POST-CONSTRUCTION WILDLIFE MONITORING AT THE ATLANTIC COUNTY UTILITIES AUTHORITY-JERSEY ATLANTIC WIND POWER FACILITY

PERIODIC REPORT COVERING WORK CONDUCTED
BETWEEN 1 AUGUST AND 30 SEPTEMBER 2008

Submitted to:

New Jersey Board of Public Utilities
New Jersey Clean Energy Program
Two Gateway Center (8th Floor)
Newark, NJ 07102

Submitted by:

New Jersey Audubon Society
Center for Research and Education
600 Route 47 North
Cape May Court House, NJ 08210

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INTRODUCTION

The following narrative describes activities New Jersey Audubon Society (NJAS) engaged in during its post-construction wildlife monitoring study conducted at the Jersey Atlantic Wind, LLC (JAW)/Atlantic City Utilities Authority (ACUA) wind power facility. The period covered by this report is 1 January - 30 September 2008 and is the second report submitted for this project. This document and attachments satisfy project reporting requirements described in the Memorandum of Understanding (MOU) between NJAS and JAW. Furthermore, the activities described herein conform to task descriptions outlined in the Scope of Work defined as part of said MOU. Finally, this report supports payment of NJAS mid-term invoice (see attached # 09-010), according the said MOU.

GOALS AND OBJECTIVES

The goal of this project is to evaluate incidents of bird and bat mortality at JAW/ACUA wind wind power facility and assess relationships between mortality and flight dynamics (e.g., magnitude, altitude, direction). Specifically, our objectives are to (1) document mortality at the facility, (2) quantify nightly magnitude of bird/bat passage through the project area (3) quantify altitudes and flight tracks relative to the height and rotor swept area of the wind turbines (4) investigate correlations between mortality and flight dynamics and (5) investigate meteorological conditions that may affect these response variables. To accomplish these objectives we will use ground based surveys to monitor mortality at the project sites and a dual marine radar system to monitor the various measures of flight behavior. This two-pronged approach is rarely used in evaluating potential impacts of wind turbines on birds and bats.

Work Performed

Task 1 - Monitor bird and bat flight patterns using dual mobile radar system

From 1 January through 30 September 2008, we collected data with our dual marine radar system (i.e., horizontally- and vertically-oriented, see Appendix 1 for a detailed description of the system and methods and protocols used to execute this task) on approximately 165 days, 24 hours/day. Data were collected two days/week during January and February and five days/week between March and August. This resulted in the collection of approximately 120,000 data images for each radar during this period.

In general, data collection went smoothly during the reporting period. However, on three occasions we experienced short term (e.g., 3-5 hours) data loss in the early morning hours (i.e., after 3:00 AM). The problem appeared to be related to a feature of the Windows XP operating system that automatically downloads system updates, installs them and then reboots the computer to effectively implement them. The rebooting process shut down our automated data collection program, which must be initiated manually. Once we were able to identify the problem, we disabled the "automatic update" feature of the operating system.

During the reporting period we completed processing the image data collected with the vertically oriented radar during the August-December 2007 sampling period. We used NJAS proprietary

software to generate night-specific templates that identify stationary reflectors (e.g., wind turbines, buildings) and ground clutter in data images. Following this procedure we used our proprietary software to (1) remove unwanted propagation from images and enumerate bird and bat targets from the vertically oriented radar, (2) enumerate targets (i.e., birds and bats and (3) determine target altitudes.

Review of output results from processed data suggested that an unacceptable amount of interference was not removed with our image processing algorithms. The nature of the unwanted interference is in part the reason why our algorithms were not as effective at its removal than we anticipated.

The radar unit is parked on the site within 100' of the turbine. Additionally, the other four turbines are well within the radar's field of view. Consequently, we have a considerable amount of radar energy reflecting off the rotating turbine blades, which show up distinctively in the data images. Generally, this kind of unwanted propagation is not a problem to remove if it occurs regularly in the same location throughout a sample period. However, because the turbine blades are spinning and frequently change their velocity and orientation within a given sample period (i.e., over the course of a night's data collection), they are more difficult to remove using a search protocol designed to remove unwanted "stationary" objects.

At the time of this report we completed the beta testing of modifications to our algorithms. Based on the test results, we made additional modifications to our target detection and enumeration software and believe we have resolved most of the issues related to unwanted propagation and false detections. We anticipate that reprocessing of data from 2007 will be completed by the next reporting period.

Task 2 - Monitor evidence of bird and bat collisions with wind turbines

During the reporting period, we conducted systematic searches three days per week on the ACUA facility for birds and bats that apparently collided with on-site wind turbines. Searches were conducted around each turbine site by a single, trained NJAS staff person. This resulted in approximately 100 days and 500 hours (approximately five hours/search day) of searching. See Appendix 1 for a detailed account of survey methods and protocols used to execute this task.

We also conducted six searcher efficiency and scavenger removal trials during the reporting period. A justification for this activity and a detailed description of the methods and protocols used to execute this task are included in Appendix 1. The fact that estimates of animal fatalities at wind power generating facilities can be affected dramatically by differences in observer efficiency and from carcass removal by a variety of scavengers is widely acknowledged (Morrison 2002). Consequently, estimates of total bird or bat fatalities can only be determined after correcting for searcher and carcass removal biases.

The following is a preliminary account of the birds and bats we encountered during our searches for collision events. The numbers of carcassses we report here are uncorrected for observer detection efficiency or scavenger removal. Correcting for these biases requires sufficient data to

understand about how observer efficiency and scavenger removal varies with season and with carcass type (e.g., small, medium, large bird or bat) and location (i.e., the kind of substrate a carcass is on). Currently we do not have enough data from observer efficiency and scavenger removal trials to generate reliable estimates of bias that take these parameters into account. Observer efficiency and scavenger removal estimates, by season, carcass type and substrate type will be provided in the final report along with corrected estimates of collision mortality that incorporate corrected for these biases. Correcting for these biases will likely increase our estimates of collision mortality.

Additionally, these estimates are not corrected for the area around turbines not searched because they were inaccessible (Figure 1). Correcting for this bias will also increase our estimates of collision mortality and this also will be incorporated in estimates we present in the final report.

Uncorrected collision mortality estimates

Since the beginning of the project (i.e., August 2007) searches have located 23 birds of at least 14 species (Table 1) that appear to have collided with wind turbines on the site. Laughing gull (*Larus atricilla*) was the species most frequently encountered (i.e., seven times) during collision event searches, followed by osprey (*Pandion haliaetus*) with two encounters (Table 1). This is noteworthy because osprey is listed as a "threatened" species in New Jersey. All other species were encountered only once during our searches (Table 1).

Fifty-one bats also were located during our searches since the start of the project (Table 2). To date, we have encountered only two species: Eastern red bat (*Lasiurus borealis*) and hoary bat (*Lasiurus cinereus*). During our searches, we located more than three times as many red bats as hoary bats and our data suggest that 90% of all bat collision events occur during August and September (Table 2).

Our data also suggest that collisions are not evenly distributed among turbines. Carcasses found at Turbines #3 and #4 (see Figure 1) accounted for 38% and 30%, respectively, of the total found during the study period (Table 3). Conversely, carcasses found at Turbines #1 and #5 accounted for only 11% and 7% respectively. It is important to note that the searchable area around each turbine differs. Only Turbine #3 is searchable in 100% of the survey area. Search areas around the other four turbines ranges from approximately 60-70% (Figure 1). However, we believe that these differences cannot explain the majority of variation in carcass detection around each turbine.

<u>Task 3 - Monitor temporal and spatial bird abundance and distribution patterns on the ACUA wind power facility</u>

We conducted weekly, systematic point count surveys to determine abundance and distribution of residents and transient birds throughout the reporting period. Surveys began at sunrise and were conducted at five points, each randomly selected within the general area of a turbine. We followed standard point count data collection protocols which included recording observations in 2-, 3-, and 5- minute sampling periods, and recording distance and direction of each detection. Seasonal variation in total birds detected since the start of the project are shown if Figure 2.

Table 1**.** Bird carcasses encountered between August 2007 and September 2008 at each turbine in the ACUA wind power facility.

Month-Year	American Woodcock	Baltimore Oriole	Blue-gray Gnatcatcher	Greater Black-backed Gull	Gray Catbird	Herring Gull	Laughing Gull	Osprey	Peregrine Falcon	Ruby-crowned Kinglet	Red-eyed Vireo	Red-winged Blackbird	Short-billed dowitcher	Swamp Sparrow	Unknown	Total
August-07							2	1	1							4
September-07															1	1
September-07										1						1
October-07														1		1
November-07	1															1
February-08				1												1
March-08							1									1
May-08											1	1	1		1	4
June-08						1										1
July-08							2	1								3
August-08			1		1											2
September-08		1					2									3
Total	1	1	1	1	1	1	7	2	1	1	1	1	1	1	2	23

Table 2. Bat carcasses encountered between August 2007 and September 2008 at each turbine in the ACUA wind power facility.

Month-Year	Hoary Bat	Red Bat	Total Count
August-07	3	12	15
September-07	3	9	12
October-07	1	2	3
May-08	0	1	1
July-08	0	1	1
August-08	3	5	8
September-08	2	9	11
Total	12	39	**51**

Table 3. Bird and bat carcasses encountered between August 2007 and September 2008 at each turbine in the ACUA wind power facility.

Turbine	Bats	Birds	Total	Proportion of Total
1	6	2	8	0.11
2	7	4	11	0.15
3	18	10	28	0.38
4	17	5	22	0.30
5	3	2	5	0.07
Total	51	23	74	

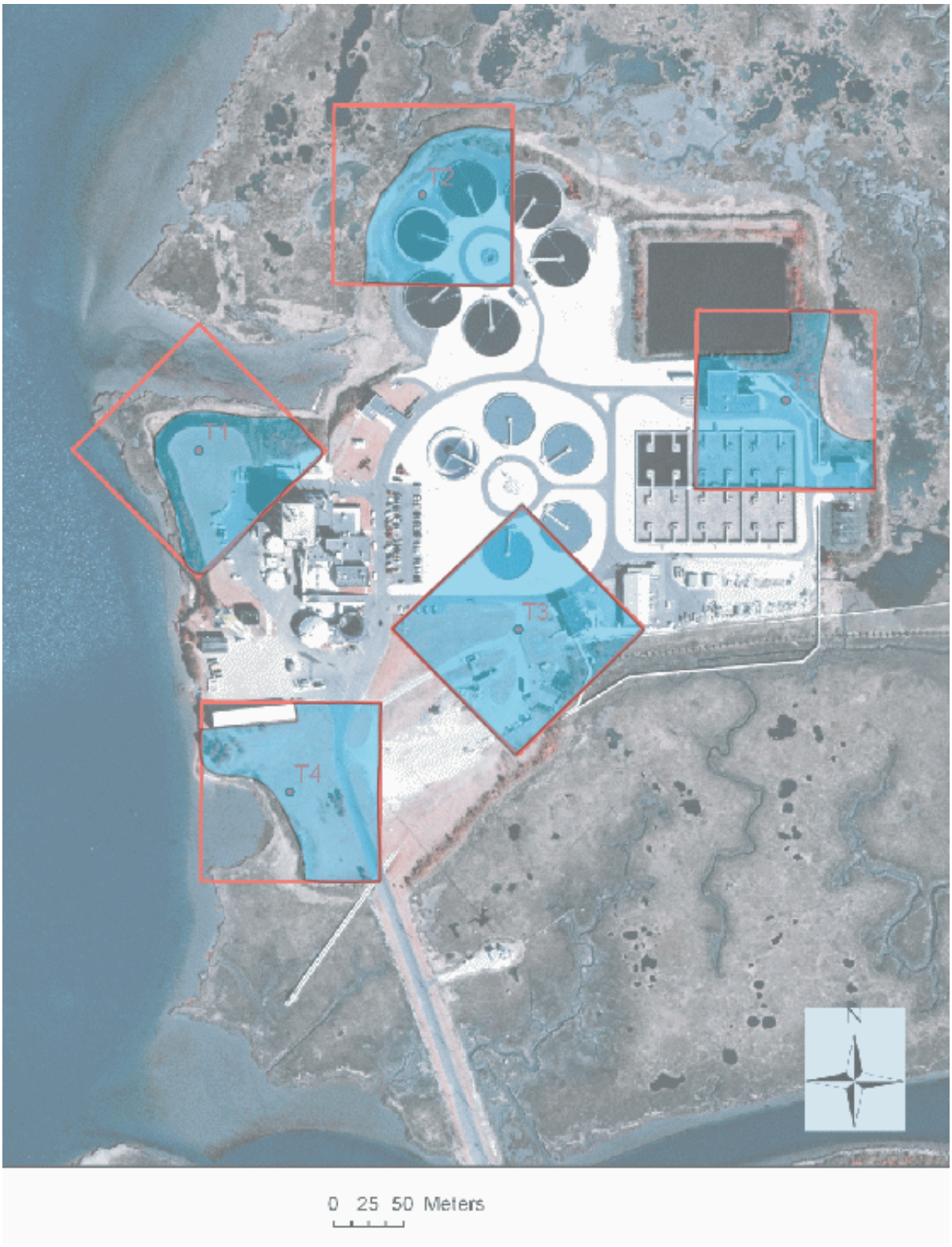

Figure 1. Atlantic City Utilities Authority (ACUA) study site showing actual survey areas (shaded in light blue) used during collision incident surveys. Low lying marsh areas within a turbine's search area were not surveyed because tidal inundation regularly prevented access to these sections. To some extent this was the case at all turbine sites except at turbine #3. If a building fell within the search area, rooftops were surveyed when accessible. Clarifying and mixing ponds, and other water bodies were also surveyed using walkways, gangways and dikes to gain access.

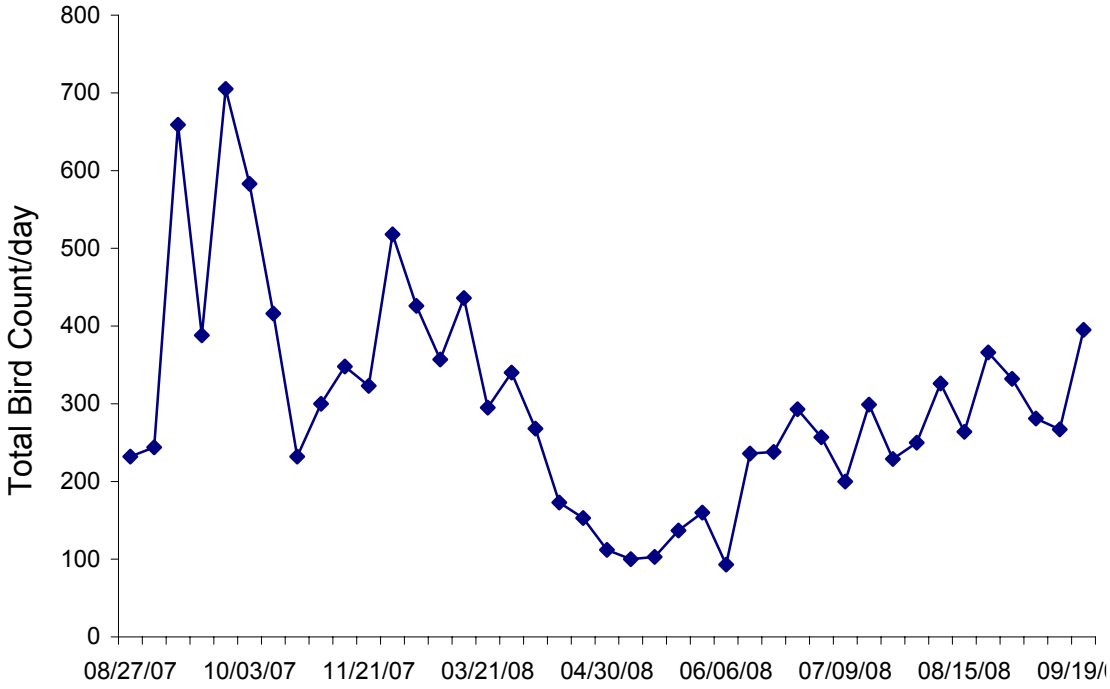

Figure 2. Total number of birds recorded on ACUA during 10-min point counts, August 2007 - September 2008. Counts represent summed daily counts from 5 independent fixed plots.