MAYFLOWER WIND

Appendix Y3. Aircraft Detection Lighting System Efficacy Analysis

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Mayflower Wind Offshore Wind Project

Mayflower Wind Energy LLC

Offshore Massachusetts

Aircraft Detection Lighting System (ADLS) Efficacy Analysis

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Summary

Capitol Airspace conducted an Aircraft Detection Lighting System (ADLS) efficacy analysis for the Mayflower Wind project (Lease Area OCS-A 0521; gray area, ***Figure 1***) located off the coast of Massachusetts. This analysis utilized historic air traffic data obtained from the Federal Aviation Administration (FAA) in order to determine the total duration that an ADLS-controlled obstruction lighting system would have been activated. The results of this analysis can be used to predict an ADLS's effectiveness in reducing the total amount of time that an obstruction lighting system would be activated.

An ADLS utilizes surveillance radar to track aircraft operating in proximity to the wind project. The ADLS will activate the obstruction lighting system when aircraft enter the light activation volume and will deactivate the system when all aircraft depart. As a result, the ADLS provides nighttime conspicuity on an as-needed basis thereby reducing the amount of time that obstruction lights will be illuminated. Depending on the volume of nighttime flights transiting a wind project's light activation volume, an ADLS could result in a significant reduction in the amount of time obstruction lights are illuminated.

Historical air traffic data for flights passing through the light activation volume indicates that ADLS-controlled obstruction lights would have been activated for a total of 4 minutes and 46 seconds over a one-year period. Considering the local sunrise and sunset times, an ADLS-controlled obstruction lighting system could result in over a 99% reduction in system activated duration as compared to a traditional always-on obstruction lighting system.

