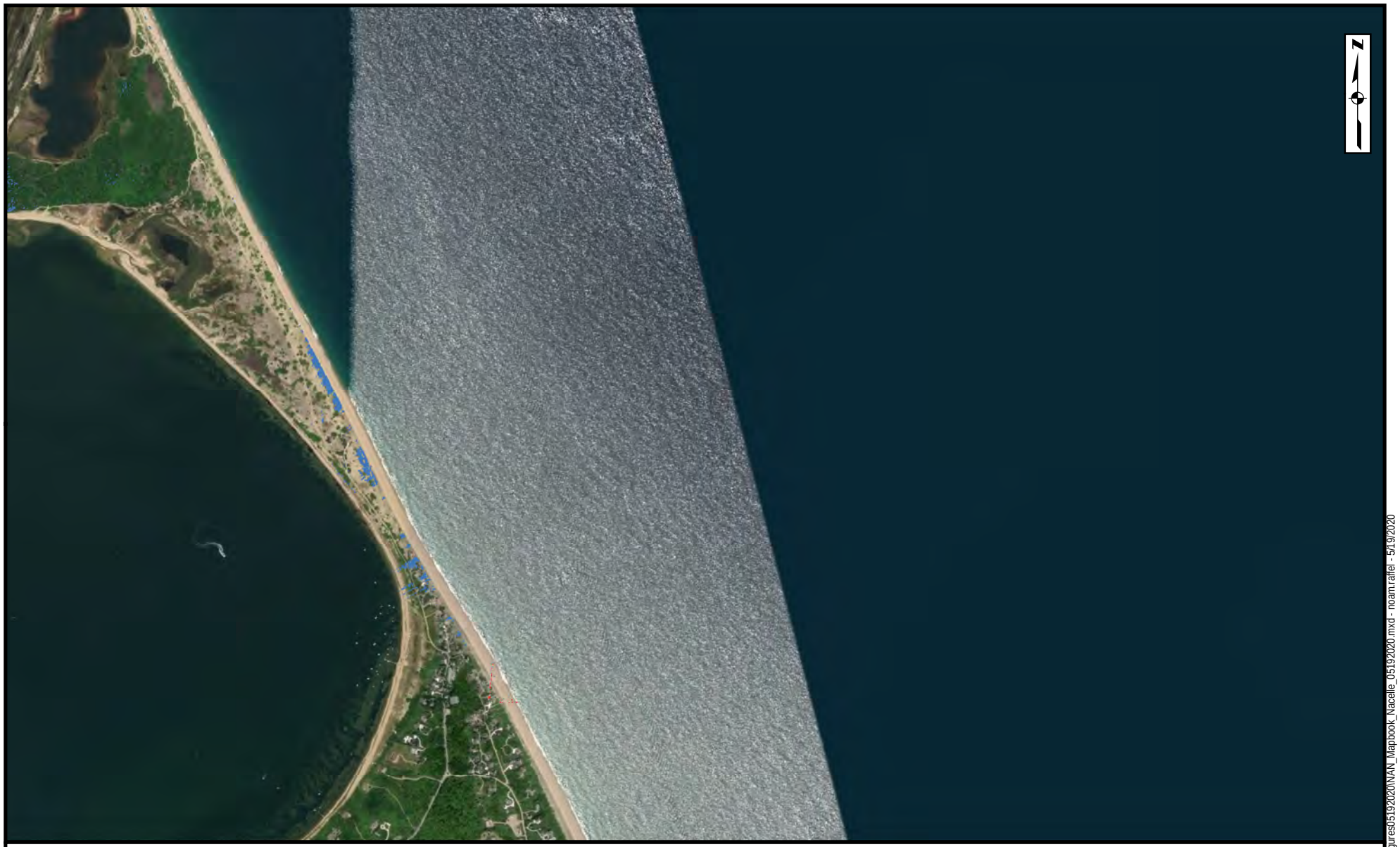


Analysis Points

Number of Visible Turbines

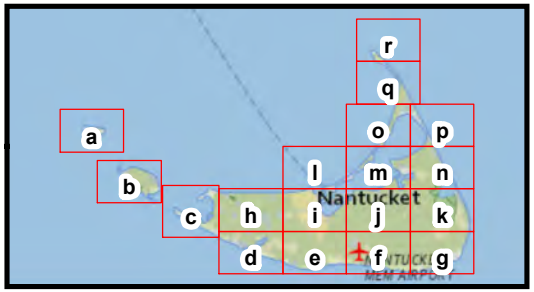
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6p

