Cape and Islands Offshore Wind Public Outreach Initiative

Progress Report
December 2002

MASSACHUSETTS TECHNOLOGY COLLABORATIVE

This progress report covers the activities of the Massachusetts ☐ Technology Collaborative's Cape & Islands Offshore Wind Public ☐ Outreach Initiative from May through December 2002, including ☐ the first four Offshore Wind Stakeholder meetings. ☐
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Raab Associates is providing facilitation services for the ☐ stakeholder process. Full summaries of all the meetings and ☐ accompanying presentations/background materials can be found ☐ on their web site: ☐
☐
www.raabassociates.org☐
☐
A final report will be prepared upon completion of the Initiative. ☐ In the meantime, we look forward to your feedback.☐
☐
Kristen Burke☐
Fara Courtney☐
Barbara Hill☐
Greg Watson☐
☐

Cape & Islands Offshore Wind Public Outreach Initiative

PROJECT TEAM*

Greg Watson

Vice President for Sustainable Development & Renewable Energy
Massachusetts Technology Collaborative

Kristen Burke

Project Manager
Renewable Energy Trust

Fara Courtney

Coastal Issues Policy Consultant
Good Harbor Consulting

Barbara Hill

Project Manager
Offshore Wind Public Outreach Initiative

Massachusetts Technology Collaborative
396 Main Street
Suite 9
Hyannis, Massachusetts 02601
(508) 775-9201
masstech.org

Facilitation Services
Provided by:

Raab Associates
raabassociates.org

Jonathan Raab, PhD
Suzanne Orenstein
Colin Rule
Greg Sobel, Environmental Mediation Services

*See Appendix for Biographies

The Massachusetts Technology Collaborative

Karl Weiss, MTC Chair; Rob Pratt, Renewable Energy Trust Director; Mitch Adams, MTC Executive Director

The Massachusetts Technology Collaborative (MTC) is the state's development agency for renewable energy and the innovation economy, which is responsible for one-quarter of all jobs in the state. We work with cutting-edge companies to create new jobs and stimulate economic activity in communities throughout the Commonwealth.

As our name suggests, we use a collaborative approach to achieving the organization's mission. We bring together leaders from industry, academia, and government to advance technology-based solutions that lead to economic growth and a cleaner environment in Massachusetts.

By developing energy from wind, solar, and other renewable resources, we're reducing our reliance on coal, oil, and other fossil fuels that contribute to air pollution and global warming. Investments in the emerging clean energy market stimulate new economic activity in the renewable industry and job growth across Massachusetts.

The MTC Community Outreach and Siting Program works with communities and regions within the Commonwealth to create the tools and resources they need to understand the renewable energy environment. We engage in broad-based outreach and siting projects which provide forums, workshops, site visits and action plans to meet

the needs of the Commonwealth.

Massachusetts Technology Collaborative

Executive Summary

Cape Wind Associates is proposing to build a 170-turbine wind farm on Horseshoe Shoal, a 25- square-mile area of protected water in Nantucket Sound off the coast of Cape Cod, MA. This would be the first offshore wind farm in North America, and one of the largest in the world

The project is generating considerable positive interest throughout Massachusetts because of its potential to initiate large scale green power development in the Commonwealth, thereby advancing a significant public policy objective – increasing renewable energy generation in New England. The project has also mobilized strong, deep-seeded opposition among some in the receiving community of Cape Cod over perceived aesthetic, economic and environmental impacts, and lack of an adequate public policy structure at the federal level for evaluating a development of this kind on the Outer Continental Shelf (OCS).

Based on numerous interviews with key stakeholders, The Massachusetts Technology Collaborative determined there was a need for contextual and project specific information to be presented in a neutral setting that would promote exchange among stakeholders with varying viewpoints. MTC was encouraged to play the role of *honest broker* in order to facilitate the debate and actively produce/identify the data and materials necessary for informed decision-making on this important project. In this capacity, MTC created an issue-oriented process to crystallize and explore areas of concern.

The Goals of the Initiative are:

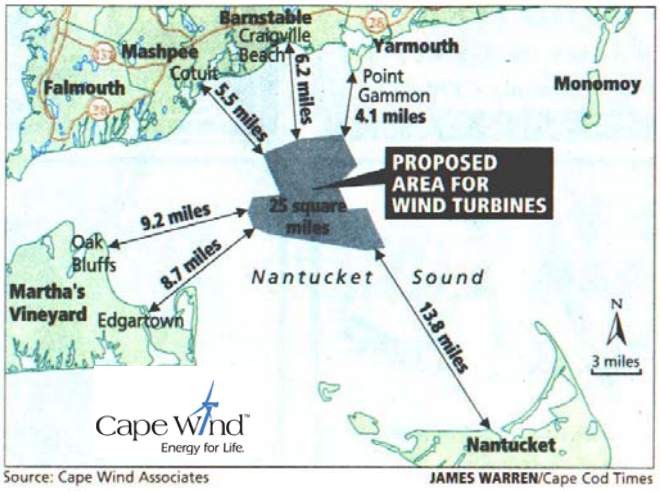
- To support a regulatory review process for the Cape Wind Project that is both transparent and well informed.
- To provide Cape residents and key decision makers with credible technical information and tools to effectively review the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/EIR) and to evaluate the proponents' and opponents' assumptions.
- To initiate a broader discussion of the energy system and renewable energy development in New England.

Cape Wind Project History

The Massachusetts Technology Collaborative (through the Renewable Energy Trust) has been involved with the project to develop a wind farm in Nantucket Sound since 1999. At that time, Brian Braginton-Smith was the visionary promoting a concept he called the *Ocean Ranch:* a combined wind farm and aquaculture facility. The major components of that project consisted of 10 wind turbines, and 90 fish pens at a cost of $30 million. By April 2000, the project had grown to 50 turbines spread over three acres with a budget of $100 million. MTC staff introduced Braginton-Smith to the Cape & Islands Renewable Energy Collaborative (CIREC) – a nonprofit organization that MTC helped form, composed of Cape & Islands-based organizations interested in exploring the region's renewable energy options.

Brian subsequently teamed up with Brian and Timothy Caffyn to form Wind Management, Ltd. Brian Caffyn is a wind developer with considerable experience building medium-sized land-based wind farms in Italy. He was well aware of the potential wind development off the coast of Cape Cod. He expanded Braginton-Smith's original plan and proposed to develop 2,400 megawatts of wind-generated electricity along Nantucket Sound.

By the end of the year Wind Management had merged with EMI to form Cape Wind Associates. Jim Gordon, an independent power producer who had built a number of gas-fired and cogeneration plants throughout New England headed EMI. Shortly after the merger the project began to assume its current design of 170 wind turbines with an installed capacity of 420 megawatts covering 25 square miles.



Source: Cape Wind Associates JAMES WARREN/Cape Cod Times

Before merging with EMI, Braginton-Smith's proposal received considerable attention from the local press, but it didn't generate much discussion and little, if any controversy. Once the merger was completed, all that changed.

Gordon's financial resources and successful track record in building energy facilities in New England turned the wind farm into a more credible, and consequently (to some) threatening project. Before long, strong organized opposition to the project emerged, most notably from some members of the Barnstable Town Council and a newly-formed nonprofit called The Alliance to Protect Nantucket Sound.

Alliance to Protect Nantucket Sound

Early in 2001, the Barnstable Town Council hosted public hearings on a proposed resolution that would ban all offshore wind projects in Nantucket Sound. The resolution was withdrawn amid protests over the lack of due process. A wind subcommittee was formed, and MTC (Greg Watson) was invited to attend these meetings chaired by Councilor Carl Riedel. Staff from Cape Wind was also invited and Jim Gordon often participated.

Current Situation

Cape Wind Associates filed a federal Notice of Intent and a state Environmental Notification Form (ENF) to initiate the permitting process in November 2001. Federal, state and local authorities have agreed to coordinate their regulatory reviews.

The US Army Corps of Engineers (ACOE) has taken primary federal jurisdiction over the Cape Wind Project.[1] They will issue an individual permit under Section 10 of the *Rivers and Harbors Act*, as well as take the lead in developing an Environmental Impact Statement (EIS) under *the National Environmental Policy Act (NEPA)*. In that capacity the ACOE is coordinating a federal interagency review of the project incorporating the requirements of a number of other regulatory authorities, including the *Fish and Wildlife Coordinating Act* (FWCA), *The Endangered Species Act (ESA),* and *the Marine Protection, Research and Sanctuaries Act (MPRSA)*, among others.

[1] This jurisdiction is based on Regulatory Guidance Letter 88-08, issued in 1988 for the purpose of exerting Corps jurisdiction over what was at the time a new class of project being proposed on the Outer Continental Shelf (OCS): artificial islands, structures to support gambling casinos and other similar installations. This Guidance Letter interprets the legislative history of the Outer Continental Shelf Lands Act (OCSLA) as reflecting Congress' intention that the Corps regulate all such structures, regardless of the purpose they serve.

The Commonwealth, under the auspices of the Massachusetts Environmental Policy Act (MEPA)[2], is conducting a concurrent review and the Cape Cod Commission will review the project as a Development of Regional Impact (DRI) under their own regulatory authority.

MTC Role Coordinated with ACOE Permitting Process:

The appropriateness of the ACOE acting as the primary federal authority over a project of this scale and unprecedented nature is under question by many parties. Nonetheless jurisdiction currently resides with them and their NEPA review is underway. The initial permitting schedule is displayed on the next page.

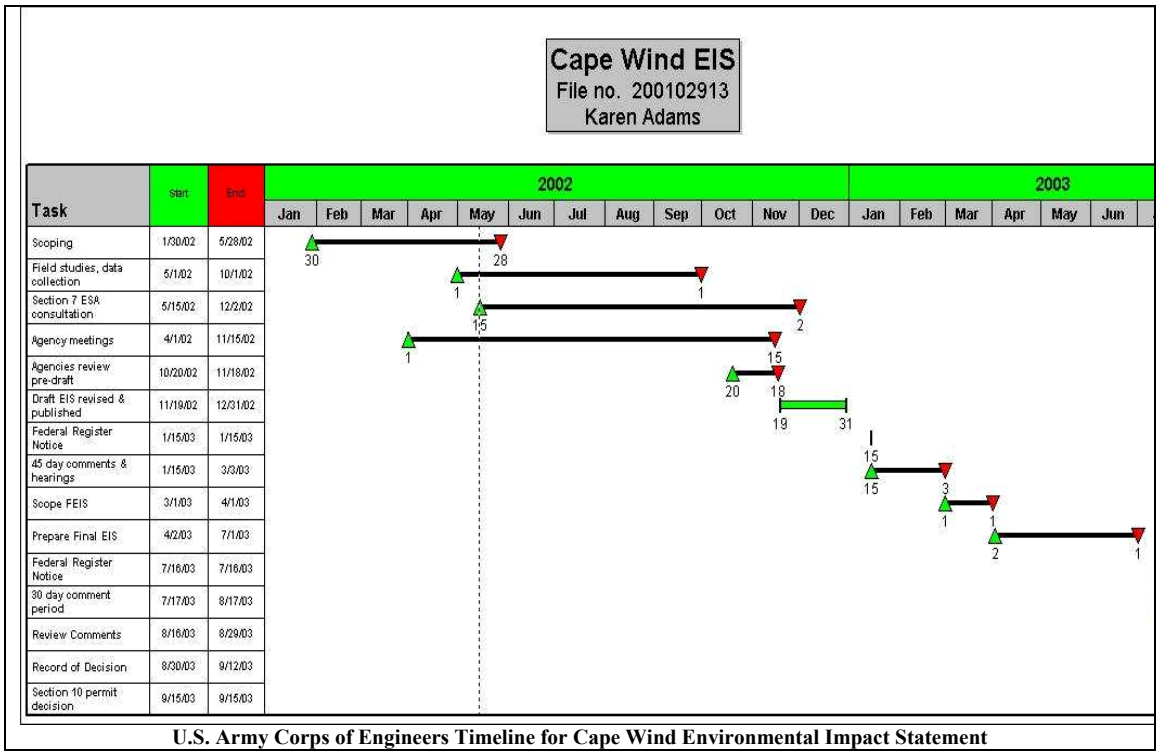
MTC Offshore Wind Public Outreach Initiative: Project Development

MTC has created a process that fits within the US Army Corps of Engineer's schedule for issuance of the Draft Environmental Impact Statement (DIES) in early 2003. By doing this we hope to encourage stakeholders (regardless of their position) to participate meaningfully and effectively in the permitting process.

From the beginning, the Cape Wind proposal had strong support as well as detractors. However, after attending a number of public forums (sponsored by individual towns including Barnstable, Harwich and Yarmouth as well as state and federal regulatory agencies) it was clear to us that a large majority of the public was undecided and needed more information before formulating an opinion. That realization, together with the fact that no process existed to engage the public in informed discussions about the wind farm proposal, was the basis for MTC's decision to develop a public outreach and education initiative. Following are the highlights of the process that we undertook to establish the initiative:

- Met with representatives from several prominent NE/Cape environmental organizations to discuss MTC's proposed honest broker role and process with respect to the offshore wind proposal
- Met with key legislators from the Cape & Islands to brief them on our proposed Initiative (Patrick, Turkington, O'Leary, and Atsalis).
- Met with staff of the Massachusetts Congressional Delegation (Kennedy, Kerry, Delahunt, Markey).

[2] State jurisdiction offshore is limited to 3 miles. The entire array of windmills is beyond this limit; therefore, the state only has jurisdiction over the transmission lines to landfall.