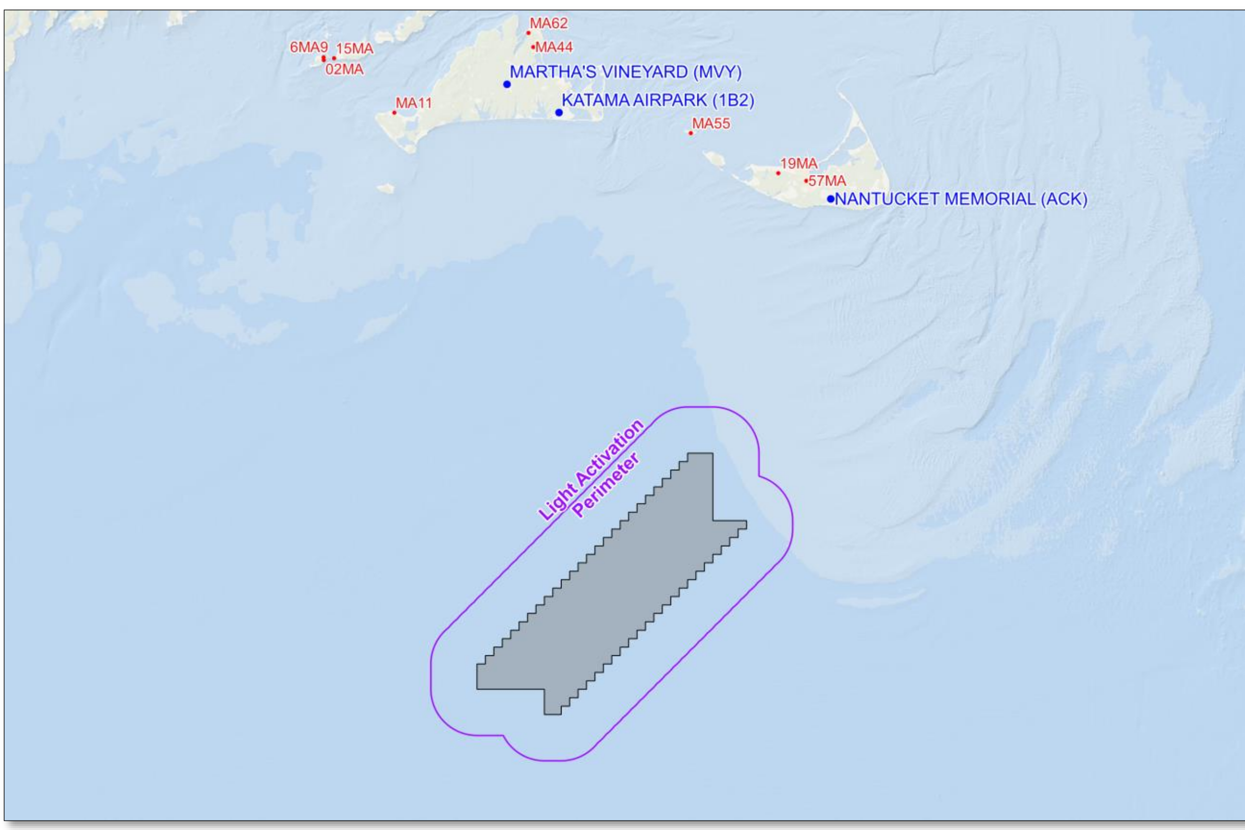

Figure 1: Public-use (blue) and private-use (red) airports in proximity to the Mayflower Wind project

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Methodology

Capitol Airspace analyzed FAA National Offload Program (NOP) radar returns in proximity to the Mayflower Wind project for the period between February 1, 2019 and January 31, 2020. FAA NOP data only includes secondary radar returns which are created if the identified aircraft is equipped with a transponder. Aircraft operations without an active transponder were not captured as part of this dataset. Within 75 nautical miles of the wind project, the NOP data contained 226,664,159 different radar returns from six different air traffic control (ATC) facilities.[1] These radar returns were associated with 1,811,898 unique flight tracks.

The following process was used to determine the frequency of nighttime aviation operations in proximity to the Mayflower Wind project:

1. **Define Three-Dimensional Light Activation Volume –** In accordance with FAA Advisory Circular 70/7460-1L, obstruction lights controlled by an ADLS must be activated and illuminated prior to an aircraft reaching three nautical miles from, and 1,000 feet above, any obstruction. However, the actual light activation volume will vary depending on the ADLS. At the time of this analysis, a specific ADLS had not been selected for the Mayflower Wind project. In order to account for varying radar systems as well as aircraft speeds and descent rates, Capitol Airspace assessed a 3.55 nautical mile buffer (solid purple outline, ***Figure 2***) around the wind project at altitudes up to 3,500 feet above the highest wind turbine (4,400 and 4,600 feet above mean sea level [AMSL] based on 808 and 1,067-foot AMSL wind turbines (the highest wind turbine in the Mayflower Wind project design envelope), respectively).
2. **Calculate Sunrise and Sunset –** Sunrise and sunset times were calculated for each day of the year based on the United States Naval Observatory definition of sunrise and sunset. Sunrise time was calculated at the westernmost edge of the light activation perimeter. Sunset time was calculated at the easternmost edge of the light activation perimeter. The data was validated through comparison to the ***United States Naval Oceanography Portal***.
3. **Select Nighttime Radar Returns –** Since traditional obstruction lights can rely on ambient light sensors to identify darkness, nighttime was considered to occur between 30 minutes prior to sunset until 30 minutes after sunrise. This represents the time during which a traditional obstruction lighting system would likely be activated. All radar returns within the light activation volume that occurred during this period were evaluated. In accordance with guidance provided by the FAA, if an ADLS loses track of an aircraft, a 30-minute timer should be initiated to keep the obstruction lights activated while the aircraft can clear the wind project area. Since the application of ADLS requires site specific radar surveillance systems that will be focused on the project area, Capitol Airspace does not anticipate a likelihood of dropped tracks.
4. **Remove Time Overlap –** To remove the duration of overlap occurring when more than one flight transits the light activation volume at the same time, each nighttime flight was compared to every other nighttime flight. Where overlapping flights were found, the overlapping flight's duration within the light activation volume was removed from the total obstruction lighting system activation time.

[1] Source facilities included Boston Consolidated (A90) Terminal Radar Approach Control (TRACON), Providence (G90) TRACON, New York (N90) TRACON, Yankee (Y90) TRACON, Boston (ZBW) Air Route Traffic Control Center (ARTCC), Washington (ZDC) ARTCC, and New York (ZNY) ARTCC.