0 0.25 0.5 1 Miles



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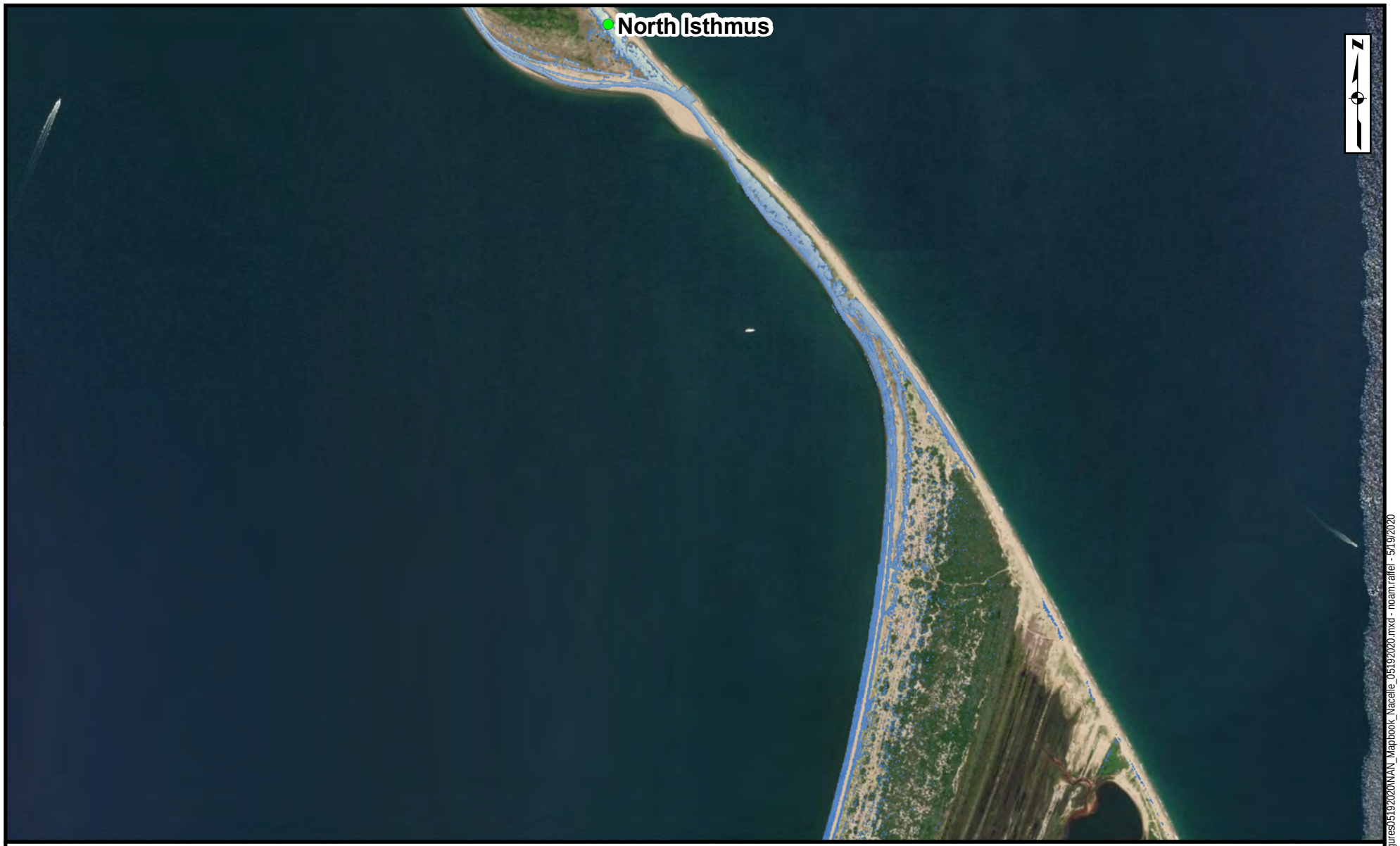


Analysis Points

Number of Visible Turbines

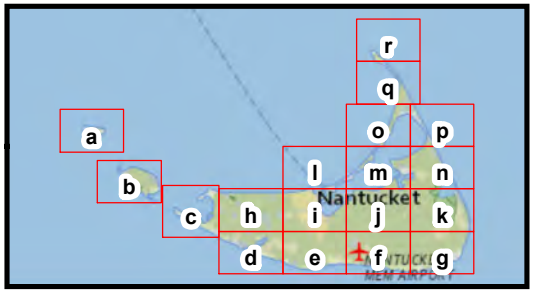
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6q

