Truro Comprehensive Watershed Management Plan

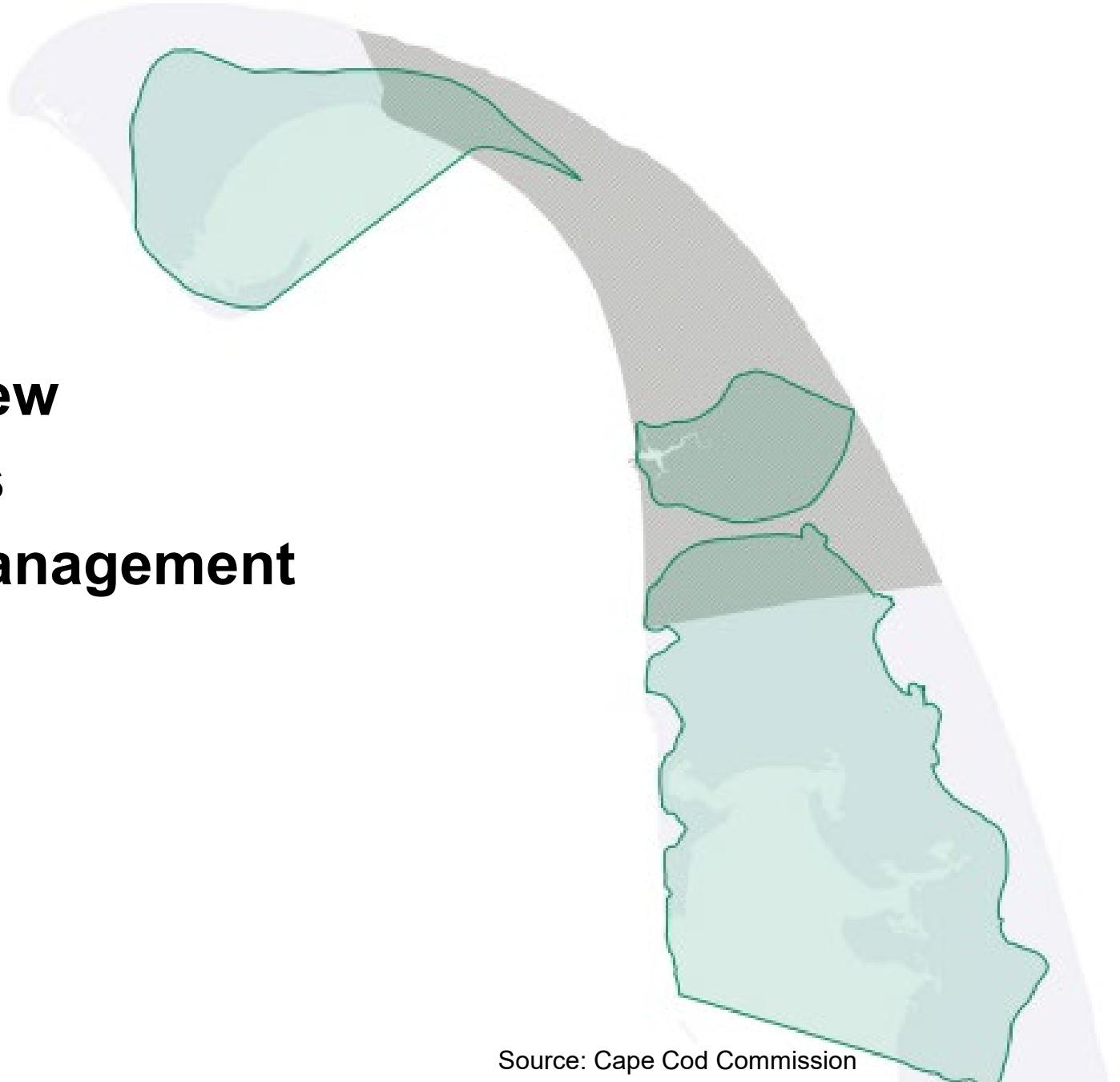
Board of Health Meeting

November 18th, 2025

Welcome

Agenda

- Background
- Draft CWMP Report Overview
- Nitrogen Reduction Targets
- Recommended Nitrogen Management Strategies
- Next steps



Source: Cape Cod Commission

Background

→ Previous Presentations Refresher

Refresher

September 25th, 2025: Joint Board of Health & Select Board Presentation

- Project background & rationale
- Environmental & public health needs
- Nitrogen management strategies

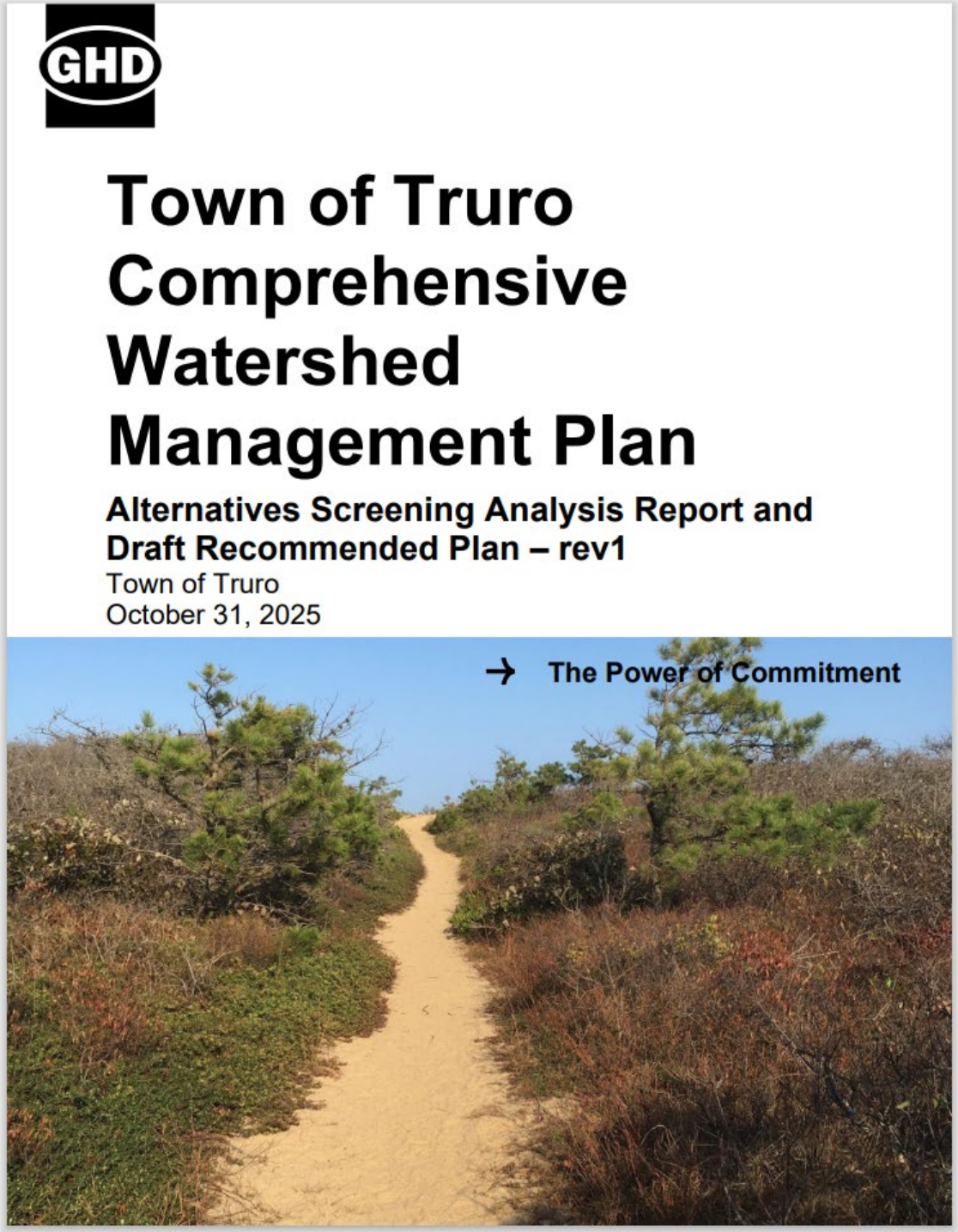
October 14th, 2025: Board of Health Presentation

- Nitrogen reduction targets
- Nitrogen management alternatives

October 31st, 2025: Draft CWMP: Alternative Screening Analysis Report & Draft Recommended Plan Published

Comprehensive Watershed Management Plan

→ Alternatives Screening Analysis Report and Draft Recommended Plan



The planning process to date has consisted of 3 parts:

- The Needs Assessment Report*
- The Alternatives Screening Analysis
- The Draft Recommended Plan

Link to Report:
[Wastewater & Watershed Management | Truro, MA]

*The NAR is included as an appendix to the CWMP Report

Nitrogen Reduction Targets

→

Truro's Future Nitrogen Reduction Goals

Watershed	Nitrogen Reduction Target Based on	Truro's Estimated Required Nitrogen Load Reduction (Future) (kg-N/yr)
Wellfleet Harbor: Herring River / The Gut	Nitrogen Total Maximum Daily Load (TMDL)	90
Provincetown Harbor: East Harbor	Cape Cod Commission (CCC) 208 Plan 25% Nitrogen Reduction Planning Target	317
Pamet River	Cape Cod Commission (CCC) 208 Plan 25% Nitrogen Reduction Planning Target	1,141

