What is the 208 Plan?
Clean Water Act Section 208

The Commission was directed to update the 1978 Plan

The Commonwealth provided $3 million to fund the project
Focus on 21st Century Problems

- Nitrogen: Saline Waters
- Phosphorus: Fresh Waters
- Growth & Title 5 Limitations
Nitrogen Removal Required
Approach to the 208 Plan Update

**Goal:**
To generate a series of approaches in each watershed that will meet water quality standards

- Watershed Based
- Stakeholder Engagement
- Maximize Benefits of Local Planning
- No Optimal Solutions
Area Boundaries
208 Water Quality Management Plan Update

- Lower Cape
- Mid Cape
- Outer Cape
- Upper Cape
What is the stakeholder process?
208 Planning Process

Public Meetings
- Goals, Work Plan & Roles: July
- Affordability, Financing: August

Watershed Working Groups
- Baseline Conditions: September
- Technology Options Review: October
- Watershed Scenarios: December
208 Planning Process

July
- Advisory Board
- Regulatory, Legal & Institutional Work Group
- TAC

August
- Advisory Board
- Regulatory, Legal & Institutional Work Group
- TAC

September
- Advisory Board
- Regulatory, Legal & Institutional Work Group
- TAC
- Tech Panel

October
- Advisory Board
- Regulatory, Legal & Institutional Work Group
- TAC
- Tech Panel
- Tech Panel
- Tech Panel

December
- Advisory Board
- Regulatory, Legal & Institutional Work Group
- TAC
- Tech Panel
- Tech Panel
- Tech Panel
- Tech Panel
- Tech Panel

Goals, Work Plan & Roles

Baseline Conditions, Affordability, Financing

Technology Options, Review

Watershed Scenarios
208 Planning Process

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

4 Public Meetings: July 15-18
4 Public Meetings: Aug 26-29
Subgroup Boundaries
208 Water Quality Management Plan Update

**Lower Cape**
- Herring River
- Pleasant Bay
- Stage Harbor Group
- Nauset and Cape Cod Bay Marsh Group

**Mid Cape**
- Cape Cod Bay Group
- Lewis Bay to Bass River
- Three Bays & Centerville River

**Outer Cape**
- Provincetown Harbor
- Wellfleet Harbor & Pamet River

**Upper Cape**
- Waquoit Bay & Popponesset Bay
- Upper Cape West & South

**11 Working Group Meetings:** Sept 18-27

**Baseline Conditions**

**Technology Options Review**

**Watershed Scenarios**
Baseline Conditions
11 Working Group Meetings: Sept 18-27

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

Watershed Scenarios

208 Planning Process
208 Planning Process

- Baseline Conditions
  - 11 Working Group Meetings: Sept 18-27

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

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

Baseline Conditions
11 Working Group Meetings: Sept 18-27

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

Watershed Scenarios
11 Working Group Meetings: Dec 2-11
Goal of Today’s 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.
Local Progress to Date

Allen Harbor
Herring River
Saquatucket Harbor
Swan Pond River
Wychmere Harbor
Brewster

From 1978 Section 208 Plan

Present and future town well sites should be protected from the non-point sources resulting from New development by creating Watershed Protection Districts.

The town should cooperate in regional water supply planning to determine future water supply needs of neighboring towns and whether it can assist.

WASTEWATER: It is expected that no new problem areas will develop and that present problem areas will be controlled during the planning period.

The Orleans 201 facility plan will soon be underway and the cooperation of Brewster in the planning of a septage facility in Orleans that can meet Brewster's septage treatment needs is highly recommended.

It is recommended that Brewster consider cooperating in a regional landfill monitoring program.

The town should form a Water Quality Advisory Committee.