0 0.25 0.5 1 Miles



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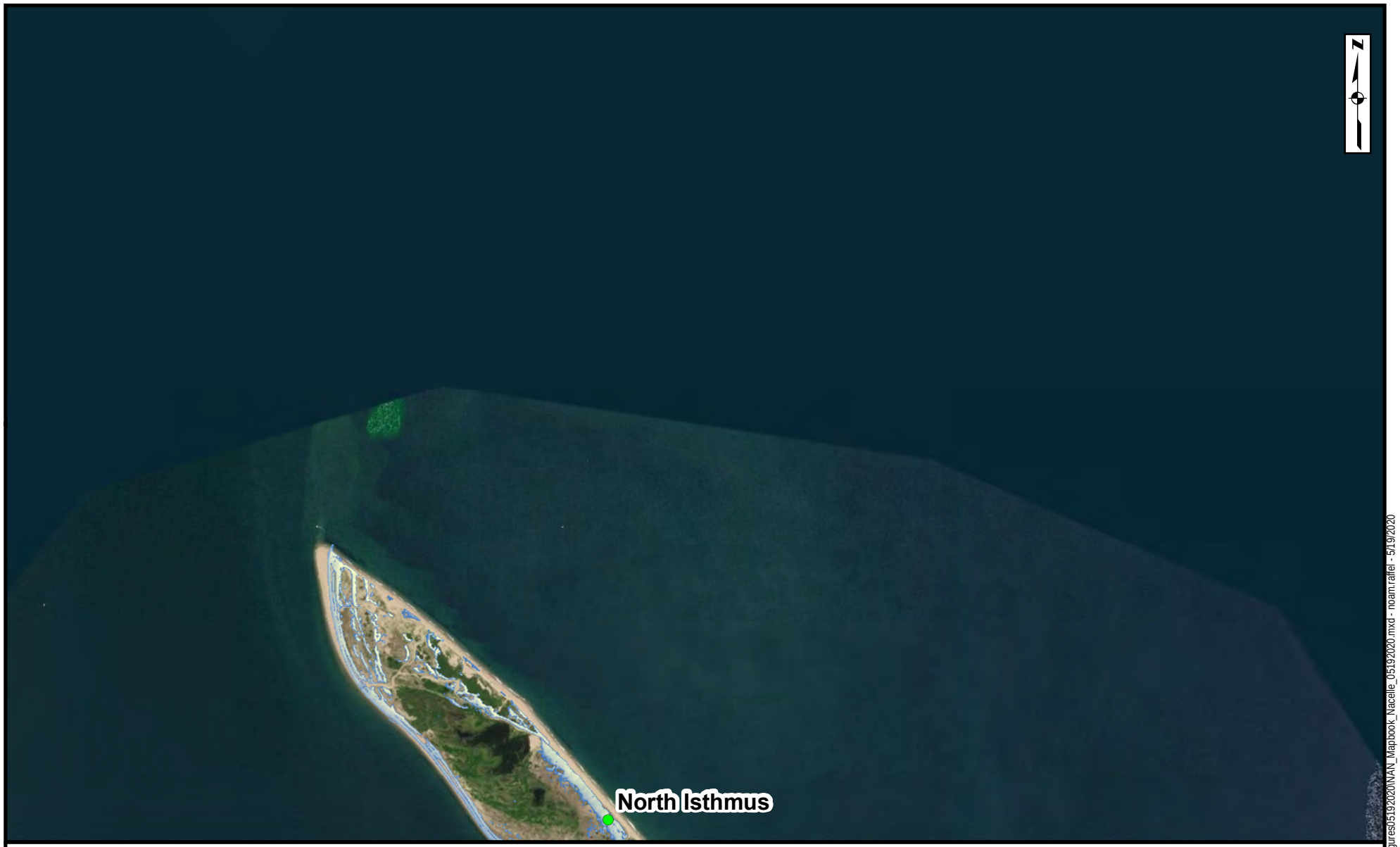