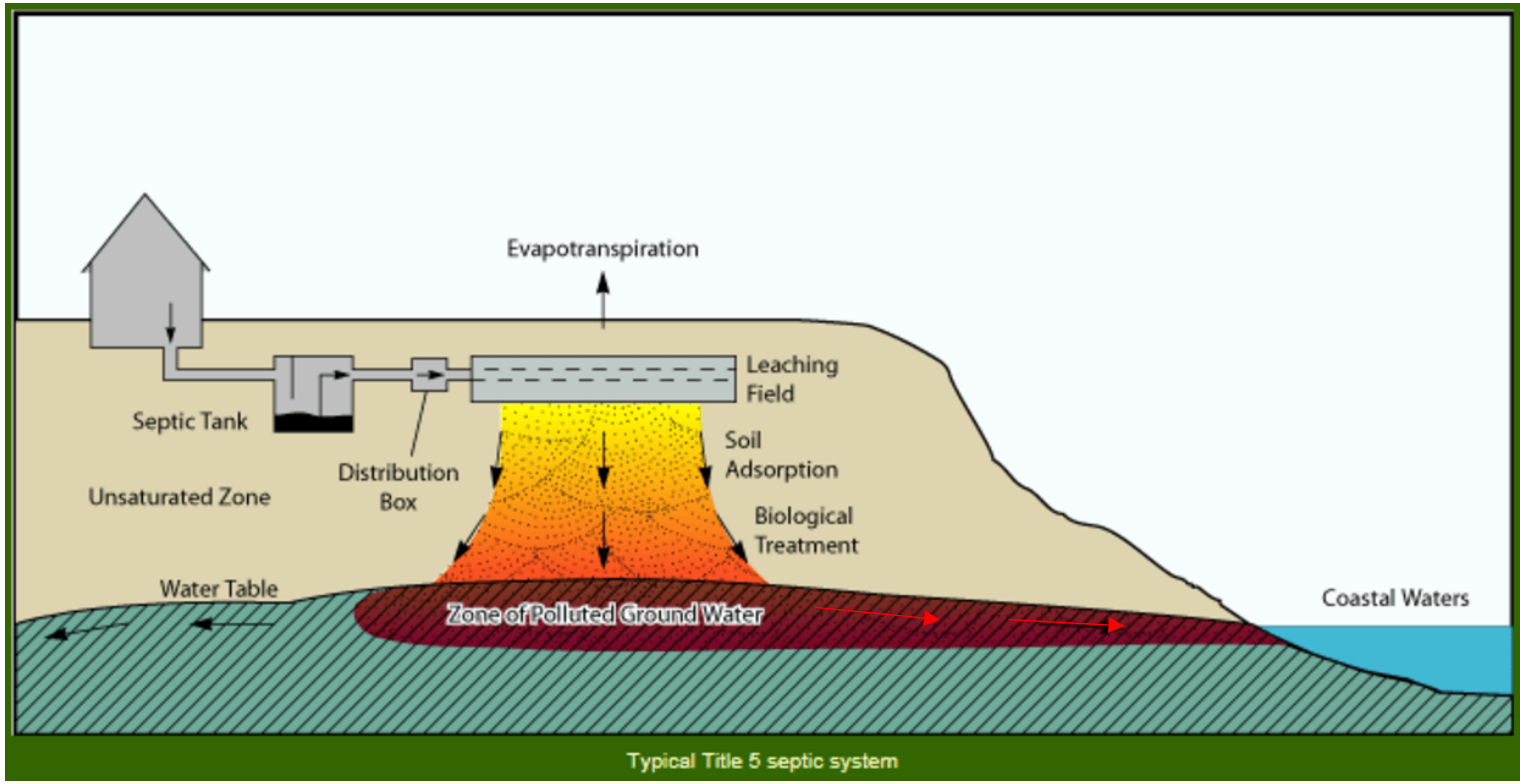
Note: The estimated average nitrogen effluent load of a single-family home is 4.7 kg/yr.

Alternatives

Conventional Nitrogen Management Strategies

Conventional strategies: MassDEP approved standard approaches, governed by Title 5 and watershed permitting.

- Wastewater nitrogen
  - MassDEP general use nitrogen reducing on-site septic systems (typical TN effluent concentration of 19 mg/L)
    - Note: The MEP estimates that a Title 5 septic system has a typical TN effluent concentration of 26.25 mg/L
  - Centralized collection and treatment
  - Cluster systems (decentralized system serving multiple properties)

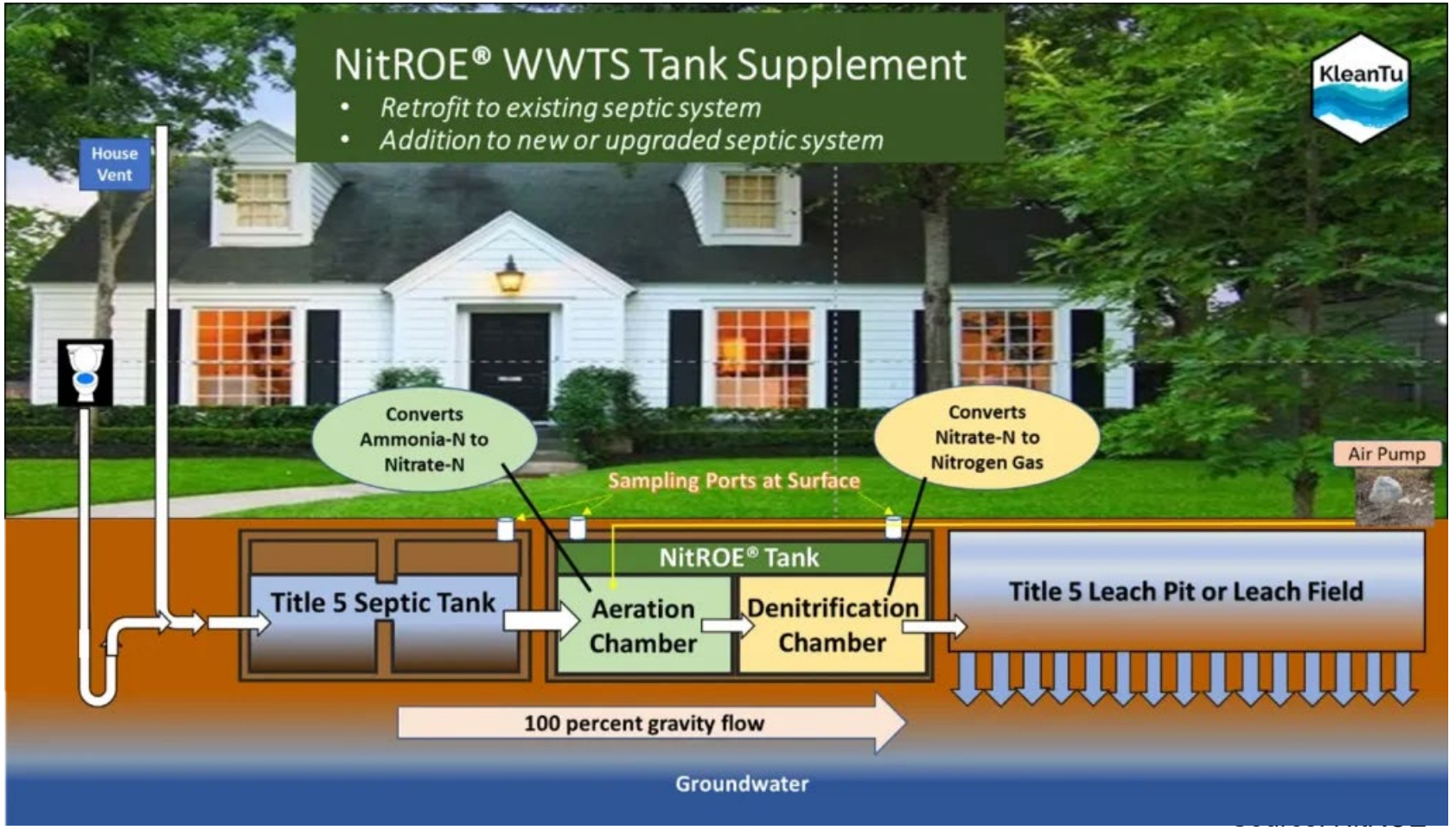


Source: capecodwaters.org

Alternative Nitrogen Management Strategies

Alternative strategies: Strategies that are not considered conventional by MassDEP but can effectively be used for nitrogen management, including decentralized and nature-based approaches to improving nitrogen removal

- Strategies for managing wastewater nitrogen include:
  - Provisional use nitrogen reducing on-site septic systems (systems achieve TN effluent concentration of 11 mg/L or less)



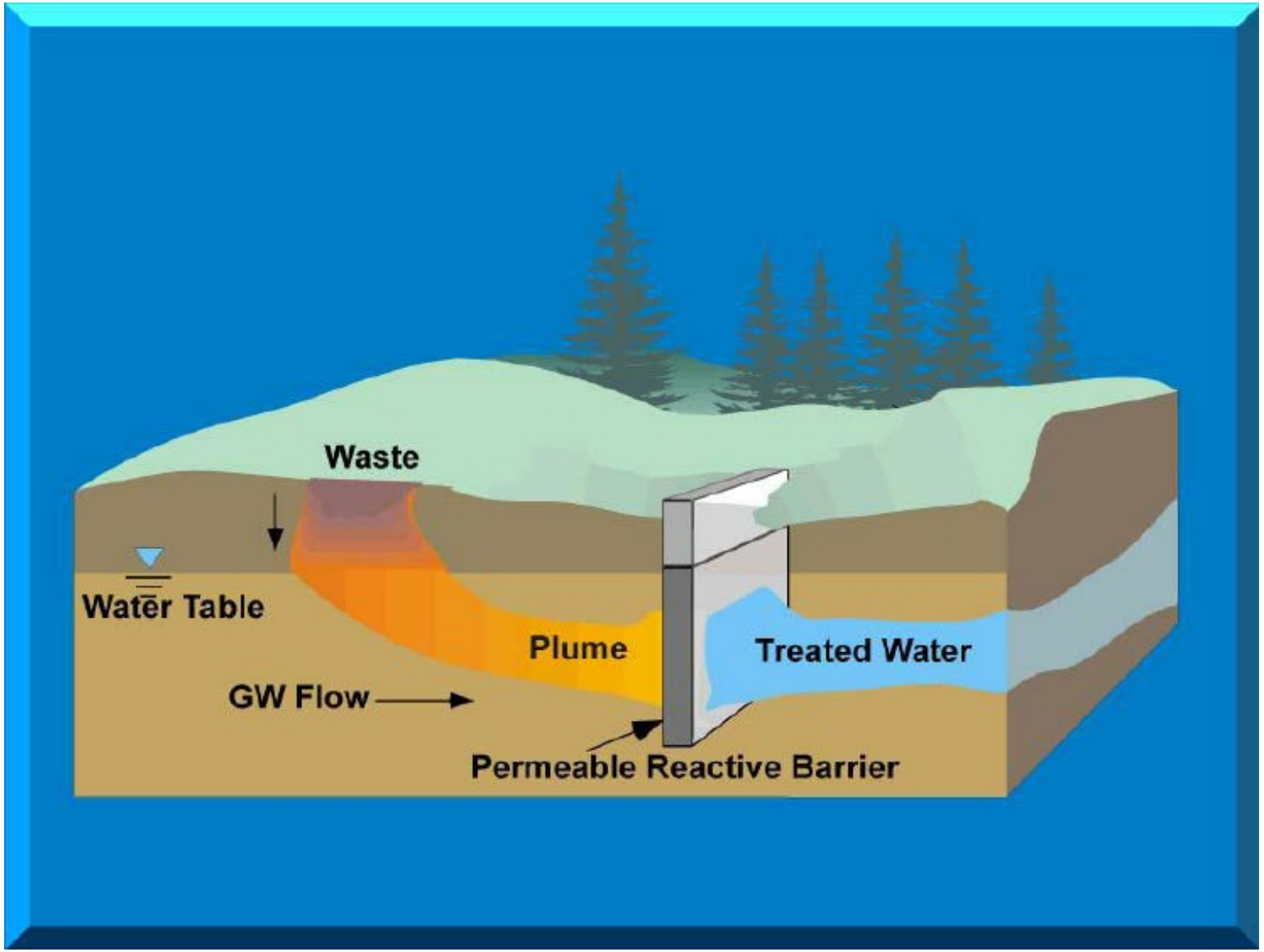
Watershed permit regulations require that a contingency plan consisting of conventional strategies is included, if alternative control approaches are proposed.

Alternative Nitrogen Management Strategies

Strategies for managing nitrogen from other controllable sources include:

- Fertilizer bylaws
- Stormwater BMPs
- Permeable reactive barriers

Watershed permit regulations require that a contingency plan consisting of conventional strategies is included, if alternative control approaches are proposed.

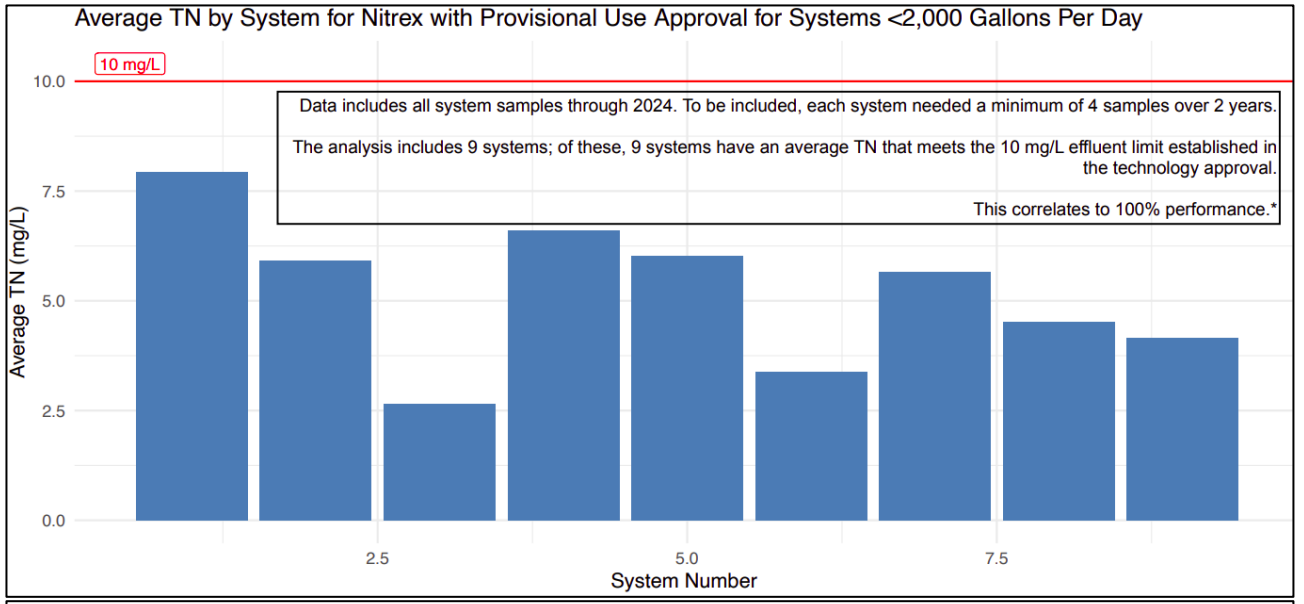


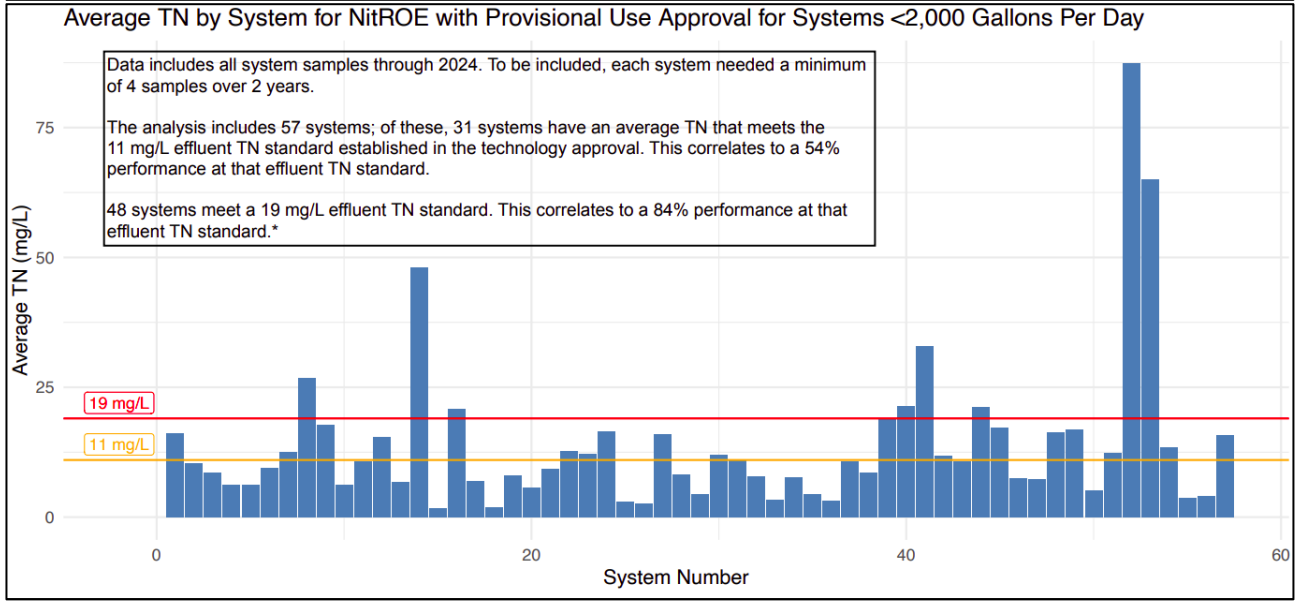
Source: Source: EPA

Provisional Use Nitrogen-Reducing Onsite Systems

Provisional Use → General Use Approval Process

- Provisional use approval is typically granted after a technology has been piloted successfully or proved satisfactory past performance over at least two years in one or more states outside Massachusetts.
- A minimum of 50 systems must be installed and evaluated for at least 3 years before a technology can apply for general use approval





Recommended Nitrogen Management Strategies

→

Town-Wide: Fertilizer Bylaws

DESCRIPTION

This approach relies on managing fertilizer application rates to lawns, golf courses, athletic facilities and cranberry bogs. Residential lawn loading rates could be reduced on existing developed parcels through an intensive public education/ outreach program. This could include a "Cape Cod Lawn" branding program, replacing some turf areas with native vegetation, establishing naturally-vegetated buffer strips on waterfront lots, and reducing application rates. Fertilizer loading rates for new development could be accomplished by reducing lot sizes (cluster development), by restricting lawn sizes and/or by incorporating more naturally-vegetated open space areas. Municipalities could directly reduce fertilizer applications on athletic fields and other properties. Golf courses can significantly reduce nitrogen loading rates by using slow-release fertilizers and reducing application rates in rough areas.Cranberry bog fertilizer exports from the bogs can be reduced using tail water recovery systems. Site-specific assessments are needed to estimate load reductions.

SITING NEEDS

- Fertilizer management does not have specific site requirements.

ECO-BENEFITS

- Enhances Habitat / Wildlife / Biodiversity

PERFORMANCE CHALLENGES

- Resulting nutrient removal rates are highly dependent on homeowner / landowner behavior and participation in the program
- Site-specific assessments are needed to estimate load reductions

CLIMATE RESILIENCE: RISKS

- Fertilizer management does not result in significant climate resiliency risks.