The first task of the committee might be participation in facility planning for regional septage treatment with Orleans.
Brewster: 1970-2013

POPULATION CHANGE: (+61.50%) 5,226 to 8,440

- Orleans, Brewster and Eastham Ground Water Protection District created
- Pleasant Bay Area of Critical Environmental Concern designation
- Wastewater plan
- Designation of Inner Cape Cod Bay Area of Critical Environmental Concern

Brewster: 1970-2013

POPULATION CHANGE: (+19.60%)

- 1990: 8,440
- 2000: 10,094

- 1993: Hydrogeologic and Hydrochemical Assessment of the Brewster Landfill
- 1996: Wastewater plan (details needed)
- Title 5 amended
Brewster: 1970-2013

- **2010**: MEP Report - Bass River (shared embayment)
- **2011**: Draft National Pollutant Discharge Elimination System (NPDES) Phase II Municipal Separate Storm Sewer System
- **2011**: Construction of Well #6 approved. $3,220,000
- **2011**: Cape Cod Water Resources Restoration Projects. $50,000
- **2011**: IWRMP Phase I report released
- **2011**: Horsley Witten Group hired for IWRMP Phase II
- **2012**: First Half of IWRMP Phase III funding approved. $130,000
- **2012**: Chapter 115 adopted governing discharges to municipal Storm system
- **2013**: Second Half of IWRMP Phase III funding approved. $125,000
- **2013**: Pleasant Bay Resource Management Plan Update

**2010**
- IWRMP Phase I Funding: $100,000

**2011**
- IWRMP Phase I report released
- Horsley Witten Group hired for IWRMP Phase II

**2012**
- Construction of Well #6 approved. $3,220,000
- Chapter 115 adopted governing discharges to municipal Storm system

**2013**
- First Half of IWRMP Phase III funding approved. $130,000
- Second Half of IWRMP Phase III funding approved. $125,000
- Pleasant Bay Resource Management Plan Update
Dennis

**From 1978 Section 208 Plan**

Dennis has a professional health agent and the town’s health regulations already implement many of the 208 plan recommendations.

It is recommended that the town consider creating a "Seasonal Residential District" in the area south of Lower County Road and carefully control the conversion of seasonal dwellings in this area.

Septage treatment is a problem in Dennis. It is recommended in the discussion of "Facility Planning in Non-Sewered Areas" that Dennis should join with Yarmouth in a regional facility.

Since the town is not planning to construct any sewage collection systems, septage flows may be large enough to make a separate facility cost-effective. Another possibility that should be investigated is regionalization with Harwich.

Implementation of the 208 water quality plan in Dennis should give priority to establishing watershed protection districts and implementing on-site system management and septage treatment.

The Water District has developed extensive wellfields and pumping capacity, which should require little expansion to serve the 1995 population.

Dennis may have water resources in excess of its needs, which could be called upon to supply other towns in the future.

Dense development in the southern half of Dennis and along Bass River may restrict the amount or area available for recharge protection purposes.

**Title 5 of State Sanitary Code goes into effect for regulation of on-site wastewater systems.**
Dennis: 1970-2013

2000

2002

2004

2006

2008

2010

2012

15,973

14,207

POPULATION CHANGE: (-11.06%)

Quivett Creek Study (fecal coliform), 2002, Town of Dennis

"Bass River Subwatershed, February 2003, Executive Office of Environmental Affairs (EOEA) Cape Cod Watershed Team"

USEPA Phase II Stormwater Discharge Permitting and Stormwater Pollution Prevention Plan

Needs Assessment Report completed by Sterns and Wheler for Dennis Water District

Final Dennis ponds report published by CCC & SMAST

MEP Report - Bass River (shared embayment)

MEP Report - Swan Pond (shared embayment)

MEP Report - Herring River (Harwich, shared)
From 1978 Section 208 Plan

That the town recognize that the Category 2 problem areas on the south side of town need special attention.

It is also suggested that the town consider establishing "Seasonal Residential Districts" in this area to control the conversion of seasonal dwellings to year-round occupancy.

The 208 plan does not indicate a sewer need in Harwich. This means that the town will not be eligible for a major central collection system for twenty years.

New wastewater management problems created by the town's failure to take recommended actions for on-site system management will not be eligible for future 201 construction funds.

While Harwich presently has a state approved interim lagoon, the town should not view this system as a long-term solution to its septage treatment problems.

There has been considerable concern raised over the possible development of a large subdivision and golf course upgradient of the town's wellfield.

