

2ND ANNUAL
CAPE COASTAL
CONFERENCE

JUNE 5



Linking Science with Local Solutions and Decision-Making

THE CAPE COD APPROACH

SOLVING OUR BIGGEST ENVIRONMENTAL PROBLEM

PAUL NIEDZWIECKI, EXECUTIVE DIRECTOR
CAPE COD COMMISSION



CAPE COD BY THE NUMBERS.

ONE CAPE COD

400 SQUARE MILES OF LAND



560 MILES

OF COASTLINE AND BEACHES



2 VEHICLE BRIDGES



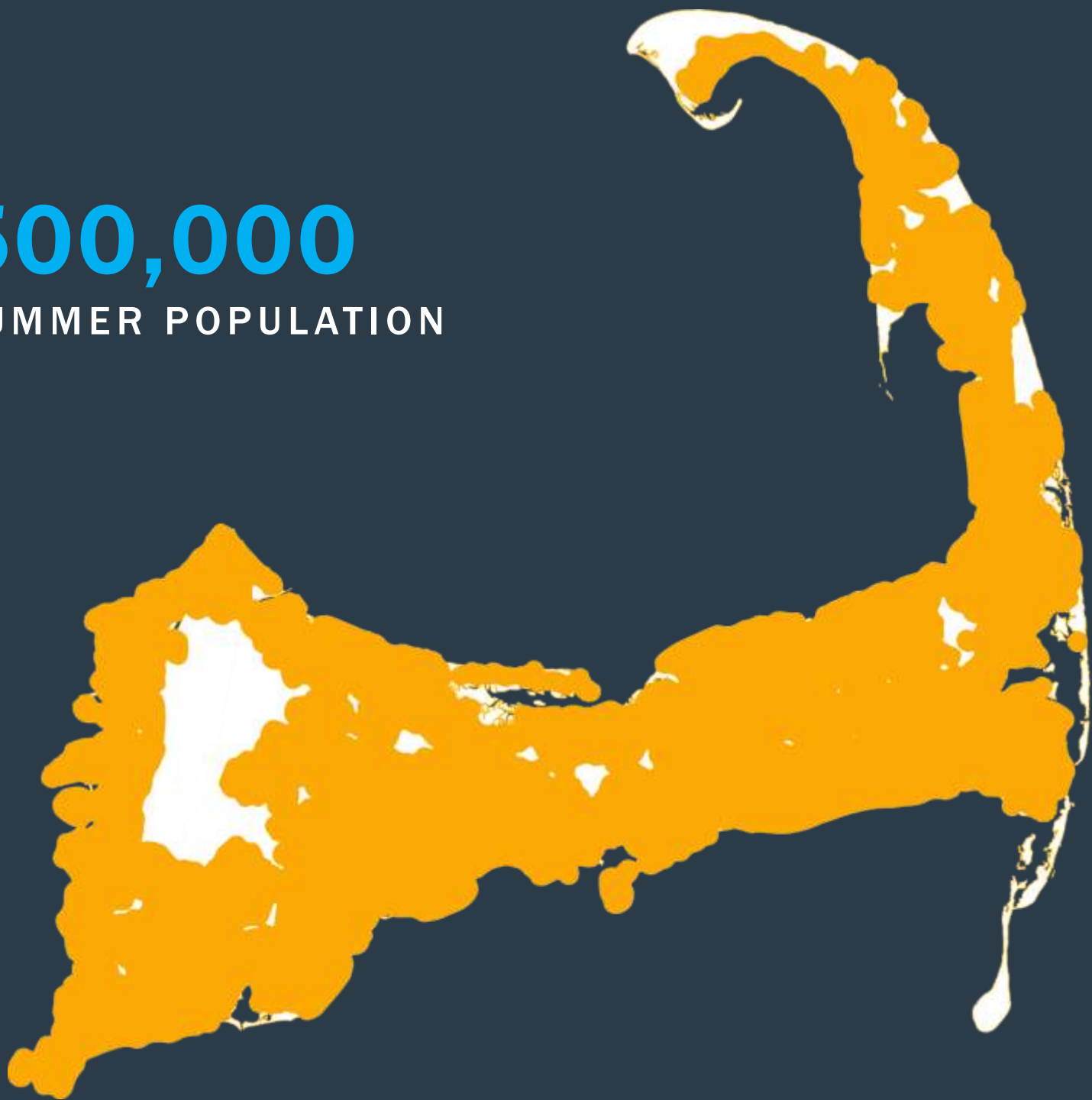
216,000

YEAR ROUND POPULATION



500,000

SUMMER POPULATION



15 TOWNS



1 SOLE SOURCE AQUIFER



105 WATERSHEDS



57 EMBAYMENT WATERSHEDS



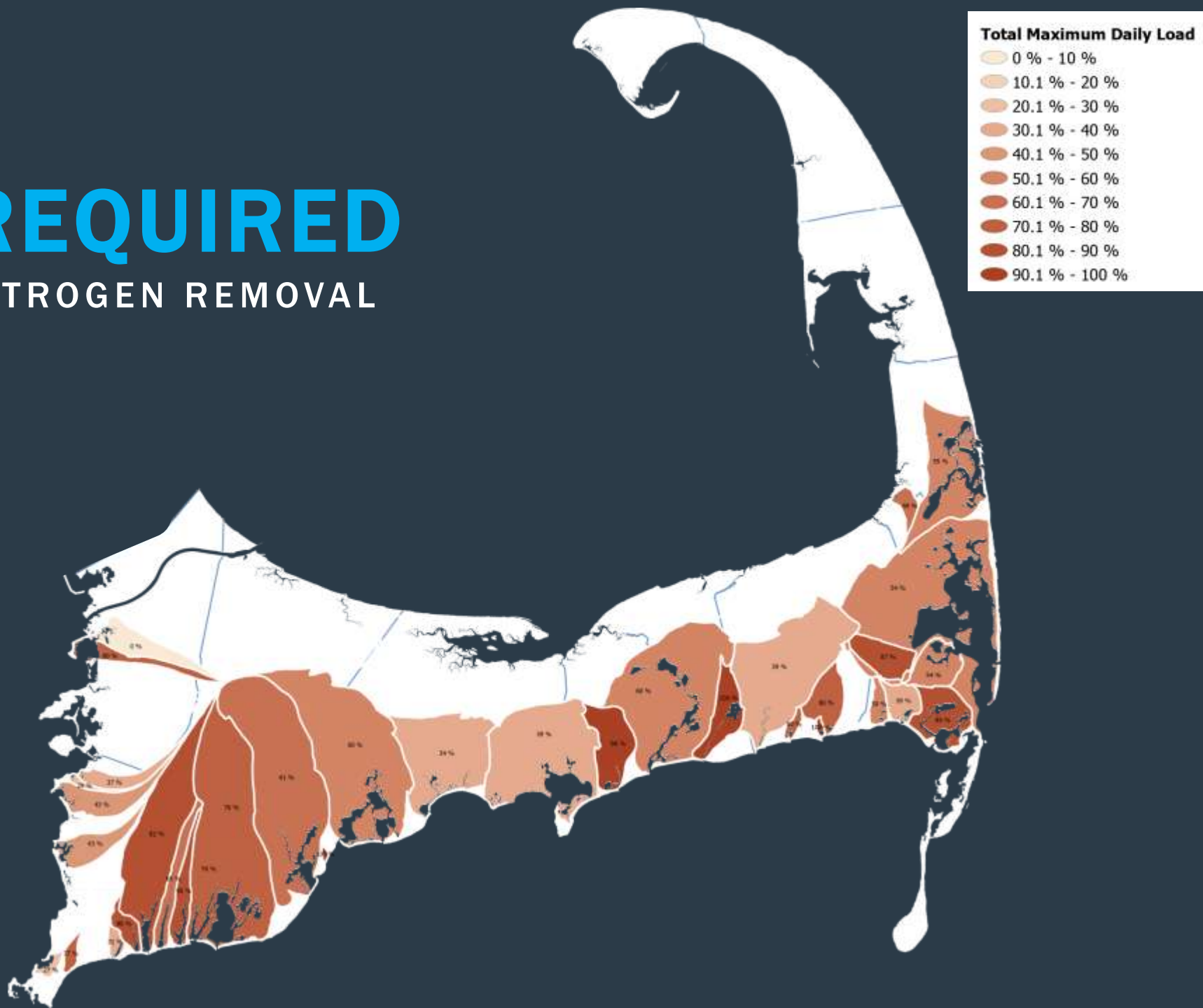
REGIONAL ISSUE

32 CROSSBOUNDARY WATERSHEDS



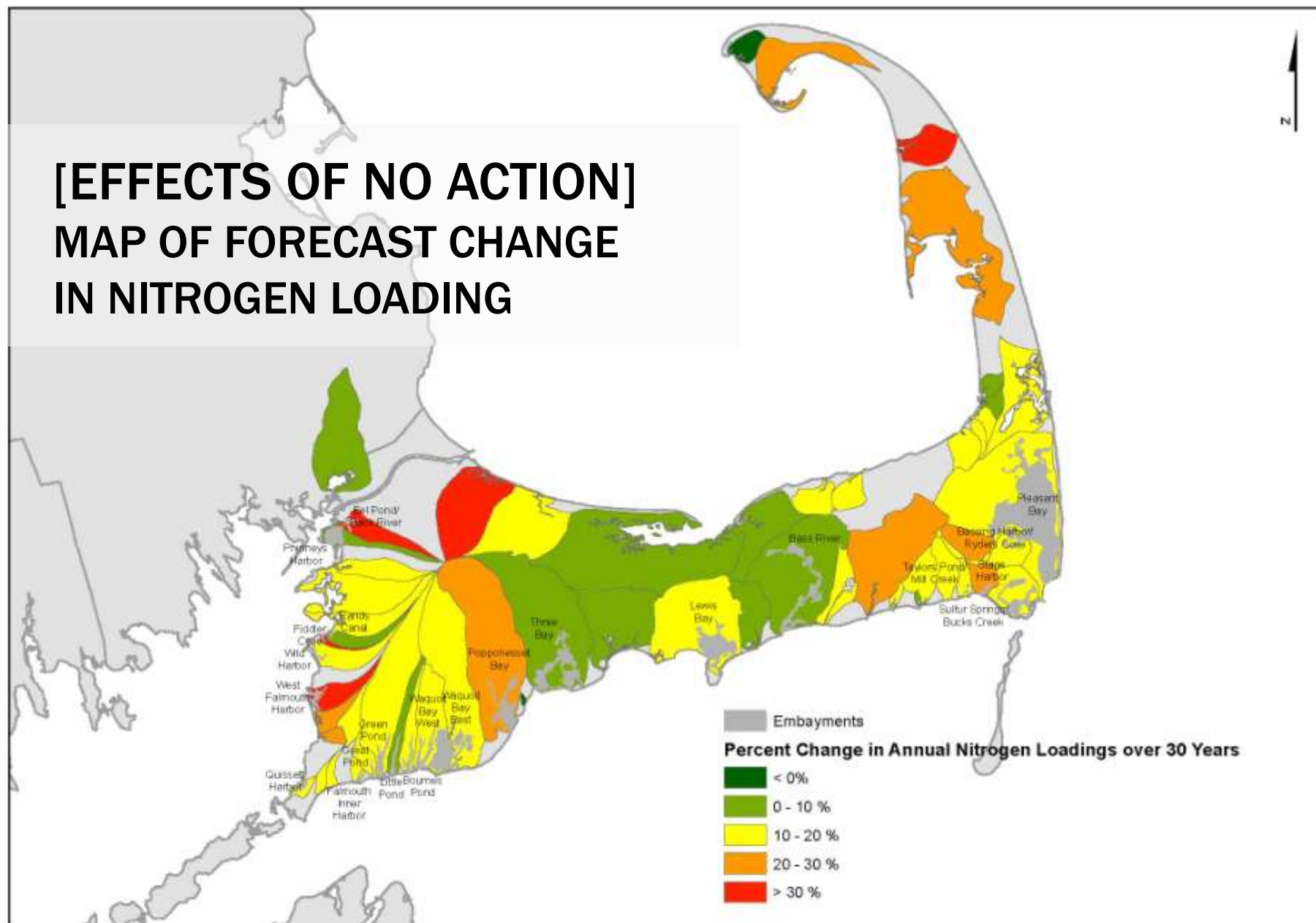
REQUIRED

NITROGEN REMOVAL



ACTION IS REQUIRED.