Analysis Points

Number of Visible Turbines

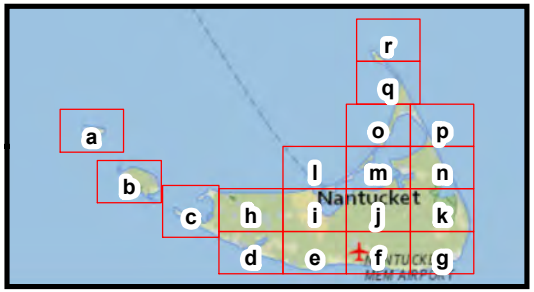
High : 564

Low : 1

Cumulative NacelleTurbine Viewshed Mapbook
Nantucket National Historic Landmark

Appendix A-6r

0 0.25 0.5 1 Miles



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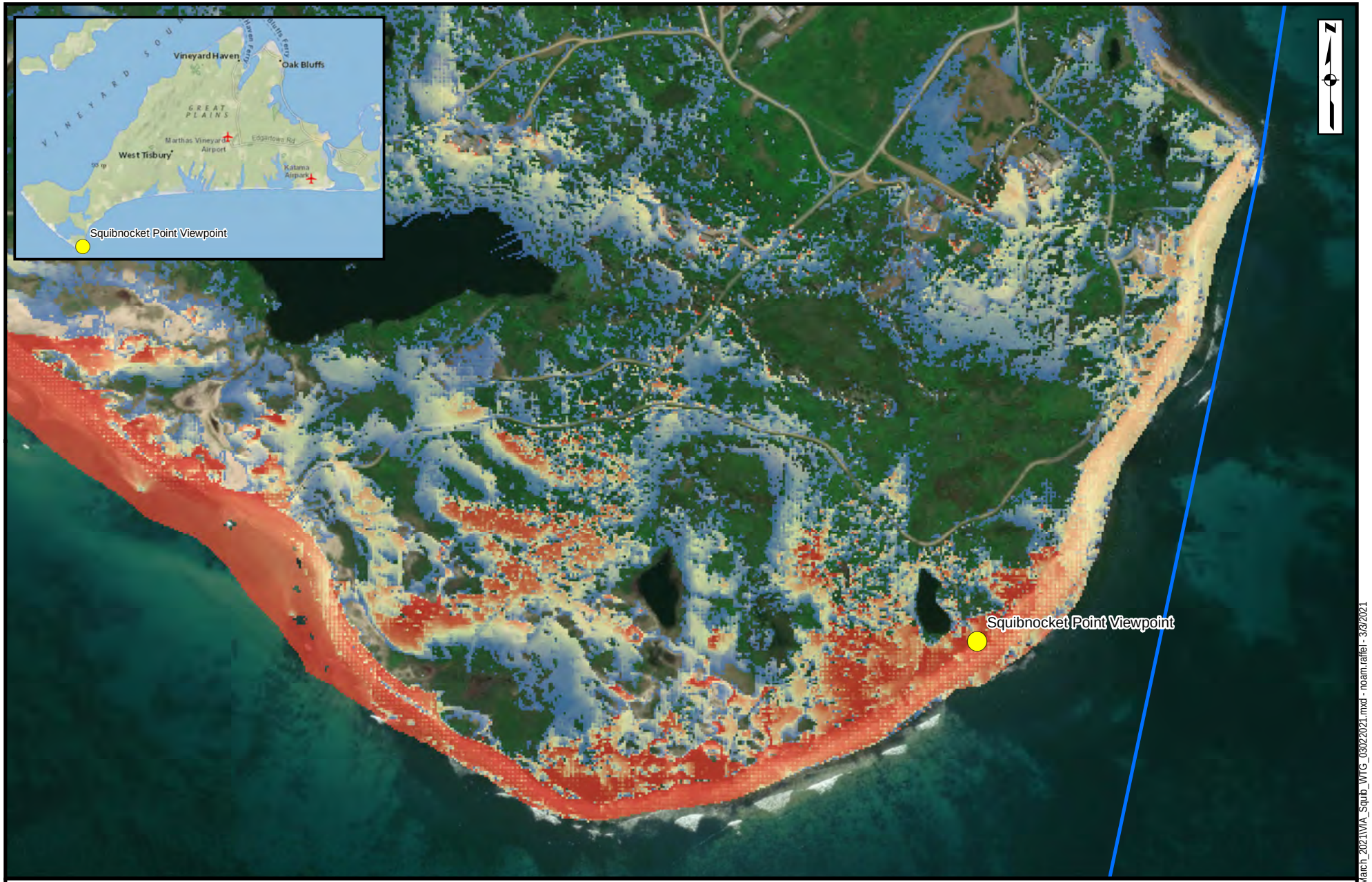

Squibnocket Point Viewpoint

Vineyard Sound and Moshup's Bridge TCP boundary

Visible Turbines

High

Low

0 250 500 1,000 Feet

NOTES:
Aerial Imagery: ESRI World Imagery
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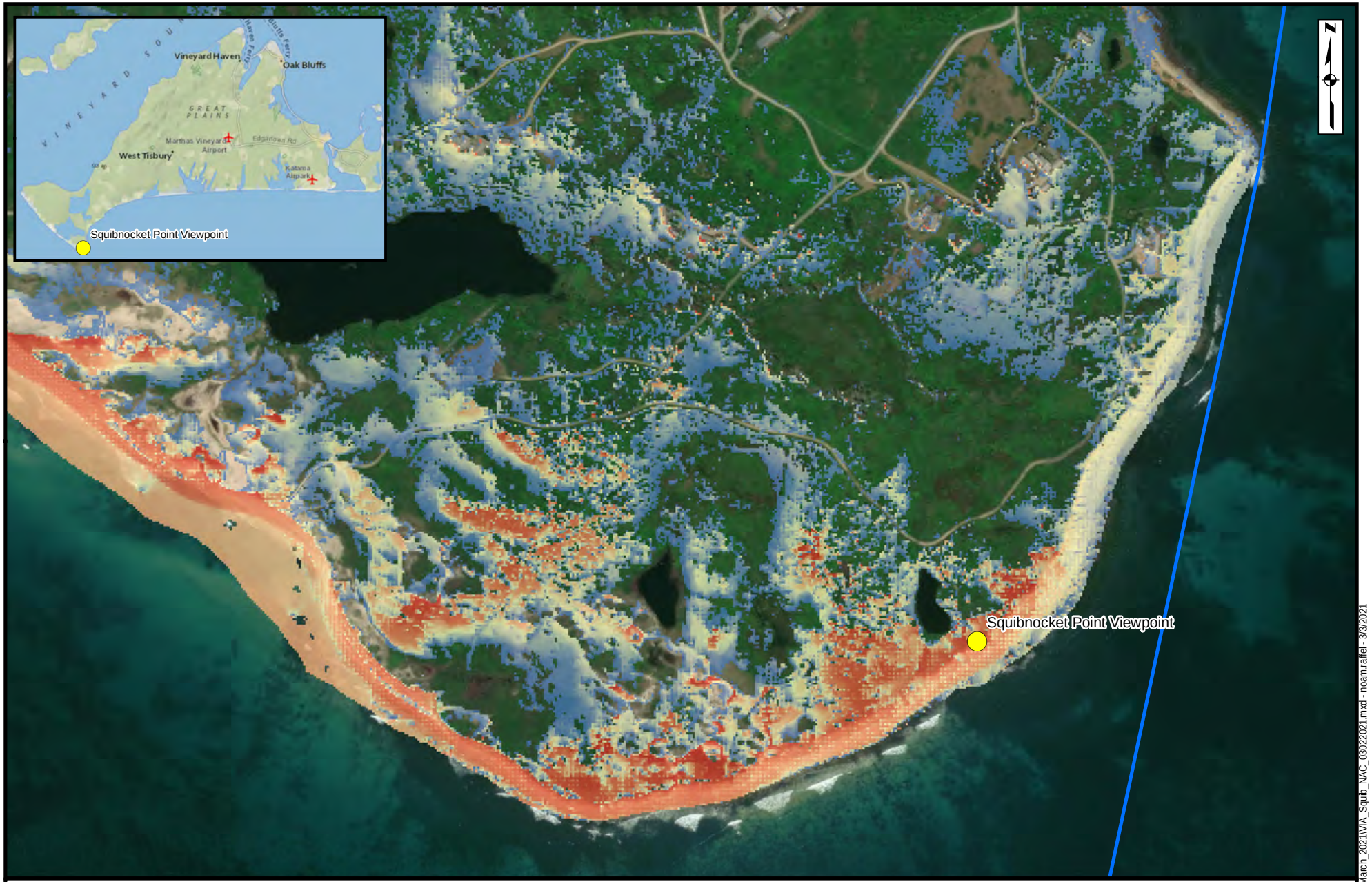
Cumulative Turbine Viewshed
Top of Blade
Squibnocket Point Viewpoint
Martha's Vineyard