The town should also consider purchasing additional areas to protect the town wells.
Harwich: 1970-2013

- Comprehensive Site Assessment, Queen Anne Road Sanitary Landfill
- MEP Report - Pleasant Bay (shared embayment)
- Skinequit Ongoing Pond Study, Harwich Natural Resources Department
- Flax Pond Water Quality Review prepared by the CCC
- Fecal Coliform Evaluation and the Mitigation Planning for the Allen’s Harbor Watershed
- Review and Interpretation of Harwich Ponds Volunteer Monitoring Data

POPULATION CHANGE:
1990: 10,275 (+20.55%)
1998: 12,386
2000: 12,386
2002: 12,386
2004: 12,386
2006: 12,386 (-1.15%)
Harwich: 1970-2013

- **2007**
  - Great Sands Lakes Report prepared by Sterns & Wheler
- **2008**
  - Wastewater Management Subcommittee established
  - CWMP Community Meeting No. 1. Overview of CWMP process, need for citizen committee
  - CWMP Community Meeting No. 2. Update on CWMP and MEP status
- **2009**
  - CWMP Community Meeting No. 3. Existing conditions report; preliminary wastewater findings
  - Ecologic Memorandum, Harwich Ponds, 2009-2010 Data Review, April 18, 2011, EcoLogic, LLC
- **2010**
  - Question 1. $200,000 for CWMP, approved, 1,273 to 956
  - ARTICLE 18. Feasibility study of Hinckley Pond for excess phosphorus, 30,000. INDEFINITELY POSTPONED
  - ARTICLE 17. Funds to complete CWMP. $200,000, subject to town vote
  - MEP Technical Memo, Updated Water Use and Muddy Creek Nitrogen Attenuation
  - MEP Report - Allen, Wynchmere and Saquatucket Harbors (Harwich)
  - MEP Technical Memo, Evaluation of Culvert in Muddy Creek Inlet

**POPULATION CHANGE: -1.15%**
Harwich: 1970-2013

- **ARTICLE 21**: Fund completion of CWMP. $210,000
- **ARTICLE 22**: Fund construction Muddy Creek culvert/bridge. $187,500
- **CWMP Community Meeting No. 4**: Discussed site screening process for effluent recharge sites.
- **Harwich LCP Update approved**
- **QUESTION 3**: $100,000 to complete CWMP. Approved. 930 to 540.
- **ARTICLE 24 Fund completion of CWMP. $200,000**
- **ARTICLE 2**: Increase room tax 4% to 6%. Indefinitely postponed.
- **Ecologic Memorandum, Harwich Ponds, 2009-2010 Data Review.**
- **Final Technical Memorandum Muddy Creek Wetland Restoration**
- **Evaluation of Hinckley’s Pond**
- **MEP Report - Swan Pond (shared embayment)**
- **Draft CWMP**
- **MEP Report - Herring River (Harwich)**
- **Cape Cod Commission CWMP Review Letter**

**Timeline:**
- **2011**
- **2012**
- **2013**

**Harwich: 1970-2013**
Did we miss anything?
Your Watersheds

Allen Harbor
Herring River
Saquatucket Harbor
Swan Pond River
Wychmere Harbor
21.2 square miles
3 Towns
### Natural Features

#### Base Map
- Town Lines
- Rivers

#### Embayment Boundary
- On Land
- On Sea

#### Major Roads
- US Highway
- State Highway
- Roads

#### Natural Areas
- Natural Heritage & Endangered Species Program (NHESP) Certified Vernal Pools
- Water Table Contours
- Cranberry Bogs
- Wetlands
- Sea, Lake, & Overland Surges from Hurricanes (SLOSH) Update 2013
- Preliminary FEMA Flood Insurance Rate Map (FIRM) Zones 2013

Sources: MassGIS, MassDOT, ICCOH, FEMA, CCC
Managed Surfaces

Base Map
- Town Lines
- Rivers

Embayment Boundary
- On Land
- On Sea

Major Roads
- US Highway
- State Highway
- Roads

Managed Surfaces
- Approximate Managed Ground Surfaces
- Approximate Residential Managed Lawns
- Approximate Managed Golf Courses
- Approximate Municipal Managed Natural Surfaces

Sources: MassGIS, MassDOT, CCC
Base Map
- Town Lines
- Rivers

Embayment Boundary
- On Land
- On Sea

Major Roads
- US Highway
- State Highway
- Roads
- Structures
- Ponds

Regulatory
- Areas of Critical Environmental Concern
- DEP Approved Wellhead Protection Areas (Zone IIIs)
- Growth Incentive Zone