[EFFECTS OF NO ACTION] MAP OF FORECAST CHANGE IN NITROGEN LOADING



DOING NOTHING IS THE MOST EXPENSIVE OPTION



Total Value of Waterfront Residences

\$270 mill

Total Value of Near Waterfront Residences

\$650 mill

Total Value of Affected Properties

\$920 mill

- Waterfront Residences (350)
- Near Waterfront Residences (2,110)
- Neighboring Watersheds
- Embayments

208 PLAN UPDATE.

WHAT IS THE **208 PLAN?**

Clean Water
Act Section
208

The Cape Cod
Commission was
directed to update the
1978 Plan

The
Commonwealth
provided \$3
million to complete
the plan



WHAT IS THE 208 PLAN?

Focus on 21st
Century
Problems

Nitrogen:
Saline waters

Phosphorus:
Fresh Waters

Growth & Title
5 Limitations



Diverse technology and multiple solutions

1

High stakeholder engagement

2

Watershed-based

3

Adaptive technology development, pilot projects, and progress monitoring

4

208 PLAN APPROACH

208 PLAN APPROACH

5

Coordinate with MassDEP and US EPA

6

Maximize the benefits of the previous town plans

7

Support and expedite targeted watershed solutions under existing plans

**COLLABORATING IN
SHARED WATERSHEDS.**

STAKEHOLDER PROCESS



USING NEW TECHNOLOGIES.

TECHNOLOGIES MATRIX SUMMARY



208 Problem Solving Approach

■ Wastewater
 ■ Existing Water Bodies
 ■ Regulatory

Traditional Approach

Identify Current N Removal Needs (Targets/Reduction Goals)

Present Load: X kg/day — **Target:** Y kg/day = **Reduction Required:** N kg/day

Additional Removal Needs

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

Targeted Sewer Collection (Maximum Footprint)

- A. Centralized Systems
- B. Satellite Systems
- C. Cluster Systems

Low Barrier Technologies

- A. Fertilizer Management
- B. Stormwater Mitigation

Supplemental Sewer Collection (Minimized Footprint)

- Priority Areas May Include:
- A. Greater Than 1 Dwelling Unit/acre
 - B. Village Centers
 - C. Economic Centers
 - D. Growth Incentive Zones

Non-Traditional Approach

Identify Current N Removal Needs (Targets/Reduction Goals)

Present Load: X kg/day — **Target:** Y kg/day = **Reduction Required:** N kg/day

Additional Removal Needs

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

Low Barrier Technologies

- A. Fertilizer Management
- B. Stormwater Mitigation

Watershed Alternative Technologies

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

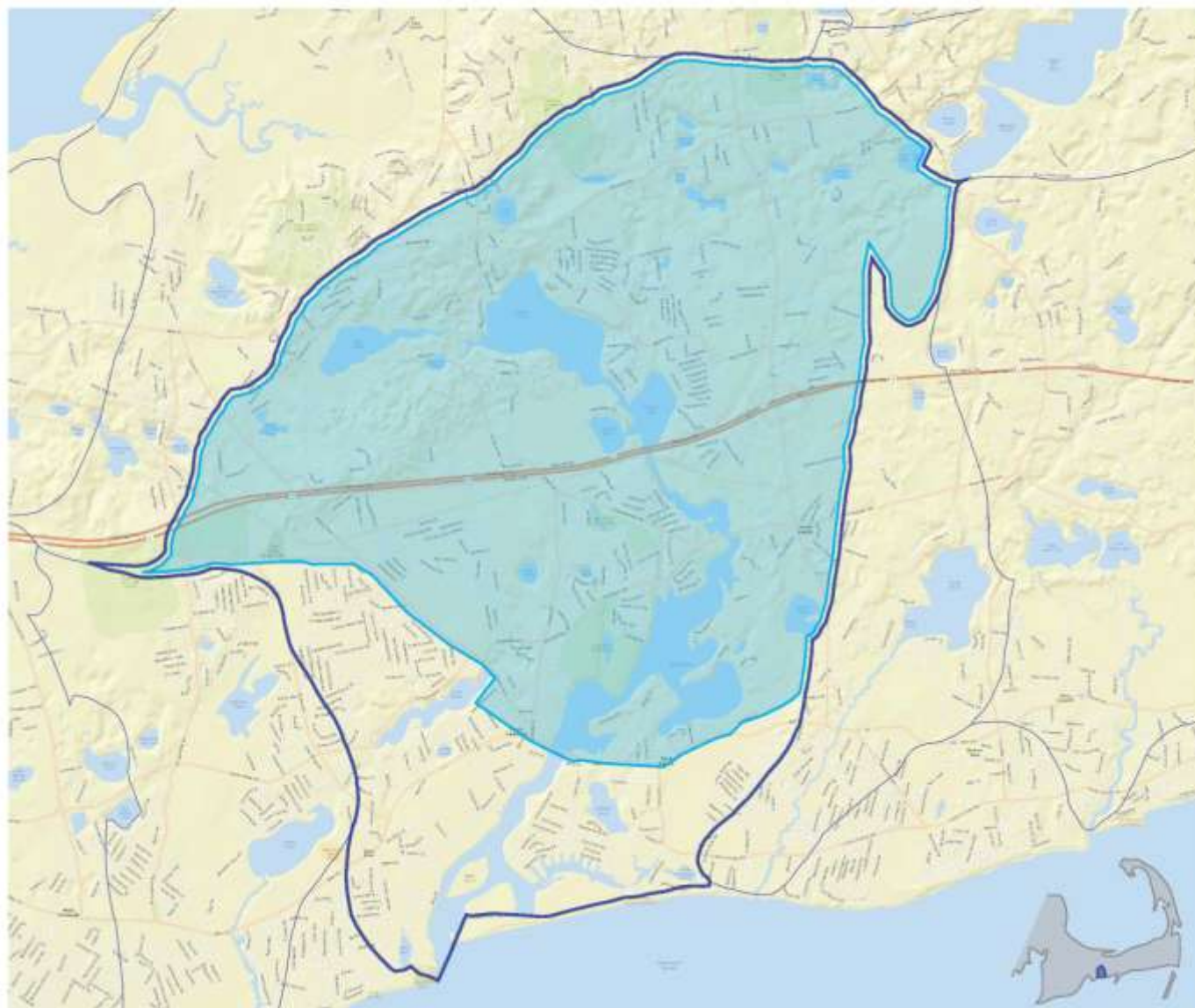
On-Site Alternative Technologies

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

Supplemental Sewer Collection (Smallest Footprint)

- Priority Areas May Include:
- A. Greater Than 1 Dwelling Unit/acre
 - B. Village Centers
 - C. Economic Centers
 - D. Growth Incentive Zones