Results

FAA NOP data indicates that as many as 16 flights had at least one radar return within the light activation volume (purple outline, ***Figure 2***). However, many of these flights occurred during daytime. Using local sunrise and sunset times, Capitol Airspace determined that as many as four flights (yellow tracks, ***Figure 3***) had at least one radar return within the light activation volume during the nighttime period when a traditional obstruction lighting system would be activated.

Each of the four flights was further evaluated to determine the amount of time it remained within the light activation volume. Over a one-year period, these flights would have resulted in a total obstruction light system activated duration of 4 minutes and 46 seconds for both 808 and 1,067-foot AMSL wind turbines. Considering that the Mayflower Wind project ADLS light activation perimeter observes approximately 4,752 hours of nighttime each year, an ADLS-controlled obstruction lighting system could result in over a 99% reduction in system activated duration as compared to a traditional always-on obstruction lighting system (***Table 1***).

Month	Nighttime Observed (HHH:MM:SS)	Light System Activated Duration (HH:MM:SS)	
		808-foot AMSL WTG	1,067-foot AMSL WTG
January	483:23:51	00:00:00 (0.000%)	00:00:00 (0.000%)
February	407:54:09	00:00:00 (0.000%)	00:00:00 (0.000%)
March	411:28:40	00:00:00 (0.000%)	00:00:00 (0.000%)
April	357:34:04	00:00:00 (0.000%)	00:00:00 (0.000%)
May	333:47:55	00:00:00 (0.000%)	00:00:00 (0.000%)
June	305:25:22	00:00:00 (0.000%)	00:00:00 (0.000%)
July	324:31:58	00:00:12 (0.001%)	00:00:12 (0.001%)
August	355:39:23	00:00:00 (0.000%)	00:00:00 (0.000%)
September	383:00:15	00:00:00 (0.000%)	00:00:00 (0.000%)
October	437:28:50	00:00:00 (0.000%)	00:00:00 (0.000%)
November	458:53:10	00:04:34 (0.017%)	00:04:34 (0.017%)
December	493:23:13	00:00:00 (0.000%)	00:00:00 (0.000%)
Total	**4752:30:50**	**00:04:46 (0.002%)**	**00:04:46 (0.002%)**

Table 1: Typical duration of light system activation time during each month

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

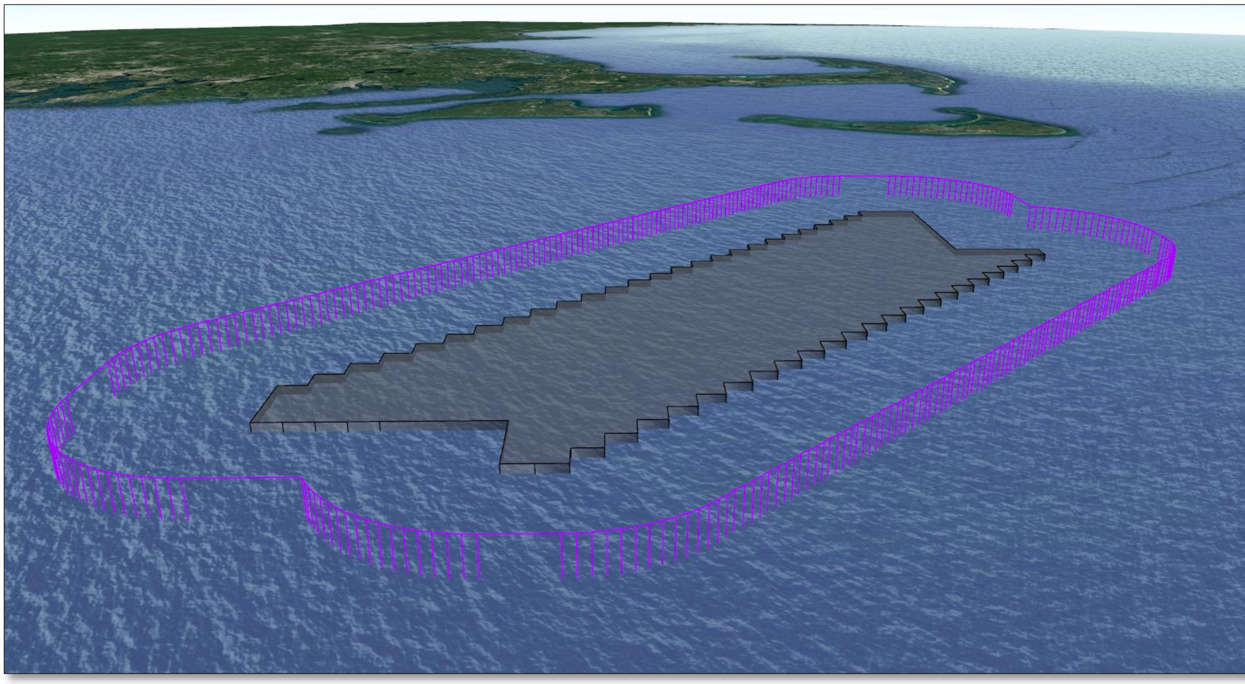

Figure 2: Mayflower Wind project (gray) and light activation volume (purple outline)

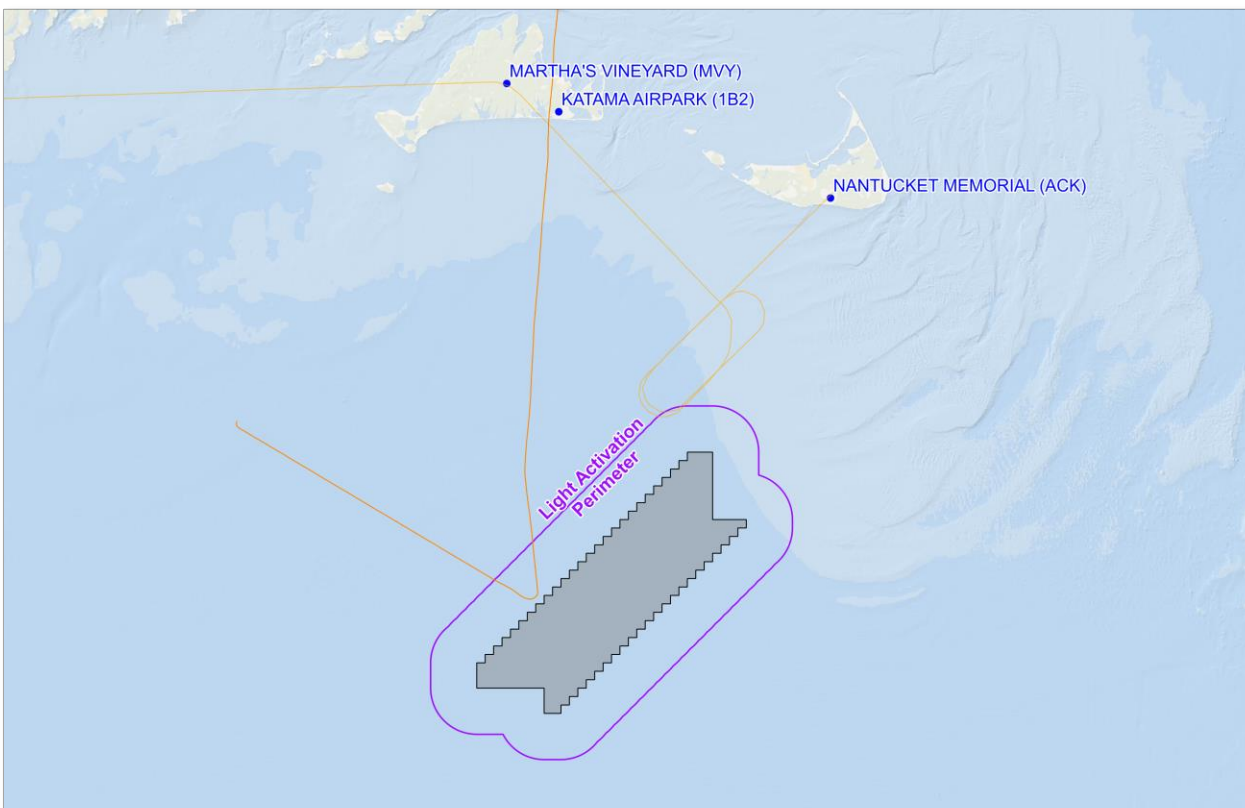

Figure 3: Flight tracks (yellow) that would have activated ADLS obstruction lights