Appendix A-7

ERM

C:\Noam_PC\Cape_Wind\Update_March_2021\VIA_Squib_WTG_03022021.mxd - noam.rafel - 3/3/2021



Squibnocket Point Viewpoint

Vineyard Sound and Moshup's Bridge TCP boundary

Visible Turbines

High

Low

0 250 500 1,000 Feet

NOTES:

Aerial Imagery: ESRI World Imagery
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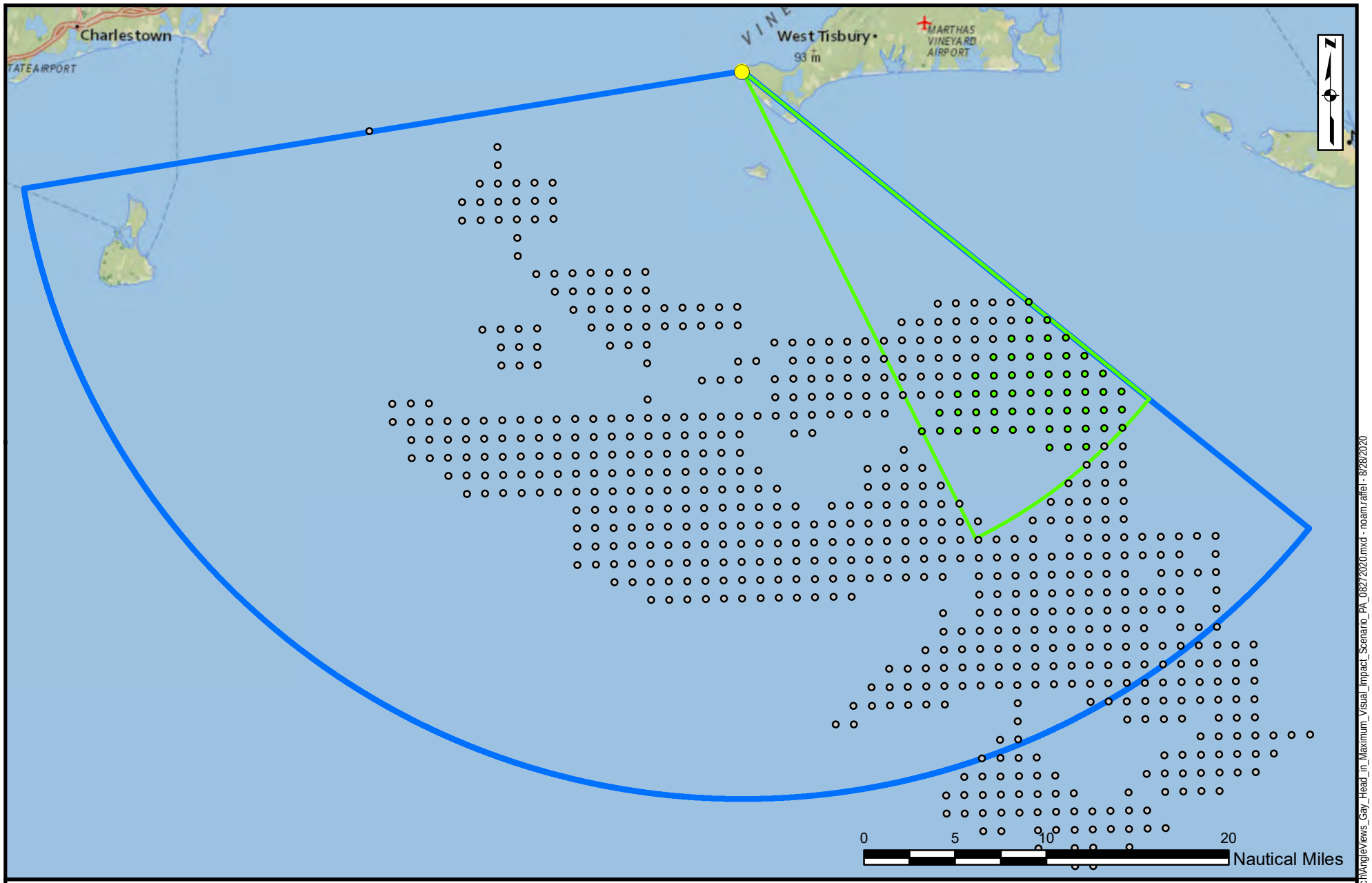
Cumulative Turbine **Nacelle** Viewshed
Squibnocket Point Viewpoint
Martha's Vineyard