1

Sample Cape Cod Subwatershed

TOWN OF YARMOUTH MASSACHUSETTS

MAP 1: TOTAL COLLECTION AREA NECESSARY TO MEET
Current Nitrogen Removal Needs

NITROGEN CALCULATOR

1 Current N Removal Needs (TMDL) **+37,400 KG/YR** | **+100%**

2 Additional N Removal Needs

Filled Tills & Systems

Anticipated Growth Areas

3 Low Barrier Technologies



Fertilizer Management



Stormwater BMPs

4 Watershed Alternative Technologies



Construct Wetlands - COW



Construct Wetlands - SW



Phytoturb



PRRB



Forested Wetlands



Shellfish Aquaculture



Inlet Relocating

5 On-Site Alternative Technologies



IA Tills & Systems



IA Solid Systems

6 Collection/Sewer **-37,400 KG/YR** | **-100%**

Remaining Nitrogen to Meet Goal **0 KG/YR** | **0%**

Indicator Bar

0%



CAPE COD
COMMISSION

3223 Main Street - Barnstable, MA 02530 (508) 362-3030 - www.capecodcommission.org	DATE 02.04.14	N
Draft Watershed Concept Maps	SHEET NUMBER SC-1	

TOWN OF YARMOUTH MASSACHUSETTS

MAP 3: TOTAL COLLECTION AREA NECESSARY TO MEET
Current Nitrogen Removal Needs
+ Additional Future Nitrogen Removal Needs
- Low Barrier Technologies

NITROGEN CALCULATOR

1	Current N Removal Needs (TMDL)	+37,400 KG/YR	+83.5%
2	Additional N Removal Needs	+2,600 KG/YR	+6.5%
	Failed Title 5 Systems	+600 KG/YR	+1.5%
	Anticipated Growth Areas	+2000 KG/YR	+5%
3	Low Barrier Technologies	-10,000 KG/YR	-26%
	Facility Upgrades	-4,000 KG/YR	-10.3%
	Stormwater BMPs	-6,000 KG/YR	-15.3%
4	Watershed Alternative Technologies		
	Coast Wetlands - COW		
	Coast Wetlands - SW		
	Phytoturb		
	Permeable Road Barrier		
	Forgotten Fields		
	Shed/Wall Allocations		
	Inlet Reducing		
5	On-Site Alternative Technologies		
	IA Title 5 Systems		
	AE Toilet Systems		
6	Collection/Sewer	-30,000 KG/YR	-75%

Remaining Nitrogen to Meet Goal 0 KG/YR 0%

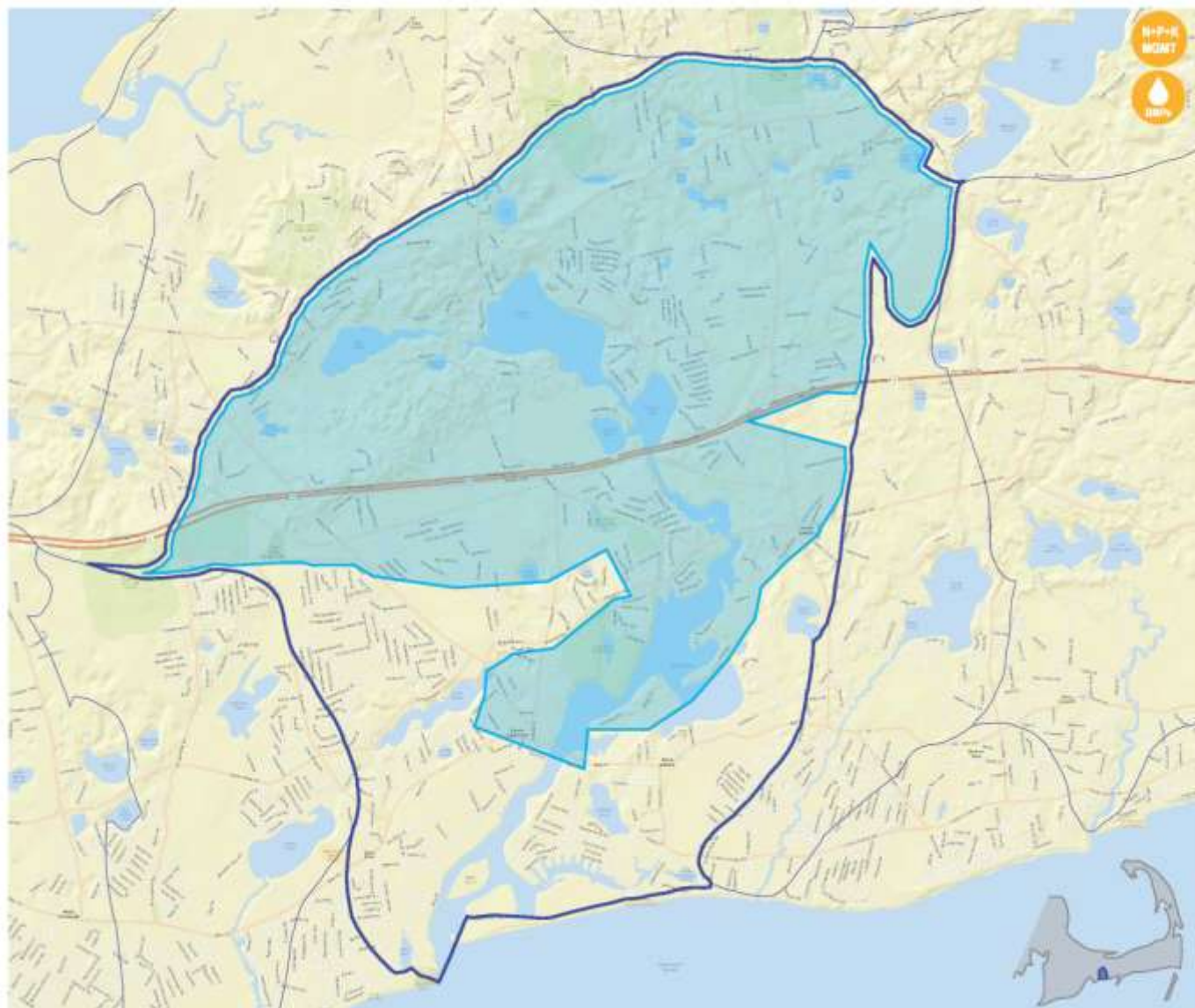
Indicator Bar

CAPE COD
COMMISSION

3223 Main Street - Barnstable, MA 02530
(508) 362-3030 - www.capecodcommission.org

DATE 02.04.14
SHEET NUMBER SC-3

Draft Watershed Concept Maps

SHEET NUMBER
SC-3

TOWN OF YARMOUTH MASSACHUSETTS

MAP 5: TOTAL COLLECTION AREA NECESSARY TO MEET
Current Nitrogen Removal Needs

+ Additional Future Nitrogen Removal Needs

- Low Barrier Technologies

- Watershed Alternative Technologies

- On-Site Alternative Technologies

NITROGEN CALCULATOR

1	Current N Removal Needs (TMDL)	+37,400 KG/YR	+83.5%
---	--------------------------------	---------------	--------

2	Additional N Removal Needs	+2,600 KG/YR	+6.5%
---	----------------------------	--------------	-------

	Failed Title 5 Systems	+400 KG/YR	+1.0%
--	------------------------	------------	-------

