Cape Cod Bay Group

Technologies and Approaches
What is the stakeholder process?
Public Meetings

Goals, Work Plan & Roles
Affordability, Financing

Watershed Working Groups
Baseline Conditions
Technology Options Review
Watershed Scenarios

July  August  September  October  December

208 Planning Process
Public Meetings

- Goals, Work Plan & Roles
- Affordability, Financing
- Baseline Conditions
- Technology Options Review
- Watershed Scenarios

Watershed Working Groups

- Advisory Board
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July  August  September  October  December

208 Planning Process
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- Goals, Work Plan & Roles
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Watershed Working Groups

- Regulatory, Legal & Institutional Work Group

July
August
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December
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Watershed Working Groups

- Advisory Board
- RLI
- TAC

July

- Regulatory, Legal & Institutional Work Group

August

- Technical Advisory Committee of Cape Cod Water Protection Collaborative
208 Planning Process

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Regulatory, Legal & Institutional Work Group

Technical Advisory Committee of Cape Cod Water Protection Collaborative

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Advisory Board

TAC

TAC

RLI

RLI

RLI

RLI

July

August

September

October

December

Regulatory, Legal & Institutional Work Group

Technical Advisory Committee of Cape Cod Water Protection Collaborative
Goal of the First Meeting:

To review and develop shared understanding of the characteristics of these watersheds, the work done to date, existing data and information available, and how to apply all of this to planning for water quality improvements for these watersheds moving forward.
Progress since last meeting

- Meeting materials
Progress since last meeting

- Meeting materials
- GIS data layers
Progress since last meeting

- Meeting materials
- GIS data layers
- Chronologies
Baseline Conditions

11 Working Group Meetings: Sept 18-27

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

208 Planning Process
Watershed Scenarios
11 Working Group Meetings: Dec 2-11

Technology Options Review
11 Working Group Meetings: Oct 21-Nov 5

Baseline Conditions
11 Working Group Meetings: Sept 18-27

208 Planning Process
Wrap up of Cape2O: ur in charge!

Summary of planning process to date

Outline of second 6 months of the 208 planning process
Goal of Today’s Meeting:

To develop a shared understanding of the potential technologies and approaches identified to date, and the benefits and limitations of each; to explore the environmental, economic, and community impacts of a range of categories of solutions; and to identify priorities and considerations for applying technologies and approaches to remediate water quality impairments in your watershed.

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

208 Planning Process
Technologies and Approaches for Improving Water Quality
Technologies and Approaches for Improving Water Quality

- The Fact Sheets present various information on the technologies being considered.

- Additional information is contained on the Technology Matrix including the following:
  - Site Requirements
  - Construction, Project and Operation and Maintenance Costs
  - Reference Information
  - Regulatory Comments

- Input from the Stakeholders is requested regarding a technology’s Public Acceptance
Technologies and Approaches for Improving Water Quality

- Comprehensive analysis of nutrient control technologies and approaches.
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- Regulatory programs can address nutrient controls for both existing development and future development.
Waterless Urinal

IBC container (220 gallons)

40" x 40" x 48"

Source: Earle Barnhart, The Green Center Inc. and Horsley-Witten Group Inc.
water vapor
CO2
ammonia N

bathroom is odor-free
air is continuously drawn
down the toilet and is
exhausted out a roof vent

Source: Earle Barnhart, The Green Center Inc.
Precedent: 12th Ave. Stormwater Project, Portland, OR

Source: City of Portland

Stormwater: Bioretention / Soil Media Filters
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<td>Enhanced IA</td>
<td>I/A Enhanced Systems</td>
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<td>Toilets: Urine Diverting</td>
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<td>Constructed Wetlands: Surface Flow</td>
<td>Stormwater BMPs</td>
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<td>Stormwater: Bioretention / Soil Media Filters</td>
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<td>Eco-Machines &amp; Living Machines</td>
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<td>Permeable Reactive Barrier</td>
<td>Fertigation Wells</td>
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<td>Aquaculture/Shelfish Farming</td>
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<td>Surface Water Remediation Wetlands</td>
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</table>
Precedent: Living Machine - South Burlington, VT + Photobioreactors - Falmouth, MA
Source: Todd Ecological and Tom Cambareri
Scale: WATERSHED
Target: WASTEWATER

Constructed Wetlands: Subsurface Flow
Precedent: Koh Phi Phi Treatment Wetland, Thailand

Source: Hans Brox
**Precedent:** Woodburn OR, Wastewater Treatment Facility

Source: CH2M Hill
Precedent: Woodburn OR, Wastewater Treatment Facility

Source: CH2M Hill

Phytoirrigation
**Scale:** NEIGHBORHOOD/ WATERSHED  
**Target:** EXISTING WATER BODIES

Phytobuffers
Precedent: Phytobuffer - Kavcee, WY
Source: Sand Creek Consultants
Precedent:
Pine Hills
Plymouth, MA
Precedent:
Pine Hills
Plymouth, MA
Precedent:
Pine Hills
Plymouth, MA
Interceptor/Irrigation Wells
WWTP

Zone II

Precedent:
Pine Hills
Plymouth, MA
Scale: SITE / NEIGHBORHOOD / WATERSHED
Target: EXISTING WATER BODIES