Appendix A-8

ERM

C:\Noam_PC\Cape_Wind\Update_March_2021\VIA_Squib_NAC_03022021.mxd - noam.rafel - 3/3/2021

APPENDIX B VIEW ANGLE MAPS



Angle of View

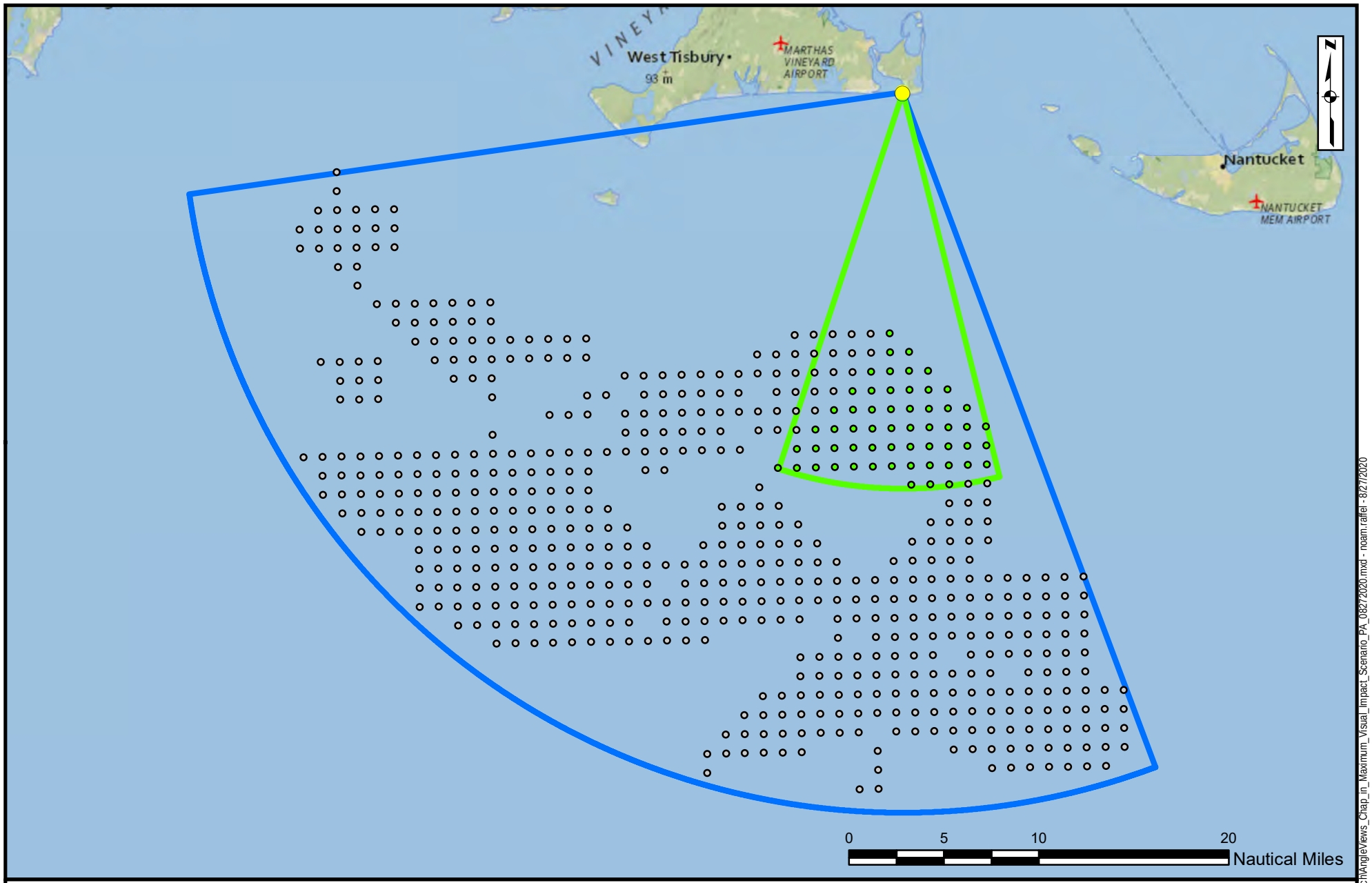
- Vineyard Wind All: 24.4°
- All Turbines: 131.8°