	Anticipated Growth Areas	+2000 KG/YR	+5%
--	--------------------------	-------------	-----

3	Low Barrier Technologies	-10,000 KG/YR	-26%
---	--------------------------	---------------	------

	Fertilizer Management	-1,000 KG/YR	-2.3%
--	-----------------------	--------------	-------

	Synthetic Nitrates	-3,000 KG/YR	-7.3%
--	--------------------	--------------	-------

4	Watershed Alternative Technologies	-22,100 KG/YR	-55.25%
---	------------------------------------	---------------	---------

	Cow Wallows - 20%	-3,100 KG/YR	-7.8%
--	-------------------	--------------	-------

	Cow Wallows - 10%	-4,000 KG/YR	-10%
--	-------------------	--------------	------

	Phytoremediation	-100 KG/YR	-0.25%
--	------------------	------------	--------

	Fertilizer Nitrates	-800 KG/YR	-2.1%
--	---------------------	------------	-------

	Shelfish Aquaculture	-10,000 KG/YR	-25%
--	----------------------	---------------	------

	Farm Road Barrier	-3,900 KG/YR	-9.75%
--	-------------------	--------------	--------

	Inlet Widening	-500 KG/YR	-1.25%
--	----------------	------------	--------

5	On-Site Alternative Technologies	-2,800 KG/YR	-7%
---	----------------------------------	--------------	-----

	IA Title 5 Systems	-0 KG/YR	-0%
--	--------------------	----------	-----

	AA Toilet Systems	-2,800 KG/YR	-7%
--	-------------------	--------------	-----

6	Collection/Sewer	+5,100 KG/YR	+12.75%
---	------------------	--------------	---------

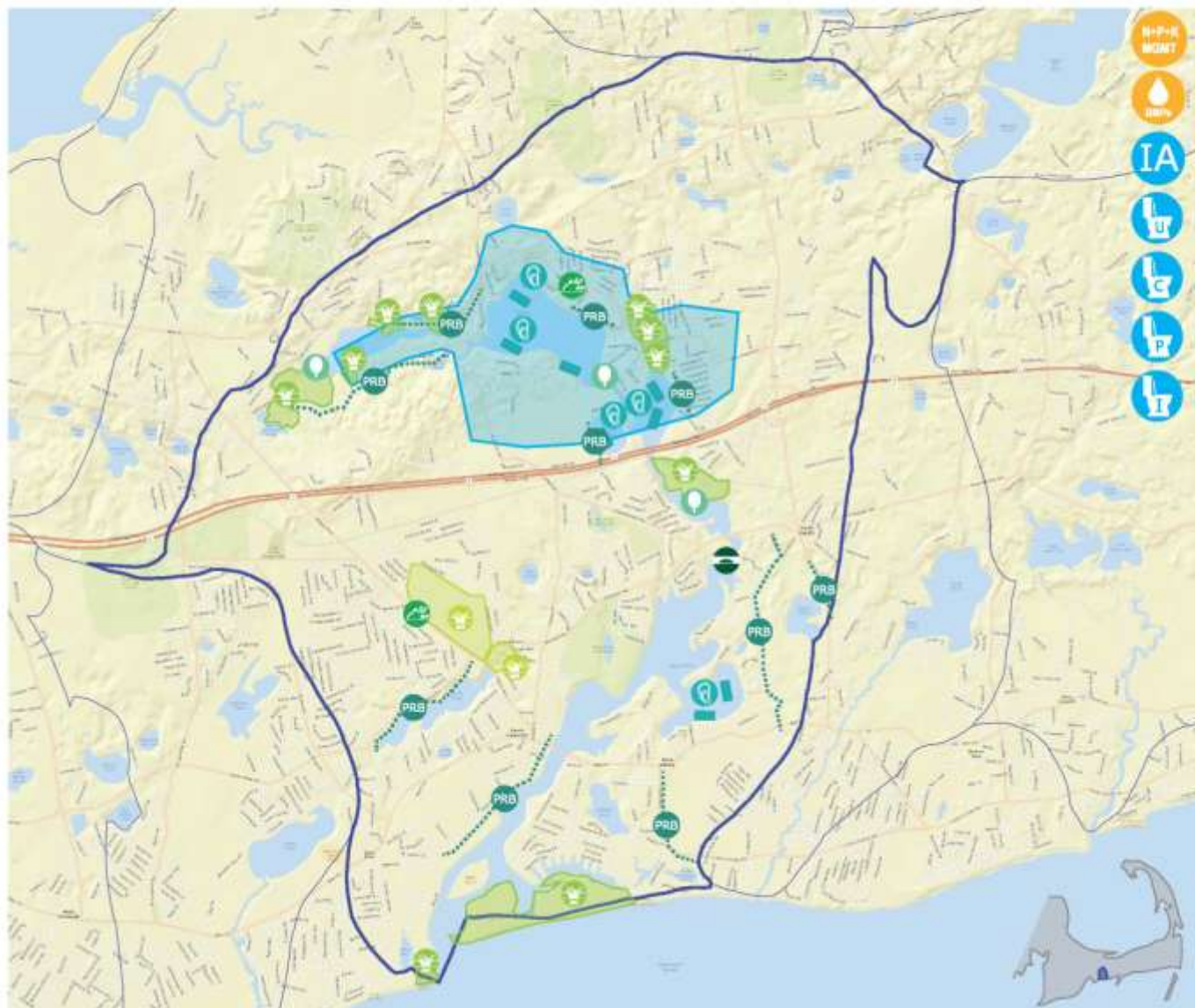
	Remaining Nitrogen to Meet Goal	0 KG/YR	0%
--	---------------------------------	---------	----

