

Mass Audubon Technical Comments on DEIS, Cape Wind Project February 23, 2005

Mass Audubon engaged in a detailed technical review of sections of the DEIS related to avian issues. This technical analysis was utilized in preparing Mass Audubon's comment letter. It is appended to the letter and the two documents should be read in concert, as both are official parts of Mass Audubon's comments on the DEIS.

Sections of DEIS Reviewed in Detail

Our technical comments pertain to the following sections of the DEIS that have been reviewed by Mass Audubon staff.

Sections 5.1 through 5.8 and associated appendices.

Qualifications of Mass Audubon technical reviewers:

All of these individuals have participated in the avian surveys of Nantucket Sound that Mass Audubon has been conducting since 2002.

Dr. Taber Allison is the Vice President for Conservation Science and Ecological Management. Dr. Allison received his Ph. D. in Ecology in 1987 from the University of Minnesota. Dr. Allison is the project manager for Mass Audubon's avian surveys in Nantucket Sound.

Dr. Robert Buchsbaum is the Southeast and Islands Regional Conservation Scientist. He received his Ph.D. in Marine Ecology in 1985 from the Boston University Marine Program. Dr. Buchsbaum's research career has included studies of salt marshes, eelgrass meadows, marine invertebrates, and estuarine fish.

Ellen Jedrey is the Assistant Director of the Coastal Waterbird Program. She is currently working on her master's in Cognitive and Behavioral Ecology at Memorial University, Newfoundland, Canada, and she has worked with coastal shorebirds and seabirds since 2000 including study of Piping Plovers and terns on Monomoy National Wildlife Refuge.

Andrea Jones is Director of the Coastal Waterbird Program. From 1993 - 2000, she coordinated the Grassland Conservation Program. Andrea has a Masters of Sciences degree in Wildlife Conservation from the University of Massachusetts. Most recently, Andrea has been managing native grassland restoration projects on several Massachusetts Audubon sanctuaries and co-coordinating the Massachusetts Important Bird Areas Program.

Simon Perkins is Senior Field Ornithologist. Simon is a New England Regional Editor for North American Birds magazine, is a founding member of the Massachusetts Avian Records Committee, and leads international bird watching tours for Mass Audubon. Simon designed and implemented bird census methodology and bird checklists for Mass Audubon's sanctuary system. Simon has extensive experience in conducting bird surveys, particularly for seabirds and waterfowl along the Massachusetts coastline and offshore.

Robert Prescott has been the Director of Massachusetts Audubon's Wellfleet Bay Wildlife Sanctuary for over 20 years. He organized and manages a major sea turtle stranding rescue network that contributes to scientific understanding of sea turtles and their distribution. He was appointed the southern Massachusetts Sea Turtle Stranding Coordinator by the National Marine Fisheries Service. He is very familiar with the marine life of Cape Cod and is particularly acknowledged as an expert on sea turtles.

Giancarlo Sadoti is Bird Conservation Assistant and has been the technical coordinator of the Nantucket Sound Avian Surveys since November 2004. Giancarlo also is the technical manager for the Massachusetts Important Bird Areas Program. He has extensive experience with database and GIS analysis and participated in dozens of aerial and boat surveys of Nantucket Sound. Prior to coming to Mass Audubon, Giancarlo conducted research on Black Hawks.

Summary Comment and Request for Additional Information

The DEIS contains a wealth of information that unfortunately is characterized by insufficient or flawed analysis. In key areas relevant data are lacking. Many statements that could best be described as assumptions are stated as conclusions consistently favorable to the project. The DEIS should forthrightly state when insufficient information is available to draw firm conclusions.

In reviewing a document of this length, Mass Audubon has chosen to focus our comments in Part 1 of this technical commentary on key data and analysis gaps that should be addressed by the Corps in order to provide an accurate risk assessment before a permitting decision is made. We highlight further specific examples of flawed reasoning, faulty analysis, or inappropriate certainty in Part 2. We do not attempt to comprehensively identify every specific point within the document that may need refinement or revision.

PART 1. PRIMARY DATA GAPS, ANALYTICAL CONCERNS, SYNTHESIS, AND MONITORING

A. Data Gaps and Analytical Issues

1) Avian Species

The Scope of Work for the DEIS states the following:

Data on use throughout the year, especially through November for migratory species, and under a range of conditions should be collected. Data collection methods should include remote sensing through radar and direct observations through aerial reconnaissance and boat-based surveys. Data gathered through radar should be validated with direct observations. The survey schedule is being coordinated with United States Fish and Wildlife Service (FWS). Data collection should allow a statistically rigorous analysis of results.

Known impacts to birds from former or current Wind Turbine Generators (WTGs) and other tall, lighted structures (such as communications towers) should be thoroughly reviewed in order to identify potential impacts which could result from terrestrial or coastal structures. Issues needing to be addressed include: (1) bird migration, (2) bird flight during storms, foul weather, and/or fog conditions, (3) food availability, (4) predation, and (5) benthic habitat and benthic food sources.

The attached table (Appendix A) outlines the avian survey time periods that yield data provided in the DEIS and data provided by Mass Audubon. During this period, the applicant's consultants conducted 47 aerial surveys and 14 boat surveys. This list of surveys does not include the preliminary aerial surveys conducted in 2001 and the 13 days of "ground-truthing" boat surveys conducted in 2002.

In addition to the surveys funded by the applicant, Mass Audubon has conducted surveys between August and September of 2002; May and September 2003; December 2003 and early April 2004; and late April and September 2004 for a total of 54 aerial surveys and 38 boat surveys. Mass Audubon characterized and separated surveys into 3 time periods to secure data on terns and waterfowl: 1) pre-migratory tern "staging period" August – September; 2) tern breeding season May – July, and 3) winter sea duck period December – April. Mass Audubon has provided three completed, peer-reviewed reports to the Corps, of which two are included in the DEIS. Mass Audubon submits, attached to these comments, the report for the 2003-2004 winter sea duck period. We will also submit reports for the 2004 tern nesting and pre-migratory staging period after completion of peer review. Mass Audubon is continuing its aerial surveys of Nantucket Sound during the winter sea duck season of November 2004 through April 2005.

Together, the applicant's and Mass Audubon's data sources provide a wealth of information on the distribution, relative abundance, and use of Nantucket Sound by focal species, including terns and winter sea ducks, primarily during conditions of good weather and visibility. We have identified key data gaps in 1) nighttime activities of winter sea ducks; 2) tern activity during the spring pre-breeding period and fall staging period; and 3) behavior of all birds during periods of poor visibility.

The DEIS also provides two months of radar data from May and September 2002. The radar studies fall short of that recommended by Mass Audubon and the USFWS. We recommend that at least one full year of additional radar data be gathered during spring and fall migrations. Our comments presented below reflect our analysis of all of the reports provided in the DEIS and the studies by Mass Audubon.

a) Winter Sea Ducks

The Corps should provide information and analysis on the movements of winter sea ducks in Nantucket Sound and the project area between November and April, focusing especially on flight heights of birds during periods of low visibility. Particular emphasis should be placed on the distribution and behavior of Long-tailed Ducks at night within the project area.

The data provided in the DEIS and by Mass Audubon provide useful information on the distribution and relative abundance of wintering sea ducks in Nantucket Sound. These data show thousands of ducks within the project area, indicating that the benthic environment of Horseshoe Shoal provides important food resources for waterfowl. Notably underrepresented in these daytime aerial surveys flown under optimal conditions of visibility is the Long-tailed Duck, which is perhaps the most abundant duck in Nantucket Sound. Long-tailed Ducks conduct daily flights, exiting the Sound at dawn and returning to the Sound at dusk. Numbers of this species are estimated in the 100,000's. It is important to determine the nighttime roosting locations of these ducks and to determine their flight behavior as they leave and return to their roosts.

In general, there is no information on the flight behavior of winter ducks at night or during periods of low visibility. Radar is the best means to gather such data (see below). The presence of boats disturbs the birds and data collected during boat surveys may not be indicative of typical flight behavior and movements of birds in the absence of such disturbance. Nighttime flights in aircraft fitted with infrared imaging equipment could provide data on the distribution of Long-tailed Ducks, although this technology is not well tested on ducks and will not provide data on duck movements.

Ultimately, the Corps should explicitly and simultaneously consider the risk to winter sea ducks from three types of impacts to sea ducks: collision mortality, disturbance, and habitat loss due to displacement. The first two will depend on movement and behavior of birds that fly through or remain in the project area after construction. Such data are not currently available for this project. Post-construction monitoring of wind farms in Europe, e.g., Horns Rev, suggests that ducks avoid wind farms, i.e., they fly around them, or that they are displaced to other areas. (Although at Horns Rev and other sites, these conclusions are based on only one year of post-construction surveys.) These two responses could reduce the risk of collision mortality, but could lead to other potential impacts – the loss of habitat and access to important foraging areas and increased flight time due to avoidance and/or disturbance behavior. Data on the distribution of winter sea ducks that are provided in the DEIS and Mass Audubon data suggest that Horseshoe Shoal is an important feeding area for ducks. The Corps should consider the potential consequences of the loss of feeding habitat to the long-term dynamics of sea ducks that utilize the Shoal for winter foraging habitat.

We also note substantial discrepancies in the number of ducks that we observed in our 2003-2004 winter aerial surveys when compared to those reported in the DEIS,

Appendix 5.7M (Table 4). For example, although the survey grids of the applicant and Mass Audubon were nearly identical, the applicant's consultants reported a total of 42,632 Common Eiders in 12 aerial surveys between September 2003 and February 2004 (a result presented with unwarranted precision) as opposed to the approximately 280,000 Common Eiders that we recorded in 13 aerial surveys between December 5, 2003 and April 8, 2004 – an average of approximately 22,000 Common Eiders per survey.

This difference may be due in part to the differences in survey period between the applicant and Mass Audubon. By beginning surveys in the fall before most sea ducks have arrived, and then pooling those results with winter surveys, the DEIS provides a dramatic underestimate of the number of ducks in the Sound and that can be found in the project area. The DEIS's inappropriate pooling of data across seasons leads to an underestimate of wintering sea ducks. Further, the DEIS extrapolates from survey counts to total numbers of ducks within the Sound and the project area. This extrapolation is invalid because of the non-random nature of the sampling design. The averages reported are meaningless because the error estimates generated from non-randomly collected data are only valid if the ducks are randomly distributed across the study area. This is unlikely to be the case; we expect that there is substantial spatial autocorrelation in duck observations. The data presented in these surveys can only be represented as relative abundance.

By our own estimates, our highest survey count of more than 50,000 Common Eiders on January 22, 2004 accounted for approximately 3% of the total estimated North American population of this species (Bellerose 1976). The area encompassed by our survey grid comprised 5% of Nantucket Sound. It is clear from our data that 100,000's of ducks use Nantucket Sound as winter habitat, and the project area can at any one time contain thousands of ducks.

b) Roseate Terns and Piping Plovers

The Corps should reanalyze May and September 2002 radar data to determine if possible, what percentage of the targets could be tern species, including Roseate Terns. Further studies are needed to accurately determine the movement of terns during the summer breeding season, especially during the period when juveniles first learn to fly and when terns begin to move to their staging areas (primarily at South Beach and Monomoy in Chatham).

Data in the DEIS and data collected by Mass Audubon show substantially fewer sightings of terns in the project area than other parts of Nantucket Sound, especially areas along the southern coast of Massachusetts and the western shore of Monomoy. From this information, the DEIS concludes that the risk to Roseate Terns is minimal and not likely to affect the species or the attainment of the goal of the USFWS Roseate Tern Recovery Plan. This conclusion may be correct, but it is based on an absence of sufficient and detailed analysis of the radar data collected in May and September 2002. The radar recorded 100,000's of targets during these sampling periods, and 10,000's of targets at the height of the rotor swept zone. The DEIS does not attempt to determine what

percentage of these targets could be terns, and in turn, could be Roseate Terns. Instead the DEIS dismisses the utility of the radar data in Appendix 5.7-H, p. 22 para. 3 “The radar data could not be used to distinguish terns from other birds.” Additional analysis should focus on greater discrimination of targets by flight speed and target density. Although we agree that specific identification of terns is unrealistic, the Corps, with the support of expert consultants, should attempt to estimate what percentage of the 10,000’s of targets that fly through the rotor swept zone during the periods of the highest tern activity could be terns.

Additional information needs to be sought to ascertain directional movements of Roseate Terns through Nantucket Sound, particularly during the August-September pre-migratory staging period. While the largest numbers of terns were sighted near the south Cape and South Beach/Monomoy area, this is to be expected given the size of the Common Tern breeding colony here, and because the area is known as a point of departure for migration to areas South. Densities for terns are also misleading because terns, as opposed to sea ducks, are more likely to be moving through the area than resting on the water. Thus, densities are based on the chance of observing moving terns, which is low, rather than the higher likelihood of seeing more stationary sea ducks. The chance of encountering terns moving towards Monomoy from Buzzards Bay and then leaving Monomoy for South America is slim given the sample size. To gain more information, radar would provide the most comprehensive information. Otherwise, aerial and boat surveys would have to be increased dramatically to increase the probability of providing a statistically valid sample of moving terns.

Mass Audubon agrees that, most of the time, terns forage at low heights, below the rotor zone. Terns, however, may be more likely to come into contact with obstacles such as wind turbines during migration, at night, and during periods of bad weather.

USFWS staff at Monomoy have observed the entire colony of Common Terns, prior to incubation, departing in the evening from land and returning early in the morning but little is known about where they are going. This “nocturnal abandonment” was not a behavioral response to predators. Knowledge of movement of these terns during this period at night is essential.

As with winter sea ducks, tern densities need to accurately reflect periods when terns are actually present in the area, rather than including times when they are not, which inaccurately lowers density estimates. Data should also be separated into breeding season and migration season estimates.

DEIS reliance primarily on a study from 1990-1991 of Roseate Terns foraging near Bird Island is inappropriate. These data are 15-years old and do not address the possibility that feeding flocks may shift with availability of food resources. The surveys did not include Horseshoe Shoal or all of Nantucket Sound to determine how far from Bird Island their foraging trips might extend. This study was also conducted during the breeding season and not the migration periods when terns are more likely to be flying through or using Nantucket Sound. In addition, some breeding areas have changed

substantially since this study; at present the majority of the population in Massachusetts breeds on Bird and Ram Islands in Buzzards Bay whereas in the early 1990's, Penikese Island (in the Elizabeth Islands chain) contained a large breeding colony which was subsequently abandoned (except for a small amount of recolonization during the 2003 Buzzards Bay oil spill).

Observations at daytime loafing areas should be explained in further detail rather than just mentioning two places observed (Waquoit Bay and Fernando's Fetch). Mass Audubon's studies of terns in August-September have suggested shifts in large groups of staging terns in Chatham, likely based on shifts in food availability. Staff at Mass Audubon's Coastal Waterbird Program have routinely observed Roseate Terns loafing at other sites along the south Cape and other areas during August (for example, Popponeset Spit, Mashpee; Gray's Beach, Yarmouth; Plymouth Long Beach, Plymouth; North Beach, Chatham). While these numbers are small, they suggest that terns utilize a large number of areas before staging in Chatham at South Beach/Monomoy.

The DEIS fails to address potential impacts to terns from construction activities involving the burying of cables in Lewis Bay near Egg Island, an area where terns are known to forage during the breeding season. Section 5.7.3.3 of the DEIS states that the landfall area for the cable is not used by birds for nesting or foraging. This is incorrect, as terns do forage in Lewis Bay and there are tern and piping plover nesting sites within approximately 1,000 feet of the cable route. Mass Audubon participated in the Energy Facility Siting Board review of the cable portion of the project and submitted comments in that process requesting that construction not take place in the vicinity of Egg Island during the breeding season when terns are present. The DEIS fails to incorporate or address the technical commentary Mass Audubon's expert witnesses submitted during the EFSB review process.

While the DEIS acknowledges risk to terns on the Electric Service Platform, it suggests methods to bird proof the platform. We suggest that known methods to deter terns from roosting on the platforms be evaluated for effectiveness, risk to birds, and maintenance issues. Specific measures should be evaluated by the USFWS and MassWildlife as well as the Corps prior to permitting rather than merely "investigated" as mentioned in the DEIS.

Tern disturbance and displacement caused by the presence of wind turbines have not been adequately addressed in the DEIS. If it is because of the lack of available studies, the DEIS should state this, rather than dismissing the issue by mentioning studies with limited applicability to the Cape Wind project.

Piping Plovers are considered at less risk for collision with the wind turbines because they are less likely to be using the Sound except during migration (although no one knows exactly how and at what height they migrate). We are therefore puzzled that the collision estimates in Section 4.2.5.2 of Appendix 5-H are higher for Piping Plovers than for Roseate Terns. This gives us little confidence in these numbers.

c) Migratory Passerines

The Corps should collect an additional year of radar data during the spring and fall migration seasons to provide an estimate of annual variability in abundance, timing, and behavior of songbird migrants.

As we stated in our comments during the Scoping Phase, the Corps should have required a minimum of three years of data on avian use of the Sound, including migratory songbirds. The DEIS provides samples for only two months in 2002. By missing substantial portions of the migration and by only sampling one year, the DEIS does not present an estimate of variability for a mass movement involving 100,000's of birds. At least one more year of data is needed. Radar studies should be conducted from mid April to late May and from the beginning of September to at least late October to adequately cover the spring and fall migration seasons. We discuss our concerns with the analysis of the radar data below.

d) Radar

As described previously, radar should be reanalyzed to more thoroughly discriminate targets such as bats and terns. While we are not experts in the use of Mobile Avian Radar Systems (MARS) and cannot comment in detail on the validity of the analysis of radar data, we have consulted with experts who are familiar with such analysis. We do note that the Scoping Requirements state "*Data gathered through radar should be validated with direct observations.*" The DEIS states that 13 boat surveys were conducted in May and September of 2002 to ground-truth radar data collected during this period, but we were unable to find any explanation in the DEIS about how these boat surveys were used to validate the radar data. Thus, the DEIS fails to meet the requirements of the Corps, and the value of the radar data are compromised.

We requested the raw radar data (email to applicant on January 25, 2005), but never received this information. We recommend that the Corps make this information available to interested parties on request.

We note that a radar "target" is not synonymous with "bird" or "bat" and these definitions are frequently conflated in the DEIS. Radar "targets" could be one or more birds or bats.

Radar records of "fast" versus "slow" birds pertain to ground speeds, and are meaningless unless they are correlated with local wind velocity. Because these critical correlations were not made at the time, the flight speed values are useless. For this same reason, flight-direction data are also highly suspect. Radar data should be reevaluated incorporating wind velocity.

The risk assessment from radar data was based only on targets within the rotor swept zone. This assumes that the probability of collisions with monopoles is zero. This is a critical assumption, especially in light of the flight characteristics of waterfowl: they

fly fast and have limited maneuverability. Lighting is an important component of collision mortality in birds, but, until emerging scientific methods and technologies more clearly elucidate the circumstances under which birds and bats collide with tall structures, we cannot assume unlighted structures, or the unlit portions of lit structures (such as the monopoles below the rotor swept zone) pose zero risk to birds.

No targets were recorded below the heights of either deployed radar in either seasonal study (spring: 23 ft; fall: 36 ft). The radar beam was angled slightly downward such that it reached the water surface at some distance out from the radar (188 feet from barge in spring and 295 feet from bluff in fall). The DEIS fails to provide any explanation why lower flight heights were not recorded at greater distances from the radar, when they should have been expected. Virtually all waterfowl and terns remain at or near the sea surface when moving around the Sound. Unless it is assumed that monopoles pose zero probability of collision risk, this type of analysis is incomplete without knowing the number of targets near the sea surface.

1,052,761 targets were observed by TracScan (horizontal): 38% in spring; 62% in fall. 491,306 targets were observed by VerCat (vertical): 31% in spring; 69% in fall. Twenty six percent of all observations (127,697) were within the rotor swept zone. More than 371,000 of 412,418 (90%) of birds recorded during boat and aerial surveys in 2002-2004 were said to be below 23 feet. This suggests that many more birds were present within the study area than were detected by radar, and these individuals should be accounted for when deriving risk values.

e) Collision-risk

The Corps should conduct a valid assessment of collision risk for all avian species entering the project area. Such an assessment should utilize the most relevant information from published studies, the data collected by the Corps, and available models. Collision risk should be described as a range of probabilities rather than a single number.

A widely publicized number of 364 birds per year estimated to die from collision with the project's 130 wind turbines has been used in the DEIS to demonstrate the low risk to birds from the construction of the wind farm. (It is interesting to note that this figure was not included in the executive summary on which initial news stories were based.) This estimate relies on the data provided in a review of 12 onshore wind farms by Erikson et al. (2001, cited in DEIS) that yielded a mortality range of 0 to 2.8 birds/turbine/yr. As we discuss below, this is one of the more glaring examples of the DEIS's inappropriate use of information for estimating risk associated with this project.

The DEIS provides a reasonably detailed discussion of the many factors that influence collision risk of birds with wind turbines including a review of estimated collision mortality from studies in the United States and Europe from both upland and nearshore wind farms. It also includes a description of results from radar data that the DEIS concludes results in more than 600,000 birds flying through the rotor swept zone (an estimate, which we believe is flawed). The DEIS then uses a set of numbers to

calculate collision mortality, without establishing the relevance of these numbers. We strongly disagree with the DEIS conclusion that these numbers represent a conservative estimate of the risk.

Alternative published data that are provided in the DEIS or that were available to the Corps at the time the DEIS was being drafted yield a very different estimate of risk. For example, on page 5-129, the DEIS cites a review by Winkelman (1995) of a nearshore wind farm in the Netherlands that indicates a substantially higher mortality of birds ranging from approximately 1,900 to 6,600 birds per year when extrapolating from the number of turbines proposed for the Cape Wind project (e.g., 0.04 – 0.14 birds per turbine per day * 365 * 13). We quote the DEIS (5-7, page 5-129) “Turbines located in low-lying areas in the Netherlands adjacent to the Wadden Sea experience a greater number of fatalities than turbines on uplands (Winkelman, 1995). Large numbers of migrants, including waterfowl, shorebirds, and some songbirds are thought to use these areas during migrations and also with low altitude flights among feeding locations.” The similarity in avifauna between this site in the Netherlands and the Cape Wind project would suggest that these collision mortalities numbers are more relevant than the numbers quoted from Erikson (2001), but the DEIS never explains why these numbers were rejected for calculating collision mortality.

The DEIS references, with little detail, a study in Belgium that yields much higher mortality rates and rejects those numbers because the studied wind farms are not representative of the proposed Horseshoe Shoal project. This study by Everaert (2004) is one of the few studies that relate collision mortality with avian activity; from these estimates the author provides collision risk mortalities. This study reported an estimated average collision mortality of 18-35 birds per turbine per day for the different nearshore wind farms that were studied. Using the ranges reported in Everaert’s study the estimated bird mortality for the Cape Wind Project ranges from 2,300 – 4,600 birds per year.

We provide the following example of a calculation of collision mortality that we feel the DEIS should provide, i.e., the example is intended to be illustrative not definitive.

We calculated estimated monthly collision mortalities for Roseate Terns in the proposed project area for the period beginning in May and ending in early September 2003 and 2004, the months that approximately correspond to the period when terns are present in the project area and Nantucket Sound. These figures were calculated using our tern sightings collected during our boat and plane surveys on Horseshoe Shoal and Nantucket Sound in 2003 and 2004, and they are summarized in Table 1.

The Biological Assessment (BA) of the Roseate Tern (Appendix 5.7-H) estimated a collision mortality of 0.0002 to 0.5 Roseate Terns per year. The BA applied a collision probability derived from Everaert (2004) for Common Terns of 1 in 600 terns passing at rotor height. The BA in the DEIS reduced this probability by multiplying the risk by fractions that reflected the authors’ assessment of the effects of differences in turbine density, turbine height, turbine spacing, and degree of colony remoteness when comparing the Cape Wind Project to the wind farms in Belgium. The degree of

discounting cannot be any more than a guess, although some of the variables are reasonable factors to discount, such as the effect of differences in activity due to the greater distance from a colony. It is not clear why the authors discounted for reduced activity at night when in the previous paragraph they state “these collisions could have occurred at any time, day or night, and in diverse weather conditions.”

Our calculations are based on the assumption that it is the number of transits across the project area during the late Spring and Summer that is the key variable for assessing risk, not density of birds in the project area per se. This is primarily because terns rarely rested in the project area, but were generally seen flying through or foraging. To calculate transits, we first calculated the mean density of terns in the project area in a particular month by the average of the number of terns seen per survey in that month. We multiplied this density estimate by the size of the project area (110 km²). We then made our most important assumption by estimating the number of transits by terns across the project area. Following Ian Nisbet, we estimated that a tern would transit the project area in 10 to 15 minutes, i.e., a tern is replaced by another tern every 10-15 minutes or approximately 4.8 times per hour. Thus, we multiplied our estimate of the total number of terns in the project area by 4.8 and then multiplied the product by the day length of 14 hours. We multiplied the result by the number of days per month and multiplied that result, the total number of transits per month, by the collision probability of one in 3,000. The results of all of these calculations are presented in Table 1. Estimates of Common Tern mortality can be calculated by multiplying the results for Roseate Tern by 3.167 or 0.76/0.24.

Because we based estimates of tern activity on our boat and plane surveys we did not discount for differences in density between Belgium and Horseshoe Shoal. We also used the collision probability from Everaert (2004) based on terns passing at all heights. So, in these calculations the greater height of the Cape Wind turbines is irrelevant. The effect of the other factors is not known, although the greater distance to nesting colonies and loafing areas in Nantucket Sound may indeed reduce risk. Rather than guessing on the magnitude of this reduction, we report our estimates without discounting. Neither do we provide a range of mortalities for each month, which are based on average densities of a variance that can be calculated.¹

In performing these calculations we made several key assumptions that would need to be tested and these include 1) we estimated the number of tern transits per hour, i.e., turnover rate, of 4.8 terns per hour. This estimate was based on the rate at which terns fly and the average width of the project area; 2) we combined tern density estimates obtained by boat and plane surveys. We chose to use these different sources of information because we had a greater number of each type of survey in different survey

¹ The mean number of all terns per boat survey in Horseshoe Shoal in May of 2004 is 58.6 with a standard error of the mean (SE) of 21.0. Assuming a 95% confidence interval (CI) is approximately ± 2 SE, the number of all terns in May 2004 on Horseshoe Shoal ranges between 16.6 and 100.6 with 95% confidence. If one plugs these values into our risk equation, the 95 % CI of Roseate Terns predicted to be killed in May 2004 by colliding with the 130 turbines on Horseshoe Shoal is between 4.7 and 28.6 birds. These calculations can be repeated for each estimate.

periods – boat surveys in Late Spring and early Summer and plane surveys in Late Summer. The area coverage of Horseshoe Shoal differed by the survey type. Boat surveys covered 64.5 km² and plane surveys covered 8.4 km². Each survey method has its own source of error regarding detectability of birds; 3) we utilized the collision probability of 1 in 3000 as cited in Everaert (2004), which the DEIS discounts in Appendix 5.7-H. We agree that this rate is probably an overestimate of the risk, but the effect of varying this risk on mortality figures can easily be calculated with the data provided in Table 1; 4) we used 24% for the percentage of all tern sightings that were Roseate Terns. Varying this percentage only influences the assessment of risk to Roseate Terns, and does not influence the assessment of risk to all terns. We do believe these estimates are closer to the worst-case scenario for tern mortality than that provided in the Biological Assessment by the applicant. By way of comparison, the DEIS cites an estimate of 364 birds of all species per year as their only estimate for collision mortality. By our estimates, the average number of Common and Roseate Terns alone that could be killed based on the period between May 1 and September 24 in 2004 is approximately 137.

Estimates of collision mortality at wind farms are fraught with enormous uncertainty, especially as it appears that location of the wind farm is the most important variable effecting risk to birds. Transferring results from one wind farm to another should be done cautiously. Mortality estimates from comparable offshore wind farms are few and based on limited observation. Mortality estimates are themselves estimates often based on correction factors of unknown accuracy applied to known mortalities based on searches of “plots” surrounding the turbines. Given this lack of certainty it is important to apply all best available methods and acknowledge that the actual risk lies somewhere within a broad range of predictions.

The DEIS ignores this uncertainty and its own data to produce the lowest estimate of collision mortality. The estimate of 364 birds per year has no connection to the specifics of the Horseshoe Shoal project area. The applicant spent a substantial amount of money to collect data on the avian use of Nantucket Sound and the project area. This data should be utilized to undertake further analysis of collision mortality risk.

As we described above, our results are intended to be illustrative of the kind of calculations that the Corps should conduct in the Supplemental DEIS – using data collected from avian surveys of the Sound to produce statistically valid estimates of collision mortality for all birds based on clearly described and defended assumptions. Given the uncertainty surrounding collision mortality figures, the Corps should report the results of these calculations as a range of collision probabilities. We note again that key data are missing, including sufficient data on flight height of sea ducks during the winter months.

Finally, the DEIS presents mortality estimates from other human-made structures, such as buildings, cars, and hunting to suggest that the additional mortality from the wind farm is inconsequential. Such comparisons are meaningless for the following reasons: First, as described above the mortality from wind turbines may be much higher than is

estimated in the DEIS. Second, the mortality is cumulative. High avian mortality due to other sources is no justification for the acceptance of additional mortality from wind turbines.