OpenSpace: Level of Protection
- In Perpetuity
- Limited
- None

Landuse Vision Map
- Economic Center
- Industrial and Service Trade Area
- Village
- Resource Protection Area
- Other
- Undesignated

Sources: MassGIS, MassDOT, CCC
Land Use Change

**Base Map**
- Town Lines
- Rivers

**Embankment Boundary**
- On Land
- On Sea

**Major Roads**
- US Highway
- State Highway
- Roads

**Land Use Change**
- Residential
- Commercial
- Industrial
- Wooded, Natural, or Wetlands
- Open - Disturbed or Managed
- Water

Sources: MassGIS, MassDOT
Cape Wide Cost Estimate:
30% growth will increase capital costs by 40%
The People

Allen Harbor
Herring River
Saquatucket Harbor
Swan Pond River
Wychmere Harbor
Total Population (2010) = 11,163
5.2% of the Total Cape Cod Population

Population (2010)

- Allen Harbor: 435
- Herring River: 1,650
- Saquatucket Harbor: 2,417
- Swan Pond River: 82
- Wychmere Harbor: 82

2010 Census
Median Age (2010)

- Allen Harbor
- Herring River
- Saquatucket Harbor
- Swan Pond River
- Wychmere Harbor
- Barnstable County
- Massachusetts

2010 Census
Race - % White (2010)

2010 Census
Seasonal vs. Year Round Housing (2010)

Year-Round  Seasonal

2010 Census
Total Assessed Value of Residential Homes = $2,723,874,350
Your Government & Taxes

Allen Harbor
Herring River
Saquatucket Harbor
Swan Pond River
Wychmere Harbor
Average Single Family Property Tax Bill (2013)

Brewster  Dennis  Harwich  Barnstable County  Massachusetts

$0  $1,000  $2,000  $3,000  $4,000  $5,000  $6,000

MA Dept of Revenue & Town of Barnstable, 2013
Average Annual Sewer Bill (2012)

Tighe & Bond, MA Sewer Rate Survey, 2012
The Problem

Allen Harbor
Herring River
Saquatucket Harbor
Swan Pond River
Wychmere Harbor
Massachusetts Estuaries Project

- Opportunity for towns to obtain independent analysis of nitrogen loading and its impact on water quality

- Provides water quality, nutrient loading, and hydrodynamic information

- Water quality monitoring – minimum of 3 years of data for each embayment

- Watershed model links water quality data to nitrogen loads
Cape-Wide Controllable Nitrogen Loads

- Septic: 79%
- Lawn Fertilizers: 9%
- Impervious Surfaces: 8%
- Wastewater Treatment Facilities: 4%
- All Other: <1%

Note: Data averaged from existing Massachusetts Estuaries Project Reports

Photo credit: Stephanie Foster, Americorps Cape Cod
Herring River Controllable Nitrogen Loads

- Septic: 68%
- Lawn Fertilizers: 10%
- Impervious Surfaces: <1%
- Wastewater Treatment Facilities: 7%
- Farm Animal Loads: 5%
- Landfill: 5%
- Cranberry Fertilizer: 5%
- Golf Course Fertilizer: 5%

Massachusetts Estuaries Project, Mar 2013

Photo credit: Stephanie Foster, Americorps Cape Cod
Allen Harbor Controllable Nitrogen Loads

- Septic: 86%
- Lawn Fertilizers: 2%
- Impervious Surfaces: 7%
- Wastewater Treatment Facilities
- Farm Animal Loads
- Landfill
- Cranberry Fertilizer
- Golf Course Fertilizer

Massachusetts Estuaries Project, 2010
Saquatucket Harbor Controllable Nitrogen Loads

- Septic: 79%
- Lawn Fertilizers: 5%
- Impervious Surfaces: 7%
- Wastewater Treatment Facilities: 5%
- Farm Animal Loads: <1%
- Landfill: 3%
- Cranberry Fertilizer
- Golf Course Fertilizer

Massachusetts Estuaries Project, 2010

Photo credit: Stephanie Foster, Americorps Cape Cod
Wychmere Harbor Controllable Nitrogen Loads

- Septic: 83%
- Lawn Fertilizers: 5%
- Impervious Surfaces: 2%
- Wastewater Treatment Facilities: 5%
- Farm Animal Loads: 4%
- Landfill: 5%
- Cranberry Fertilizer: 0%
- Golf Course Fertilizer: 0%