Task	Start	End
Scoping	1/30/02	5/28/02
Field studies, data collection	5/1/02	10/1/02
Section 7 ESA consultation	5/15/02	12/2/02
Agency meetings	4/1/02	11/15/02
Agencies review pre-draft	10/20/02	11/18/02
Draft EIS revised & published	11/19/02	12/31/02
Federal Register Notice	1/15/03	1/15/03
45 day comments & hearings	1/15/03	3/3/03
Scope FEIS	3/1/03	4/1/03
Prepare Final EIS	4/2/03	7/1/03
Federal Register Notice	7/16/03	7/16/03
30 day comment period	7/17/03	8/17/03
Review Comments	8/18/03	8/29/03
Record of Decision	8/30/03	9/12/03
Section 10 permit decision	9/15/03	9/15/03

U.S. Army Corps of Engineers Timeline for Cape Wind Environmental Impact Statement

- Made a presentation explaining how the New England Power System works to the US Army Corps of Engineers Joint Processing Committee (consisting of representatives from relevant state and federal regulatory agencies).
- Met with and made presentation on our proposed Initiative to key staff from the Massachusetts Coastal Zone Management (CZM) Office.
- Met with representatives from dozens of Cape organizations as part of our stakeholder interview process.
- Got op-ed pieces placed in **Cape Cod Times** and **Boston Globe**.
- Met with Cape Cod Times editorial board
- Monitored state and federal policy initiatives re: offshore wind and renewable energy development on the Outer Continental Shelf (OCS).
- Attended Congressional hearing in Washington, DC on HR 5165: A bill pertaining to the use of alternate energy on the OCS.

We began meeting with organizations in the Cape and Islands region to gain a better understanding of the concerns surrounding Cape Wind's offshore wind proposal. Based on these meetings with key stakeholders, MTC determined a need for contextual and project specific information presented in a neutral setting which supports exchange

among stakeholders with varying viewpoints.

Subsequently, MTC was encouraged to play the role of *honest broker* in order to facilitate the discussion and actively produce/identify the data and materials necessary for informed decision-making on this important project. We are providing educational forums and convening stakeholder meetings in an effort to initiate discussions and educate the residents.

Individuals representing key interests/constituencies were identified and recruited to participate in five all-day meetings as members of the Offshore Wind Stakeholder Committee. Representatives from relevant local, regional, state and federal agencies were also invited to attend these meetings and serve as resources. The complete lists of committee members and resources can be found in the Appendix.

Stakeholder Committee Meeting Schedule and Agendas

At the initial organizational session on October 10, 2002, the stakeholders were charged with identifying the issues they as a group wanted to focus on for the remaining four all-day meetings. The MTC project team worked closely with Raab Associates to identify appropriate presenters and address any issues of concern about the process on the part of the stakeholders. The discussion topics and presenters for each meeting are outlined in the following section:

Facilitators Greg Sobel and Jonathan Raab

Charlie Salamone - NSTAR

MTC STAKEHOLDER COMMITTEE MEETINGS

Meeting #1: October 10: Setting the Stage

At this session, the stakeholders first had an opportunity to agree on the goals, ground rules and structures of the meetings to follow, as well as share their perspectives on the project based on current knowledge. Second, through several presentations, the group was provided with a common set of facts about the project proposal, the review process and relevant studies that are underway and will contribute to the development of the EIS.
Finally, the stakeholders collectively identified topics to be considered at subsequent meetings.

Presentations:
Cape Wind Project: *What do we know? What do we need to know?*

- Jim Gordon, Cape Wind
- Issac Rosen, Alliance to Protect Nantucket Sound
- Maggie Geist, Association to Preserve Cape Cod

Overview of Current and Proposed Studies

- Migratory Bird Study, Jack Clarke, Massachusetts Audubon Society
- Wind Mapping Project, Kristen Burke, MTC
- Cape Wind Data Tower, Len Fagan, Cape Wind Associates

Meeting #2: October 31: Understanding Existing Conditions

The discussion of information needs at the first meeting concluded that an appropriate starting point for information gathering would be to look at the current status of both the natural system of Nantucket Sound and the electric utility industry in Massachusetts. It was important to understand the economic and environmental context within which the Cape Wind project has been proposed. A series of questions were provided in advance to help the speakers focus their comments in such a way as to highlight what is *known*, as well as where *more information is needed* to understand existing conditions, or where we will *need to work with uncertainty* in evaluating the Cape Wind proposal.

Presentations:

Panel # 1: **Electricity Supply, Reliability, Pricing, and Air Impacts**
Focus Questions:

What are the current electricity-related conditions on the Cape & Islands?
What are the key questions and analyses necessary to further our understanding in this area?
What, if anything, can we predict today about the positive and/or negative impacts of offshore wind development on those conditions?

- David O'Connor, Commissioner, MA Division of Energy Resources, *Electricity Supply, Fuel Diversity, and Price Issues*
- Charlie Salamone, Director of System Planning, NSTAR, *Electricity Transmission, Distribution, and Reliability Issues*
- Bill Lamkin, Bureau of Waste Prevention, Mass Department of Environmental Protection, *Impacts on Air Quality From Electricity Production and Use*

Panel #2: **Avian Information Baseline, Methodologies, and Concerns**
Focus Questions:

What do we know about avian activity on Nantucket Sound and how do we know it?

What studies are currently underway and how are they structured?

What are the key questions regarding off-shore wind development and birds that need to be addressed?

- Carolyn Mostello, MA Natural Heritage and Endangered Species Program, *Historic Information re: Bird populations in Nantucket Sound*
- Jeffrey Burm, Environmental Science Services, for Cape Wind, *Scope and Methodologies of Avian Studies for EIS*
- Vernon Lang, U.S. Fish and Wildlife Service, *Existing Data Known to FWS, and Key Assessment Issues*

Panel #3: **Marine Species and Habitat Information Baseline**

What do we know about fisheries, protected marine species and habitat conditions in Nantucket Sound, how do we know it?

What studies are currently underway and how are they structured?

What are the key questions regarding off-shore wind development and marine species and habitat that need to be addressed?

- Jack Terrill, National Marine Fisheries Service, *Essential Fish Habitat*
- Kimberly Damon-Randall, National Marine Fisheries Service, *Marine Mammals and Protected Species*
- Vincent Malkoski, MA Division of Marine Fisheries, *Overview of Commercial and Recreational Fishing Activities*

Meeting #3: November 21: Natural Resource Issues (continued discussion) and Offshore Wind Technologies/Economics

Due to the extensive and high quality presentations at the previous session, stakeholders had expressed frustration at the limited time available for discussion, particularly regarding avian and marine resource issues. It was therefore determined this third meeting should start with an opportunity to continue the

dialogue on those topics, including a presentation by the Corps on the process for integrating all this information into the EIS. The afternoon continued with presentations on baseline information regarding offshore wind technologies and the economic factors that determine development potential, including and how such factors as size, location, energy prices, and renewable energy credits.

Focus questions for continuing the dialogue marine resources and avian issues:

What have you learned from the panels on 1)marine issues; and 2) avian issues; that is useful in evaluating the DEIS and offshore wind development in general?

What more did you want to learn on these topic?

What are the most important marine habitat/avian-related issues that you feel may not be adequately addressed by the proposed impact assessment for offshore wind?

How are impacts on these resources being assessed in the EIS?

Presentations:

How the Studies of Potential Impacts Will be Compiled Into the Draft EIS

- Karen Adams, U.S Army Corps of Engineers

Off-Shore Wind Farm Technologies and Economics

- Professor Jim Manwell, Renewable Energy Lab, UMass (Amherst)

Carolyn Mostello - MA Natural Heritage & Endangered Species Program

Ron Borjeson - Massachusetts Commercial Fishing Association

Meeting #4: December 12: Visual Impacts and Alternative Site

This session focused on two of the most prominent issues raised regarding the siting of a large-scale wind farm in Nantucket Sound: *What will it look like from shore?* And w*hy Nantucket Sound?* Presentations on visual modeling resulted in surprising agreement among stakeholders about methodologies for creating visual simulations and the outcomes of applying those procedures to the Cape Wind proposal. Discussion of siting criteria led to a greater understanding of the economic and technical factors leading the project proponent to focus on Nantucket Sound.

Presentations:

Modeling Visual Impacts

- Rick Smardon, SUNY College of Environmental Science and Forestry
- Isaac Rosen, Alliance to Protect Nantucket Sound
- Michael Prybyla, Earth Tech (consultant to Alliance)
- Len Fagan, Cape Wind
- John Hecklau, Environmental Design & Research (consultant to Cape Wind)
- Bruce Bailey, AWS Scientific *(re. Long Island Power Authority study)*

Alternative Sites

- Bruce Bailey, AWS Scientific
- Len Fagan, Cape Wind Associates
- Bob Link, Winergy LLC

Suzanne Orenstein, Bruce Bailey, Len Fagan, Bob Link

Bob Link, Jim Gordon

Fara Courtney, Vernon Lang

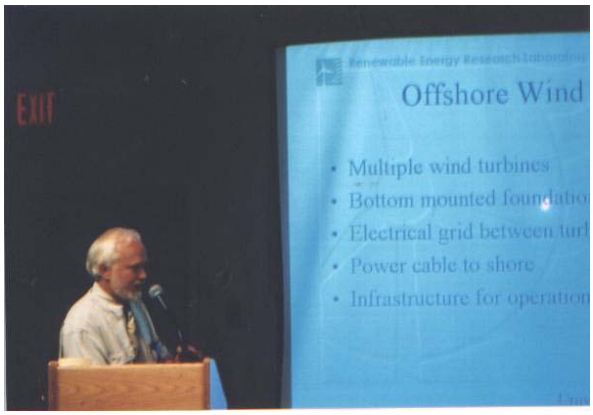
Meeting summaries, agendas, presentations and all other relevant documation can be accessed from both the MTC (http://www.masstech.org/RenewableEnergy/) and Raab Associates (http://wind.raabassociates.org/) web sites.

Response to the stakeholder process to discuss the Cape Wind proposal created through MTC's initiative has been extremely positive. The process of encouragiong interaction among regulators, citizens and nongovernmental organizations in a repsectful, well-managed environment has been indentified as a valuable aid in sorting through the hype and hyperbole by many participants. Attendance has been high and the discussions have been very informative. The only concern that has been expressed is that there will not be enough time to thoroughly vet all the issues raised. Representatives from the US Army Corps of Engineers have stated that the presentations and dialogue are helping to frame the development of the DEIS more effectively.

David O'Connor – MA Division of Energy Resources

Suzanne Orenstein - Facilitator

Karen Adams - U.S. Army Corps of Engineers,
Jonathan Raab – Raab Associates



Jim Manwell – University of Massachusetts, Amherst

Facilitate Critical Thinking

An informed citizenry is the bulwark of a democracy

Thomas Jefferson

The process that MTC has developed is not mediation. We are not attempting to achieve consensus among the stakeholders on Cape Wind's proposed offshore wind farm. The project is far too controversial and the time constraints too great to attempt that. Rather, MTC is attempting to create a forum that will support and encourage stakeholders to rise above the hyperbole that has been generated by both proponents and opponents of this proposed project and examine it *objectively* and *comprehensively*.

The primary goal of this process is to help sharpen the thinking of every stakeholder regardless of their position (for, against, undecided). If there are key questions that can be answered definitively and thereby lessen public confusion, we may seek to provide those answers. In addition, both sides have developed models and/or computer simulations in attempts to address or highlight concerns for which no final conclusions have been reached. The results more often than not contradict one another. In those instances, we shall strive to help stakeholders better understand the methodologies employed to generate the information, allowing them to then determine how reliable their results might be.

Our goal is not to provide answers, but to offer information that will support stakeholders' efforts to make informed decisions while acknowledging that the answers to some of the hardest questions may defy definitive analysis – at least within the scope and timeframe of the current permitting process.

An underlying assumption of *this* process is that informed citizens are more likely to make wise decisions. We feel that this is especially true when citizens are not only informed on the issues, but also on the processes by which those issues will be resolved and an ultimate decision reached.

Broad Public Outreach

In addition to the Stakeholder Process the Offshore Wind Initiative has generated other tools to bring the discussion to a larger audience.

The **Community Newspaper Company (CNC)** has stepped forward and assumed a leadership role in educating the public on the vast range of issues surrounding the proposed wind farm, and reporting on the project's day-to-day developments. While remaining editorially neutral on the project, Glenn Ritt, CNC editor-in-chief has made the pages of his newspapers available to MTC for the purpose of expanding its outreach efforts to a broader audience. In the weeks leading up to MTC's public forum on "Renewable Energy Options for the Cape & Islands, he invited the expert panelists to write op-eds on the topics they would be addressing at the forum (see Appendix).