2) Sea Turtles and Marine Mammals

From the Scope of Work:

Marine mammals and turtles to be addressed include northern right whale, humpback whale, fin whale, harbor seal and grey seal, loggerhead sea turtle, Kemp's Ridley sea turtle and leatherback sea turtle.

The proponents should reconsider the potential impacts of the proposed wind farm on sea turtles. The DEIS (e.g., Appendix 5.5A) refers to turtles as rare in Nantucket Sound and the project area. During late summer aerial surveys for terns between 2002 and 2004 along a regular flight grid, Mass Audubon counted 115 sea turtles in the Sound. This number likely underestimates turtle abundance since what is observed from aerial surveys is probably only a subset of those turtles that are present. These sightings indicate a degree of use of the Sound by turtles far exceeding that known prior to these studies. This new information was not incorporated into the Scope of Work requirements for the DEIS, but the assessment of impact on turtles is now necessary.

The rationale for requiring an additional special study of sea turtles is that:

1. Sea Turtles are all federally listed as endangered;
2. The 130 turbines in Nantucket Sound may alter feeding patterns of some sea turtles, particularly loggerheads. As the monopoles become covered with invertebrates, they may attract turtles; and
3. Sea turtles are more prevalent in the study area than realized when the scope of the DEIS was determined.

The DEIS presents substantial background natural history information on loggerheads, Ridley, and leatherbacks. Unfortunately, very little of it is relevant to Nantucket Sound. There is little information available for Nantucket Sound but there is information available for Long Island Sound. A consideration of sea turtle behavior in Long Island Sound would be relevant.

The DEIS implies that loggerheads do not come any farther north than Long Island. However, Table 1 shows that many loggerhead turtles strand in Massachusetts, indicating that they are present. Citing Shoop and Kenny is not valid because most of their work was offshore and involved adults, not juveniles. Work of numerous authors confirm Lazell's hypothesis that northern waters are critical habitat for juvenile sea turtles. (Lazell, 1980)

Mass Audubon's observations and our stranding data suggest that leatherbacks are far more active in late July and August than the DEIS indicates. Any increase in boat

traffic raises the potential concern of collisions with boats. The DEIS indicates that construction vessels will travel at reduced speed (< 14 kts), but does not include maintenance trips, which the DEIS describes as occurring hundreds of times in a year. If the monopoles develop a fouling community that attracts turtles, the risk of collision with maintenance vessels will increase unless strict rules are implemented to slow these vessels. In addition, the possibility of creating a “habitat sink” within the turbine array needs to be addressed within the DEIS. Turtles and other wildlife will have to negotiate two major shipping lanes (The Main Channel and North Channel) outside the turbine array (Fig. 5-12.1), which surround the array on the west, south and eastern borders. These lanes will experience higher densities of boat traffic, particularly in the warmer months (April – Oct). Currently, there is no way to ascertain the numbers of boats using the two channels because vessel traffic is self-reporting. However, the average annual number of vessels utilizing the Main Channel in 1998 – 2001 was reported in the DEIS as 1361. This number is undoubtedly much higher, and the DEIS should provide a means to determine an estimate of total ship traffic on a daily/seasonal/annual basis to provide a parameter for incorporation into a risk assessment for turtles.

The DEIS should include a synopsis of green sea turtles. This species does occur in the area.

3) Bats

The Corps should reanalyze radar data from May and September 2002 to determine if bats can be distinguished from other “targets” in order to provide information on the use of Nantucket Sound as a flyway by migratory bats. In the absence of such information no conclusions on the risk posed by this project to migratory bats can be made.

The DEIS (Section 5.6.2.4.3.) states that “collision risk to bats is expected to be minimal” and that bats can use echolocation to avoid the turbines. In light of the recent determination of large bat kills at the Backbone Mountain, West Virginia wind farm (data that were available at the time of the preparation of the DEIS), these statements need to be reevaluated. Further, the DEIS states that although bat migratory routes are not well documented, Nantucket Sound is not known as a bat flyway. No data are provided to substantiate this statement. Red bats, in particular, are strong flyers that might regularly migrate across the Sound during the fall. The Corps has radar data that should be reanalyzed to determine whether target discrimination could provide data on the relative abundance of migrating bats. The strong statements made in this section of the DEIS are not warranted as the DEIS presents no data on which to base such statements.

B. Inadequate Synthesis of Information in the DEIS

The Scope of Work for the DEIS states the following:

The EIS will attempt to comprehensively address the interconnections between the benthic, fisheries and avian resources. The predator-prey interactions are important

considerations in fully understanding the potential impacts in siting a project within Nantucket Sound.

The DEIS fails to do this. The Corps should provide a holistic or ecosystem level summary of environmental impacts. Nantucket Sound contains a complex food web, and the DEIS does not do an adequate job of relating the impacts of one component of the food web on the ecosystem as a whole. Because the major avian resources in Nantucket Sound, terns and waterfowl, rely on fish and shellfish as their food supply and in the case of terns, to feed their young, any alterations or impacts to the benthic community could shift food distributions of these species. Sea ducks in particular congregate in large numbers in the Sound during the winter, and our survey data over two winters have shown substantial shifts in distributions of large rafts. These shifts could be due to a number of factors including variation in weather and food availability; any alteration of this habitat will likely result in a redistribution of food resources.

In addition, there are few data available that describe the main shellfish and fish species preyed upon by sea ducks and other seabirds utilizing the Sound. While it is well known that sea ducks such as eiders and scoters forage on mollusks, scoters also utilize other resources, including invertebrates and fish species. The DEIS does not adequately connect the relationship between foraging sea duck and sea bird species and their prey items making a complete risk assessment difficult.