CLIMATE RESILIENCE: SOLUTIONS

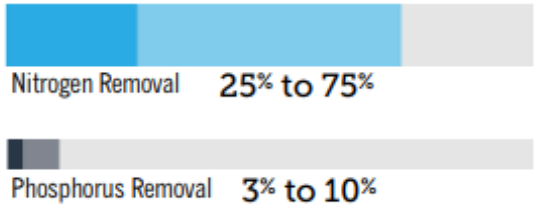
- Climate resiliency solutions are not needed for Fertilizer Management.

Permitting

POTENTIAL PERMITTING AUTHORITIES

- Municipal Board of Health
- Massachusetts Department of Agricultural Resources

Technology Performance



$24	$141
Removal Cost per kg N (avg life cycle)	Removal Cost per kg P (avg life cycle)
20 years	1 to 10 years
Useful Life	Time to See Results

Source: CCC 208 Plan

Town-Wide: Stormwater Best Management Practices

REMEDIATION

DESCRIPTION

Non-Structural Stormwater strategies. These strategies include street sweeping, maintenance of stormwater utilities, education and public outreach programs, land use planning, and IC reduction and control.

SITING NEEDS

- Varies

ECO-BENEFITS

- Enhances Habitat / Wildlife / Biodiversity
- Promotes Green Space / Conservation / Recreation
- Improves Management of Flooding / Extreme Events

PERFORMANCE CHALLENGES

- Requires the creation and enforce of stormwater regulations and policies

CLIMATE RESILIENCE: RISKS

- Reduced effectiveness of biological processes as a result of more frequent inundation or exposure to saline water (surface or ground water

CLIMATE RESILIENCE: SOLUTIONS

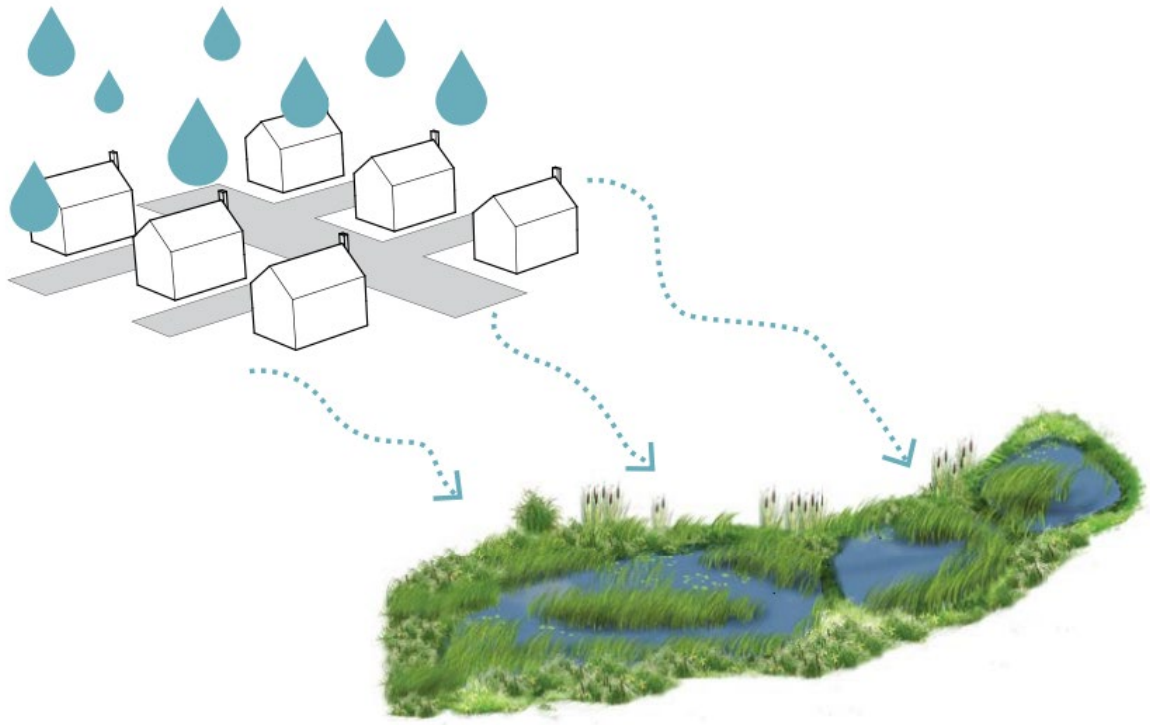
- Ensure frequent maintenance inspections to monitor condition and performance of technology (e.g. achieving nutrient removal targets, health of vegetation)
- Project design and species selection to ensure adequate performance in increasingly saline environments

Permitting

POTENTIAL PERMITTING AUTHORITIES

- Municipal Conservation Commission
- Massachusetts Department of Environmental Protection

Source: CCC 208 Plan



Constructed Wetland - Source: CCC 208 Plan

Pamet River: Permeable Reactive Barrier

REMEDIATION

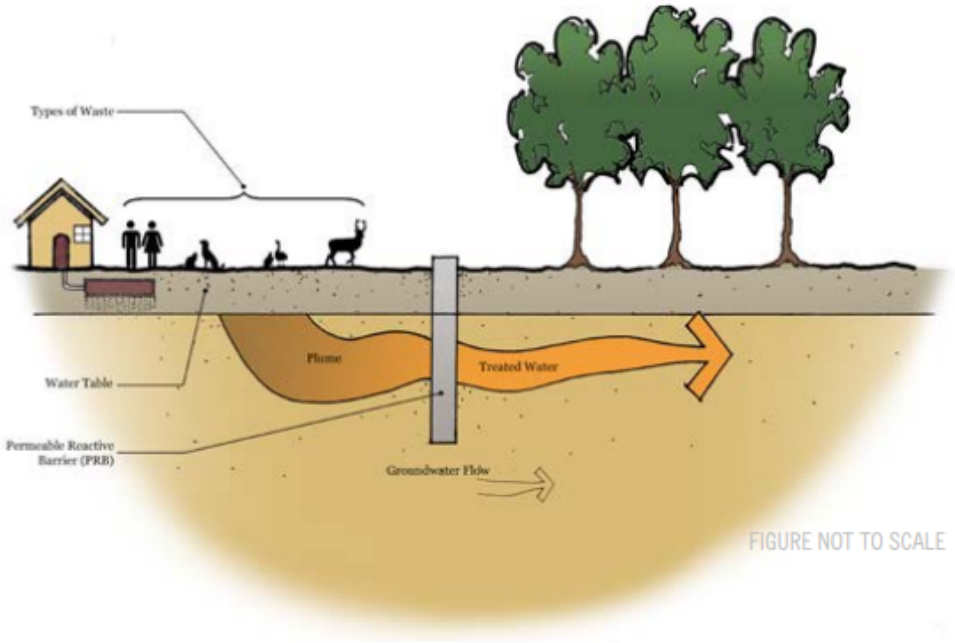


Figure 4-15

Permeable Reactive Barriers (PRBs) Trench Method

PRB

SCALE: SITE/NEIGHBORHOOD
APPROACH: REMEDIATION

SCENARIO PLANNING: SELECTED FOR USE
IDENTIFIED FOR PILOTING

DESCRIPTION

A permeable reactive barrier (PRB) is an in-situ (installed within the aquifer) treatment zone designed to intercept nitrogen enriched groundwater. Through use of a carbon source (the PRB medium), microbes in the groundwater uptake the nitrogen, denitrifying the groundwater. The trench method PRB uses large trenching equipment to install a mixture of coarse sand, wood chips, compost and/or other materials (medium) in the trench created by the trencher. The vertical wall can be installed to a depth of 40 feet with a width of 1.5 to 3 feet; PRBs can also be installed in large diameter columns. As groundwater flows through the wall, the medium provides a carbon source for microbes living in the groundwater. The microbes consume the carbon source as well as oxygen, developing an anaerobic environment which releases nitrogen gas to the atmosphere, reducing the groundwater nitrogen load before reaching the estuary.

Technology Performance

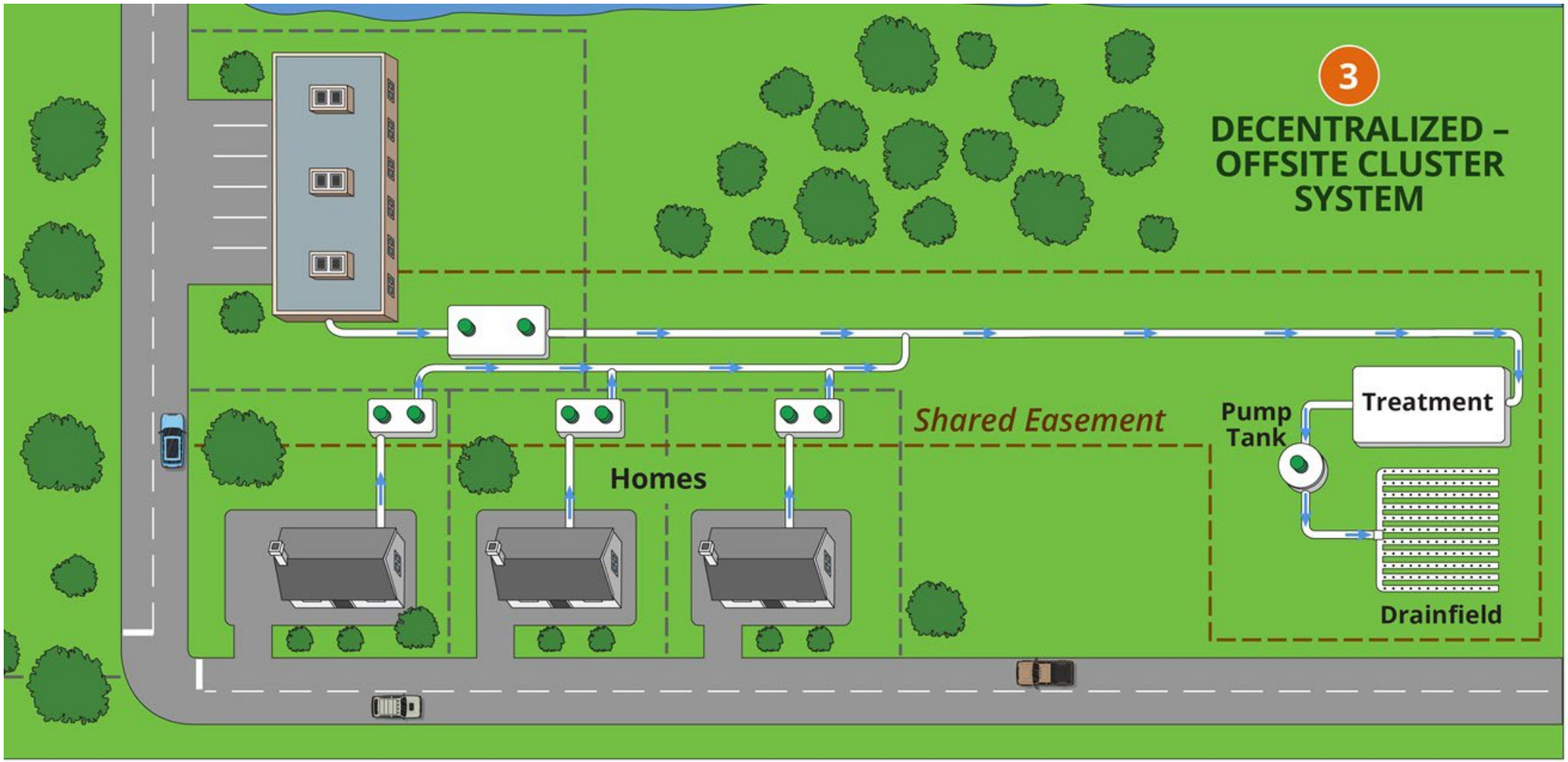
Nitrogen Removal 75% to 95%

Phosphorus Removal 50% to 95%

$158	$743
Removal Cost per kg N (avg life cycle)	Removal Cost per kg P (avg life cycle)
20 years	1 to 10 years
Useful Life	Time to See Results

Source: CCC 208 Plan

Pamet River: Cluster System



Source: US EPA

Pamet River & Wellfleet Harbor: Best Available Nitrogen Reducing Septic Systems

Approved for General Use	Approved for Provisional Use
STAAR by SeptiTech/BioMicrobics (MicroFAST): TN Approval Limit = 19 mg/L	Nitrex Filter: TN Approval Limit = 10 mg/L
Advantex Treatment System: TN Approval Limit = 19 mg/L	NitROE: TN Approval Limit = 11 mg/L

Recommended Evaluations

Town Wide: Implementation Methodology

Develop methodology to implement nitrogen-reducing on-site septic system program

- Board of Health triggers
  - Existing (for general use systems)
    - Flows greater than 600 gpd
    - Certain non-conforming systems
    - Systems that exceed a nitrogen loading rate of 110 gpd / 10,000 SF of lot area
  - Potential triggers:
    - Property sale / transfer
    - Failed septic systems
    - New construction
    - Redevelopment or flow-increasing expansions (additional dwelling units)
- Phased approach
  - Phasing can be based on:
    - Watershed
    - Proximity to surface waters
    - Wellhead protection zones

Town Wide: Structural Stormwater BMPs

Identify locations for potential structural stormwater improvements

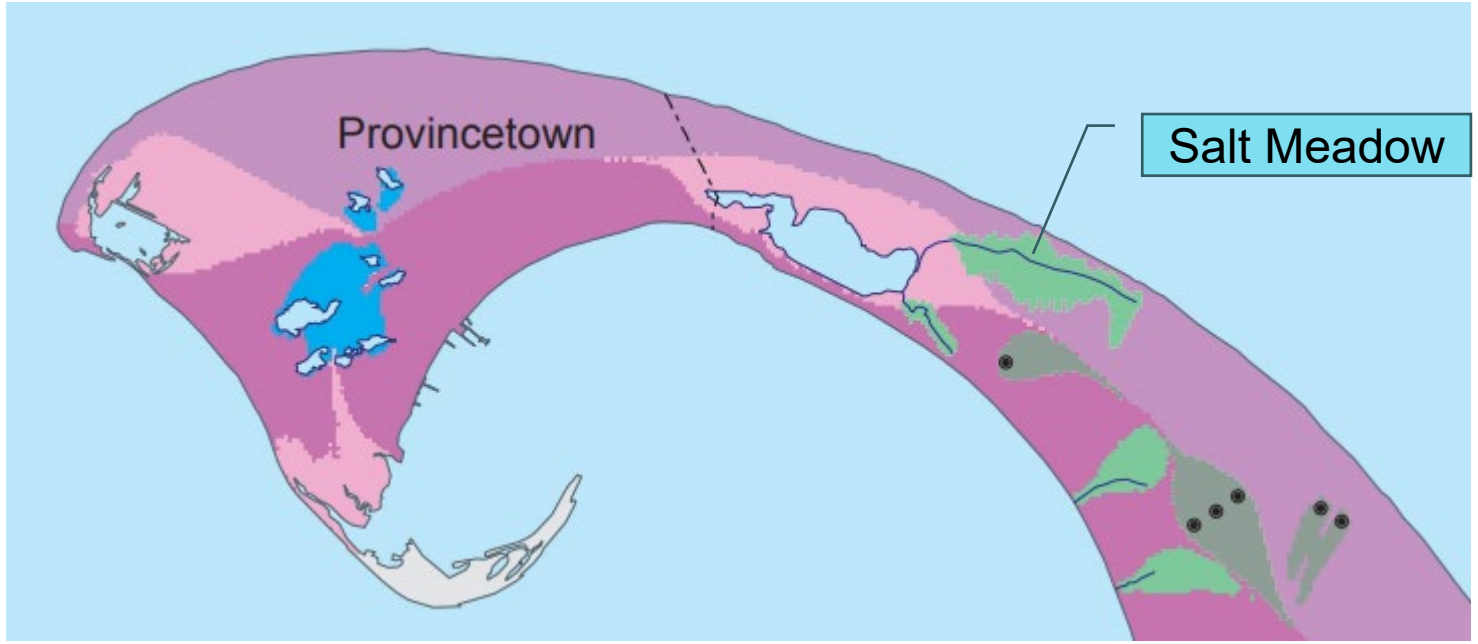
- Site selection considerations
  - Town-owned parcels with vacant land area
  - Site topography
  - MassDOT roads (Route 6)
- Potential technologies
  - Leaching galleys
  - Rain gardens
  - Bioretention systems
  - Constructed wetlands

Source: Cape Cod Green Infrastructure Guide

Provincetown Harbor: East Harbor

Further analysis required prior to development of Recommended Nitrogen Management Plan

- Continue discussions with Provincetown regarding potential connection to Provincetown Wastewater Treatment Facility
- Vulnerability assessment of Beach Point
- Culvert sizing evaluation of East Harbor culvert
- Delineation of Salt Meadow (northern tributary to East Harbor)



Source: USGS

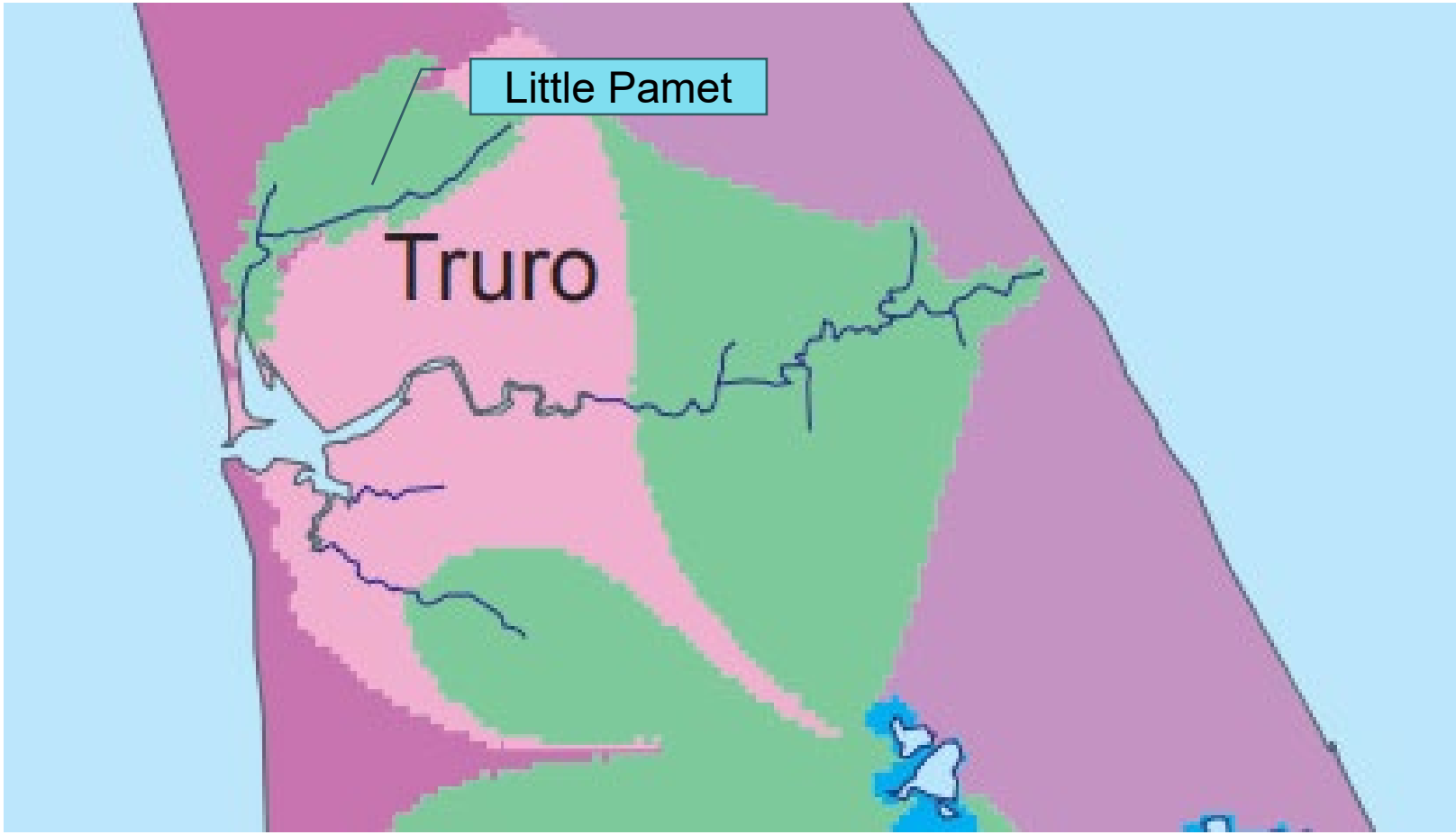
Pamet River

Permeable Reactive Barrier

- Site screening analysis at the identified potential candidate sites
- Initiate groundwater characterization at the identified site(s)
- Initiate PRB piloting