The network of Cape-based community newspapers have also carried a number of articles and editorials designed to help create a substatantive context for MTC's stakeholder meetings. (**www.townonline.com**)

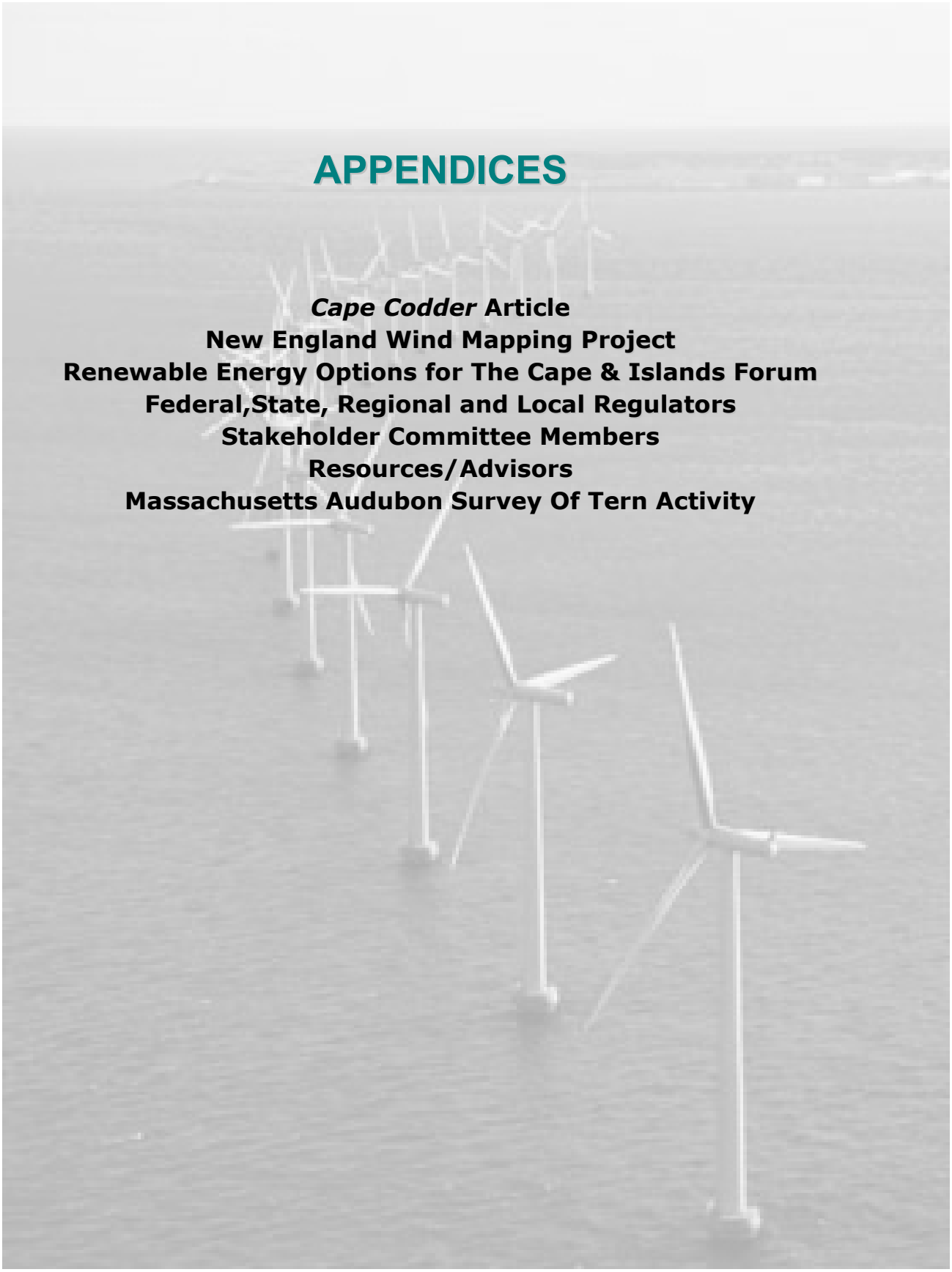
Energy Alternatives for the Cape and Islands

This half-day public forum *"Renewable Energy Options for the Cape & Islands"* was designed to provide an overview and respond to questions regarding the New England Energy system, potential regional impacts from global climate change, the status of renewable energy development here and abroad, and an analysis of specific opportunities for renewable energy development for the communities of Cape Cod, Martha's Vineyard and Nantucket.

Other Public Forums and Conferences

In addition, MTC staff have presented at numerous public forums realted to offshore wind development including (but not limited to) the following:

- Cape Cod League of Women Voters Coast Week
- Harvard Club of Cape Cod
- Wellfleet, Truo & Eastham Non-Resident Taxpayers Association
- Boston College Law School
- Massachusetts Institute of Technology Environmental Policy Group
- Massachusetts Climate Action Network



APPENDICES

***Cape Codder* Article**
New England Wind Mapping Project
Renewable Energy Options for The Cape & Islands Forum
Federal,State, Regional and Local Regulators
Stakeholder Committee Members
Resources/Advisors
Massachusetts Audubon Survey Of Tern Activity

THE CAPE CODDER on TOWNONLINE.com

The Massachusetts Technology Collaborative hopes to make sense of the battle over a Cape wind farm

By Doreen Leggett
Thursday, September 12, 2002

Just off Route 495, a group of stately brick buildings on expansive green lawns once nurtured the semi-conductor revolution. Now, 20 years later, this place born in the glow of fossil fuel's electricity is the gatekeeper of a nascent renewable energy industry.

It's an industry sure to play an ever-expanding role as Massachusetts and the nation face an uncertain energy future. And the stakes are very high, says Greg Watson, who is vice president of sustainable development and renewable energy for the Massachusetts Technology Collaborative in Westborough.

From the Route 495 complex and his other office in downtown Hyannis, Watson now focuses much of his attention on an ambitious proposal by Cape Wind Associates to construct 170 wind turbines in Nantucket Sound.

The wind farm, which is attracting national attention and growing local opposition, promises to take renewable energy far beyond its relatively theoretical setting.

Until now, "getting anyone to focus on energy issues in the abstract, especially renewables, (has) really (been) impossible," Watson said. That is a big mistake, he emphasized.

That view was echoed by a colleague, Robert Pratt, MTC's director of the state's $150 million renewable trust and a man who worked on renewables in Washington D.C. for 15 years.

"What is frustrating to me," said Pratt, "is people don't get the connections. You are looking at temperatures in the Arctic going up 5-7 degrees between 2000 and 2050. That is one hell of a big chunk, and in a place like the Cape, especially, that makes a difference. It's very scary stuff."

People are not linking increased carbon in the atmosphere with a disappearing ozone layer, or power plants and global warming.

"The planet is on the line, and people really don't understand that," said Pratt. "And the more you know, the scarier it is."

Insurance companies know, he said, and residents are going to see premiums go way up on the Cape. Those rate increases will be directly tied to global warming.

With the technology collaborative so clearly a supporter of renewable energy, it would seem likely that it also endorses Cape Wind's plan to generate an average of 170 megawatts of electricity from wind turbines in Nantucket Sound.

But it's precisely because it sees renewable energy as so critical - and the stakes so high - that the MTC is taking a totally neutral position on the proposal. It hopes that neutrality will give it a preeminent role in separating fact from fiction for the project's many stakeholders.

The entire world will be watching how state and federal regulators evaluate the project; how the Cape's many stakeholders mobilize for and against it; how Congress and the Bush administration approach it politically.

"If it's done poorly and (fulfills) people's fears, it could set renewable (energy) back decades, or perhaps so far that they couldn't recover," Watson said.

The strongest opposition to Cape Winds is coming from the well-organized Alliance to Save Nantucket Sound. The umbrella organization supports renewable energy, but not at the expense of tourism or the boating and fishing industries it claims will be damaged by the wind farm.

Others, however, are lining up with Cape Wind, touting the project's environmental and health benefits by reducing the need for dirty fossil fuels and limiting the nation's dependency on foreign oil.

In the middle are several environmental organizations torn between their allegiance to renewable energy and concerns over the fate of bird and fish populations in Nantucket Sound.

The emerging debate is growing in volume by the week.

The question for Watson and the MTC is whether that debate is sufficiently informed, especially given the nearly virgin territory the wind farm represents - not only on Cape Cod, but nationally.

Watson remembers a meeting last spring in Barnstable when one person after another stood up to give an opinion on the wind farm. After several hours, as the meeting was drawing to a close, a man burst through the door. He had been watching the hearing on television and ran from his house to get in his opinion.

"All he said was we need to know more," recalled Watson. "What we clearly saw was that the majority of people were in the middle. They may be leaning, but they definitely have questions."

Moreover, many environmental groups are torn between their innate support of renewable energy on the one hand and their uncertainty over where a wind farm should be built and how it might impact fish and bird populations.

That's where the MTC comes in, Watson said.

It is mobilizing to become the "honest broker," bringing experts to the table to help all the stakeholders and general public discover the most accurate answers to a the many questions surrounding the wind farm. They range from whether the project is environmentally safe to whether it truly benefits Cape electric ratepayers.

"We are not designed to persuade or convince," Watson said. "The main point here is: Are we asking the right questions? (Can we) get the answers we need and can we find the right people to respond?"

The MTC has identified two dozen local "stakeholders," from Cape Wind to local yachtsmen, from the Massachusetts Audubon Society and League of Women Voters to the Cape Cod Commercial Hook Fishermen's Association and Cape Light Compact.

And next month, they all will congregate under the MTC's aegis for an unprecedented stakeholders session, one of five planned between now and the end of the year.

Watson expects every party invited to be represented - either because they accept the MTC's "honest broker" premise, or simply can't afford to be absent.

It will be the first opportunity for these stakeholders to sit at the same table and talk with each other, comparing notes, asking questions, hearing answers simultaneously.

These stakeholders, scrupulously identified by the MTC, are critical because they not only have significant constituencies, but they also have standing in the Cape Cod and Islands communities, Watson explained.

At next month's forum, MTC is inviting ISO New England, which manages the region's electricity grid. Its officials will explain how electricity moves through that grid, and how it is marketed. Specifically, will Cape Codders benefit first and most directly from the electricity generated from the wind farm in Nantucket Sound?

It's a question addressed differently by both sides of the wind farm debate, with

the public left to wonder who is correct, and why.

And as Watson is learning, no interested party, even the U.S. Army Corps of Engineers, which shares regulatory authority over the Cape Wind project, seems certain on this important point.

MTC also plans to have experts talk about alternative energy sources available to New England besides wind, and how they can be applied in a smart environmental and economic fashion.

When people think about the outer continental shelf, wind may spring to mind, but it also produces thermal and wave energy, Watson pointed out

He also hopes to acquire information on other sites in New England that could support a project the size and scope of Cape Wind.

Regardless of a specific question - and there are scores of them - the most important mission of the MTC is to become a neutral and trusted source of information - not only for stakeholders and the public, but also for the very state and federal agencies charged with reviewing and approving the wind farm.

"(Residents) want to know that people who talk aren't paid for by one side or another,' said Chris Kealey, another MTC official. "Ultimately it is about trust."

That was the goal set by the state Legislature when it created Massachusetts Microelectronics Center (which later became MTC) in 1982 at the behest of then Secretary of Economic Affairs George Keriotis and Governor Ed King.

At that time, Massachusetts, long lauded for its strong economy and bright university minds, found itself lagging in an increasing high-tech world.

The idea was to bring together universities, the state and businesses, to fire up the industry. And it worked, according to Karl Weiss, president of MTC's board of directors, and an Eastham resident.

The state contributed $20 million to the collaborative; another $30 million was independently raised. Their building, boasting state-of-the-art equipment, let students experiment with designs and learn how to fabricate microelectronic chips. Weiss said more than 8,000 students benefited directly from the program.

In the early 1990s, however, the bottom fell out of the technology market, and the park began to manufacture computer chips like the ones in automobile guidance systems.

But this pure business function was not working well; so MTC broadened its focus from technology to what it terms the "innovation economy."

It helped the state formulate policy; became a clearinghouse for information; and brought industry, universities and government together in a collaborative process.

"We basically had no agenda for ourselves; we weren't trying to make a fast buck," Weiss said.

Since then, MTC has worked to nurture the "innovation economy," focusing on nine clusters: post-secondary education, defense, textiles and apparel, software, communications, healthcare technology, financial services and engineering and management services.

These industries are tracked partly because they pay an average salary of $67,306, which is 34 percent higher than the overall statewide average.

MTC publishes an index that lists high-tech companies in the state, their output and revenue. They also compare here versus other states, explained Mitchell Adams, its executive director. The index also hones in on trouble signs and identifies growth opportunities.

MTC was instrumental in helping to form Mass MEDIC, an association of businesses engaged in the medical device industry. "It

is one of the only industries that are doing well right now," said Kealey.

MTC also has helped bring together an Internet system that rivals those of businesses in New York City. On the Cape, it's Cape Cod Connect.

Adams said MTC fills a "unique" niche in its ability to pull industry, academics, and the government together. Last fall, it sponsored a conference on how to fight terrorism.

In 1997, when the electric industry was restructured, MTC was picked by the state legislature to oversee the Renewable Energy Trust fund, which brings in about $25 million a year from customers' bills.

Watson said the responsibility - and money - could have gone to the state Department of Energy. But the Legislature chose MTC because it is at the crossroads of technology, economic development and education.

The trust now has $100 million, and MTC is working with utility companies such as NStar, as they dedicate more resources to renewable energy and energy efficiency projects.

The trust not only funds renewable energy initiatives, such as fuel cells, solar power and landfill gases, but it also supports educational programs and grants to organizations such as Cape Light Compact and local school districts.

MTC also realizes it can't fund projects and walk away. There must be an infrastructure in place to maintain momentum.

Until now, the state's renewal energy economy has generated little public notice. But, activities have been significant. For example, Advanced Switching Corporation in Lowell is working with huge photovoltaic columns that hang from the ceiling in Star Wars fashion.

"This is not just small stuff," MTC's Pratt said. Renewable energy supplies up to 2000 jobs in the state.

The arguments for renewable energy aren't all environmental, he added. Europeans get 15 percent of their energy from wind. "We are talking about one hell of an industry," he said. "Why don't we capture some of those jobs in Massachusetts."

In the next decade, 4 percent of energy is expected to come from new renewable sources, as compared to 1 percent now. The trust's target is 1,000 new renewable megawatts by the end of this decade.

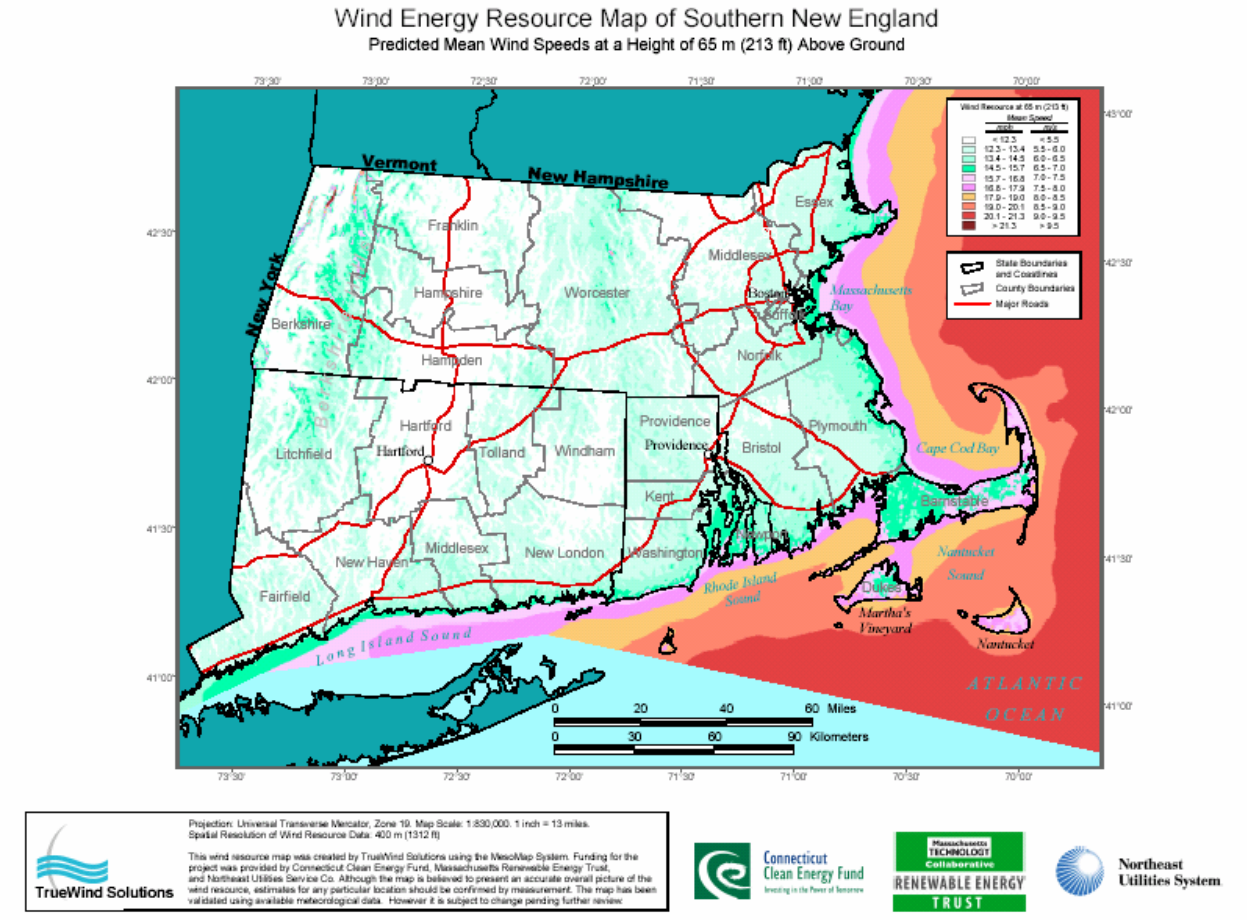
"That is a pretty tall order. And wind looms large," Weiss said. "So we have our work cut out for us."

Because New England has a very rich wind resource, and it's usually created in more pristine areas, the table is set for thoughtful discussion of where to place wind energy and how it will fit into a larger energy and oceans policy

"There are no totally benign sources of energy," Weiss said.

It is a policy issue, said Pratt. "On the Cape we have a microcosm of every concern going on right now. It is one of the toughest siting issues you can imagine."

Wind Resource Mapping Project



Summary

This project, sponsored in part by MTC, was initiated in late 2000 and has two objectives: (1) to map the wind resource characteristics of southern New England, including its offshore areas, to support the evaluation and planning of future wind energy development opportunities in the region, and (2) to collect new wind measurements at offshore locations and investigate offshore measurement platform designs, to further our understanding of the potential of offshore wind projects.

The mapping task, completed in early 2002, analyzed surface and upper-air geophysical databases using a powerful mesoscale atmospheric modeling system (MesoMap) to produce 400-m gridded maps of the wind resource at different heights across the region. The wind measurement task began collecting wind data at the Bishop & Clerk's Light House in Nantucket Sound in December 2000. Measurements are also being taken on Thompson Island in Boston Harbor.

RENEWABLE ENERGY OPTIONS FOR THE CAPE & ISLANDS

Saturday, October 26, 2002
Barnstable High School Performing Arts Center
Hyannis, MA
8:30 AM to 1:00 PM

PROGRAM

8:30 **Overview and Logistics – Greg Watson,** *Massachusetts Technology Collaborative*
8:45 **Welcome – Kathleen Schatzberg,** *Cape Cod Community College*

9:00 am Panel One

Rob Pratt, Massachusetts Renewable Energy Trust
Renewable Energy Funding Opportunities for the Cape & Islands
Stephen Burrington, Conservation Law Foundation
Global Warming, Energy and the Cape & Islands
Deborah Donovan, Union of Concerned Scientists
Renewable Energy Development Around the World

10:30 am BREAK

The **Barnstable Quarterback Club** will be selling coffee and donuts with the proceeds going to the Football Program. Thank you for your support

10:45 am Panel Two

Craig Kazin, ISO New England Inc.
Electricity in New England – An Industry in Transition
David O'Connor, Massachusetts Division of Energy Resources
Massachusetts Renewables Portfolio Standard: Setting The Stage For Green Power
Scott Ridley, Ridley & Associates
Assessing The Cape & Islands' Sustainable Energy Options

1:00 pm Adjourn

This is an interactive forum. Write your questions on the index cards provided and submit them to staff and volunteers at any time.
Any questions that are not answered, due to time constraints, will be addressed on MTC's web site www.masstech.org. If you provided your
E-mail address at pre-registration or sign-in you will be notified when questions and answers are posted.

MASSACHUSETTS TECHNOLOGY COLLABORATIVE
www.masstech.org

THE REGULATORS

FEDERAL JURISDICTION

(Adapted from charts developed by the ***Cape Codder*** newspaper)

Army Corps of Engineers
Lead Federal agency

US Fish & Wildlife Service
Endangered Species Act, Migratory Bird Treaty Act

National Marine Fisheries Service
Marine Mammal Protection Act, Magnusun Stevens Act

Environmental Protection Agency
Clean Water Act

Federal Aviation Administration
Air Navigation, radar and telecommunications

U.S. Coast Guard
Impact to Navigation, overall risk assessment

Department of the Navy
National Security, naval operations

National Historic Preservation Act
Impacts on historic places

STATE JURISDICTION

Massachusetts Environmental Policy Act Unit (MEPA)
Issues scope for the Environmental Impact Report

Department of Environmental Protection
401 Water Certification, Waterways License

Energy Facilities Siting Board
Approval for new generation capacity, transmission lines

Massachusetts Highway Department
Permits for underground transmission cables

Division of Marine Fisheries
Fisheries management for entire Sound

Coastal Zone Management Office
Assures consistency with state's coastal program

Division of Fisheries and Wildlife
State-listed migratory birds and endangered species

Board of Underwater Archeology
Shipwrecks and submerged cultural artifacts

Massachusetts Historic Commission
Visual impacts to historic resources

LOCAL AND REGIONAL JURISDICTION

Cape Cod Commission
Development of Regional Impact (DRI)

Towns of Barnstable and Yarmouth, Massachusetts
Orders of Condition under MA Wetlands Act

STAKEHOLDER COMMITTEE

Convener

Greg Watson, Vice President Sustainable Development & Renewable Energy
Massachusetts Technology Collaborative
396 Main Street, Suite 9
Hyannis, MA 02601
watson@masstech.org
www.masstech.org

Members

Isaac Rosen, Executive Director
Alliance to Protect Nantucket Sound
396 Main Street, Suite 2
Hyannis, MA 02601
rosen@saveoursound.org
www.saveoursound.org

Margaret Geist, Executive Director
Association to Preserve Cape Cod
3010 Main Street, PO Box 398
Barnstable, MA 02630
mgeist@apcc.org
www.apcc.org

Jaci Barton, Executive Director
Barnstable Land Trust
PO Box 224
Cotuit, MA 02635
blt@cape.com
www.blt.org

Gary Blazis, President
Barnstable (Town)
Barnstable Town Hall
367 Main Street
Hyannis, MA 02601
gblazis@attbi.com
www.town.barnstable.ma

Chris Powicki, Representative
Cape & Islands Renewable Energy Collaborative
PO Box 382
Cummaquid, MA 02637
chrisp@weeinfo.com

Megan Amsler, Executive Director
Cape & Islands Self Reliance Corp
PO Box 3203
Waquoit, MA 02536
reliance@reliance.org
www.reliance.org

Charles Kleekamp, Executive Director
Cape Clean Air
20 Water Street
PO Box 1300
Sandwich, MA 02563-1300
kleekamp@tiac.net

Henry DiGiacomo, CEO
Cape Cod & Islands Association of Realtors, Inc.
22 Mid-Tech Drive
W. Yarmouth, MA 02673
hdigiacomo@capecod.net
www.cciaor.com

John O'Brien, Legislative Liaison
Cape Cod Chamber of Commerce
307 Main Street, Suite Two
PO Box 2125
Hyannis, MA 02601
john@capecodchamber.org
www.capecodchamber.org

Spyro Mitrokostas, Executive Director
Cape Cod Technology Council
3180 Main Street
PO Box 456
Barnstable, MA 02630
spyro@capetech.com
www.capetech.com

Fred Fenlon, Representative
Cape Light Compact
40 Baldwin Road
North Eastham, MA 02651-1321
fredfj@attbi.com
www.capelightcompact.org

Jim Gordon, President
Cape Wind Associates
75 Arlington Street, Suite 704

Boston, MA 02116
jgordon@capewind.org
www.capewind.org

Peter Borelli, Executive Director
Center for Coastal Studies
PO Box 1036
Provincetown, MA 02657
borrelli@coastalstudies.org
www.coastalstudies.org

Steve Burrington, General Counsel
Conservation Law Foundation
62 Summer Street
Boston, MA 02110-1016
sburrington@clf.org
www.clf.org

Wayne Kurker, President
Hyannis Marina
1 Willow Street
Hyannis, MA 02601
wk@hyannismarina.com
www.hyannismarina.com

Jean Mangiafico, Chairperson, Environmental Committee
League of Women Voters
912 Main Street, Apt 307
Chatham, MA 02633
emangiafic@aol.com
www.lwv.org

Bill Veno, Acting Principal Planner
Martha's Vineyard Commission
PO Box 1447
Oak Bluffs, MA 02557
mvcommiss@adelphia.net
www.mvy.com/county

Jack Clarke, Director of Advocacy
MA Audubon Society
208 South Great Road
Lincoln, MA 01773
jclarke@massaudubon.org
www.massaudubon.org

Ron Borjeson, Vice President
Massachusetts Commercial Fishing Association

PO Box 613
Sandwich, MA 02563

Frank Gorke, Staff Attorney
MA Public Interest Research Group
29 Temple Place
Boston, MA 02111
frank@masspirg.org
www.masspirg.org

John Pagini, Director
Nantucket Planning & Economic Development Commission
1 East Chestnut Street
Nantucket, MA 02554
jpagini@town.nantucket.net
www.town.nantucket.ma

Chris Neill, Chairman
Sierra Club of Cape Cod
100 Boylston Street
Boston, MA 02116
cneill@sierraclubmass.org
www.sierraclubmass.org

Jack McCormack, Planning Board Member
Yarmouth (Town)
Town of Yarmouth
1146 Route 28
South Yarmouth, MA 02664
rlawton@yarmouth.ma.us
www.yarmouthcapecod.org

RESOURCES/ADVISORS

Cape Cod Commission
Margo Fenn, Executive Director
3225 Main Street
PO Box 226
Barnstable, MA 02630
mfenn@capecodcommission.org
www.capecodcommission.org

MA Aeronautics Commission
Jeff Senterman
10 Park Plaza, Suite 6620
Boston, MA 02116
Jeff.Senterman@mac.state.ma.us
www.state.ma.us/eotc/

MA Attorney General's Office
Judith Laster
One Ashburton Place
Boston, MA 02108
judith.laster@ago.state.ma.us
www.ago.state.ma.us

MA Board of Underwater Archaeological Resources
Victor Mastone, Director
125 Causeway Street, Suite 900
Boston, MA 02114
victor.mastone@state.ma.us
www.state.ma.us/czm/buar

MA Department of Environmental Protection
Bill Lamkin
One Winter Street
Boston, MA 02108
bill.lamkin@state.ma.us.
www.state.ma.us/dep

MA Department of Environmental Protection
Elizabeth Kouloharas
One Winter Street
Boston, MA 02108
elizabeth.kouloharas@state.ma.us

MA Division of Energy Resources
David O'Connor, Commissioner
70 Franklin Street, 7th Floor

Boston, MA 02110-1313
david.oconnor@state.ma.us
www.state.ma.us/doer

MA Division of Energy Resources
Jean Cummiskey, Director of Public Information
70 Franklin Street, 7th floor
Boston, MA 02110-1313
jean.cummiskey@state.ma.us

MA Division of Marine Fisheries
Vincent Malkoski, Aquatic Biologist
South Shore Office
50A Portside Drive
Pocasset, MA 02559
Vincent.Malkoski@state.ma.us
www.state.ma.us/dfwelw

MA Division of Marine Fisheries
Stephanie Cunningham
Annisquam River Marine Fisheries Field Station
30 Emerson Avenue
Gloucester, MA 01930
Stephannie.cunningham@state.ma.us

MA Natural Heritage & Endangered Species Program
Carolyn Mostello
1 Rabbit Hill Road
Westboro, MA 01581
Carolyn.Mostello@state.ma.us
www.state.ma.us/dfwele/dfn/nhesp/heritage

MA Office of Coastal Zone Management
Truman Henson
252 Causeway Street, Suite 900
Boston, MA 02114
Truman.Henson@state.ma.us
www.state.ma.us/czm/

National Marine Fisheries Service, Northeast Regional Office
Jack Terrill, Coordinator
New Bedford Harbor Trustee Council
One Blackburn Drive
Gloucester, MA 01930
Jack.Terrill@noaa.gov
www.nero.nmfs.gov/ro/doc/nero

National Marine Fisheries Service, Northeast Regional Office
Sean McDermott
One Blackburn Drive
Gloucester, MA 01930
Sean.McDermott@noaa.gov

National Marine Fisheries Service, Northeast Regional Office
Kim Damon-Randall
One Blackburn Drive
Gloucester, MA 01930
Kim.Damon-Randall@noaa.gov

US Army Corp of Engineers, New England District
Karen Adams, Chief, Permits and Enforcement Branch
696 Virginia Road
Concord, MA 01742
karen.k.adams@usace.army.mil
www.nae.usace.army.mil

US Army Corp of Engineers, New England District
Christine Godfrey,
696 Virginia Road
Concord, MA 01742

US Coast Guard, First District
Kevin Blount
408 Atlantic Avenue
Boston, MA 02110
KBlount@D1.uscg.mil
www.uscg.mil/nscg.shtm

US Coast Guard, Marine Safety Office Providence
Peter A. Popko, Waterway Management Specialist
20 Risho Avenue
East Providence, RI 02914
PPopko@msoprov.uscg.mil

US Dept of Energy, Boston Regional Office
Albert Benson, Renewable Energy Technologies
JFK Federal Building, Room 675
Boston, MA 02203
Al.Benson@ee.doe.gov
www.eren.doe.gov/bro

US Dept of Energy, Boston Regional Office
Richard Michaud

JFK Federal Building
Boston, MA 02203
Richard.Michaud@ee.doe.gov

US Environmental Protection Agency, Region 1: New England
Tim Timmermann
1 Congress Street, Suite 1100
Boston, MA 02114
Timmermann.Timothy@epa.gov
www.epa.gov/regional/index.html

US Federal Aviation Administration
Theresa Flieger
12 New England Executive Park
Burlington, MA 01803
Theresa.A.Flieger@faa.gov
www.faa.gov/

US Fish & Wildlife Service, New England Field Office
Vernon Lang
70 Commercial Street, Suite 300
Concord, NH 03301-5087
Vernon_Lang@fws.gov
www.fws.gov/

ISO New England Inc.
Craig Kazin, External/Legislative Affairs
One Sullivan Road
Holyoke, MA 01040
ckazin@iso-ne.com
www.iso-ne.com/

National Wind Coordinating Committee
c/o Resolve
Juliana Birkoff, PhD., Senior Mediator
1255 23rd Street, NW, Suite 275
Washington, DC 20037
jbirkhoff@resolv.org
www.nationalwind.org

NSTAR
Charles P. Salamone, Director System Planning
One NStar Way
Westwood, MA 02090-9230
Charles_Salamone@nstaronline.com
www.nstaronline.com

NSTAR
Mary Grover
One NStar Way
Westwood, MA 02090-9230

University of Massachusetts, Renewable Energy Lab
Jim Manwell, PhD., Associate Professor
Mechanical and Industrial Engineering Department
Amherst, MA 01003-2210
manwell@ecs.umass.edu
www.ecs.umass.edu/research.html/

University of Massachusetts, Renewable Energy Lab
Anthony L. Rogers, PhD., Research Associate
Mechanical and Industrial Engineering Department
Amherst, MA 01003-2210
arogers@ecs.umass.edu

Woods Hole Oceanographic Institute
Peter Hoagland, Research Associate
Marine Policy Center
Woods Hole, MA 02543
phoagland@whoi.edu
www.whoi.edu/

Truman Henson, Maggie Geist

Cape & Islands Offshore Wind Attendance List
Stakeholder Committee

Name	Organization	10/10	10/31	11/21	12/12	1/30
Greg Watson	MTC	X	X	X	X	
Isaac Rosen	Alliance to Protect Nan. Sound	X	X		X	
John Donelan (alternate)	Alliance to Protect Nan. Sound			X		
Margaret Geist	Assn. to Preserve Cape Cod	X	X	X	X	
Jaci Barton	Barnstable Land Trust		X	X		
Gary Blazis	Barnstable Town Council	X	X	X	X	
Chris Powicki	CIREC	X	X	X	X	
Megan Amsler	Cape & Islands Self Reliance		X	X	X	
Richard Lawrence (alt)	Cape & Islands Self Reliance	X				
Charles Kleekamp	Cape Clean Air	X	X	X	X	
John O'Brien	Cape Chamber of Commerce	X	X	X		
Henry DiGiacomo	Cape Cod Assn. of Realtors					
Spyro Mitrokostos	Cape Cod Technology Council	X	X	X	X	
Fred Fenlon	Cape Light Compact	X	X	X	X	
Jim Gordon	Cape Wind	X		X	X	
Mark Rodgers (alternate)	Cape Wind		X			
Peter Borrelli *	Center for Coastal Studies			X		
Steve Burrington	Conservation Law Foundation	X	X	X	X	
Wayne Kurker	Hyannis Marina	X		X	X	
Jean Mangiafico	League of Women Voters			X		
Rhonda Tewes (alternate)	League of Women Voters	X	X	X	X	
Bill Veno	Martha's Vineyard Commission	X	X	X	X	
Jack Clarke	MA Audubon Society	X	X	X	X	
Ron Borjeson	MA Commercial Fishing Assn.		X			
Frank Gorke	MASSPIRG	X	X	X		
John Pagini	Nant. Plan. & Econ. Dvt Comm.	X	X	X		
Chris Neill	Sierra Club of Cape Cod	X		X		
Jack McCormack	Town of Yarmouth	X	X	X	X	

*Mr. Borrelli was appointed to the committee on 11/21

Cape & Islands Offshore Wind Attendance List
Resources / Advisors

Name	Organization	10/10	10/31	11/21	12/12	1/30
Margo Fenn	Cape Cod Commission	X	X	X	X	
Phil Dascombe	Cape Cod Commission	X		X	X	
Steve Tucker	Cape Cod Commission		X			
Jeff Senterman	MA Aeronautics Commission					
Judith Laster	MA Attorney General's Office	X	X	X	X	
Elizabeth Kouloheras	MA DEP	X				
Bill Lamkin	MA DEP		X			
David Hill	MA DEP	X				
David O'Connor	MA DOER	X	X			
Jean Cummiskey	MA DOER	X	X	X	X	
Truman Henson	MA Office of CZM	X	X	X	X	
Joan Muller	MA Office of CZM			X		
Carolyn Mostello	MA Natural Heritage & En Spec.		X	X	X	
Jack Terrill	NOAA Fisheries		X	X	X	
Kim Damon-Randall	NOAA Fisheries	X	X	X	X	
Sean McDermott	NOAA Fisheries	X				
Vin Malkowski	MA Division of Marine Fisheries		X	X	X	
Stephanie Cunningham	MA Division of Marine Fisheries	X	X			
Karen Adams	US Army Corp of Engineers	X	X	X	X	
Christine Godfrey	US Army Corp of Engineers	X	X			
Kevin Blount	US Coast Guard	X			X	
Al Benson	US Dept of Energy			X		
Richard Michaud	US Dept of Energy	X	X	X	X	
Tim Timmerman	US EPA	X	X	X	X	
John Maskal	US EPA		X			
Vern Lang	US Fish & Wildlife Service	X	X	X	X	
Juliana Birkhoff	National Wind Coor Comm.	X				
Charlie Salamone	NStar	X	X	X		
Mary Grover	NStar	X	X			
Dr. Jim Manwell	UMass - Amherst			X		
Dr. Anthony Rogers	UMass-Amherst	X	X		X	
Porter Hoagland	WHOI	X		X	X	
Richard Payne	WHOI			X	X	
Mary Schumacker	WHOI	X	X			

MTC PROJECT TEAM

Greg Watson

As the Vice-President for Sustainable Energy Greg is leading MTC on our Cape and Islands Offshore Wind Initiative. Greg brings with him considerable experience working on collaborative efforts including serving as executive director of the Dudley Street Neighborhood Initiative (DSNI), a resident-driven community planning organization in Roxbury, Massachusetts founded in 1984 to help revitalize the economically disenfranchised Dudley area of Boston as well as the Executive Director of the New Alchemy Institute. The New Alchemy Institute was a non-profit research and education center dedicated to developing environmentally sound approaches to agriculture. Additionally Greg has maneuvered through the regulatory and policy arena serving as Commissioner of the Massachusetts Department of Food and Agriculture as well as Assistant Secretary for Science and Technology within the Massachusetts Executive Office of Economic Affairs.

Working primarily from the Cape Cod Office in Hyannis located on Main Street. Greg can be reached at 508-775-9230 and watson@masstech.org

Kristen Burke

At MTC Kristen is working to develop a community planning and outreach initiative within the Trust's Green Power Program designed to increase wholesale supply and stimulate retail demand in the emerging renewable energy market in Massachusetts. Using her professional experience in municipal and state governance and community relations, she is coordinating resources to support siting and permitting activities for projects throughout New England. She is assisting to coordinate the Cape and Islands Offshore Wind Public Outreach Initiative.

Kristen is located in MTC's main office located in Westborough and can be reached at 508-870-0312 x 480 and burke@masstech.org

Fara Courtney, Good Harbor Consulting

Fara brings 20 years experience in coastal policy, environmental planning and community involvement to MTC's Offshore Wind Initiative. She served as Regional Manager for the Massachusetts Coastal Zone Management Office for 10 years, providing cities and towns with technical assistance in state and federal regulatory matters, harbor planning, watershed protection and consensus building. Since 1995, Fara has worked as a consultant and project manager in environmental policy, coastal management and program development, with a focus on collaborative projects linking environmental, economic and social objectives. Her clients include state and federal agencies, municipalities and non-governmental organizations. Good Harbor Consulting is located in Gloucester, Massachusetts. Fara can be reached at 978-317-3321, or via e-mail at fcourt@cove.com.

Barbara Hill

Barbara has over 25 years of experience in working with community based organizations on Cape Cod. Currently she serves as community liaison to the MTC Cape & Islands Offshore Wind Initiative. Barbara's experience includes establishing relationships between the business and environmental communities. She has facilitated both state and federal applications for local developers and housing authorities to develop affordable housing while overseeing the state grant by the Massachusetts Executive Office of Communities and Development awarded to Housing Assistance Corporation. She has extensive experience in public relations and fund raising through her work for the Association to Protect Cape Cod: Festival Cape Cod and the Cape & Islands Self-Reliance Corp. Barbara has experience with government and non-profit agencies in overseeing a $2.5 million budget for the South Shore Community Action Council. She currently lives in Centerville with her 14 year old son Kahlil and is serving her first term on the Town of Barnstable Planning Board. Barbara can be reached at 508-775-9204 and bhill@masstech.org.

Raab Associates, Ltd.

At Raab Associates, Ltd., we provide expert facilitation and mediation services. We run effective meetings keeping participants focused on the subject matter at hand, providing an atmosphere conducive to real dialogue and consensus building. We also actively assist stakeholders in reaching mutually beneficial agreements and comprehensive settlements. By employing the latest technology, we ensure that the entire process is efficient and smooth. Often, we conduct detailed conflict assessments prior to commencing a project by interviewing key stakeholders. We also utilize joint fact-finding and single-text document development techniques during the course of negotiations.

With particular expertise on energy, environmental, and regulatory issues, Raab Associates has served as a neutral third party on a wide range of subject matters including telecommunications, land-use issues, public health, education policy, organizational design, and scientific research. We have particular expertise in complex, multi-party disputes often involving 15-25 different stakeholder groups.

Dr. Raab, an accomplished mediator and facilitator, serves on the mediation and arbitration panels for the PJM Power Pool, and on the dispute resolution rosters for the Environmental Protection Agency and the US Institute for Environmental Conflict Resolution. He is also a member of the Society for Professionals in Dispute Resolution.

Some recent projects include:

Connecticut Greenhouse Gas Planning Retreat

Electricity ISO and Member Disputes

Federal Energy Technology Center Merger and Consolidation Plan

Massachusetts Restructuring Roundtables

Renewable Portfolio Standard Advisory Group

Rhode Island Greenhouse Gas Project

Cape & Islands Offshore Wind Public Outreach Initiative 39

Survey of Tern Activity within Nantucket Sound, Massachusetts, during Pre-migratory Fall Staging

Draft Report for Massachusetts Technology Collaborative

5 November 2002

Simon Perkins, Andrea Jones, and Taber Allison
Conservation Science and Ecological Management
Massachusetts Audubon Society
208 South Great Road
Lincoln, MA 01773

INTRODUCTION

A proposed wind farm on Horseshoe Shoals in Nantucket Sound would be the largest in the United States and one of the largest in the World. Few if any data are available to assess the potential risks to North American birds posed by this offshore wind farm. A study of terns and waterfowl in Nantucket Sound is a critical step in assessing the potential avian impacts of the proposed wind farm's construction and deployment.

Several of the largest tern colonies in New England are found within 20 miles of Horseshoe Shoals. Approximately 50% of the North American population of Roseate Terns breeds within Buzzards Bay in Massachusetts (USFWS 1998), and in 2002, 8,032 pairs of Common Terns nested at Monomoy Island NWR, Chatham (Mass Wildlife 2002). Common and Roseate terns forage within or pass through the Sound between early May and late September as they move to and from their colonies, foraging areas, and staging sites. Little is known about the actual abundance, dispersal, and daily movements of these terns during migration. In addition, the areas where they focus their feeding activities both within the breeding season and during spring and fall migration are poorly known.

In an effort to fill some of these data gaps, we conducted aerial surveys of Nantucket Sound between August 19 and September 19, 2002. The primary objectives of this study were to ascertain the abundance and distribution of Common and Roseate terns within the Sound during fall migration and staging and to detect any temporal variation in these parameters. During this same period, we conducted four boat surveys in the waters on, and in the immediate vicinity of, Horseshoe Shoals in an effort to observe the behaviors of the terns (e.g., traveling or actively feeding) and determine the heights at which the birds were flying.

The timing of the tern survey was based on the hypothesis that Common and Roseate terns approach their maximum abundance within the Sound in late summer as they move from their breeding colonies and summer feeding grounds to their primary pre-migration staging areas on or near South Beach in Chatham (Trull et al. 1999). For example, surveys of staging birds in Chatham have produced estimates that have included as many as 15,000 Roseate Terns in early September (Trull et al. 1999). Color-banding studies have demonstrated that the Roseate Terns that stage in Chatham come from colonies throughout the northeastern United States and Canadian Maritimes as well as from Massachusetts colonies, and that, every year, these late-summer congregations may comprise nearly the entire North American population (Trull et al. 1999).

Initially, our study was intended to cover the period between August 5 and the approximate date when most of the terns would depart on their southbound migration. In most years this exodus typically occurs in the third week of September. Because we

did not receive notification of funding until early August, we did not begin our aerial surveys until August 19.

METHODS

Aerial surveys were conducted along sixteen fixed, parallel transects oriented north to south. This grid encompassed nearly all the waters south of Cape Cod between Martha's Vineyard and the Monomoy Island NWR in Chatham; the transects extended south to an east-west line roughly even with Great Point, Nantucket (Fig. 1). Individual transects were positioned at 7,500 foot intervals, and the total combined linear length of all 16 transects was 247.4 miles.

Aerial surveys were flown with a high-winged, twin-engine aircraft (Cessna Sky Master 337) at an average altitude of 500 feet, and at an average airspeed of 90 kts. Flights were conducted only on days with light to moderate winds (not exceeding 20-25 kts) and on days with good atmospheric clarity (visibility >10 miles). Flights usually commenced mid morning and the average duration of each survey was roughly 2.5 hrs. We recorded all birds seen along or on either side of the north-south transects. All birds within the limit of visibility, including those detected with the aid of binoculars, were recorded. Birds observed while flying the short, east-west legs between transects were not counted.

Each survey team was composed of a pilot, a recorder in the co-pilot seat, and two experienced observers positioned on each side of the plane. All members of the team communicated through an onboard intercom system. The observers verbally communicated all bird sightings to the recorder. The recorder immediately entered this information into an Excel spreadsheet on a laptop computer. Recorded information included all species, number of birds, their behavior (traveling or actively feeding), and geographical location of the plane at the time of the sighting. Geographical location was determined using an onboard GPS system. We also recorded starting and ending times, ground temperature, wind direction and velocity, sea state, visibility, and cloud cover for each transect on every survey. Surveys were conducted over a wide range of tidal stages.

We conducted four boat surveys along a series of transects oriented in two approximately parallel tracks, one mile apart; the position of these transects were selected in order to "capture" all the waters over Horseshoe Shoals as well as the waters in the immediate vicinity of the Shoals (see Fig. 1). Surveys were conducted using a 40 ft powerboat, cruising at an average speed of roughly 15 kts. Surveys lasted approximately 1.5 hours. The total linear length of all transects was 24.9 miles. The survey teams consisted of at least one observer and one recorder, and data collected included all bird species, their numbers, and their flight altitudes, plus starting and ending time, general weather (e.g., rain, sunny, cloudy), wind speed and direction, temperature, sea state, and visibility. For each bird, the recorder entered a corresponding geographical location determined by an onboard GPS system. All birds observed within approximately 0.5 miles on either side of the transects were recorded. Observers used binoculars whenever necessary.

RESULTS

Eleven aerial surveys were completed before the majority of birds departed on or around September 19. During this period, we observed a total of 5,710 terns in the study area including 1,766 Common Terns, 633 Roseate Terns, and 3,412 Common-Roseate-type terns (Table 1). We recorded all birds to species whenever possible, but it is not possible to always differentiate between Roseate and Common terns. When we could not distinguish between the two species, we lumped our observations into category of Roseate/Common Tern (Tern spp.).

Terns were recorded on all aerial surveys. The highest single-day count of 1,302 birds was recorded on August 26, and the second highest count of 1,089 birds was recorded on September 9 (Fig. 2). Common Terns were recorded more frequently than Roseate Terns (Fig. 3). On the last survey, September 19, only one Common Tern was recorded. Transect number 16 (closest to Monomoy Island NWR) (see Figs.1 and 4) contained the largest counts of terns over the course of the study period. The numbers of terns recorded on any given day tended to increase as we approached Monomoy Island NWR, and this distributional pattern became increasingly prevalent during the latter surveys when, in the final few days, the birds began departing the region on migration (Figs. 4, 6-9). Tern abundance also tended to be higher within a few miles of the southern shore of Cape Cod, in the northern portion of our survey area, while relatively few terns were detected directly over Horseshoe Shoals (see Figs. 6-9).

The majority of birds observed during aerial surveys were flying at low altitudes (estimated at less than 100 feet) over the water. On August 28, however, several flocks of terns were detected high aloft. One flock composed of an estimated 120 terns extended from roughly sea level to an altitude equal to or slightly above our own (500 feet). In another flock of 18 Common Terns, three were observed at roughly 400 feet. The birds appeared to be “kettling” on thermals, but why they were found aloft on that day and not on other days is unknown. During the same time, we also observed a flock of 25 Double-crested Cormorants flying at roughly 500 feet, apparently migrating. Other avian species observed during aerial flights included loons, storm-petrels, gannets, sea ducks, jaegers, gulls, and shorebirds (see Table 2).

A cumulative total of 34 sea turtles were observed (Table 3). We recorded turtles on nine of the eleven aerial surveys. The turtles were distributed throughout the sound, including several on Horseshoe Shoals (Fig. 10), although most were loosely clustered in an area to the west of the south end of Monomoy Island NWR, Chatham.

Four boat surveys were conducted, spaced throughout the study period: August 21 and 26, and September 6 and 20. A combined total of 42 terns were observed directly over Horseshoe Shoals (Table 4) on Aug. 21 and 26; no terns were sighted on the latter two surveys. Of the terns seen, 19 were observed in direct flight (traveling) and 23 were actively feeding within the shoals. The altitude range of all observed terns was between 5 and 50 feet high. See Table 5 for a list of other species of birds observed. Three boat surveys were conducted concurrently with aerial surveys, but

ground-truthing efforts by means of establishing radio or cell phone communications between the plane and the boat in attempts to correlate simultaneous observations failed.

DISCUSSION

The majority of terns recorded during this study were observed near Monomoy Island NWR or the south shore of Cape Cod. Substantially fewer terns were seen on Horseshoe Shoals. These lower numbers suggest that the Shoals were used less frequently than other portions of the Sound during this survey window.

Very few data have been collected on tern use of Nantucket Sound. Heinemann (1992) reported that feeding sites of Roseate Terns foraging from their colonies in Buzzards Bay included portions of Nantucket Sound, and that during their feeding forays, the terns ranged up to roughly 20 miles from their colonies (Gochfeld et. al. 1998). It is unclear, however, how the late start of our surveys may have influenced the results of this study, but one possible consequence might have been the failure to observe many terns, including perhaps individuals from the Buzzards Bay colonies, foraging in the more westerly portions of the Sound (including Horseshoe Shoals); perhaps by then the birds had already dispersed to their staging areas and were foraging elsewhere.

Trull et al. (1999) confirmed what local birders had been observing for years: South Beach and Monomoy NWR in Chatham represent important pre-migration staging sites for Common and Roseate terns. In recent years, tern totals derived from various land-based counts at South Beach in Chatham have numbered in the tens of thousands. However, for reasons yet unknown, data from this study, as well as data collected concurrently during land-based counts in Chatham, indicated that the numbers of terns in that area during the survey period were much lower than usual. For example, on South Beach maximum counts among land-based surveys in late summer 2002 included 800 Roseate Terns and 3000 Common Terns (Bird Observer). No counts of Common Terns were submitted in September (when numbers typically peak) due to the lower-than-normal numbers of birds observed there (P. Flood, B. Nikula, pers. comm.). In recent past years, >20,000 Common/Roseate-type terns have been estimated in Chatham during August and September (Bird Observer). The fact that the numbers of terns staging at Chatham this year were substantially lower than average could have accounted for the small numbers of birds recorded on Horseshoe Shoals during the study period.

The distributional (west-to-east) shift that we observed during the survey period may have been attributable to the terns' tendency to spend increasing amounts of time at or near their staging sites (Chatham) as their migratory departure date drew near. The attraction to Chatham is thought to be, in part, due to the presence of numerous sandbars, the shallows they create, and the favorable fishing conditions these bathymetric features produce. Likewise, the clustering of terns in the northern portion of the survey area was likely related to terns' preference for feeding in the Sound's shallower margins.

Adequate assessment of the use of the Sound by terns will require at least three years of surveys, during spring migration, the breeding season, and through fall staging. We hope to begin 2003 surveys at the beginning of August to obtain more complete coverage of the staging period. Tern distribution may shift annually as, for example, a function of shifts in the local distribution of fish, and the fish distribution may in turn be influenced by factors such as annual variations in water temperatures. A three-year study period would provide the opportunity to detect these and other such annual variations.

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Table 1. Numbers of Common, Roseate, and Least terns, and Tern spp. (Common/Roseate type) counted during aerial surveys of Nantucket Sound, Aug. 19 – Sept. 19, 2002.

DATE	Common Tern	Roseate Tern	Tern spp.	Least Tern	ALL TERNS
19-Aug-02	0	92	534	1	627
21-Aug-02	0	7	977	0	984
26-Aug-02	438	193	671	1	1,303
28-Aug-02	332	29	460	0	821
5-Sep-02	24	17	149	1	191
6-Sep-02	43	10	172	5	230
7-Sep-02	87	18	329	0	434
9-Sep-02	825	260	3	1	1,089
13-Sep-02	10	7	14	0	31
18-Sep-02	6	0	3	0	9
19-Sep-02	1	0	0	0	1
TOTALS	**1,766**	**633**	**3,312**	**9**	**5,720**

Table 2. Number of individuals of other species of birds observed during aerial surveys of Nantucket Sound, Aug. 19 – Sept. 19, 2002.

Species	Number
Northern Gannet	13
Double-crested Cormorant	2,702
Common Eider	8
White-winged Scoter	14
American Oystercatcher	4
Laughing Gull	22
Bonaparte's Gull	5
Herring Gull	198
Great Black-backed Gull	290
Black Tern	4
Gull species	199
Jaeger species	2
Loon species	1
Shorebird Species	154
Wilson's Storm Petrel	7
Grand Total	**3,623**

Table 3. Non-avian species observed during aerial surveys of Nantucket Sound, Aug. 19 – Sept. 19, 2002.

Species	Number
Large sea turtle - unidentified species	20
Kemp Ridley's Sea Turtle	1
Leatherback Sea Turtle	8
Loggerhead Sea Turtle	5
Ocean Sunfish	4
Seals	5

Table 4. Numbers and altitudes of Common and Roseate terns and Tern spp. (Common/Roseate type) counted during boat surveys on Horseshoe Shoals, Aug. 19 – Sept. 19, 2002.

Date	Number	Species	Altitude (ft.)
21-Aug-02	11	Common Tern	5-30
	1	Common Tern	1
	4	Common Tern	0-5
28-Aug-02	14	Common Tern	10-50
	1	Roseate Tern	10
	11	Tern spp.	15-50
6-Sep-02	*0*	*No terns seen.*	
20-Sep-02	*0*	*No terns seen.*	
TOTAL	**42**		

Table 5. Species and number of other birds observed during boat surveys of Horseshoe Shoals, Aug. 19 – Sept. 19, 200.

Date	Number	Species	Altitude (ft.)
28-Aug-02	1	Wilson's Storm-Petrel	2
6-Sep-02	11	Double-crested Cormorant	0-30
6-Sep-02	4	Herring Gull	0-30
6-Sep-02	15	White-winged Scoter	20

Figure 2. Total numbers of all terns counted during aerial surveys over Nantucket Sound, Aug. 19 – Sept. 19, 2002.