Massachusetts Estuaries Project, 2010

Photo credit: Stephanie Foster, Americorps Cape Cod
Swan Pond River Controllable Nitrogen Loads

- Septic: 77%
- Lawn Fertilizers: 13%
- Impervious Surfaces: 7%
- Wastewater Treatment Facilities: 5%
- Farm Animal Loads: 13%
- Landfill: 7%
- Cranberry Fertilizer: 5%
- Golf Course Fertilizer: 5%

Massachusetts Estuaries Project, 2012
Nitrogen Problem

Base Map
- Town Lines
- Rivers

Embayment Boundary
- On Land
- On Sea

Major Roads
- US Highway
- State Highway
- Roads
- Structures
- Ponds

Nitrogen
Water Quality Stations
- Healthy
- Healthy/Moderately Impacted
- Healthy/Significantly Impacted
- Moderately Impacted
- Moderately Impacted/Significantly Impacted
- Significantly Impacted
- Significantly Impacted/Significantly Degraded
- Significantly Degraded

Yearly Nitrate Concentration Averages
- 0 - 0.5 mg/l in Public Water Supply Wells
- 0.5 - 1 mg/l
- 1 - 2.5 mg/l
- 2.5 - 5 mg/l

Embayments with Removal Target
Total NLoad Percent Removal
- 0 %
- 1 - 52 %
- 53 - 72 %
- 73 - 86 %
- 87 - 100 %

Subwatersheds with Removal Target
Total NLoad Percent Removal
- 0.1 % - 9 %
- 9.1 % - 38 %
- 38.1 % - 62 %
- 62.1 % - 86 %
- 86.1 % - 100 %

Sources: MassGIS, MEP, CCC
Contour Plot of **modeled total nitrogen concentrations (mg/L)** in Herring River System, for no anthropogenic loading conditions, and bathymetry. The approximate location of the sentinel threshold station for Herring River System (HAR-7) is shown.

(Source: MEP 2013)
Contour Plot of **average total nitrogen concentrations** from results of the present conditions loading scenario, for Herring River System. The approximate location of the sentinel threshold station for Herring River System (HAR-7) is shown.

(Source: MEP 2013)
Contour Plot of modeled total nitrogen concentrations (mg/L) in Herring River System, for projected build-out loading conditions, and bathymetry. The approximate location of the sentinel threshold station for Herring River System (HAR-7) is shown.

(Source: MEP 2013)
Pre-Colonial Conditions: Allen Harbor, Saquatucket Harbor, & Wychmere Harbor
Contour plots of **average total nitrogen concentrations** from results of the present conditions loading scenario, for Allen Harbor, Wychmere Harbor and Saquatucket Harbor estuarine systems.

(Source: MEP 2010)
Contour plots of **modeled total nitrogen concentrations** (mg/L) in Allen Harbor, Wychmere Harbor and Saquatucket Harbor estuarine systems, for projected build-out loading conditions. The approximate location of the sentinel threshold stations for Allen Harbor (HAR-4), Wychmere Harbor (HAR-3), and Saquatucket Harbor (HAR-2) are shown.

(Source: MEP 2010)
Contour Plot of **modeled total nitrogen concentrations (mg/L)** in Swan Pond River system, for no anthropogenic loading conditions, and bathymetry. The approximate location of the sentinel threshold station for Swan Pond River system (SWP-2) is shown.

(Source: MEP 2012)
Contour Plot of **average total nitrogen concentrations (mg/L)** from the results of the present conditions loading scenario, for Swan Pond River system. The approximate location of the sentinel threshold station for Swan Pond River system (SWP-2) is shown.

(Source: MEP 2012)
Contour plots of **modeled total nitrogen concentrations (mg/L)** in Swan Pond River system, for projected build-out loading conditions, and bathymetry. The approximate location of the sentinel threshold station for Swan Pond River System (SWP-2) is shown.