- Gay Head Historic Lighthouse
- Vineyard Wind Turbines
- Other Turbines

NOTES:
Water is included in this viewshed model
Aerial Imagery: ESRI World Imagery
Reproduced under license in ArcGIS 10.7

Angle of Views to Turbines
Visible to Gay Head Lighthouse
Nantucket and Martha's Vineyard

C:\Noam_PC\Cape_Wind\Update_March\AngleViews_Gay_Head_in_Maximum_Visual_Impact_Scenario_PA_08272020.mxd - noam.raifel - 8/28/2020



Angle of View

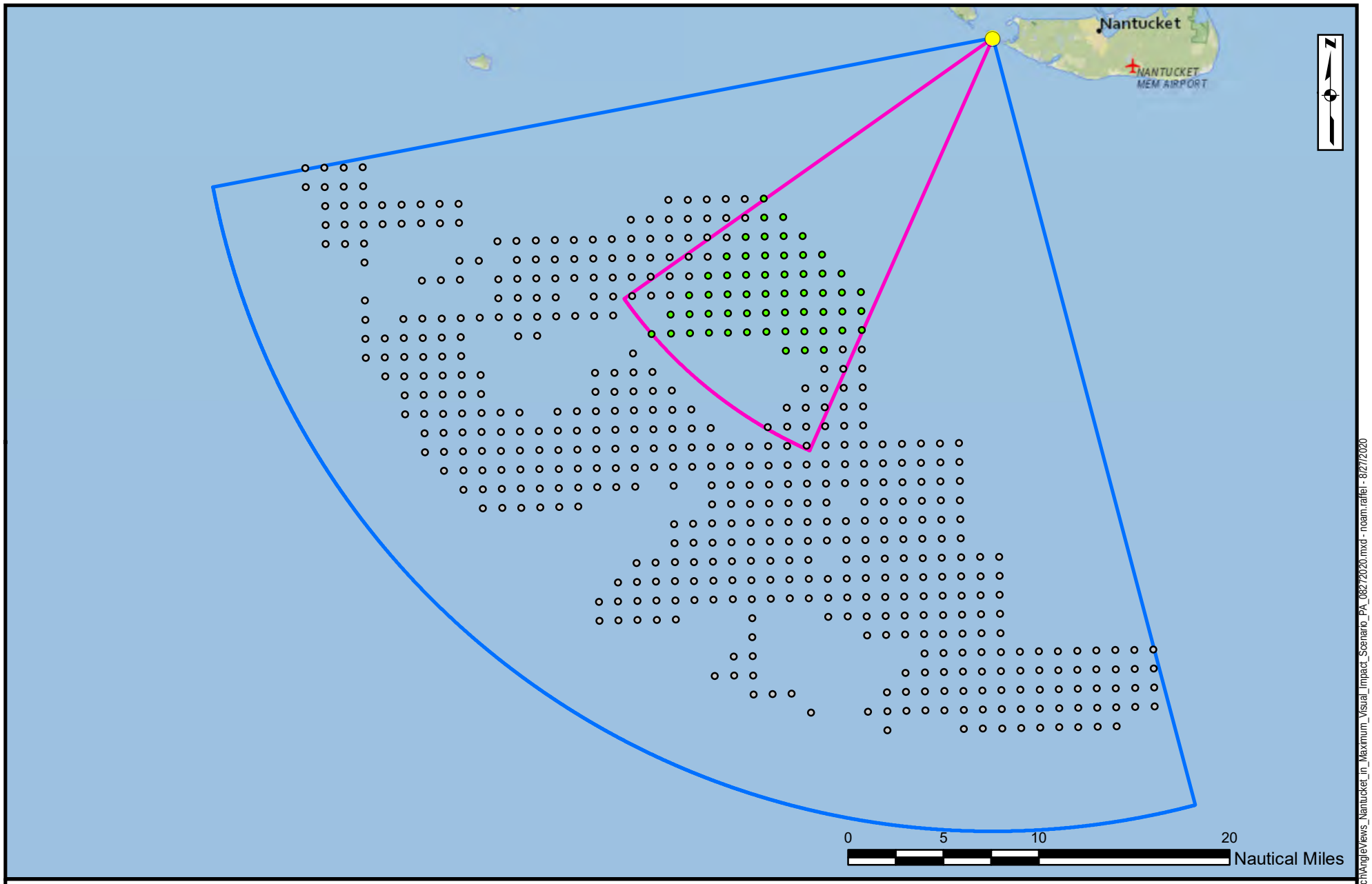
- Vineyard Wind All: 32.27°
- All Turbines: 102.3°

- Chappaquiddick Beach
- Vineyard Wind Turbines
- Other Turbines

NOTES:
Water is included in this viewshed model
Aerial Imagery: ESRI World Imagery
Reproduced under license in ArcGIS 10.7