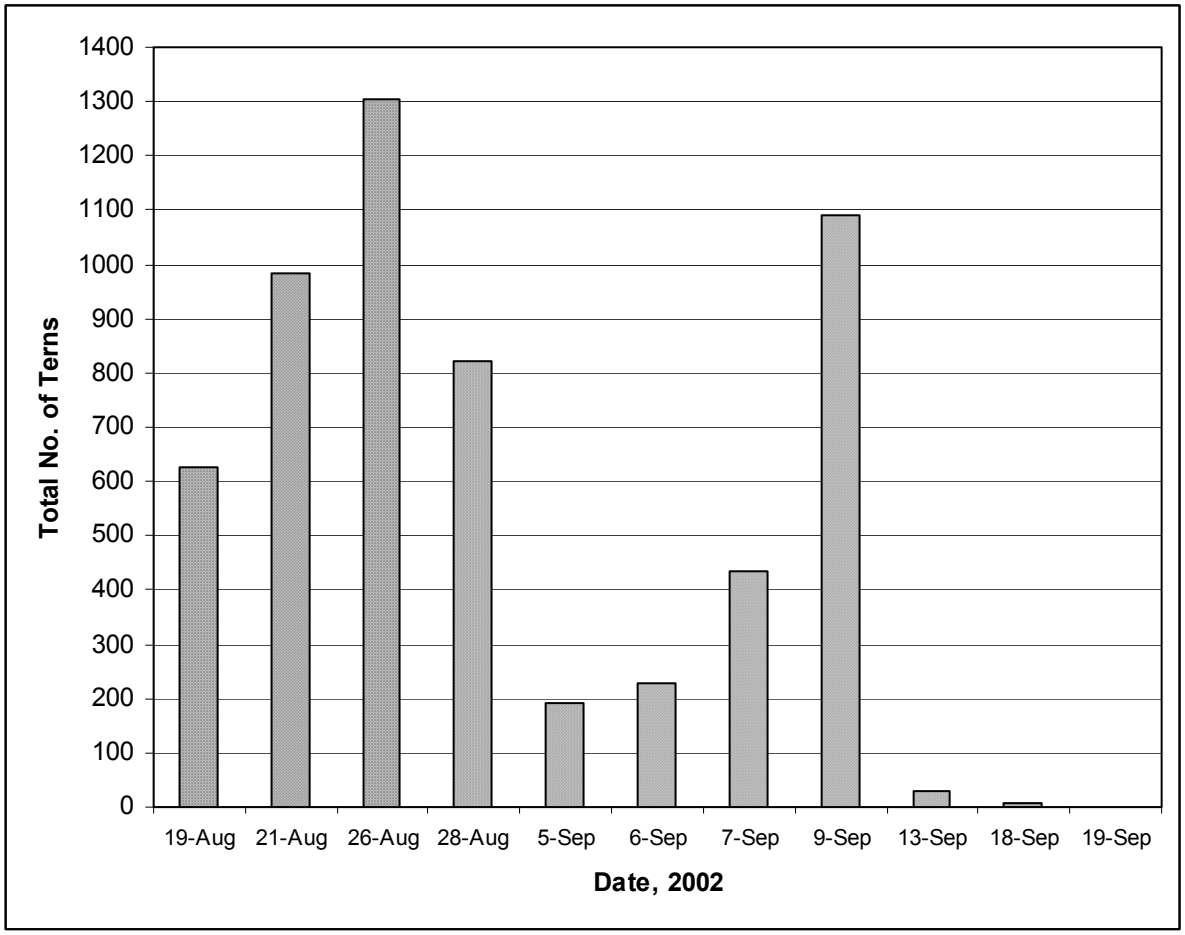


Figure 3. Total numbers of Common/Roseate type terns, Roseate Terns, and Least Terns counted during aerial surveys over Nantucket Sound, Aug. 19 – Sept. 19, 2002.

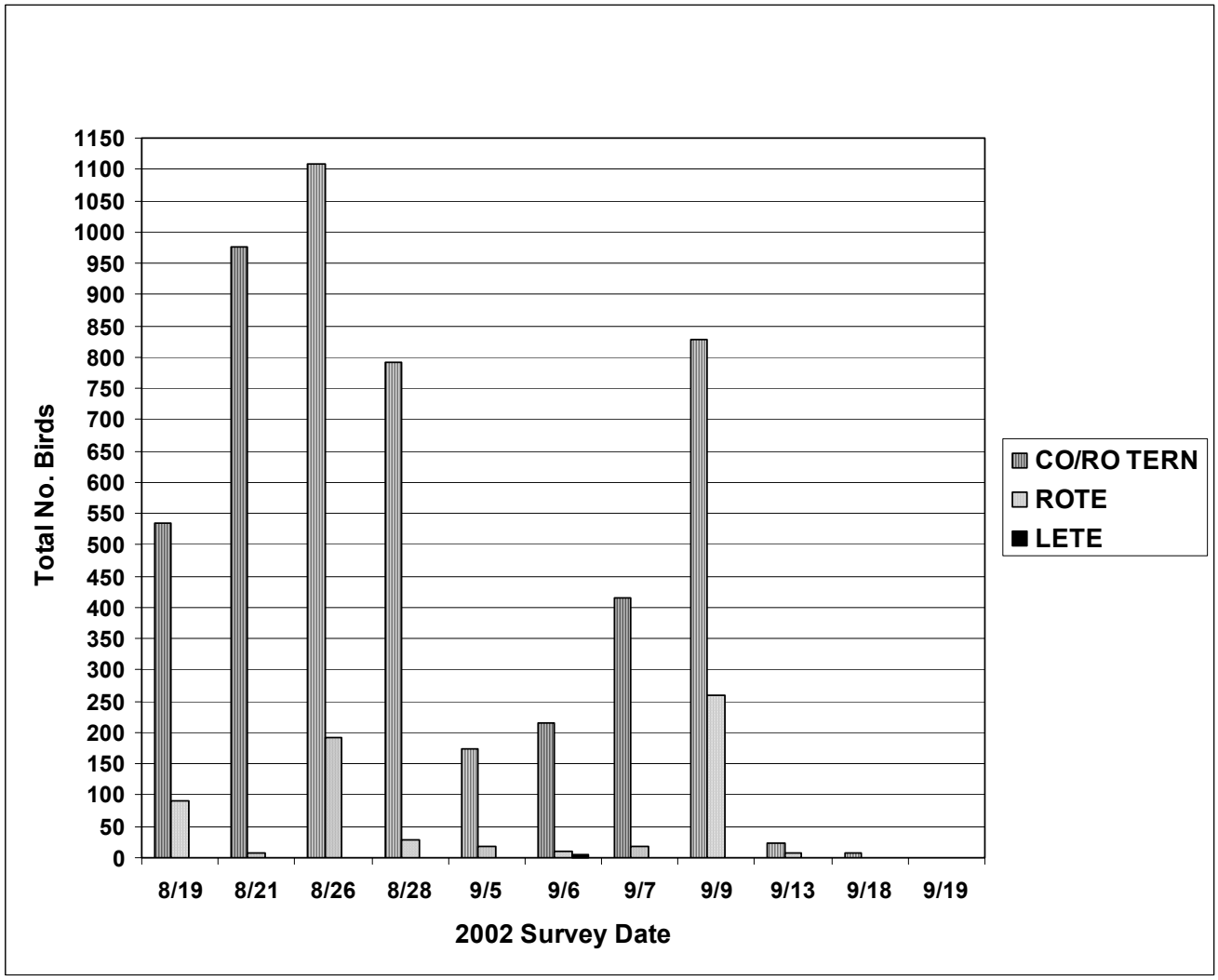


Figure 4. Total number of terns counted across each aerial transect line within Nantucket Sound on 11 survey days, from Aug. 19 – Sept. 19, 2002.

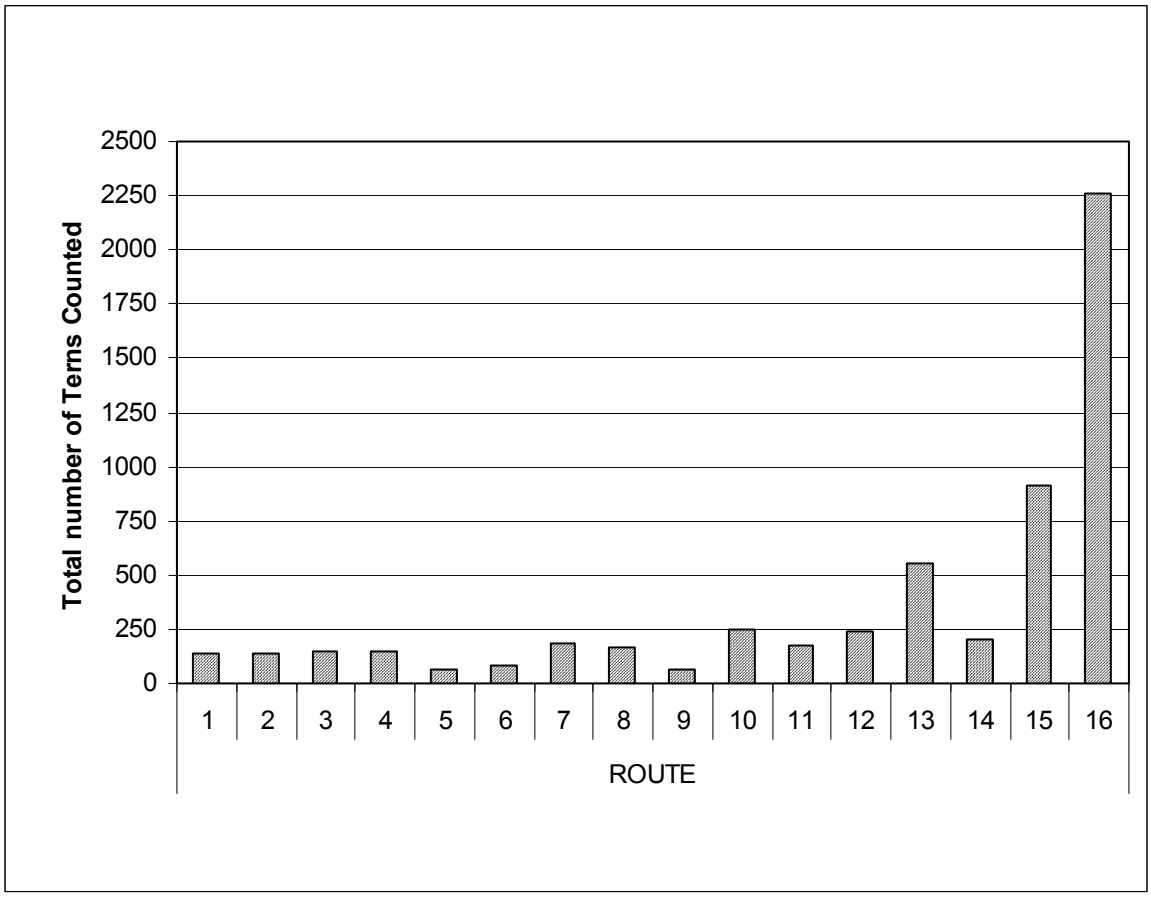


Figure 5. Number of terns counted on each aerial transect over Nantucket Sound, by date, from Aug. 19 – Sept. 19, 2002.

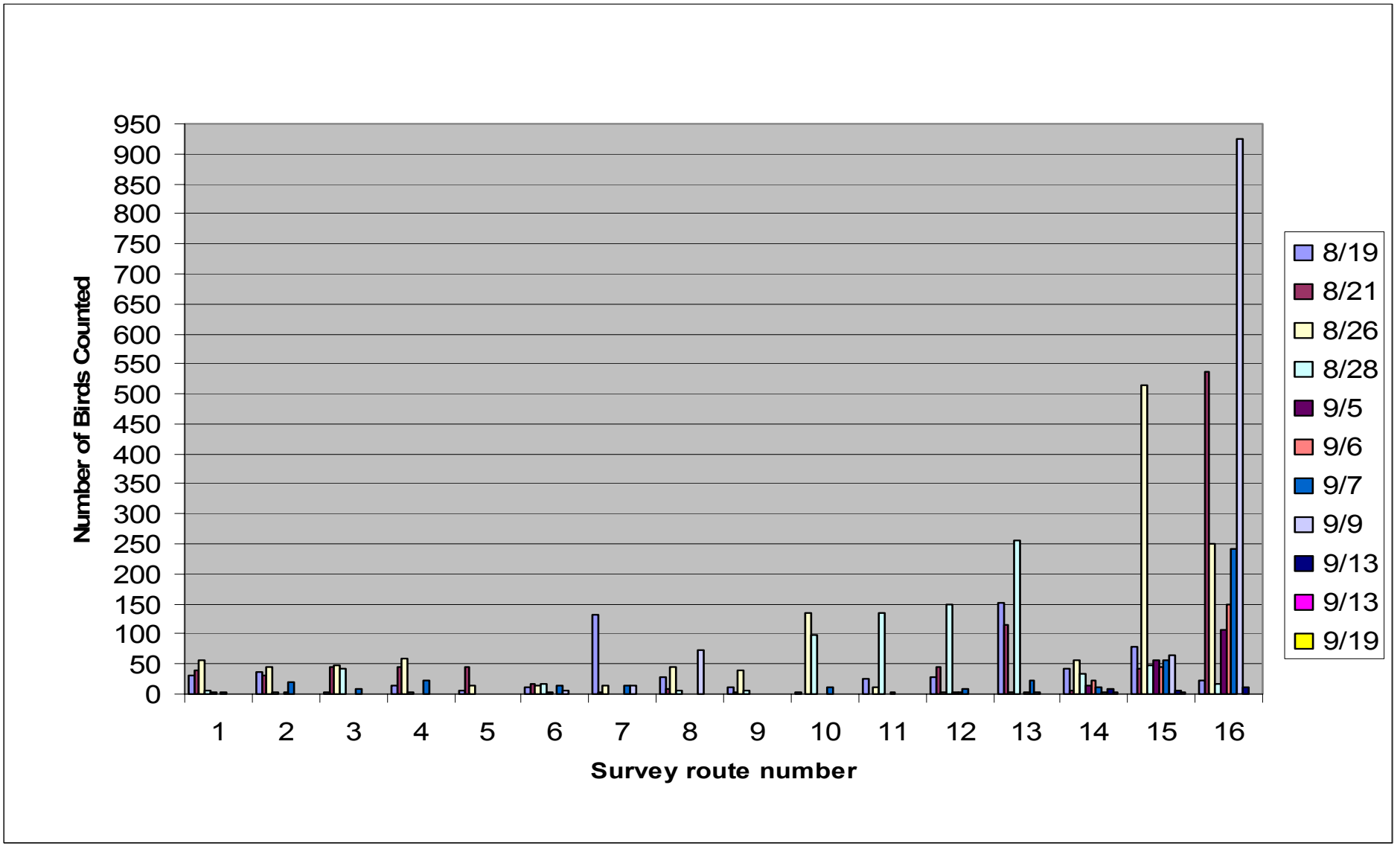
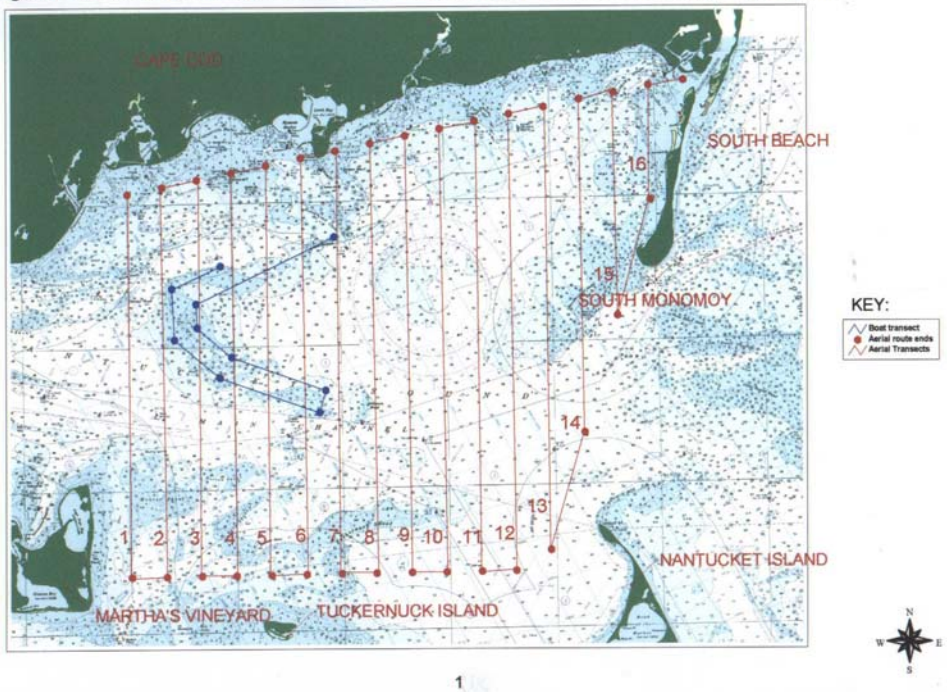