Little Pamet delineation

- Ongoing Little Pamet restoration project



Source: USGS

Implementation Schedule

Phase	Years		Activity
-	-	Up to 2027	• Develop methodology to implement nitrogen-reducing onsite septic system program
1	1 to 5	2027 – 2031	• Obtain watershed permit for Wellfleet Harbor (by 2030) • Enact Fertilizer Reduction Bylaw • Implement non-structural stormwater best management practices • Initiate installation of nitrogen-reducing onsite septic systems
2	6 to 10	2032 – 2036	• Install permeable reactive barrier in Pamet River watershed • Install Pamet River East cluster system • Install nitrogen-reducing onsite septic systems
3	11 to 15	2036 – 2041	• Install nitrogen-reducing onsite septic systems
4	16 to 20	2042 - 2046	• Install nitrogen-reducing onsite septic systems

During each phase, evaluate monitoring data and include any changes in the Recommended Plans identified through the Adaptive Management Program.

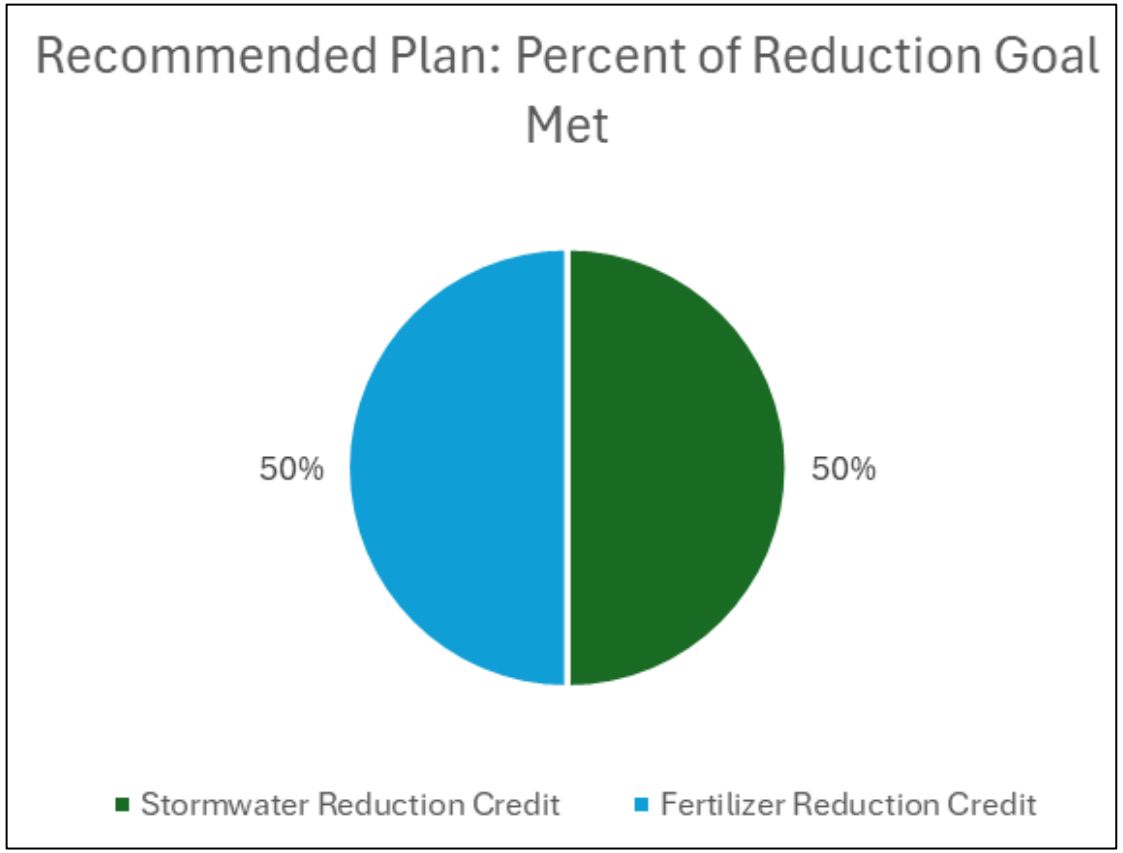
Financing Options

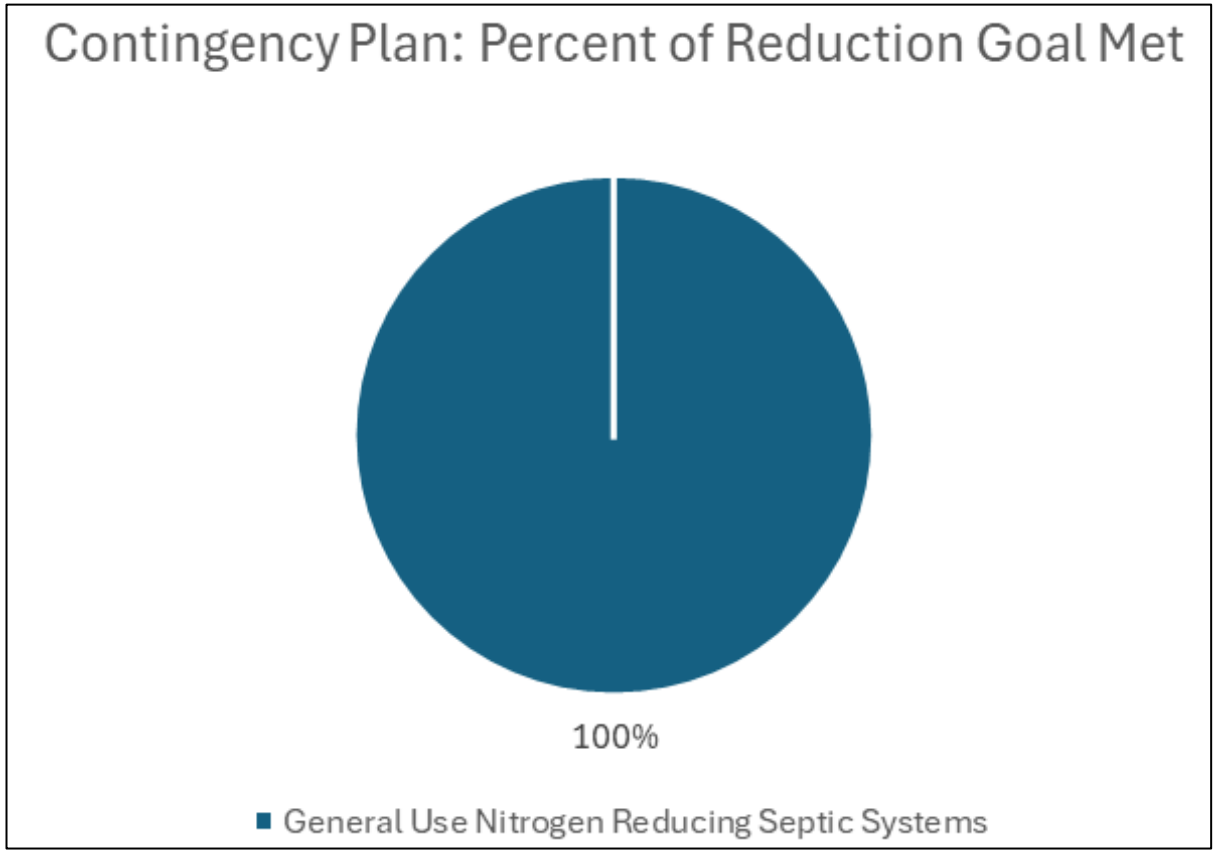
Determine financing options and develop schedule

- Low-interest Loan opportunities:
  - State Revolving Fund, AQUIFund, Massachusetts Communities Septic Management Program
- Grant opportunities
  - Cape & Islands Water Protection Fund, OneStop (CZM & MVP), Natural Resource Nitrogen Sensitive Area Grant, Municipal Water Infrastructure Investment Fund, MassWorks,
- Tax Credit: Massachusetts State provided tax credit to assist with septic upgrade costs at primary residences
- Bulk purchasing opportunities for nitrogen-reducing onsite septic systems
- Allocation of Town funds for nitrogen-reducing technologies and implementation of the Recommended Plan