Indicator Bar



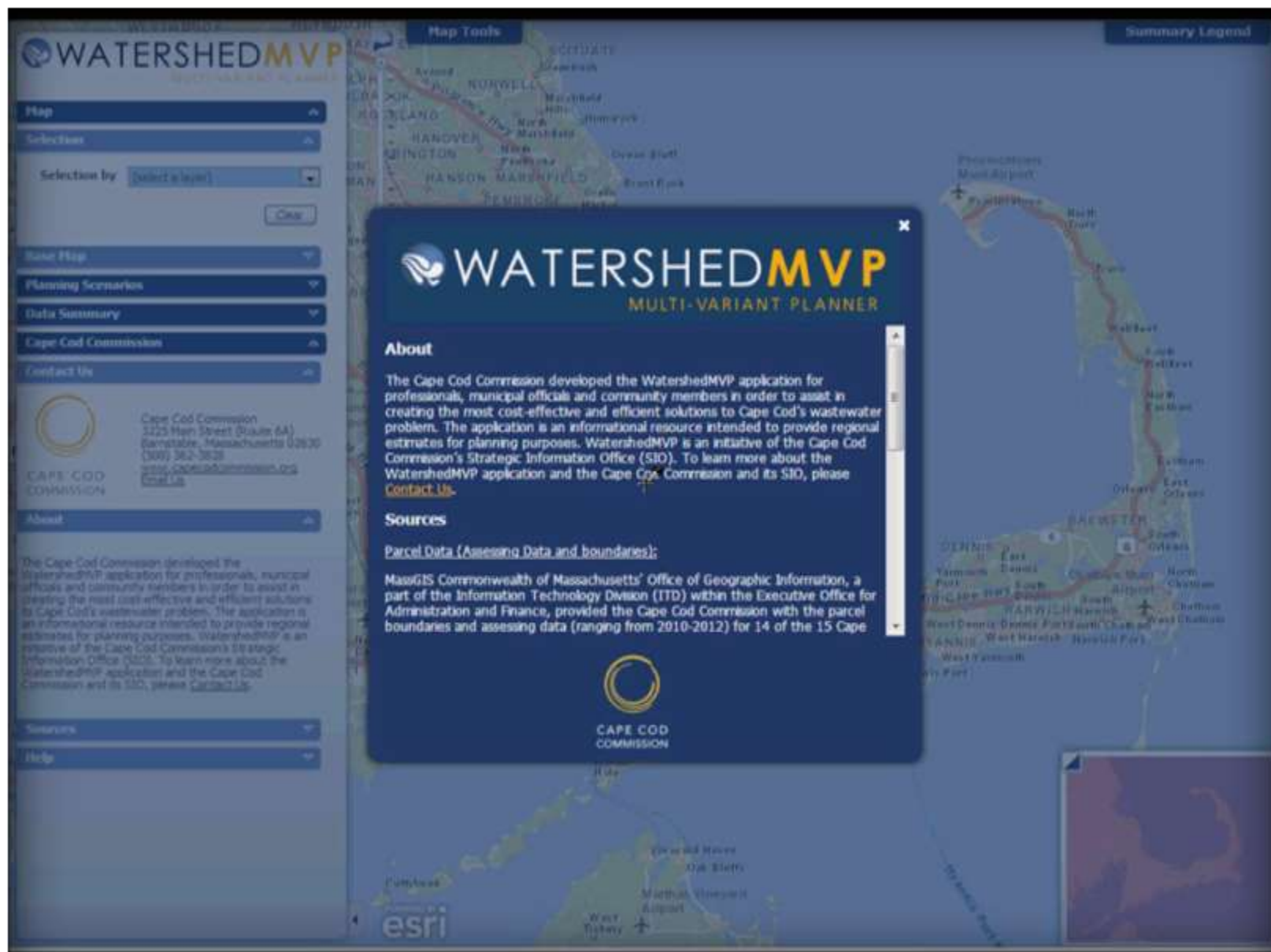
3225 Main Street - Barnstable, MA 02530	DATE	02.04.14
---	------	----------

(508) 362-3030 - www.capecodcommission.org	SHEET NUMBER	SC-5
--	--------------	------



WATERSHEDMVP

MULTI-VARIANT PLANNER



The screenshot displays the WatershedMVP application interface. On the left is a sidebar with navigation links: Map, Selection, Same Map, Planning Scenarios, Data Summary, Cape Cod Commission, Contact Us, About, Sources, and Help. The main area shows a map of Cape Cod with a pop-up window titled 'WATERSHEDMVP MULTI-VARIANT PLANNER'. The pop-up contains the following text:

About

The Cape Cod Commission developed the WatershedMVP application for professionals, municipal officials and community members in order to assist in creating the most cost-effective and efficient solutions to Cape Cod's wastewater problem. The application is an informational resource intended to provide regional estimates for planning purposes. WatershedMVP is an initiative of the Cape Cod Commission's Strategic Information Office (SIO). To learn more about the WatershedMVP application and the Cape Cod Commission and its SIO, please [Contact Us](#).

Sources

Parcel Data (Assessing Data and boundaries):

MassGIS Commonwealth of Massachusetts' Office of Geographic Information, a part of the Information Technology Division (ITD) within the Executive Office for Administration and Finance, provided the Cape Cod Commission with the parcel boundaries and assessing data (ranging from 2010-2012) for 14 of the 15 Cape

The background map shows Cape Cod with various towns labeled, including Bourne, Sandwich, Falmouth, and others. A sidebar on the left contains the 'WATERSHEDMVP' logo and navigation links. A 'Summary Legend' is visible in the top right corner. The ESRI logo is in the bottom left corner.

The 208 Plan Scenarios Viewer

This map has been developed as a reference to display potential traditional and non-traditional scenarios developed through the Section 208 Plan update process.

[More...](#)[Basemap](#)

The 208 Plan Scenarios Viewer

This map has been developed as a reference to display potential traditional and non-traditional scenarios developed through the Section 208 Plan update process.



West Barnstable

More...

Basemap

Map Contents

Layer Visibility

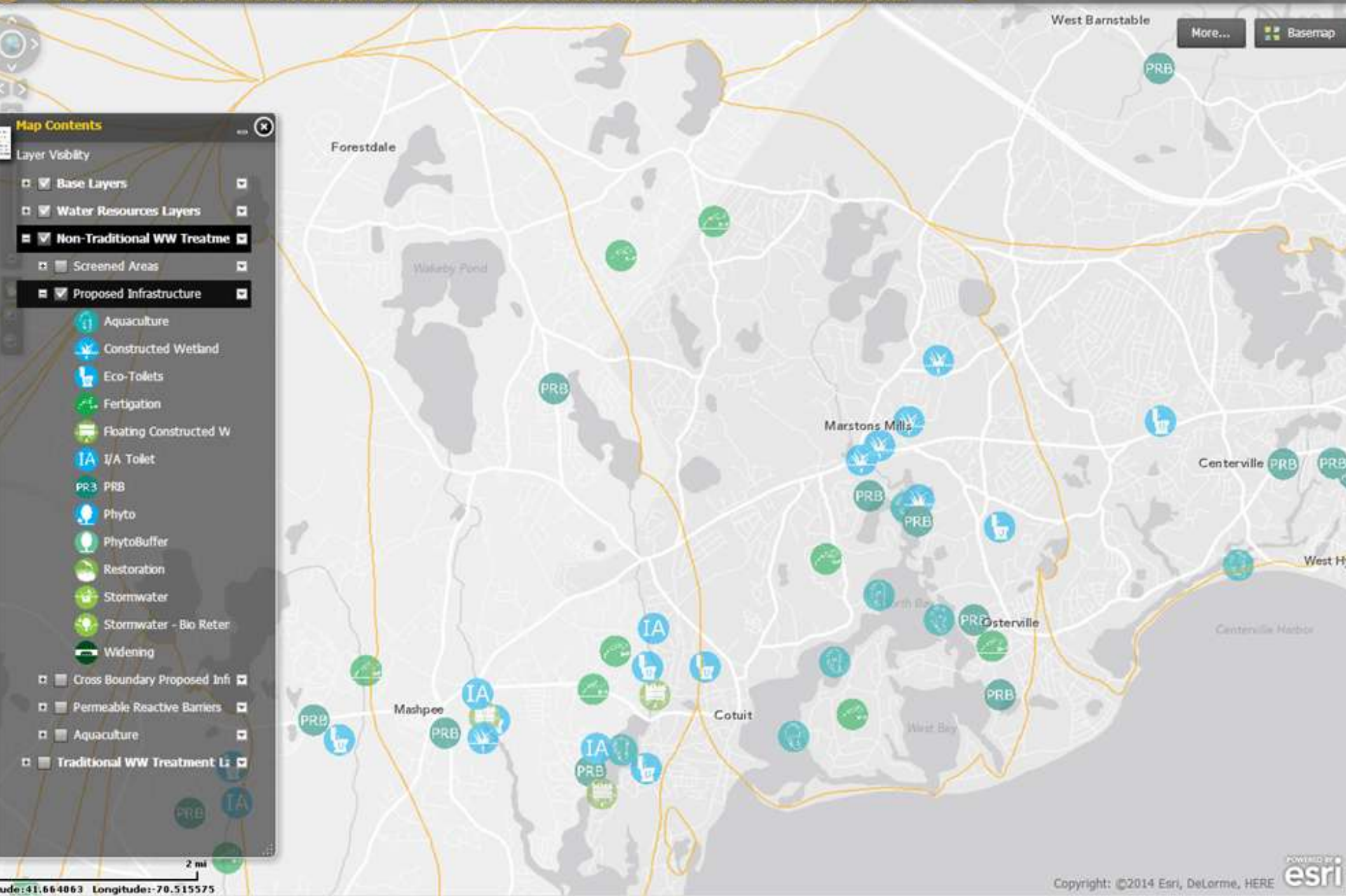
- ☒ Base Layers
- ☒ Water Resources Layers
- ☐ Non-Traditional WW Treatment
- ☒ Traditional WW Treatment L
- ☐ Upper Cape Scenarios
- ☐ Mid Cape Scenarios
- ☐ Lower Cape Scenarios
- ☐ Outer Cape Centralized 25%
- ☒ Scenarios
- ☒ Centralized
 - ☐ Centralized with Fertilizer/
 - ☐ Centralized 25% N Reduct
 - ☐ Centralized 50% N Reduct
- ☐ Non-Traditional Centralized R
- ☐ CWMP Phasing
- ☐ Existing Sewer Service Areas

2 mi

Latitude: 41.671244 Longitude: -70.514373

The 208 Plan Scenarios Viewer

This map has been developed as a reference to display potential traditional and non-traditional scenarios developed through the Section 208 Plan update process.



TRIPLE BOTTOM LINE

SCENARIO EVALUATION CRITERIA



SOCIAL

- System Resilience
- Allocation of Costs to Users
- Employment: Direct Investment
- Employment: Tourism
- Tax Revenues
- Property Values
- Growth Compatibility