Figure 1. Locations of aerial and boat transects used for surveys of Nantucket Sound, Aug. 19 - Sept. 19, 2002.



1

Figure 6. Locations, dates, and abundance of Common Terns observed during aerial surveys of Nantucket Sound, Aug. 19 - Sept 19, 2002.

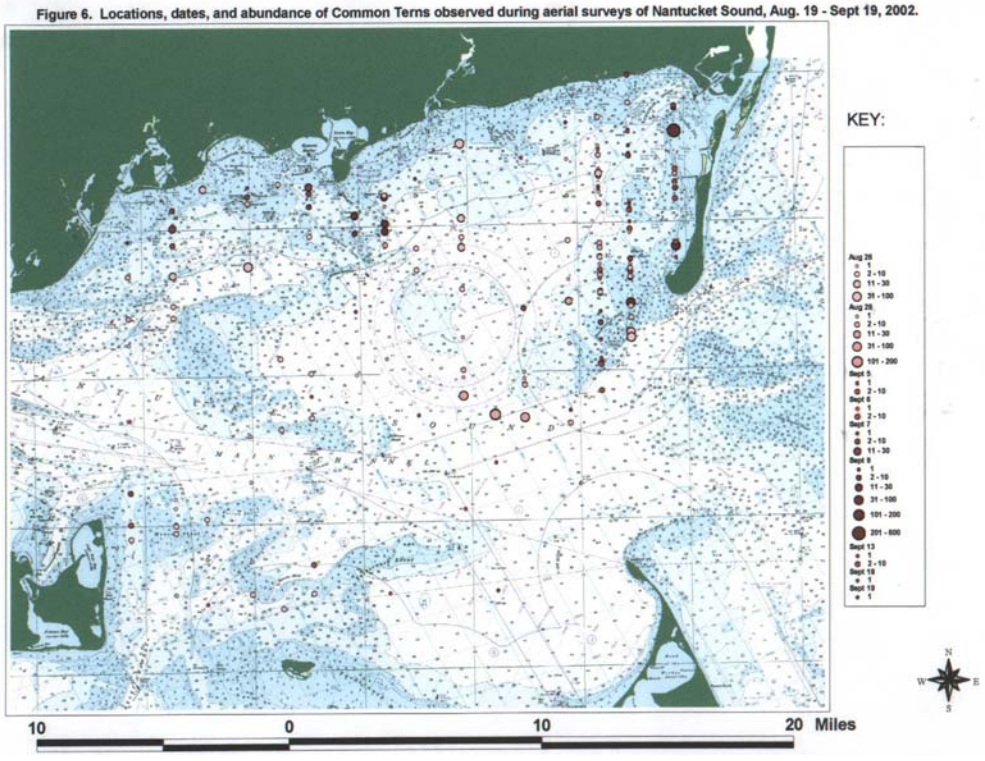


Figure 7. Locations and numbers of Roseate Terns observed during aerial surveys of Nantucket Sound, Aug. 19 - Sept. 19, 2002.

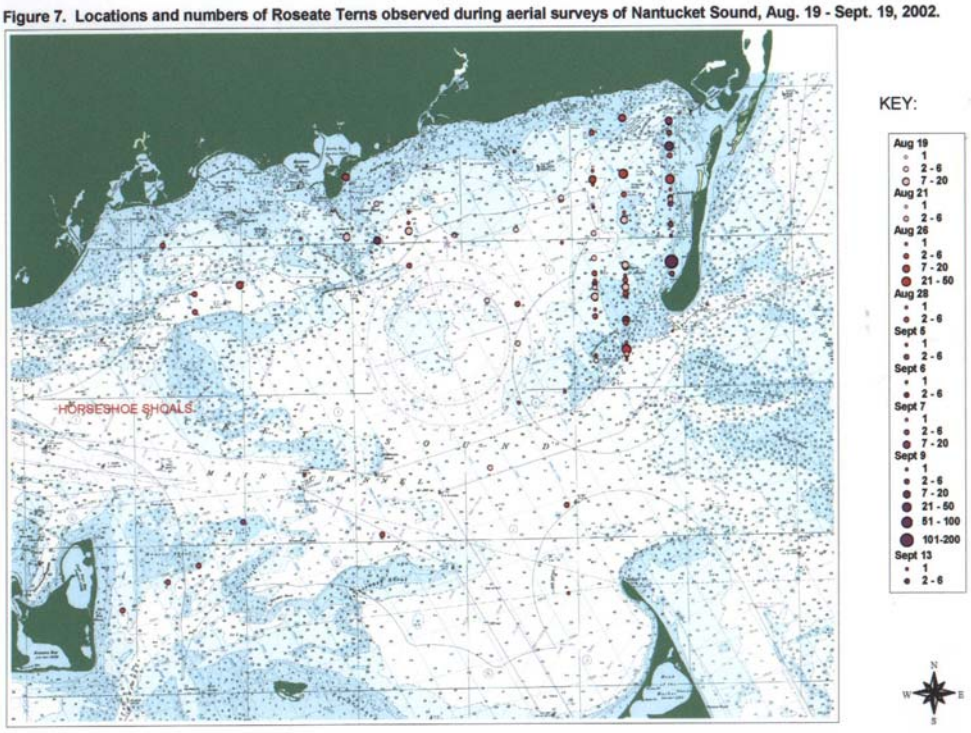


Figure 8 Locations, dates, and abundance of Common/Roseate type terns sighted during aerial surveys of Nantucket Sound, Aug. 19 - Sept. 19, 2002.

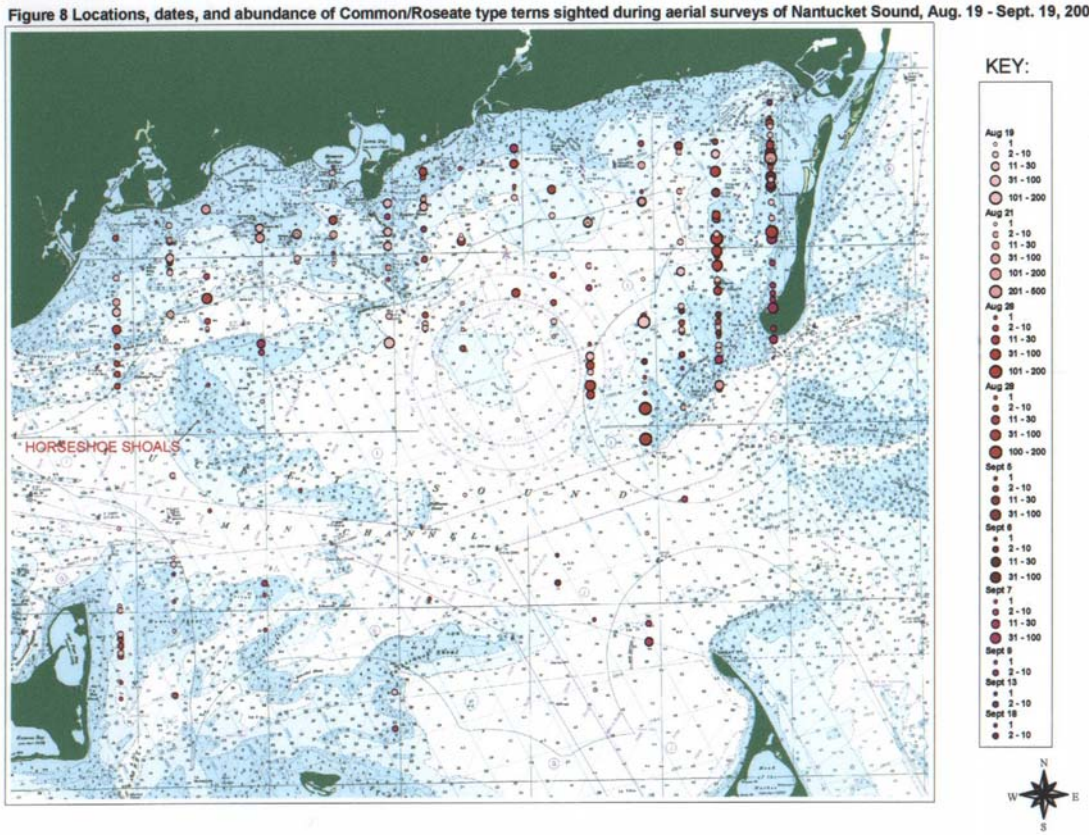


Figure 9. Location and numbers of Least Terns observed during aerial surveys of Nantucket Sound, Aug. 19 - Sept. 19, 2002.

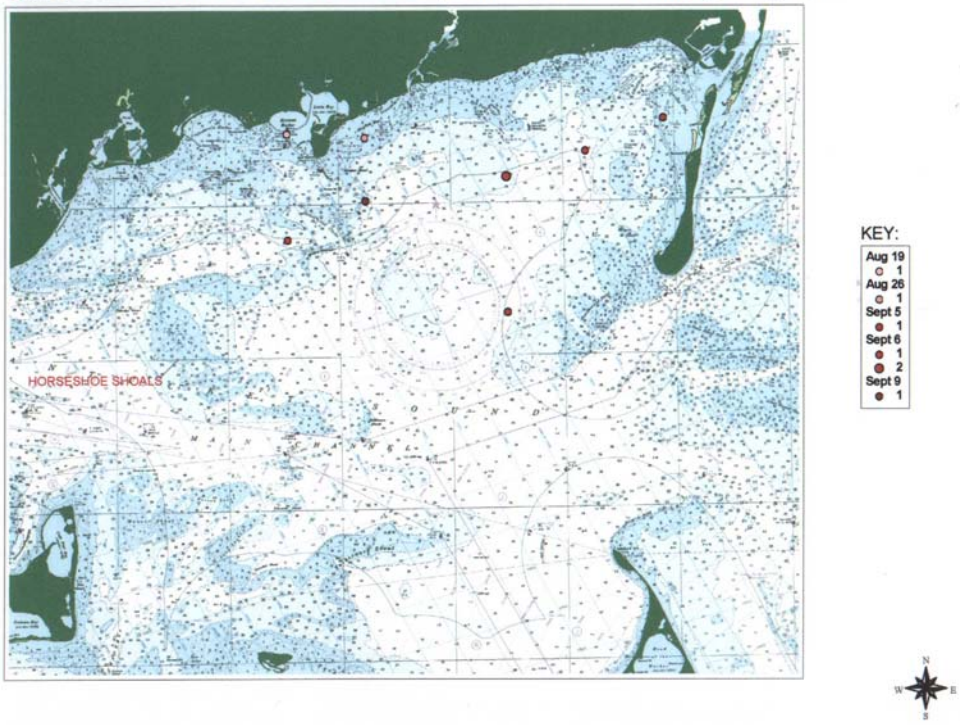


Figure 10. Sea turtle sightings during aerial surveys of Nantucket Sound, Aug. 19 - Sept. 19, 2002