(Source: MEP 2012)
Nitrogen Problem

**Base Map**
- Town Lines
- Rivers

**Embayment Boundary**
- On Land
- On Sea

**Major Roads**
- US Highway
- State Highway
- Roads

**Nitrogen**

**Water Quality Stations**
- Healthy
- Healthy/Moderately Impacted
- Healthy/Significantly Impacted
- Moderately Impacted
- Moderately Impacted/Significantly Impacted
- Significantly Impacted
- Significantly Impacted/Significantly Degraded
- Significantly Degraded

**Yearly Nitrate Concentration Averages**
- 0 - 0.5 mg/l
- 0.5 - 1 mg/l
- 1 - 2.5 mg/l
- 2.5 - 5 mg/l

**Embayments with Removal Target**

<table>
<thead>
<tr>
<th>Total NLoad Percent Removal</th>
<th>0 %</th>
<th>1 - 52 %</th>
<th>53 - 72 %</th>
<th>73 - 86 %</th>
<th>87 - 100 %</th>
</tr>
</thead>
</table>

**Subwatersheds with Removal Target**

<table>
<thead>
<tr>
<th>Total NLoad Percent Removal</th>
<th>0.1 % - 9%</th>
<th>9.1 % - 38 %</th>
<th>38.1 % - 62 %</th>
<th>62.1 % - 86 %</th>
<th>86.1 % - 100%</th>
</tr>
</thead>
</table>

Sources: MassGIS, MEP, CCC
Phosphorus Problem

**Base Map**
- Town Lines
- Rivers

**Embayment Boundary**
- On Land
- On Sea

**Major Roads**
- US Highway
- State Highway
- Roads

**Phosphorus Priority Ponds**
- Trophic Status
  - Eutrophic
  - Mesotrophic
  - Oligotrophic
  - Not Interpreted

Sources: MassGIS, MassDOT, CCC
Title 5 Compliance Issues

Base Map
- Town Lines
- Rivers

Embayment Boundary
- On Land
- On Sea

Major Roads
- US Highway
- State Highway
- Roads

Existing Conditions
- Approx. Locations of Loans Issued for Title 5 Repair
- Potential Title 5 Compliance Issues
- Wastewater Treatment Facility
- Groundwater Discharge Points
- Sewered Parcels

Sources: MassGIS, MassDOT, MassDEP, Barnstable County Community Septic Loan Program, CCC
Existing & Proposed Solutions

Allen Harbor
Herring River
Saquatucket Harbor
Swan Pond River
Wychmere Harbor
Existing Infrastructure

**Base Map**
- Town Lines
- Rivers

**Embayment Boundary**
- On Land
- On Sea

**Major Roads**
- US Highway
- State Highway
- Roads
- Structures
- Ponds

**Existing Conditions**
- Approx. Locations of Loans Issued for Title 5 Repair
- Potential Title 5 Compliance Issues

**Enhanced Attenuation Sites**
- Wastewater Treatment Facility
- Groundwater Discharge Points
- Sewered Parcels

**Public Supply Wells**
- Public Water Supply Well
- Small Volume Wells, Non-Transient
- Proposed Public Water Supply Well
- Surface Water Supply
- Small Volume Wells, Transient

Sources: MassGIS, MassDOT, MassDEP, Barnstable County Community Septic Loan Program, CCC
Proposed Infrastructure

**Base Map**
- Town Lines
- Rivers

**Embayment Boundary**
- On Land
- On Sea

**Major Roads**
- US Highway
- State Highway
- Roads

**Proposed Conditions**

**Natural Attenuation Sites**
- Bridge
- Culvert
- Inlet
- Pipe
- Sewer Alternatives
- Stormwater

**CWMP Sewershed Phasing**

- No Date Set
- Phase Date
  - 2001 - 2010
  - 2011 - 2020
  - 2021 - 2030
  - 2031 - 2040
  - 2041 - 2050

Sources: MassGIS, MassDOT, CCC
Framework for Addressing Solutions Moving Forward

Allen Harbor
Herring River
Saquatucket Harbor
Swan Pond River
Wychmere Harbor
Targets/ Goals

**Present Load:**

\[ X \text{ kg/day} \]

**Target:**

\[ Y \text{ kg/day} \]

**Reduction Required:**

\[ N \text{ kg/day} \]

Composite Target Areas

A. High Nitrogen Reduction Areas
B. Pond Recharge Areas
C. Title 5 Problem Areas

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. Dredging

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
All materials and resources for the Herring River Group will be available on the Cape Cod Commission website: