

# RI Ocean Special Area Management Plan

## Overview of the Ocean SAMP *Renewable Energy* Chapter

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URI Coastal Resources Center/RI Sea Grant

Ocean SAMP Stakeholder Meeting  
March 2, 2010

# Presentation Overview

- Chapter Objectives
- Chapter Outline
- Methodology
- Summary of Preliminary Findings
- Next Steps



# Chapter Objectives

- Provide background on renewable energy and offshore wind
- Describe the process/tools used to identify viable sites
- Summarize all potential +/- effects
- Outline policies, standards and monitoring requirements for future development

# Chapter Outline

## Chapter 8

### Renewable Energy Table of Contents

800	Introduction
810	Renewable Energy Overview
810.1	Increasing Energy Demands and Global Climate Change
810.2	Renewable Energy Initiatives and Standards in Rhode Island
810.3	Renewable Energy Sources in Rhode Island
820	Utility-Scale Offshore Renewable Energy
820.1	Offshore Wind Energy Facilities
820.2	Turbine and Foundation Technology
820.3	Transmission Cables and Substations
820.4	Stages of Development
820.5	Project Costs
820.6	Federal and State Incentives
830	Offshore Renewable Energy in the SAMP Area
830.1	Offshore Wind Resources
830.2	Siting Analysis-Technology Development Index
830.3	Selection of Suitable Sites
840	Potential Economic Effects of Offshore Renewable Energy in the SAMP Area
840.1	Port Development and Job Creation
840.2	Electricity Rates
840.3	Revenue Sharing
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850	Potential Effects on Existing Uses and Resources in the SAMP Area
850.1	Avoided Air Emissions
850.2	Physical Oceanography and Climate
850.3	Benthic Ecology
850.4	Birds
850.5	Sea Turtles
850.6	Marine Mammals
850.7	Cultural and Historic Resources
850.8	Fish and Fisheries Resources
850.9	Recreation and Tourism
850.10	Marine Transportation, Navigation and Infrastructure
850.11	Cumulative Impacts
860	Renewable Energy Policies and Standards
860.1	Policies
860.2	Design Standards
860.3	Site Specific Research Requirements
860.4	Monitoring Requirements
870	Works Cited

Appendix- Application of Technology Development Index and Principal Component Analysis and Cluster Methods to Ocean Renewable Energy Facility Siting.

# Methodology

- **Background Sections**
  - Literature Review
  - Ocean SAMP Researchers
  - MMS Rules & Regulations
  - Cape Wind EIS
  - MA Ocean Plan



# Methodology

- **Potential Effects Sections**
  - MMS Programmatic EIS
  - Cape Wind EIS
  - Ocean SAMP Researchers
  - European Colleagues

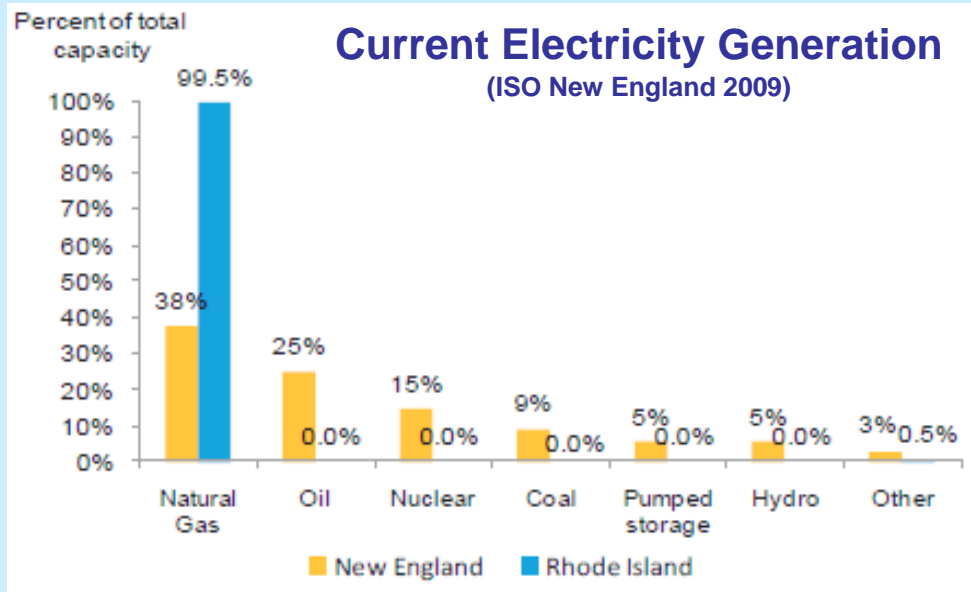


# Methodology

- **Policies and Standards**
  - Review of European Standards
  - Consultation with European Colleagues
  - Best Management Practices
    - MMS
    - European Reports & Research
  - Cape Wind EIS
  - National Academies Marine Board Design Standards



# Planning for future energy needs:



- **Increasing energy demands**
  - New England
  - Rhode Island
- **Planning Considerations**
  - Diversifying energy resources
  - Global Climate Change
  - Renewable Energy Standards
    - 16% by 2019



# Renewable Energy Sources in Rhode Island

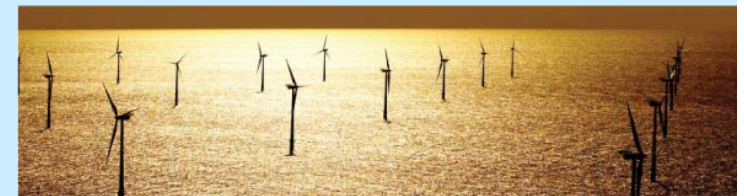
- **Utility-Scale**

- **Onshore**

- Solar
    - Geothermal
    - Biomass or Landfill Gas
    - Hydropower
    - Wind

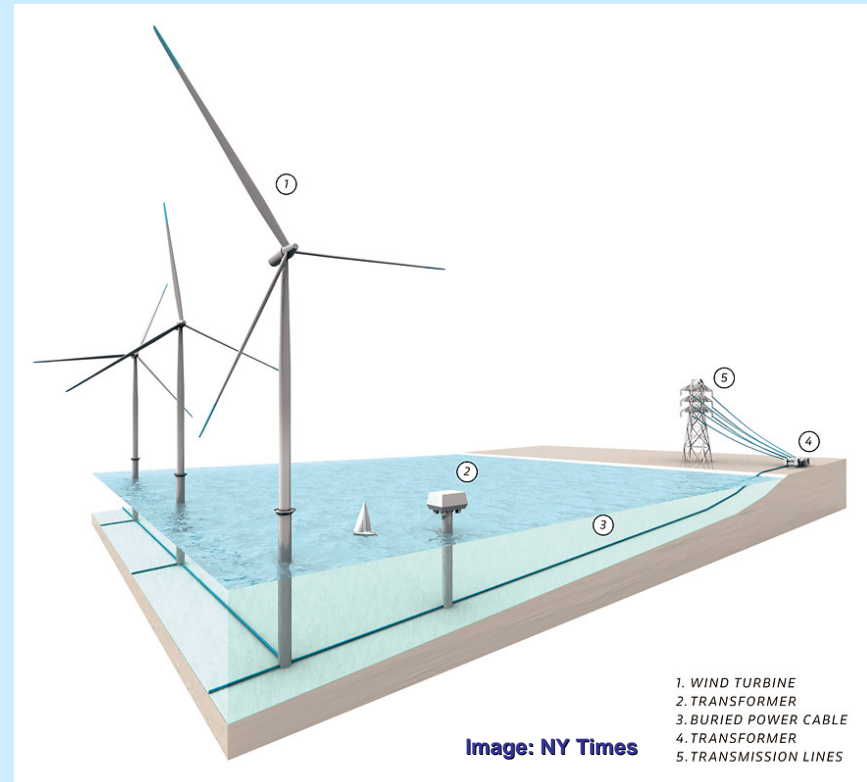
- **Offshore**

- Ocean Thermal
    - Wave Energy
    - Tidal Energy
    - Offshore Wind



# Utility-Scale Offshore Wind Energy

- **Components of an offshore wind farm**
- **Technology**
  - Turbines
  - Foundations
  - Cables



# Stages of Development

Stage of Development	Approximate Duration	Associated Activities
Pre-Construction	Years	<p>Siting of Proposed Project</p> <ul style="list-style-type: none"> <li>• Wind Resource Assessment</li> <li>• Seabed topography and substrate composition</li> </ul> <p>Facility Design</p> <ul style="list-style-type: none"> <li>• Size</li> <li>• Turbine Technology</li> <li>• Foundation and Substructure</li> <li>• Transmission</li> </ul> <p>Permitting and Review Process</p> <ul style="list-style-type: none"> <li>• Baseline Monitoring</li> <li>• Environmental Impact Assessments</li> <li>• Lease Agreements</li> </ul>
Construction	Months – Years	<p>Installations</p> <ul style="list-style-type: none"> <li>• Foundations and Substructure</li> <li>• Turbines</li> <li>• Electric Service Platform/ Offshore Substation</li> <li>• Cable Laying</li> <li>• Onshore Substation/Connection to Utility Grid</li> </ul>
Operation	Approximately 20-25 years	<p>Maintenance Activities</p> <ul style="list-style-type: none"> <li>• Equipment Servicing</li> </ul> <p>Monitoring Activities</p> <ul style="list-style-type: none"> <li>• Environmental Monitoring</li> </ul>
Decommissioning	Months	Removal of Structures to the Mud Line

