

## Appendix II-M4

### Aircraft Detection Lighting System (ADLS) Efficacy Analysis

#### Note:

On March 26, 2021, Atlantic Shores Offshore Wind, LLC (Atlantic Shores) submitted a Construction and Operations Plan (COP) to BOEM for the southern portion of Lease OCS-A 0499. On June 30, 2021, the New Jersey Board of Public Utilities (NJ BPU) awarded Atlantic Shores an Offshore Renewable Energy Credit (OREC) allowance to deliver 1,509.6 megawatts (MW) of offshore renewable wind energy into the State of New Jersey. In response to this award, Atlantic Shores updated Volume 1 of the COP to divide the southern portion of Lease OCS-A 0499 into two separate and electrically distinct Projects. Project 1 will deliver renewable energy under this OREC allowance and Project 2 will be developed to support future New Jersey solicitations and power purchase agreements.

As a result of the June 30, 2021 NJ BPU OREC award, Atlantic Shores updated Volume I (Project Information) of the COP in August 2021 to reflect the two Projects. COP Volume II (Affected Environment) and applicable Appendices do not currently include this update and will be updated to reflect Projects 1 and 2 as part Atlantic Shores' December 2021 COP revision.

# Atlantic Shores Offshore Wind Project

Environmental Design & Research

*Offshore Atlantic and Ocean Counties, New Jersey*

---

*Aircraft Detection Lighting System (ADLS) Efficacy Analysis*

February 4, 2021



Capitol Airspace Group

*capitolairspace.com*

*(703) 256 - 2485*



## Summary

Capitol Airspace conducted an Aircraft Detection Lighting System (ADLS) efficacy analysis for the Atlantic Shores Offshore Wind Project (the Project, blue area, [Figure 1](#)) located off the coast of Atlantic, Monmouth, and Ocean Counties, New Jersey. An ADLS is a sensor-based system designed to detect aircraft as they approach an obstruction or group of obstructions and automatically activates appropriate obstruction lighting until they are no longer needed by the aircraft. This technology reduces the impact of nighttime lighting on nearby communities, and migratory birds and extends the life expectancy of the obstruction lights.<sup>1</sup> 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 for the Project (blue area, [Figure 1](#)) as well as for the smaller Wind Turbine Area (the WTA, dashed orange outline, [Figure 1](#)). The results of this analysis will 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 Project. The ADLS will activate the obstruction lighting system when aircraft enter the light activation volume<sup>2</sup> and will deactivate the system when all aircraft depart the light activation volume. 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 project's light activation volume, an ADLS could result in a significant reduction in the amount of time obstruction lights are illuminated.

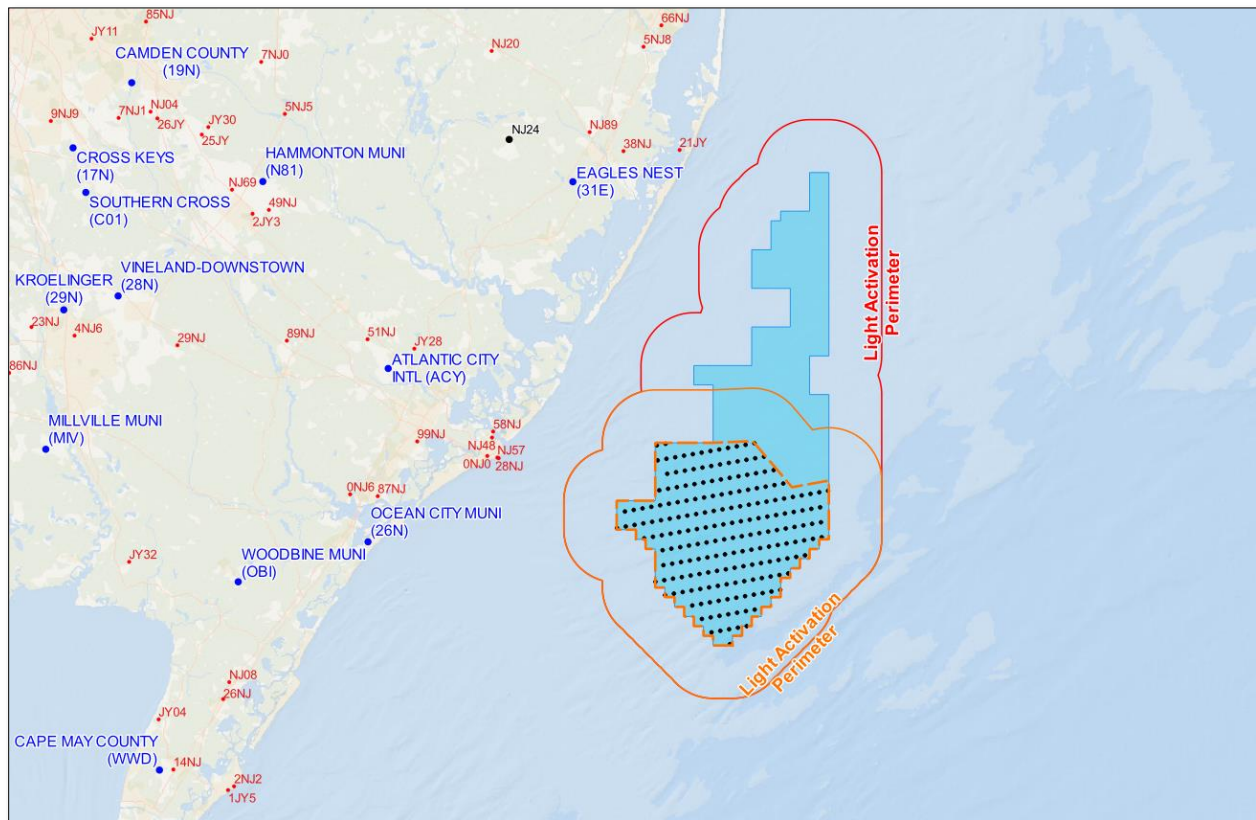
Historical air traffic data for flights passing through the Project light activation volume indicates that ADLS-controlled obstruction lights would have been activated for a total of 10 hours 20 minutes and 47 seconds over a one-year period for 880- or 890-foot-tall wind turbines. Light activation duration increases slightly for 1,050-foot-tall wind turbines to 10 hours 51 minutes and 16 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.

Historical air traffic data for flights passing through the WTA light activation volume indicated that ADLS-controlled obstruction lights would have been activated for a total of 6 hours 53 minutes and 4 seconds over a one-year period for 880- or 890-foot-tall wind turbines. Light activation duration increases slightly for 1,050-foot-tall wind turbines to 8 hours 36 minutes and 55 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.

---

<sup>1</sup> FAA Marking and Lighting Advisory Circular AC 70/7460-1M, Chapter 10. Aircraft Detection Lighting Systems, Purpose, 11/16/2020

<sup>2</sup> Light Activation Volume – A three-dimensional volume of airspace, or coverage area, around the obstructions with a minimum 3 nautical mile perimeter around the edge of the Project, and a minimum of 1,000 feet above the highest part of the obstructions in the Project.



**Figure 1: Public-use (blue), private-use (red), and military (black) airports in proximity to the Atlantic Shores offshore wind project with a lateral depiction of the Project Light Activation Volume (red outline) and WTA Light Activation Volume (orange outline)**



## Methodology

Capitol Airspace analyzed FAA National Offload Program (NOP) radar returns in proximity to the Project for the period that occurred between January 1, 2019 and December 31, 2019. 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 Project, the NOP data contained 936,495,259 different radar returns from 15 different air traffic control (ATC) facilities.<sup>3</sup> These radar returns were associated with 8,058,387 unique flight tracks.

The following process was followed to determine the frequency of nighttime aviation operations in proximity to the Project:

1. **Define Three-Dimensional Light Activation Volume** – In accordance with FAA Advisory Circular 70/7460-1M, 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 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 red 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 880/890- and 1,050-foot-tall wind turbines, 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.<sup>4</sup> Sunrise time was calculated at the westernmost edge of the light activation volume. Sunset time was calculated at the easternmost edge of the light activation volume.
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.

---

<sup>3</sup> Source facilities included Allentown (ABE) TRACON, Atlantic City (ACY) TRACON, Albany (ALB) TRACON, Wilkes-Barre (AVP) TRACON, Harrisburg (MDT) TRACON, New York (N90) TRACON, Norfolk (ORF) TRACON, Potomac (PCT) TRACON, Philadelphia (PHL) TRACON, Reading (RDG) TRACON, Yankee (Y90) TRACON, Boston (ZBW) ARTCC, Washington (ZDC) ARTCC, New York (ZNY) ARTCC, and Cleveland (ZOB) ARTCC.

<sup>4</sup> Sunrise and sunset conventionally refer to the times when the upper edge of the disk of the Sun is on the horizon, considered unobstructed relative to the location of interest. Atmospheric conditions are assumed to be average, and the location is in a level region on the Earth's surface. (U.S. Naval Observatory Astronomical Applications Department: Rise, Set, and Twilight Definitions, 8/16/2004).

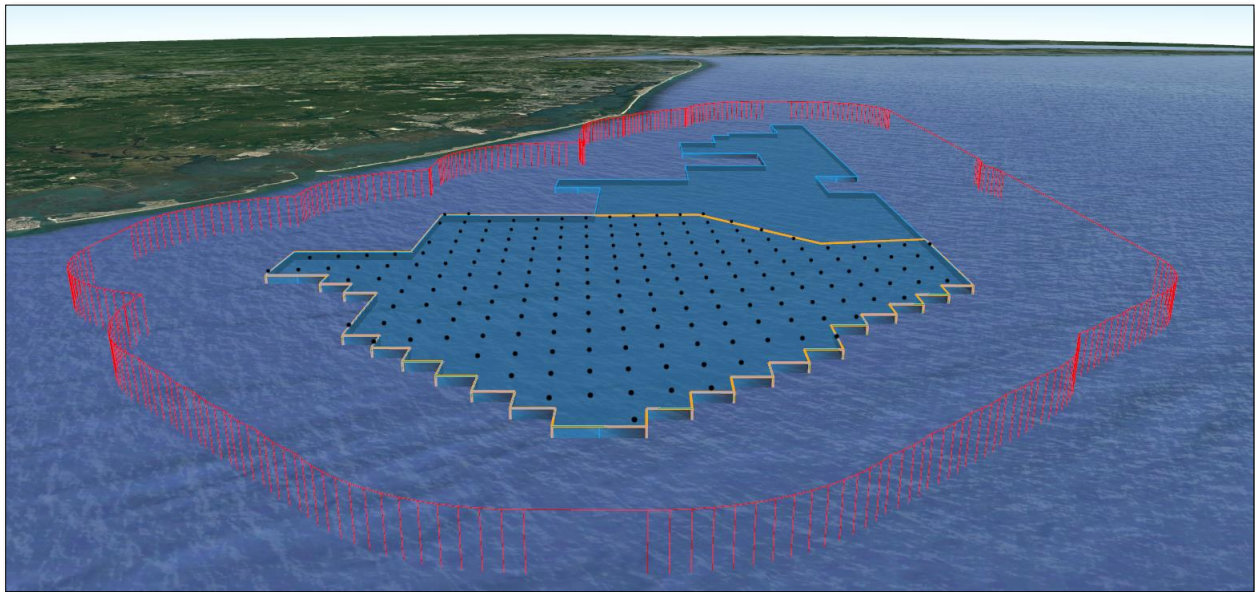




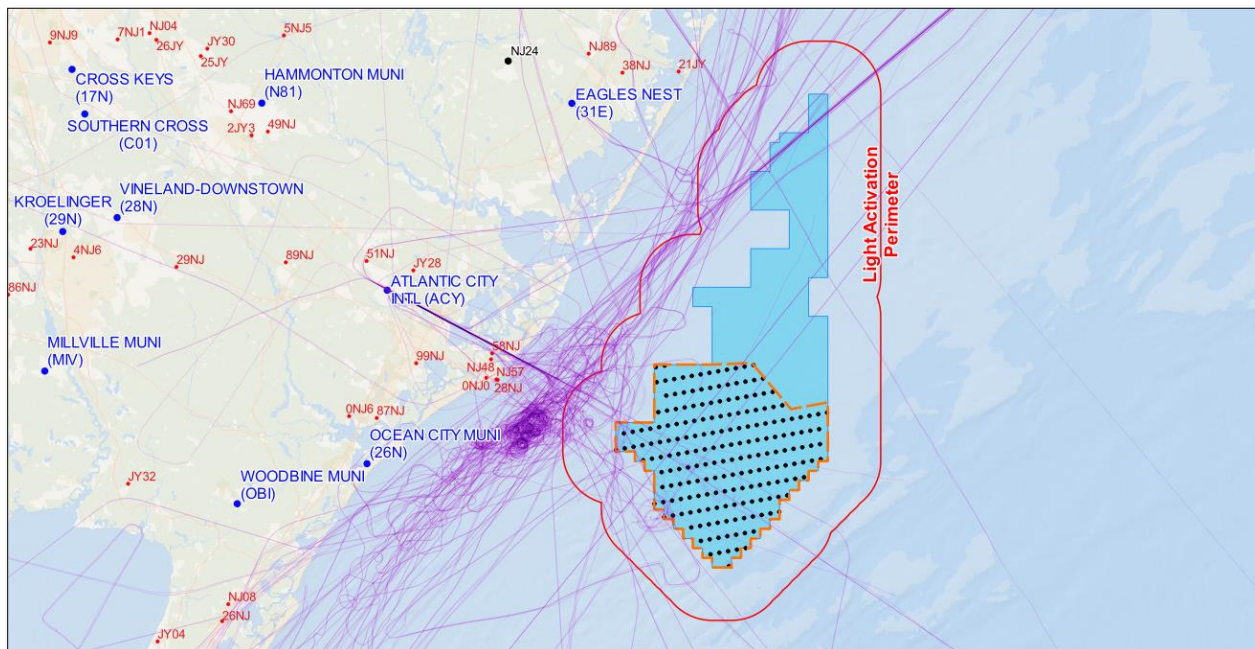
## Results

### Project Study Area

FAA NOP data indicates that as many as 4,397 flights had at least one radar return within for the Project light activation volume (red outline, [Figure 2](#)). However, many of these flights occurred during daytime. Using local sunrise and sunset times, Capitol Airspace determined that as many as 651 flights (purple 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.



**Figure 2: Atlantic Shores offshore wind project (blue) and the Project light activation volume (red outline)**



**Figure 3: Flight tracks (purple) that would have activated ADLS obstruction lights (based on 1,050-foot-tall wind turbines within the Project)**



Each of the 651 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 10 hours 20 minutes and 47 seconds for 880- or 890-foot-tall wind turbines. Total obstruction light system activated duration increases slightly to 10 hours 51 minutes and 16 seconds for 1,050-foot-tall wind turbines. Considering that the Project ADLS light activation perimeter observes approximately 4,751 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](#)).

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

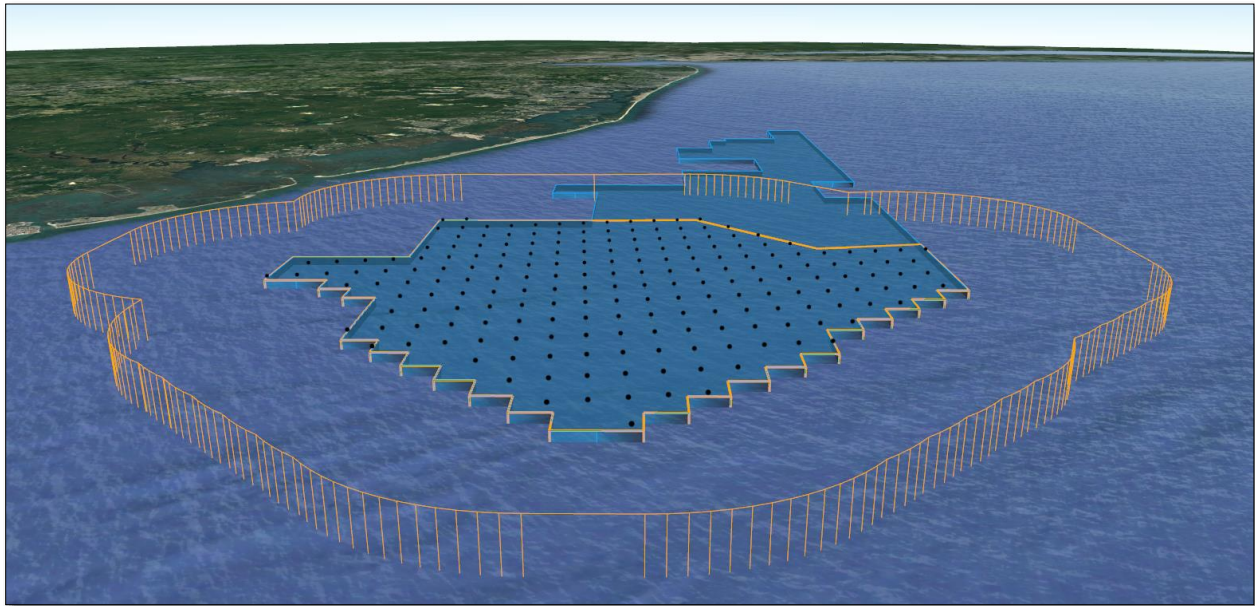
Month	Nighttime Observed (HHH:MM:SS)	Light System Activated Duration (HH:MM:SS)		
		880-foot-tall wind turbines	890-foot-tall wind turbines	1,050-foot-tall wind turbines
January	479:05:44	01:07:26 (0.23%)	01:07:26 (0.23%)	01:08:24 (0.24%)
February	405:38:51	01:16:06 (0.31%)	01:16:06 (0.31%)	01:26:57 (0.36%)
March	410:56:29	00:59:40 (0.24%)	00:59:40 (0.24%)	01:01:29 (0.25%)
April	359:01:19	00:23:37 (0.11%)	00:23:37 (0.11%)	00:23:44 (0.11%)
May	337:05:53	00:19:34 (0.10%)	00:19:34 (0.10%)	00:20:34 (0.10%)
June	309:35:09	00:22:09 (0.12%)	00:22:09 (0.12%)	00:22:24 (0.12%)
July	328:20:35	01:06:12 (0.34%)	01:06:12 (0.34%)	01:07:35 (0.34%)
August	357:52:21	00:21:33 (0.10%)	00:21:33 (0.10%)	00:22:54 (0.11%)
September	383:14:51	00:18:51 (0.08%)	00:18:51 (0.08%)	00:19:04 (0.08%)
October	435:42:32	00:38:23 (0.15%)	00:38:23 (0.15%)	00:40:48 (0.16%)
November	455:22:55	02:43:17 (0.60%)	02:43:17 (0.60%)	02:45:37 (0.61%)
December	488:44:19	00:43:59 (0.15%)	00:43:59 (0.15%)	00:51:46 (0.18%)
<b>Total</b>	<b>4750:40:58</b>	<b>10:20:47 (0.22%)</b>	<b>10:20:47 (0.22%)</b>	<b>10:51:16 (0.23%)</b>