Angle of Views to Turbines
Visible to Chappaquiddick Beach
Nantucket and Martha's Vineyard

C:\Noam_PC\Cape_Wind\Update_March\AngleViews_Chap_in_Maximum_Visual_Impact_Scenario_PA_08272020.mxd - noam.raifel - 8/27/2020



Angle of View

All Turbines: 93.94°

Vineyard Wind All: 30.7°

Nantucket Beach West

Vineyard Wind Turbines

Other Turbines

NOTES:

Water is included in this viewshed model

Aerial Imagery: ESRI World Imagery

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Angle of Views to Turbines
Visible to Nantucket Beach West
Nantucket and Martha's Vineyard

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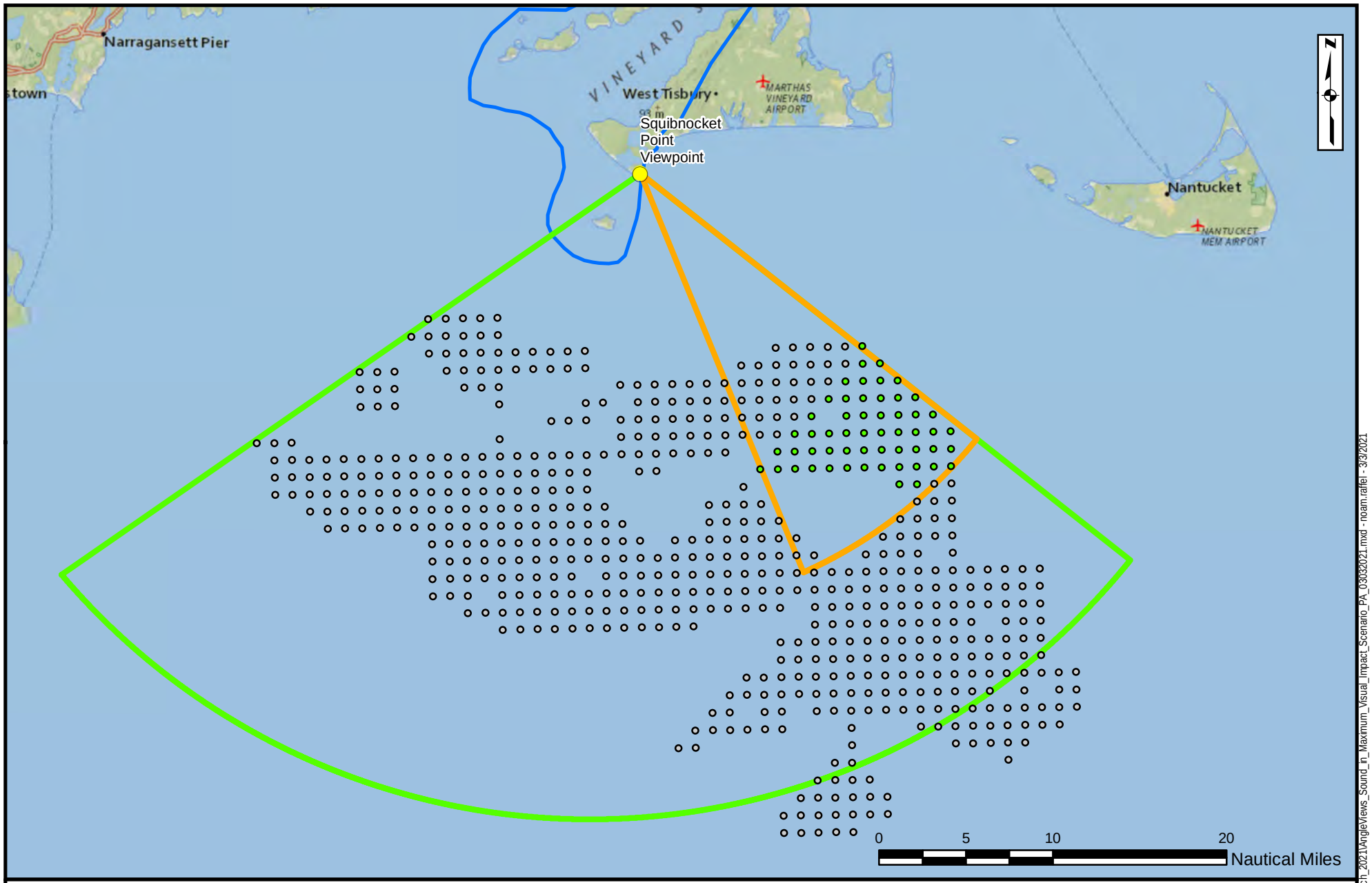

Angle of View

- Vineyard Wind: 29.9°
- All Turbines: 107.4°

- Vineyard Wind Turbines
- Other Turbines
- Squibnocket Point Viewpoint
- Vineyard Sound and Moshup's Bridge TCP boundary

NOTES:
Water is included in this viewshed model
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Angle of Views to Turbines
Visible to Squibnocket Point Viewpoint
Nantucket and Martha's Vineyard

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