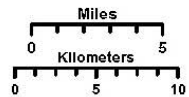
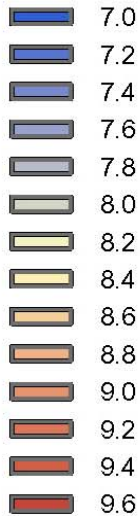
# Wind Resources in the SAMP Area

## Map Key

 OceanSAMP Study Area

 State Waters

### Wind at 80m Interpolated Speed m/s



Coordinate System:

Projection: RI Stateplane

Units: Feet

FIPS Zone: 3800

Datum: NAD83

Map Base Data:

State Borders: RIGIS; MAGIS; CTGIS

SAMP Study Area: RI SAMP Database

State Waters: MMS SLA Boundary

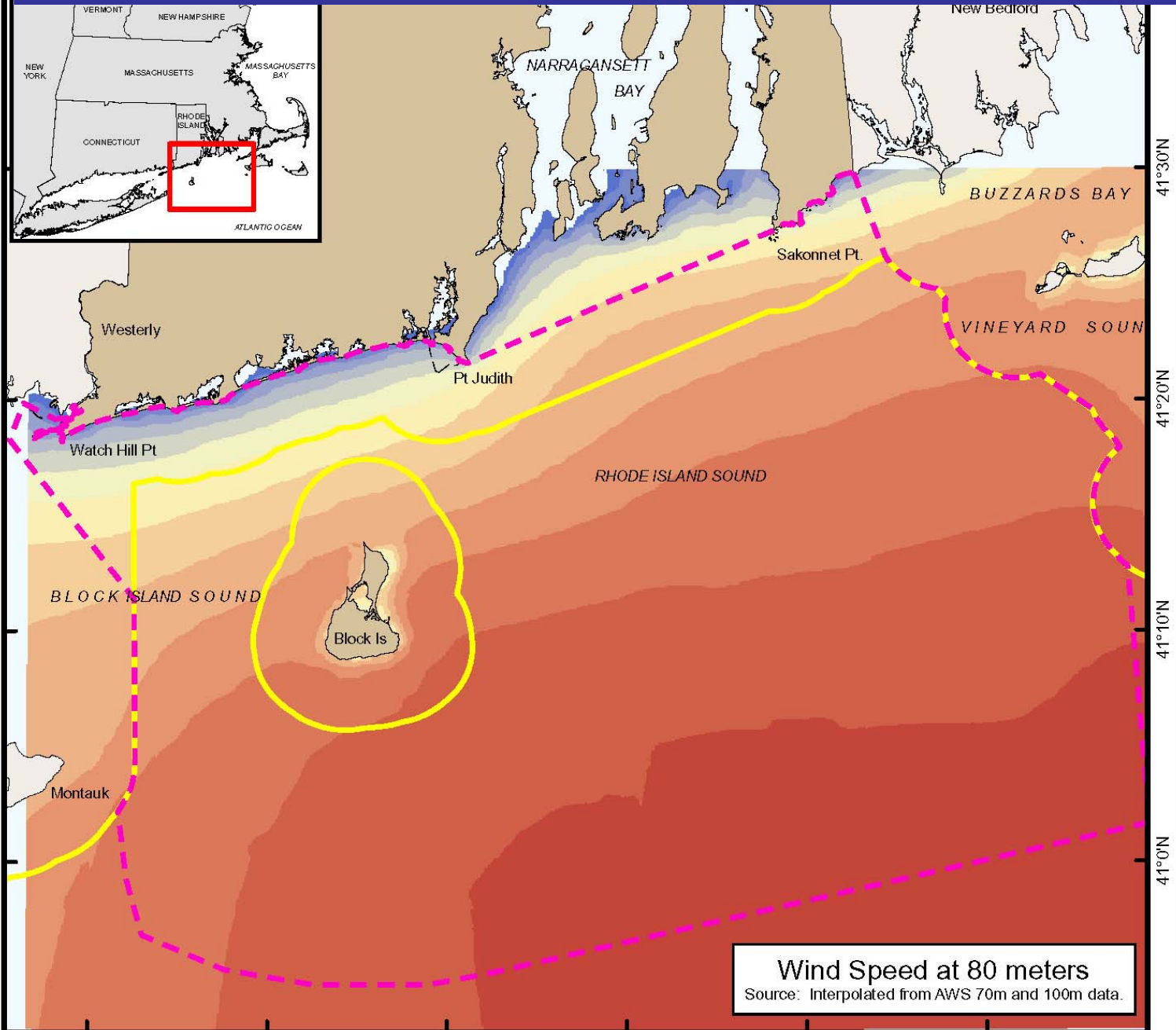
Bathymetry: Interpolated from NOS Soundings