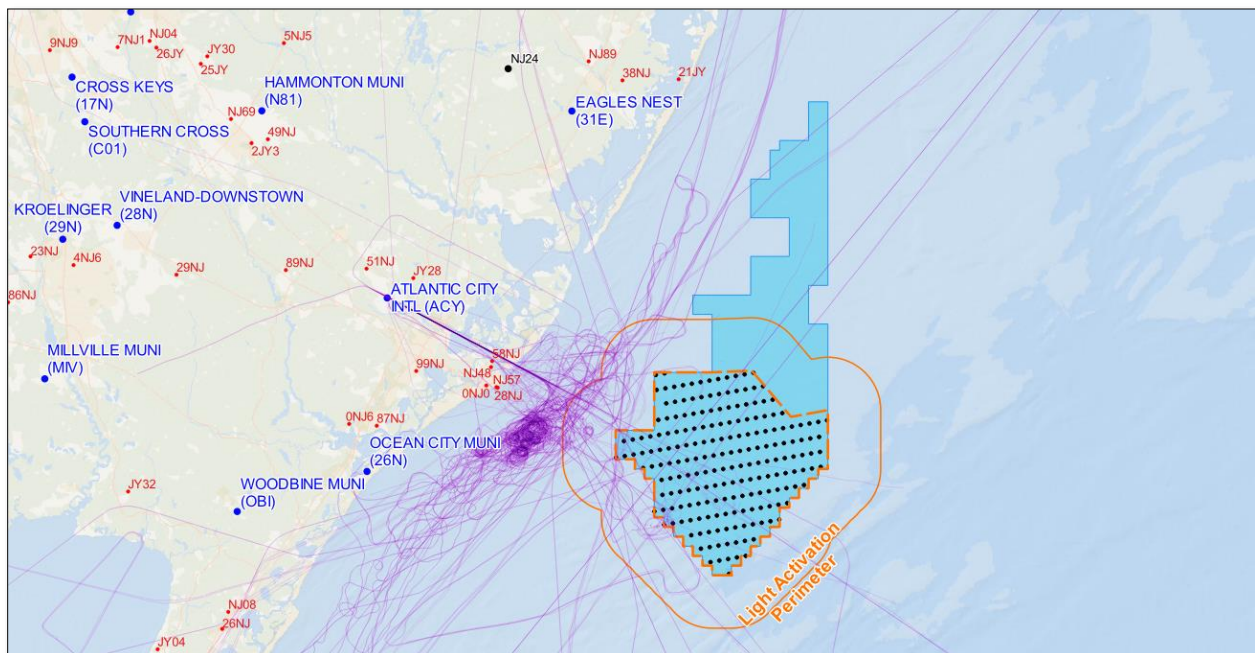


## Wind Turbine Area

FAA NOP data indicates that as many as 3,478 flights had at least one radar return within the WTA light activation volume (outer orange outline, [Figure 4](#)). However, many of these flights occurred during daytime. Using local sunrise and sunset times, Capitol Airspace determined that as many as 521 flights (purple tracks, [Figure 5](#)) had at least one radar return within the light activation volume during the nighttime period when a traditional obstruction lighting system would be activated.



*Figure 4: Atlantic Shores offshore WTA (inner orange outline)  
and light activation volume (outer orange outline)*



*Figure 5: Flight tracks (purple) that would have activated ADLS obstruction lights  
(based on 1,050-foot-tall wind turbines within the WTA)*





Each of the 521 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 6 hours 53 minutes and 4 seconds for 880- or 890-foot-tall wind turbines. Total obstruction light system activated duration increases slightly to 8 hours 36 minutes and 55 seconds for 1,050-foot-tall wind turbines. Considering that the Atlantic Shores offshore wind project ADLS light activation perimeter observes approximately 4,751 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 2](#)).

**Table 2: Typical duration of light system activation time during each month**

Month	Nighttime Observed (HHH:MM:SS)	Light System Activated Duration (HH:MM:SS)		
		880-foot-tall wind turbines	890-foot-tall wind turbines	1,050-foot-tall wind turbines
January	479:05:36	00:51:01 (0.18%)	00:51:01 (0.18%)	01:02:13 (0.22%)
February	405:38:50	00:52:42 (0.22%)	00:52:42 (0.22%)	01:01:15 (0.25%)
March	410:56:24	00:44:38 (0.18%)	00:44:38 (0.18%)	00:58:01 (0.24%)
April	359:01:17	00:02:17 (0.01%)	00:02:17 (0.01%)	00:07:28 (0.03%)
May	337:05:52	00:06:33 (0.03%)	00:06:33 (0.03%)	00:15:29 (0.08%)
June	309:35:08	00:05:31 (0.03%)	00:05:31 (0.03%)	00:08:05 (0.04%)
July	328:20:32	00:58:40 (0.30%)	00:58:40 (0.30%)	01:04:51 (0.33%)
August	357:52:20	00:14:53 (0.07%)	00:14:53 (0.07%)	00:21:16 (0.10%)
September	383:14:48	00:08:36 (0.04%)	00:08:36 (0.04%)	00:13:48 (0.06%)
October	435:42:31	00:07:27 (0.03%)	00:07:27 (0.03%)	00:15:20 (0.06%)
November	455:22:51	02:26:07 (0.53%)	02:26:07 (0.53%)	02:40:10 (0.59%)
December	488:44:16	00:14:39 (0.05%)	00:14:39 (0.05%)	00:28:59 (0.10%)
<b>Total</b>	<b>4750:40:25</b>	<b>06:53:04 (0.14%)</b>	<b>06:53:04 (0.14%)</b>	<b>08:36:55 (0.18%)</b>

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