Draft Nitrogen Management Plans

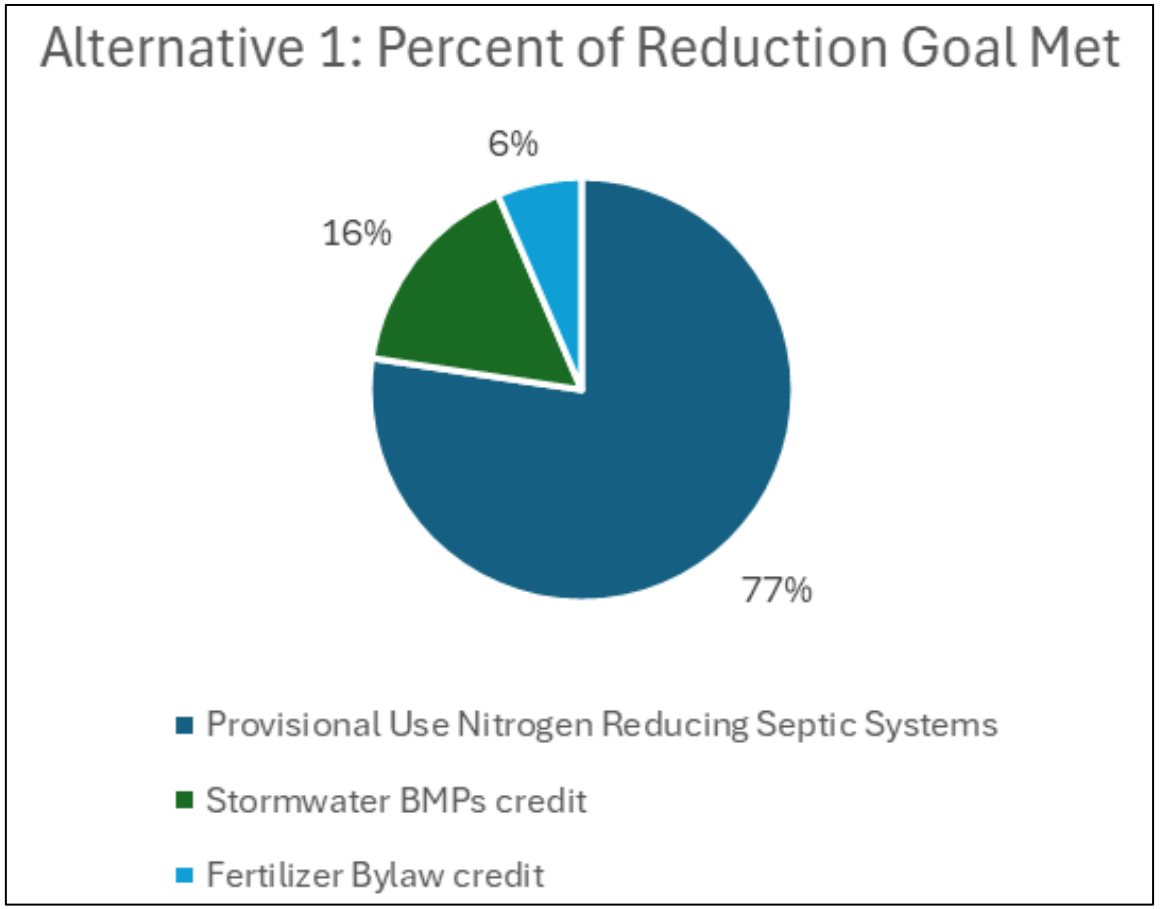
Wellfleet Harbor

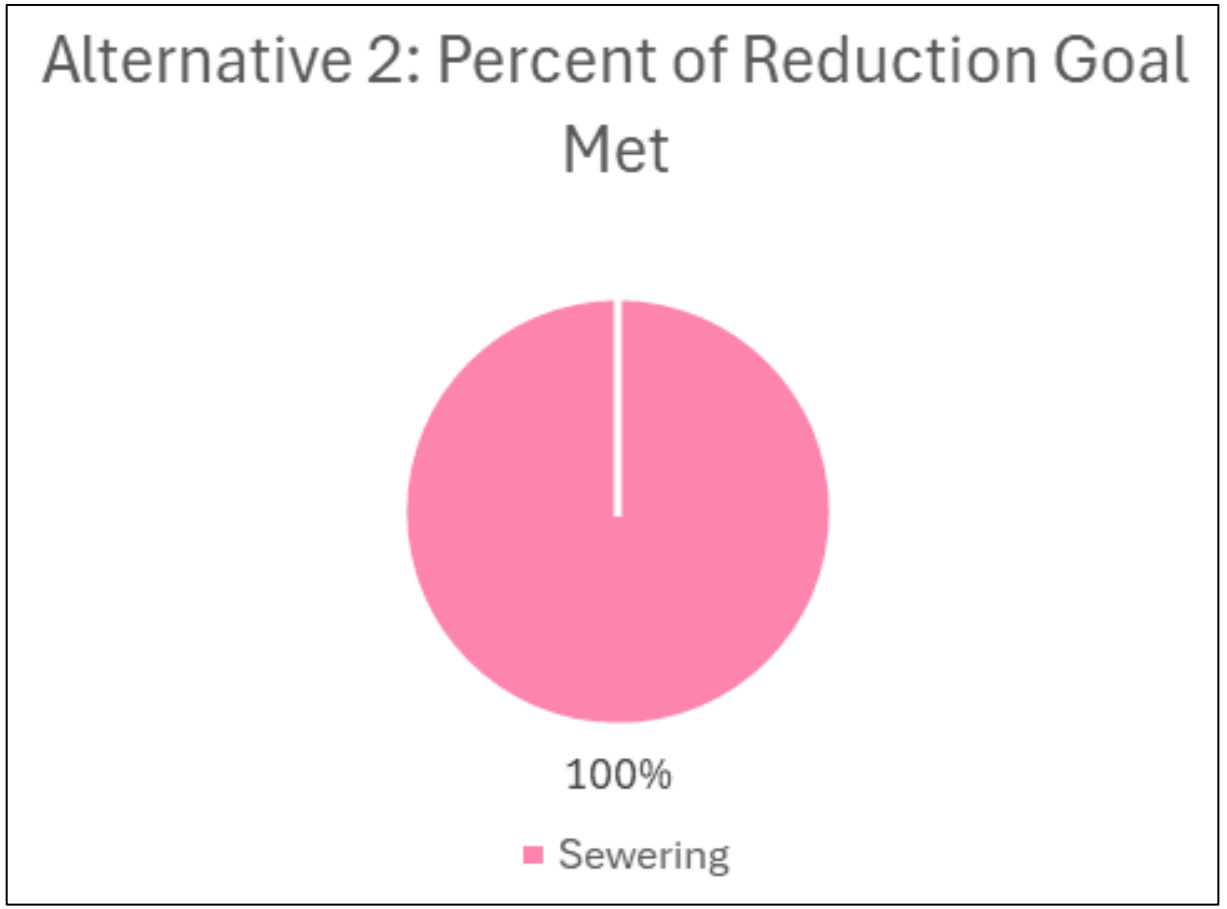




~61 nitrogen-reducing systems (or 66% of existing septic systems)

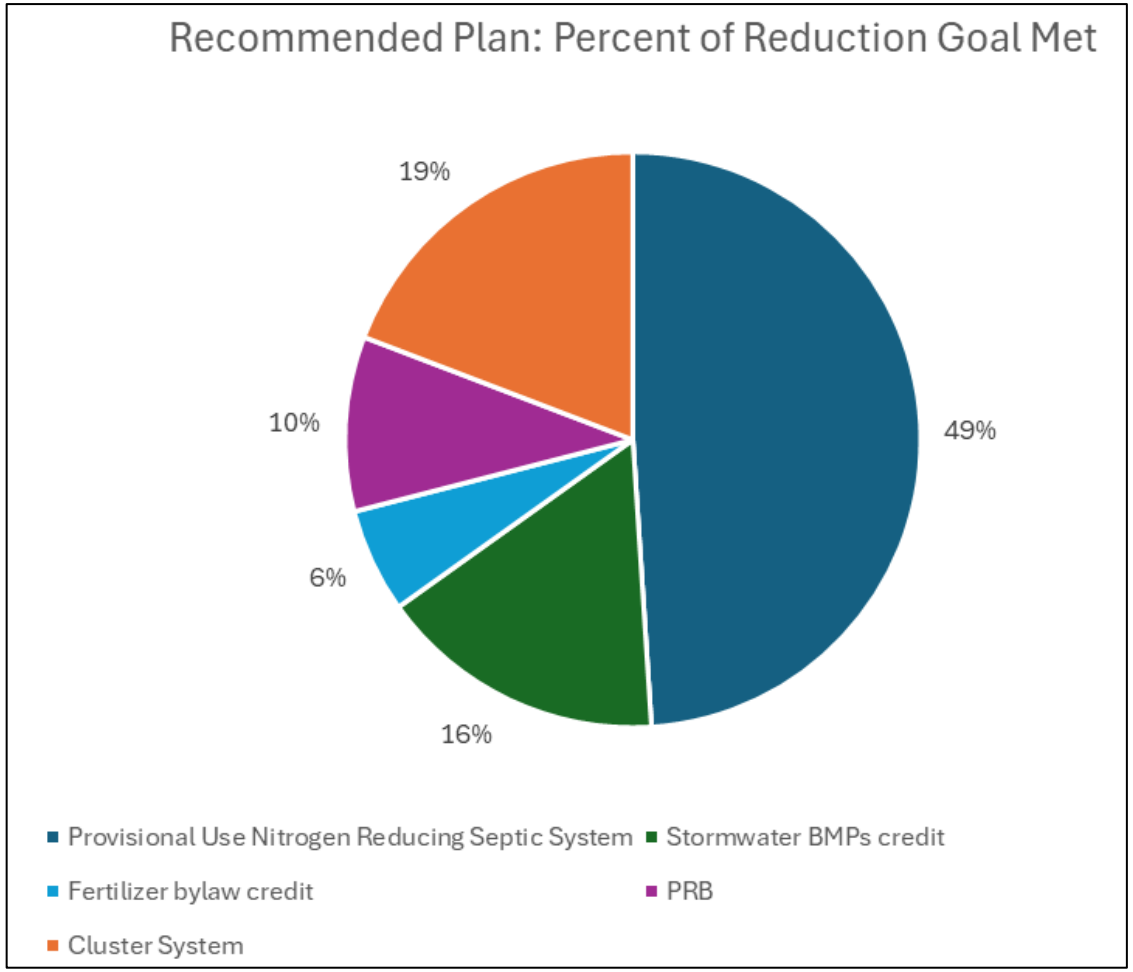
East Harbor



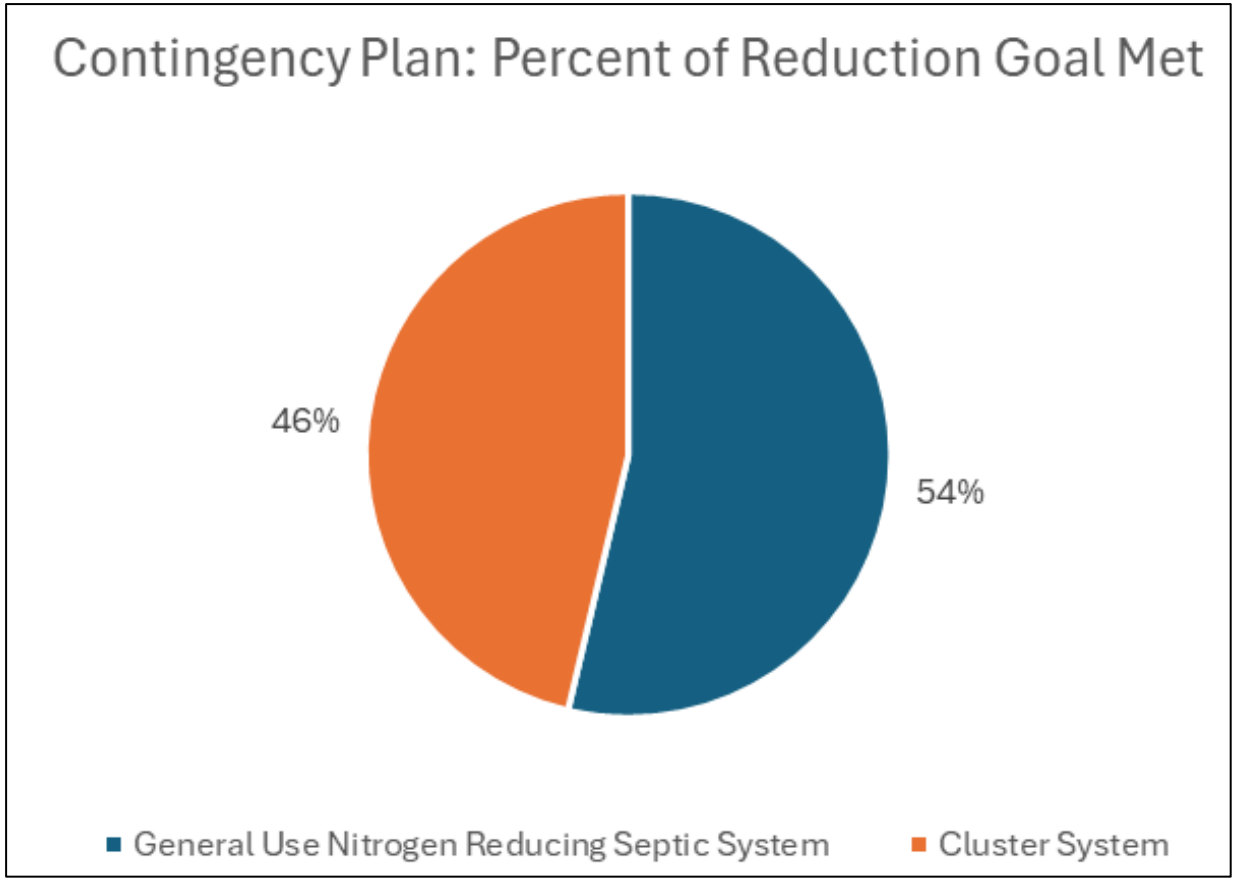


~32 nitrogen-reducing systems (or 32% of existing septic systems)

Pamet River



~98 nitrogen-reducing systems (or 17% of existing septic systems)



~412 nitrogen-reducing systems (or 72% of existing septic systems)

Planning Level Project Costs

Strategy	Recommended Plan – Estimated Capital Cost (2025 $M)	Contingency Plan – Estimated Capital Cost (2025 $M)
Fertilizer Management Allowance		
Stormwater Best Management Practices Allowance	$8.7	
Permeable Reactive Barrier Allowance	$1.4	
Nitrogen-Reducing Onsite Septic System Program	$9.1	$32.8
Centralized Sewering (Treated at Provincetown WWTF)		$14.8
Cluster System – Pamet River East	$4.5	$5.9
Cluster System – Pamet River West		$6.3
Total	**$23.7**	**$59.8**

Summary & Next Steps

Comprehensive Watershed Management Plan

Strategy	Recommended Plan: Implementation Notes	Contingency Plan: Implementation Notes
Fertilizer Management	• Town-Wide	
Non-Structural Stormwater Best Management Practices	• Town-Wide	
Permeable Reactive Barrier (PRB)	• Pamet River (East)	
Nitrogen-Reducing On-Site Septic Program	• Pamet River • East Harbor (dependent on future evaluations)	• Pamet River • Wellfleet Harbor
Cluster Systems	• Pamet River East	• Pamet River East • Pamet River West
Centralized Sewering		• East Harbor (dependent on future evaluations)

Summary

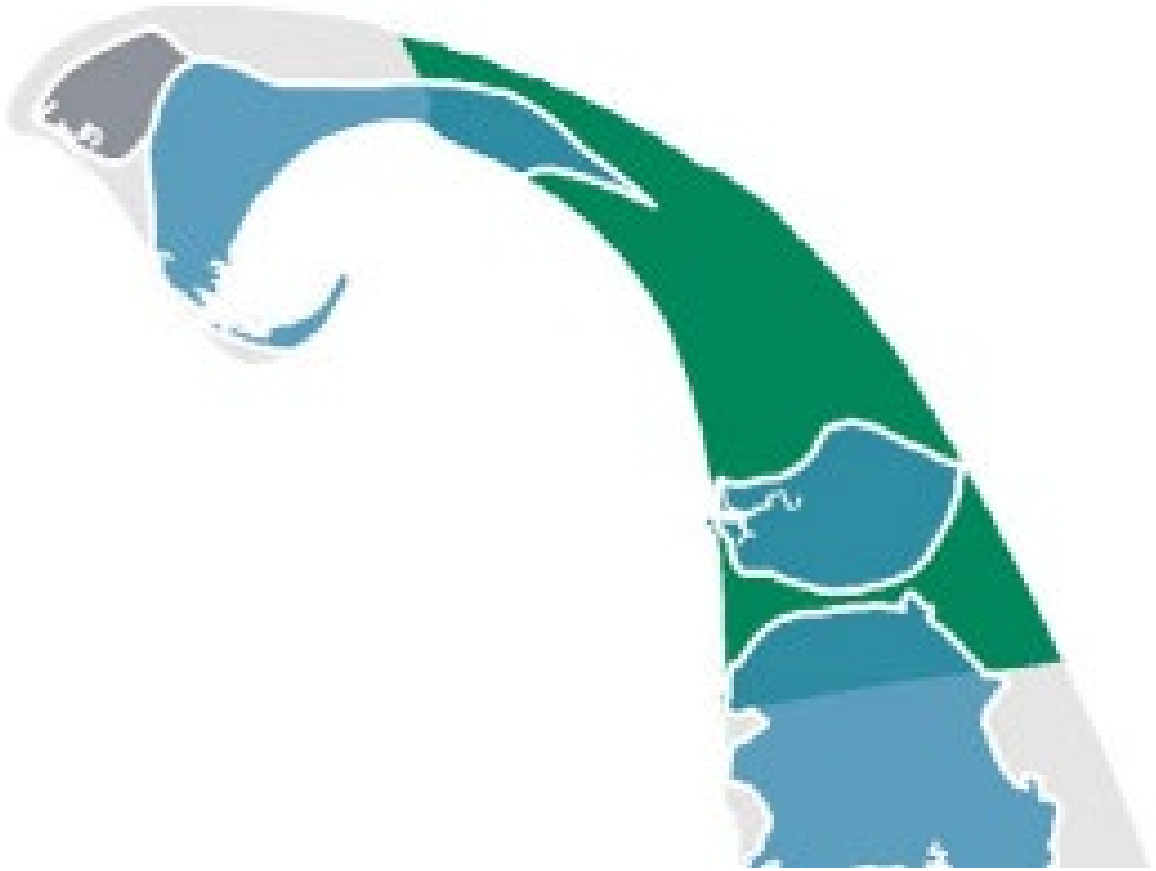
Goal: Reduce the amount of nitrogen entering Truro's coastal estuaries

- Wellfleet Harbor
- Pamet River
- Provincetown Harbor (East Harbor)

Comprehensive Watershed Management Plan

- 20-year plan outlining strategies to achieve the goal

Outcome: Enhanced water quality, human health, and environmental health



Source: Cape Cod Commission

Next Steps

- Submit Expanded Environmental Notification Form (EENF) to MEPA
  - Initiates regulatory and public review of the report
  - Opportunity for Truro residents to provide comments
  - Determines if an Environmental Impact Report (EIR) is required for the project
    - EIR requires proponents to quantify the anticipated environmental impacts of the proposed project and identify all feasible measures to avoid, minimize, and mitigate negative environmental impacts
  - MEPA certificate scopes the EIR (if required)

Thank you

ghd.com