For Project Background Information:

<http://seagrant.gso.uri.edu/oceansamp>

For Project Map and Data Products:

[http://www.narrbay.org/d\\_projects/oceansamp](http://www.narrbay.org/d_projects/oceansamp)



**Wind Speed at 80 meters**  
Source: Interpolated from AWS 70m and 100m data.

# Siting Analysis Tools



- **Technology Development Index (TDI)**
  - Measure of how difficult it would be to develop a location given construction effort and the potential power production
  - Low TDI → optimum site for development

**TDI = Construction Requirement (depth, geology) + Cable Distance**  
Measure of the Extractable Energy in Watts



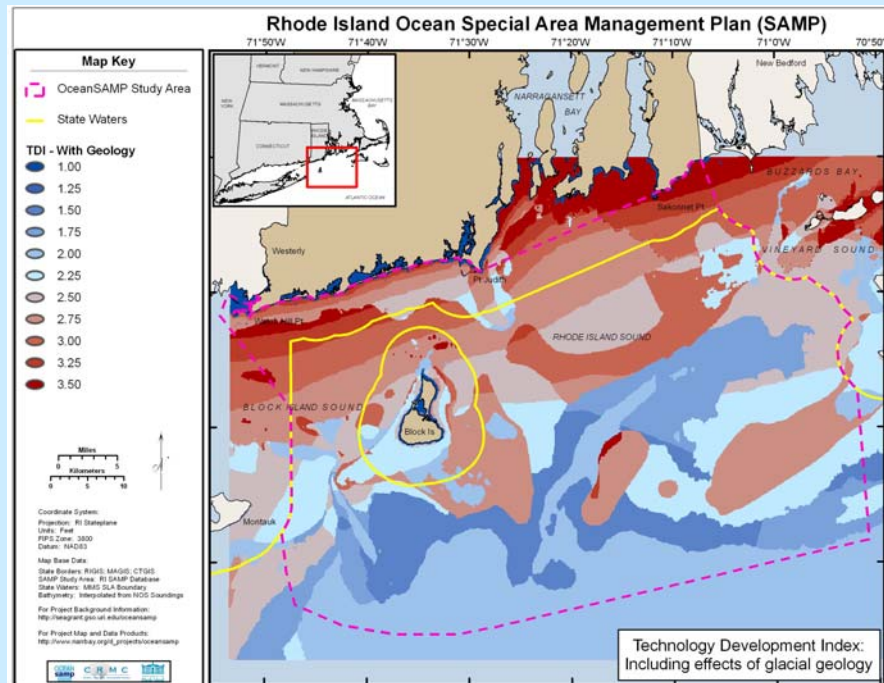
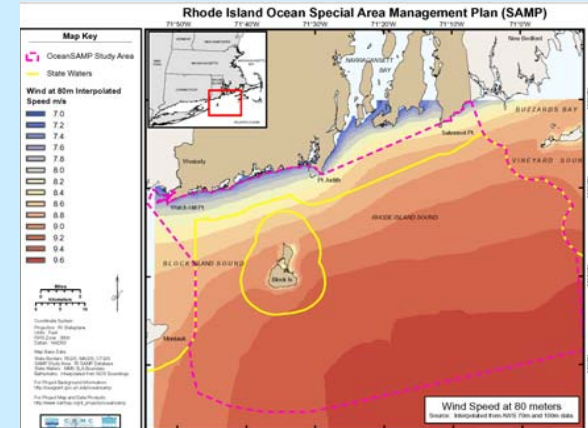
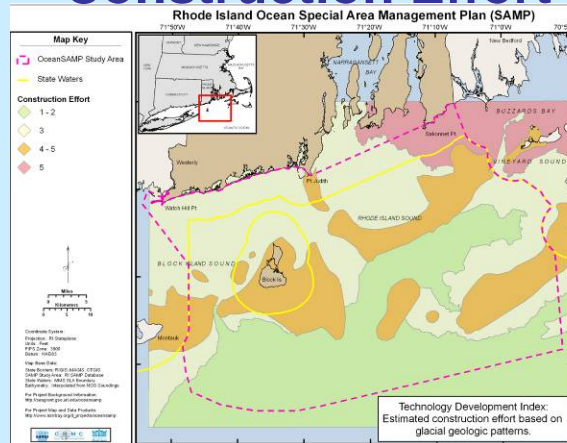
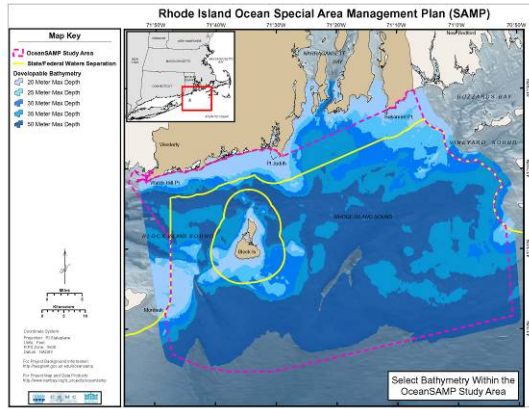
# Bathymetry

+

# Construction Effort

+

# Wind Speed



# Technology Development Index

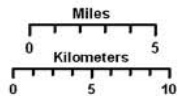
## Map Key

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### TDI - With Geology

-  1.00
-  1.25
-  1.50
-  1.75
-  2.00
-  2.25
-  2.50
-  2.75
-  3.00
-  3.25
-  3.50



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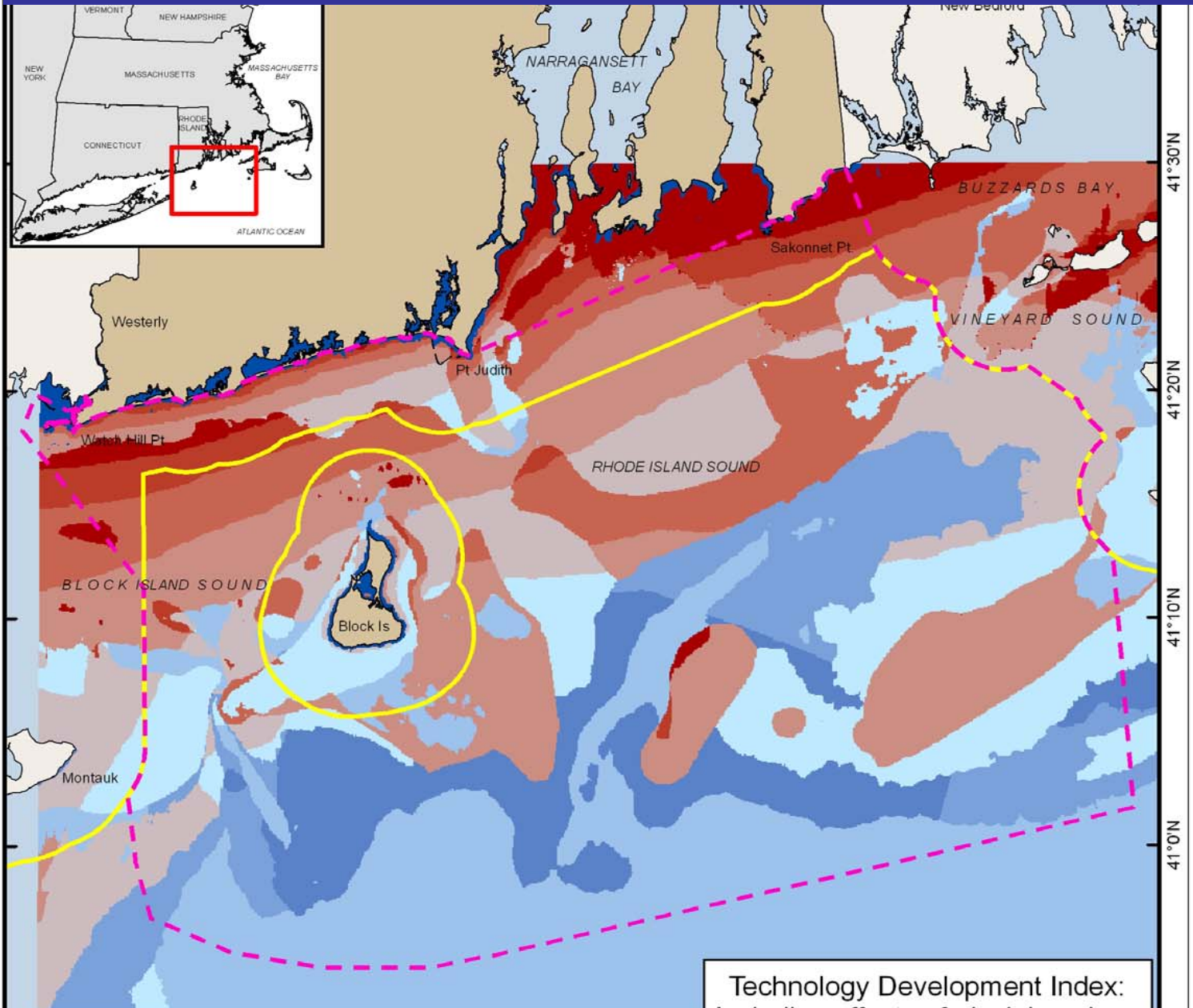
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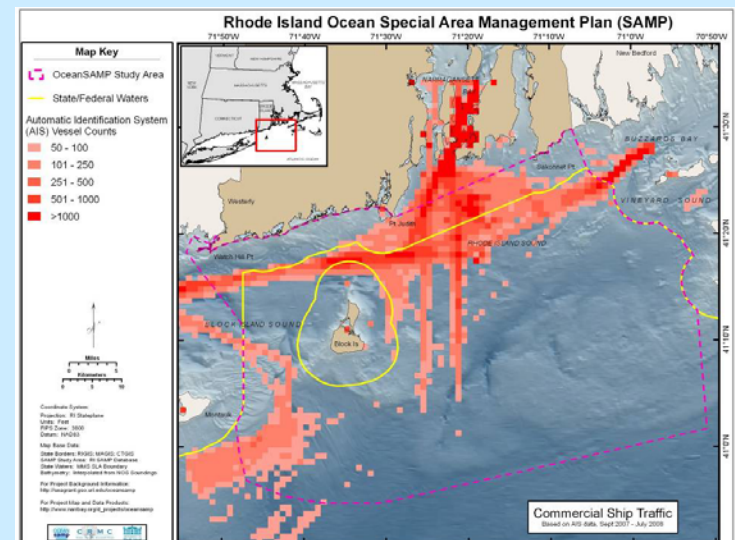
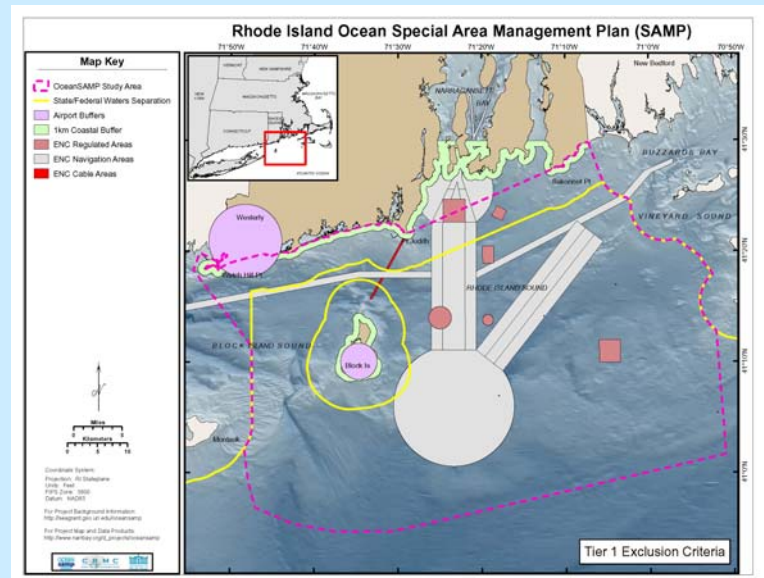


Technology Development Index:  
Including effects of glacial geology



# Tier 1 Analysis

- **Exclusions**
  - TDI > 3.0
  - Designated Shipping Lanes & Precautionary Areas
  - Recommended Vessel Routes
  - Ferry Routes
  - Areas with > 24 Records of Commercial Ship Traffic (AIS Data)
  - Dredge Disposal Sites
  - Military Testing Areas
  - Unexploded Ordnances
  - Airport buffer zones
  - Coastal buffer zone of 1 km

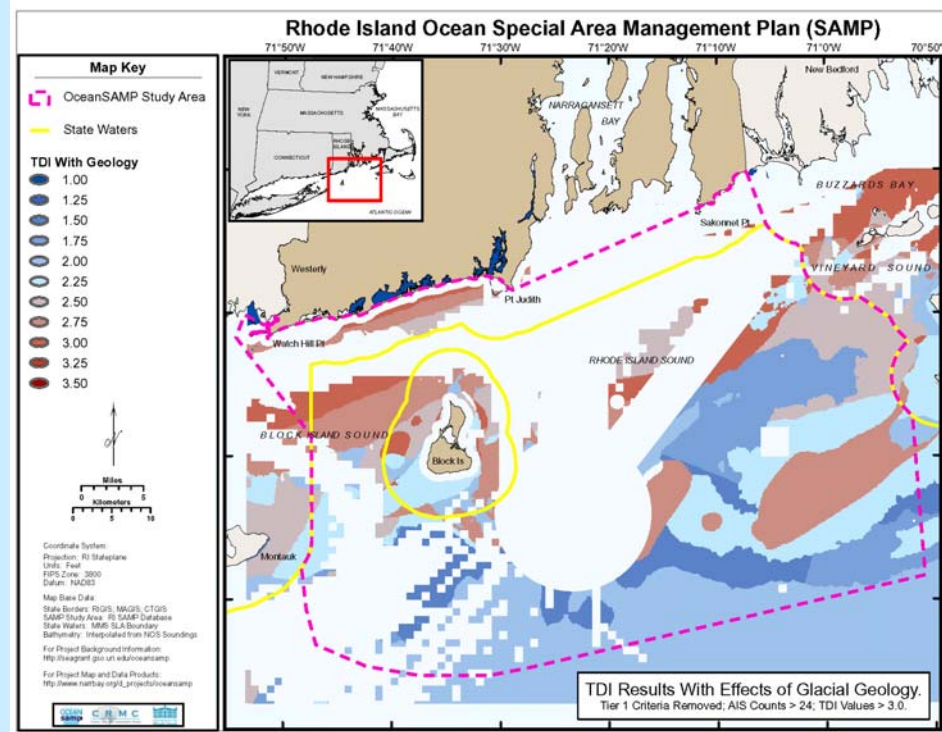
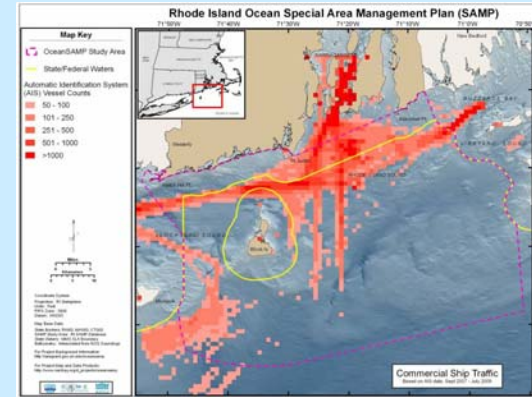
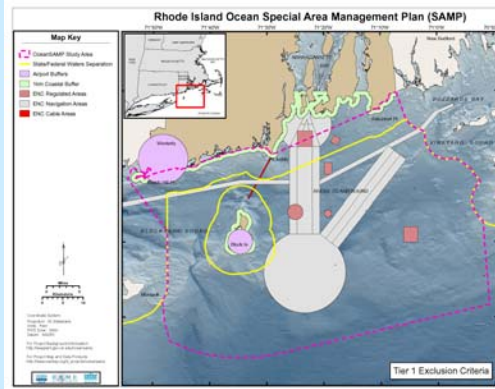
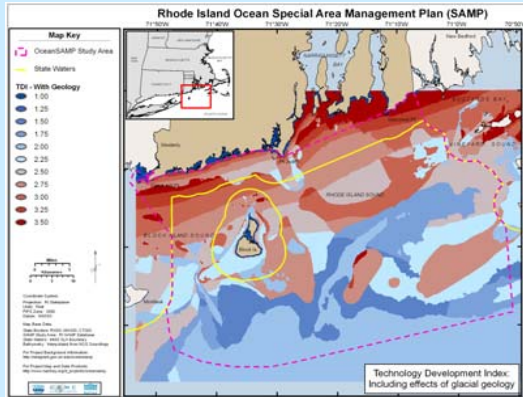




TDI <3


Excluded Areas

AIS Data



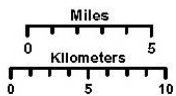
# Results of the Tier 1 Analysis

## Map Key

 OceanSAMP Study Area

 State Waters

### TDI With Geology



Coordinate System:

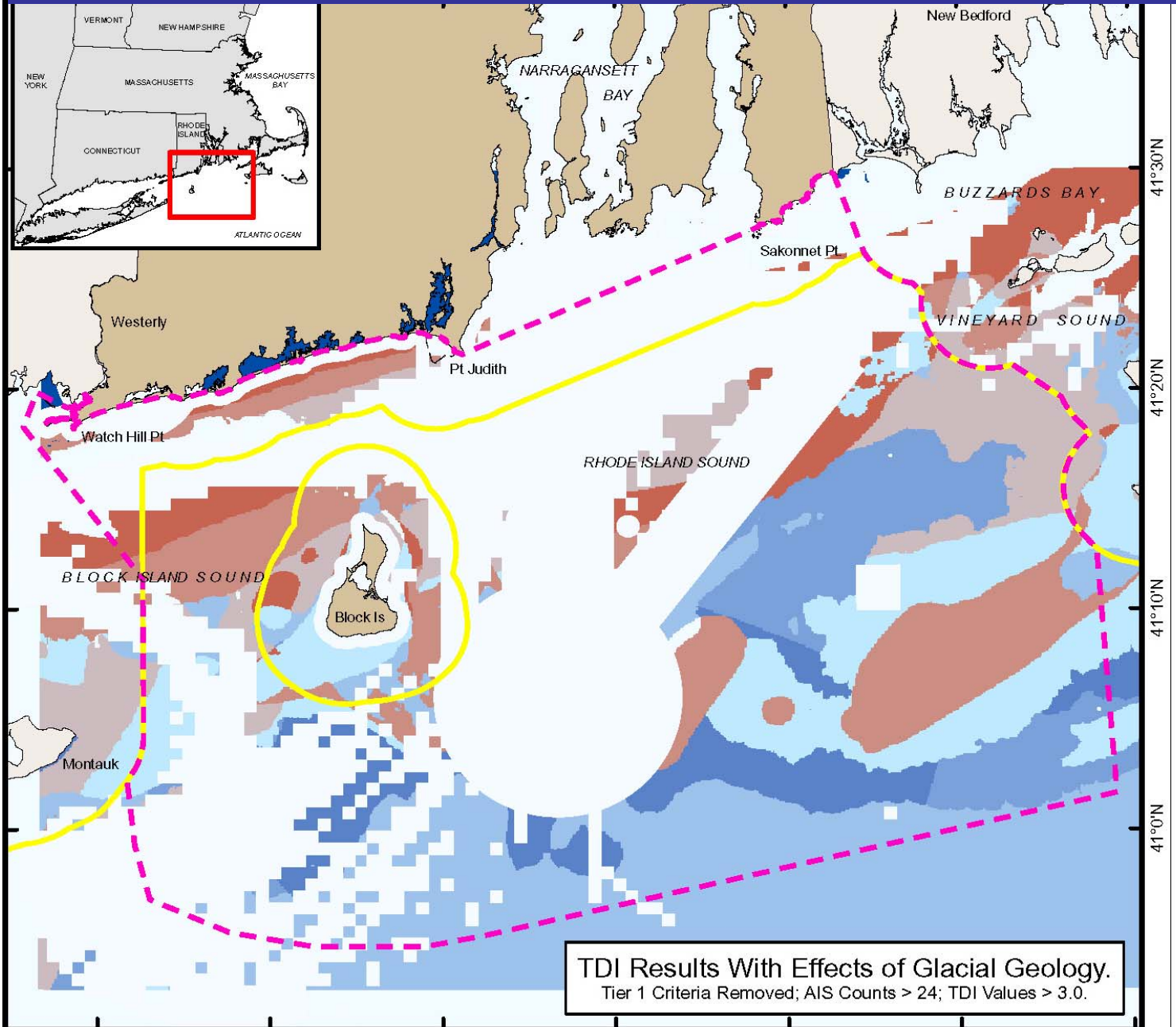
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TDI Results With Effects of Glacial Geology.  
Tier 1 Criteria Removed; AIS Counts > 24; TDI Values > 3.0.

# Siting Analysis Tools

- **Ecological Services Value Index (ESVI)**
  - Tool used to measure the ecological value of an area
    - **Habitat (type, quality and productivity);**
    - **Presence and degree of usage by biological resources**
      - Birds
      - marine mammals & sea turtles
      - fish and shellfish
      - Bats
      - Other species of interest
    - **Human use:**
      - Fisheries
      - Recreational





# Potential Effects of Offshore Wind Energy Development



- **Economic**
- **Biological/Ecological**
  - Benthic ecology
  - Birds
  - Sea Turtles
  - Marine Mammals
  - Fish
- **Physical**
  - Circulation patterns
  - Sediment Deposition
- **Cultural & Historic Resources**
- **Human Uses**
  - Fisheries
  - Recreation\*
  - Transportation/Navigation\*
- **Avoided Air Emissions**
- **Cumulative**

# Potential Economic Effects

- **Port Development & Job Creation**
  - Quonset/Davisville
- **Electricity Rates**
- **Revenue Sharing from Federal Leases**
- **Non-Market Value**
  - Global Climate Change Mitigation
  - Diversified energy portfolio



# Potential Environmental Effects of Offshore Renewable Energy Development

- Extensive Review Process (ongoing)
- Upcoming Event:

**Public Lecture Wednesday, March 31st**

***Dr. Andrew Gill & Dr. Frank Thomsen***

*(Cranfield University & U.K. Centre for Environment, Fisheries and Aquaculture Science)*

E.U. Offshore Wind Energy Development,  
Fisheries and Marine Mammals

URI Coastal Institute

# Next Steps:

- **Technical Advisory Committee Review**
  - **Proposed Organizations:**
    - National Renewable Energy Laboratory
    - National Grid
    - Rhode Island Public Utilities Commission
    - RI Office of Energy Resources
    - Ocean SAMP Researchers
    - Quonset Development Corporation
  - **Federal and State Agencies**
- **National Academies Marine Board Meeting**
  - **Design Standards for Offshore Wind Facilities**



***Thank you!***

**Please read the chapter online at:  
*[seagrant.gso.uri.edu/oceansamp](http://seagrant.gso.uri.edu/oceansamp)***

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