ENVIRONMENTAL

- Habitat
- Climate
- Marine Water Quality
- Fresh Water Quality

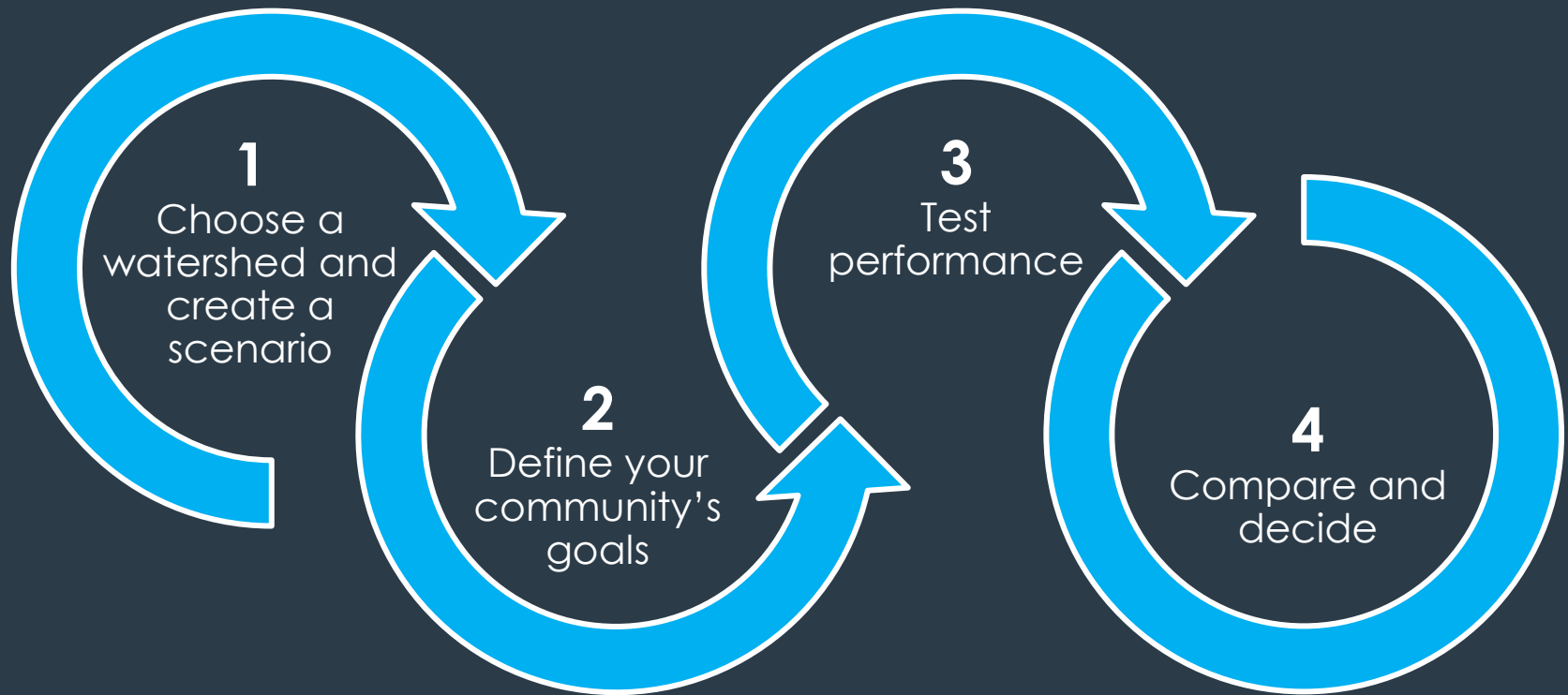


FINANCIAL

- Municipal Costs, Passed on to Ratepayers
- Costs, Incurred Directly by Property Owners

TRIPLE BOTTOM LINE

PROCESS





Triple Bottom Line (TBL) Assessment Model

Environmental + Social + Financial Sustainability



HOME

MODEL INPUTS

CRITERIA EVALUATION

SCENARIO BUILDER

COMPARE SCENARIOS

TBL DATABASE

Load Scenario

Scenario Results

Scenario Scoring Rules

AECOM

Scoring/Ranking

Criterion

SOCIAL	
System Resilience	S1
Employment	S2
Ratepayer Distribution	S3
Tourism	S4
Property Values	S5
Tax Revenue	S6
Land Use Compatibility	S7
ENVIRONMENTAL	
Marine Water Quality	E1
Fresh Water Quality	E2
Habitat	E3
Climate	E4
FINANCIAL	
Municipal Costs	F1
Direct Costs to System Users	F2

Strategy/Technology Distribution

Scenario 1

Minimum Cost



Scenario 2

Cost Effective



Scenario 3

Maximum Performance



* Financials are not final

COST & PERFORMANCE

Nitrogen Reduction %	46%
Time to Reduce (years)	35.1
Municipal O&M Cost (\$K)	\$325
Municipal Project Cost (\$K)	\$1,329
Property Owner O&M Cost (\$K)	\$98
Property Owner Project Cost (\$K)	\$397

COMMUNITY BENEFITS

Quality Habitat (acres)	0.5
New Open Space Added (acres)	1.5
GHG Reduced (MT CO2e/yr)	2.1
Avg. Increase in Property Value (\$/pty)	\$200
New Employment Added (jobs)	4
Additional Cost per Household (\$/HH/yr)	\$20

Nitrogen Reduction %	46%
Time to Reduce (years)	29.5
Municipal O&M Cost (\$K)	\$425
Municipal Project Cost (\$K)	\$1,600
Property Owner O&M Cost (\$K)	\$128
Property Owner Project Cost (\$K)	\$480

Nitrogen Reduction %	46%
Time to Reduce (years)	27.3
Municipal O&M Cost (\$K)	\$610
Municipal Project Cost (\$K)	\$1,800
Property Owner O&M Cost (\$K)	\$183
Property Owner Project Cost (\$K)	\$540

Quality Habitat (acres)	2.4
New Open Space Added (acres)	5.0
GHG Reduced (MT CO2e/yr)	3.3
Avg. Increase in Property Value (\$/pty)	\$2,000
New Employment Added (jobs)	7
Additional Cost per Household (\$/HH/yr)	\$37

FINANCE/AFFORDABILITY MODEL

AFFORDABILITY MODULE

REVENUE MODULE

FINANCE MODULE

AFFORDABILITY MODULE

PURPOSE:

- Establish existing wastewater liability by watershed and by town and the resulting household burden to achieve TMDLs

This module can...

- Identify traditional EPA affordability criteria
- Establish town financial capability to finance wastewater costs
- Identify wastewater payments by other communities as a benchmark

REVENUE MODULE

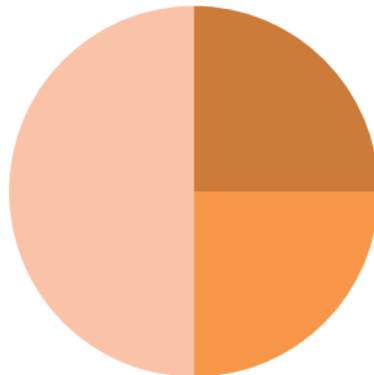
PURPOSE:

- Provide macro level revenue sources to finance Cape wide wastewater solutions.

This module can...

- Provide revenue sources to finance watershed, a combination of watersheds, and town wastewater solutions.

The initial macro-level revenue plan consists of:



■ Federal Construction Grant Funding

■ State Financing (Multiple Revenue Sources)

■ Local Financing, with 0-2% SRF Financing

FINANCE MODULE

PURPOSE:

- Identify costs to a town, watershed, or region by engineer solution.

This module can...

- Compile a financial plan that can be adapted to meet EPA affordability criteria
- Account for existing and new costs:
 - Wastewater
 - Capital Replacement

2ND ANNUAL
CAPE COASTAL
CONFERENCE

JUNE 5



Linking Science with Local Solutions and Decision-Making

THE CAPE COD APPROACH

SOLVING OUR BIGGEST ENVIRONMENTAL PROBLEM

PAUL NIEDZWIECKI, EXECUTIVE DIRECTOR
CAPE COD COMMISSION