C. Monitoring

As a condition of any construction permit, the Corps should require the development and implementation of a detailed construction and post-construction monitoring protocol to assess the impact of the wind farm on birds, bats, benthic communities, fish, turtles, and marine mammals. This is especially critical given the lack of information on the impact of large wind farms on these species. The monitoring program should assess the overall ecological impact of the project. Studies should be designed to address specific questions, such as the extent to which shifts in avian distribution following construction of the project due to avoidance, versus shifts in food supply.

We recommend that an independent fund be established and that independent consultants be hired to conduct the construction and post-construction monitoring. Post-construction monitoring should be paid for from the proceeds of energy sales. Furthermore, we ask that an independent scientific expert review panel be established that would review and evaluate reports produced by the consultants. The panel's findings should be reported directly to the supervising agencies and made available to the public.

We recommend consideration of the protocols developed in Europe for post-construction monitoring of offshore wind farms, such as Horns Rev off the western coast of Denmark. Such monitoring should include regular aerial surveys conducted over three years. The aerial surveys should follow the same flight grid as utilized by the studies presented in the DEIS or undertaken by Mass Audubon. Radar should operate at least

during the periods of peak movement of terns, sea ducks, and migratory songbirds into and out of the Sound, including April through June and August through November. Radar observations should be regularly “ground-truthed” by qualified technicians stationed at periodic intervals on the Electrical Service Platform using spotting scopes fitted with a range finder. Underwater sampling of the “fouling” community and the benthos around the turbines should be conducted, the latter to assess the effectiveness of the scour pads. The eelgrass community in Lewis Bay should be mapped immediately before and after laying of the submarine cable. Finally, if the technology is available, rotors should be outfitted with impact sensors to record avian and bat strikes.

PART 2. COMMENTS ON SPECIFIC SECTIONS OF THE DEIS

Section 5.3: Impacts on the benthic community.

General Comments:

We agree with the statement that much of the sea bottom is sandy and subjected to frequent natural disturbances. Thus the organisms that live there would tend to be those that can rapidly recolonize sandy substrata and should therefore not be affected permanently by construction activities, operations, or decommissioning.

In general, it is essential that the Corps adequately document the marine environment prior to construction, as this will provide the baseline for interpreting post construction changes should the wind farm be constructed. For example, the DEIS does not adequately characterize the rocky substrata, which do not lend themselves to sampling by grab samplers. Slipper Shells, *Crepidula fornicata* and *C. convexa*, were present in 25% (2001) and 9% (2002) of benthic grab samples, and this suggests a more widespread amount of relatively stable habitat that could include rocks and cobbles. The Corps should provide a more accurate and comprehensive estimate of the amount of existing rocky habitat.

p5-42. The Corps should require periodic inspections of the scour mats after construction to determine that they are working properly.

Shellfish

Detailed comments:

p5-38 Shellfish resources: The DEIS states that “Bay scallops are a negligible fishery in MA according to DMF.” For the Cape Cod and Islands region, we would not characterize the bay scallop fishery as “negligible.” It is a highly valuable resource, but varies much from year to year. It is particularly important to the economies of Nantucket and Martha’s Vineyard.

p5-46. The Corps should provide an example of the type of mitigation for impacts to the recreational shellfish bed.

Section 5.4 Finfish

General comments:

Jet plowing should be timed and located to avoid winter flounder spawning.

p5-62. Here and in a number of other places the DEIS claims that the mortality of benthic organisms will provide a significant food source for predatory fish and marine mammals. We dispute the contention that any mortality during the construction will be beneficial to the ecosystem by providing an additional food source to predators and scavengers. It is logically flawed and sets up a situation where the DEIS appears to have it both ways, first by saying that there will be minimal impacts, and then claiming that impacts will be beneficial.

Section 5.5. Protected Marine Species

Specific comments:

Section 5.5.3.1. Federally Protected Species Under the ESA

p5-72. Why are piping plovers and roseate terns not listed as federally protected species in the study area?

Section 5.5.3.3

“...it is possible that (LF Pilot and Fin Whales and Harbor Porpoises) have the potential to occur in Nantucket Sound”.

Harbor Porpoise is the only cetacean one of the reviewers has seen from Nantucket Steamship Authority ferries in over forty years of crossings. Both Long-finned Pilot Whales and Fin Whales have stranded on the Sound (north) side of Nantucket.

North Atlantic Right Whales occur frequently around the outer (eastern and southern) shores of Nantucket. Island.

Section 5.5.6.1.1. Acoustic Harassment

The Corp describes decibel levels of 180 at 1220 meters, but does not characterize the acoustic environment at a distance less than this. The Corps should provide a graphic illustrating the relationship between decibel levels and distance from the construction zone.

Section 5.5.7. Mitigation.

We are not convinced that a soft start will be effective in avoiding acoustic impact. Although it is an appealing concept, the DEIS does not analyze whether and how sensitive organisms will leave the area after a “soft start,” or how long it will take various

types of animals to move out of the area if they are motivated to do so by the “soft start” noise. Neither is it clear how this process would be monitored or enforced. The Corps should provide further details.

Section 5.7. Avian Resources

General Comments

The DEIS’s claim that bird flight heights were determined from plane surveys is unjustified. Because of the vertical perspective, flight heights cannot be accurately estimated from a plane. The only accurate estimates of flight heights were made during boat surveys and radar scans.

Aerial surveys reported in the DEIS were conducted at 250 feet. At this height, birds will flush, despite claims to the contrary made in the document. In the survey layout utilized in this study, this could lead to double counting of birds. Further, it is likely that observers would not detect birds flying above 250 feet as the observers attention would be focused downward.

5.7.1, paragraph 4.

The DEIS states: “To validate whether the applicant’s field studies occurred in years considered to have typical abundance levels of bird species in Nantucket Sound, existing databases from independent entities were reviewed to compare avian numbers in 2002 and 2003.”

The data used for this comparison, such as Mass Wildlife coastal aerial surveys, were not collected within the project area. Other surveys, such as National Audubon’s Christmas Bird Count (CBC) circles, contained different groups of species. Further, there is an unstated assumption that counts in different geographic units covary. No evidence is presented to support this assumption, and we believe that this comparison is irrelevant and cannot be used to validate the duck survey data as “typical”.