Permeable Reactive Barrier (PRB)
Measuring Oysters' Improvements on Water Quality

Overall project area with new oyster reef

- Already 2-3 million additional oysters
- Great 5,800 pounds of nutrients removed per year
- Shrimp increase in commercial shellfish values of $1 million/year
- Increased water filtration approximately 100 million gallons/day
- Nutrient control
- Sediment reduction
- Increased recruitment, etc., juvenile fish habitat

Source: Anamarija Francik

Precedent: Wellfleet Oyster Restoration Project

Shellfish Habitat Restoration
Precedent: Wellfleet Oyster Restoration Project
Source: Anamaria Frankik
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Aquaculture / Shellfish Farming
Precedent: Shanghai Houton Park
Source: Turenscape
Precedent: Pond and Estuary Dredging - Dennis, MA

Source: Cape Cod Times
### Site Scale
- **Title 5**: Standard Title 5 Systems
- **I/A**: I/A Title 5 Systems
- **IA**: I/A Enhanced Systems
- **Toilets**: Urine Diverting
- **Toilets**: Composting
- **Toilets**: Packaging
- **Stormwater**: Bioretention / Soil Media Filters
- **Eco-Machines**: Living Machines
- **PRB**: Permeable Reactive Barrier

### Neighborhood
- **Compact Development**: Cluster & Satellite Treatment Systems
- **STEP/STEG**: Collection
- **Toilets**: Composting
- **Toilets**: Packaging
- **Stormwater**: Wetlands
- **Phytobuffers**: Inlet / Culvert Widening
- **Pond and Estuary Dredging**: Surface Water Remediation Wetlands

### Watershed
- **Remediation of Existing Development**: Conventional Treatment
- **Transfer of Development Rights**: Advanced Treatment
- **Wastewater Collection Systems**: Constructed Wetlands: Surface Flow
- **Effluent Disposal Systems**: Constructed Wetlands: Subsurface Flow
- **Effluent Disposal**: Out of Watershed/Ocean Outfall
- **Phytoirrigation**: Stormwater: Wetlands

### Cape-Wide
- **Fertilizer Management**: Stormwater BMPs
- **Shellfish and Salt Marsh Habitat Restoration**: Aquaculture/Shelfish Farming
Transfer of Developments Rights
The Concept

Owner of “sending” parcel sells development rights in exchange for permanent conservation easement.

Owner of “receiving” parcel buys development rights to build at densities higher than allowed under base zoning.

Source: Massachusetts Smart Growth Toolkit
## Town Consideration of Alternative Technologies & Approaches

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<th>Town</th>
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<td>Wellfleet</td>
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<tr>
<td>Mashpee</td>
<td>Aquaculture &amp; Expanding Existing Systems</td>
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<td>Brewster</td>
<td>PRB &amp; Bioswales</td>
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<td>Orleans</td>
<td>Fertilizer Control By-Law</td>
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<td>Harwich &amp; Chatham</td>
<td>Muddy Creek &amp; Cold Brook Natural Attenuation</td>
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<tr>
<td>Falmouth</td>
<td>Aquaculture, Inlet Widening, Eco-Toilet Demonstration Project, PRBs, Stormwater Management (Little Pond Watershed), Fertilizer Control By-Law, Subsurface Nitrogen Removal Septic Systems</td>
</tr>
<tr>
<td>Problem Solving Approach</td>
<td></td>
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</table>

### Targets/Reduction Goals

- **Present Load:** \( X \) kg/day
- **Target:** \( Y \) kg/day
- **Reduction Required:** \( N \) kg/day

### Other Wastewater Management Needs

- A. Title 5 Problem Areas
- B. Pond Recharge Areas
- C. Growth Management

### Low Barrier to Implementation

- A. Fertilizer Management
- B. Stormwater Mitigation

### Watershed/Embayment Options

- A. Permeable Reactive Barriers
- B. Inlet/Culvert Openings
- C. Constructed Wetlands
- D. Aquaculture

### Alternative On-Site Options

- A. Eco-toilets (UD & Compost)
- B. I/A Technologies
- C. Enhanced I/A Technologies
- D. Shared Systems

### Priority Collection/High-Density Areas

- A. Greater Than 1 Dwelling Unit/acre
- B. Village Centers
- C. Economic Centers
- D. Growth Incentive Zones

### Supplemental Sewering
Total Controllable Nitrogen Percent Removal to meet Total Maximum Daily Load
Septic Nitrogen Percent Removal to meet Total Maximum Daily Load
Nitrogen Load

Existing Controllable Load

- Portion of Septic Load
- Fert. & Storm.

Target Load

Required Reduction

Fert. & Storm.

Existing Controllable Load

- Portion of Septic Load

Target Load

Required Reduction
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**Supplemental Sewering**
Triple Bottom Line

Impacts of Technologies and Approaches

Environmental

Economic

Social
Technology Selection: Process and Principles

- 100% septic removal subwatershed
- Scale: On-Site vs. Collection System vs. Natural System
- Nutrient intervention and time of travel
- Permitting Status
- Land use and Impacts of Growth
Preparing for Meeting 3 and Beyond

- Review tools and alternatives analysis approach
- Evaluating scenarios for meeting water quality goals
- Attend the November 13th meeting:
  
  6:00
  Cape Cod Museum of Art
  Dennis, MA