5.7.2.2.5, paragraph 1.

The DEIS acknowledges “no systematic, qualitative studies have been conducted in the central portion of the Sound where the Project is proposed.” As such, the data are not sufficient to correlate abundance patterns within the sound to National Audubon CBC or Mass Wildlife counts conducted from near- or on-shore vantage points. The DEIS suggests that CBC and Mass Wildlife data from these years represented typical abundance levels between 1989 and 2003, but these results do not validate information gathered during surveys conducted for the DEIS in an area where little to no data has been gathered previously.

5.7.2.3, paragraph 3.

The DEIS concludes that Horseshoe Shoal, compared with the other shoal areas studied and with the other areas of Nantucket Sound, exhibits lower abundance and diversity.

This statement is misleading. The abundance percentages within the alternative project areas were calculated by pooling totals over an entire field season, and over two years (March 2002 – February 2004). Because the data were presented in this way, any patterns that might have emerged within a shorter time frame were “lost”. For example, Mass Audubon surveys of winter sea duck distribution in 2003-2004 indicated that, during December 2003, HS Shoal supported disproportionately higher numbers of scoters (~21% in an area comprising ~11% of the Sound). When these abundance values are pooled with abundance data compiled throughout the remainder of the winter season this pattern is obscured. Abundance and duration of occupancy represent equally important components of the avian risk equations, and by pooling the data, the apparent significance of the abundance component is diminished.

Section 5.7.2.3 The seasonal bird count totals for aerial and boat surveys represent *sightings, not individual birds*, given that recounting was inevitable between two or more surveys.

Section 5.7.2.3.1 The DEIS claims that none of the 90 terns recorded by Mass Audubon in May 2003 were Roseate Terns. Actually, 53 of those were “Common/Roseate types,” i.e., some or all of them could have been Roseate Terns, but were unidentifiable to the species level.

Section 5.7 (throughout) With the exception of locally nesting terns, it is impossible to ascertain what “populations” are represented, especially in overwintering sea ducks. Without knowing this, even if we knew the death rate of each species, no claims could be made as to the likely impact on any given species at a population level.

Section 5.7.1 “Industry standard” claims risk is related to “number of birds/unit area/unit time as a measure of how much time birds spend in a given area; and the proportion of time spent flying at rotor height”. This presumes monopoles pose no threat. This is inconsistent with findings at static structures such as telecommunication towers, skyscrapers, etc.

Section 5.7.3.2.1 “Visibility” (of turbines) - claim that movement of waterbirds is more limited during periods of reduced visibility is unsubstantiated. The DEIS claims that most collisions “apparently” occur with rotors versus the monopole and this claim is unsubstantiated.

Section 5.8. Coastal and Freshwater Wetland Resources

General Comments on Coastal Wetland Resources:

The DEIS states that the submarine cable will pass within 21 meters of an eelgrass bed in Lewis Bay. The proponent states in Section 5.8.4.2.1, p5-149) that, “Potential indirect impacts to SAV during cable embedment related to sediment resuspension would be minimized by maintaining an appropriate distance between the jet plow and the mapped SAV beds.” We ask the Corps to be more specific about the effects of the sediment plume on eelgrass in Lewis Bay. We assume that use of the term, “mapped SAV beds” refers to eelgrass habitats mapped by the Massachusetts Department of Environmental Protection. The Corps should clarify whether it has noted any additional eelgrass beds in their surveys that could be affected by the installation of the submarine cable or any other component of the project. The basis and justification should be provided for the statement that there will be no impacts on the eelgrass bed within 21 meters of the jet plow.

The draft Energy Facilities Siting Board decision on the cable requires Cape Wind to aerially photograph Lewis Bay in the month of July immediately preceding construction and to use this information in final routing of the cable in order to avoid impacts to eelgrass. The Corps should incorporate this mitigation requirement into its documents.

ADDITIONAL REFERENCES NOT CITED IN DEIS

Bellrose, F.C., ed. 1980. Ducks, geese, and swans of North America. 3rd ed. Stackpole Books, Harrisburg, PA.

Everaert, J. 2004. Wind turbines and birds in Flanders: Preliminary study results and recommendations. *Natuur. Oriolus* 69(4): 145-155.

Lazell, J.D., Jr. 1980. New England Waters: Critical Habitat for Marine Turtles. *Copeia* 1980: 290-295

Table 1: Estimated collision mortalities by month for Roseate Terns (RT) based on density data calculated from a) 2003 and b) 2004 boat (May – July) and plane (August – September) surveys conducted by Mass Audubon. The area of Horseshoe Shoal was estimated at 110 km², and the number of tern transits per hour was estimated at 4.8. Day length was assumed to be 14 hours. Roseate Terns were estimated to be 24% of all tern sightings. The collision probability was estimated at 1 in 3000 based on data from Everaert (2004). N equals the number of surveys on which density estimates were based. Estimated Common Tern mortalities can be calculated by multiplying Roseate Tern mortalities by 3.17. *Italicized months indicate that tern data were collected during plane surveys.* All calculated numbers presented in the table were rounded after calculation.

a)

2003	N	RT Density (per km²)	Total # of RT in HSS	Number of RT Transits per month	Estimated RT collision deaths per month
May	3	0.24	26.9	56,000	18.7
June	4	0.02	2.0	4,130	1.4
July	6	0.02	2.3	4,690	1.6
<i>August</i>	6	0.005	0.5	1,090	0.4
<i>September</i>	7	0.3	36.6	61,530	20.5
Total	26				42.5

b)

2004	N	RT Density (per km²)	Total # of RT in HSS	Number of RT Transits per month	Estimated RT collision deaths per month
May	5	0.22	24.0	49,970	16.7
June	4	0.01	1.6	3,300	1.1
July	3	0.01	1.1	2,270	0.8
<i>August</i>	3	0.2	19.8	41,250	13.8
<i>September</i>	7	0.008	0.9	1,440	0.5
Total	26				32.7