# Cleaning Up The Bays

## Managing Stormwater in the Three Bays

APCC Association to Preserve Cape Cod
Preserving the Very Nature of Cape Cod

United States Environmental Protection Agency

Massachusetts Office of Coastal Zone Management

Seal of the Town of Barnstable, Mass. 1639. Adopted May 4, 1899

Barnstable Land Trust

Horsley Witten Group

Barnstable Clean Water Coalition

SNEP Southeast New England Program

# Stormwater 101

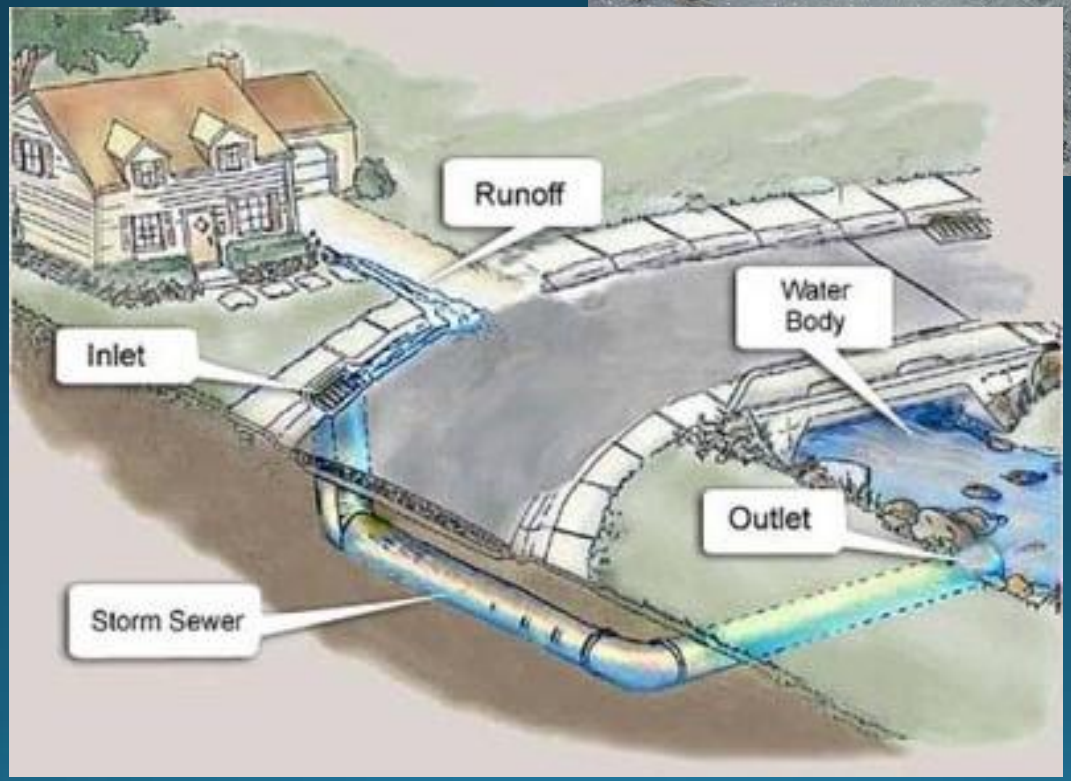
rain

↓

impervious surfaces

↓

runoff

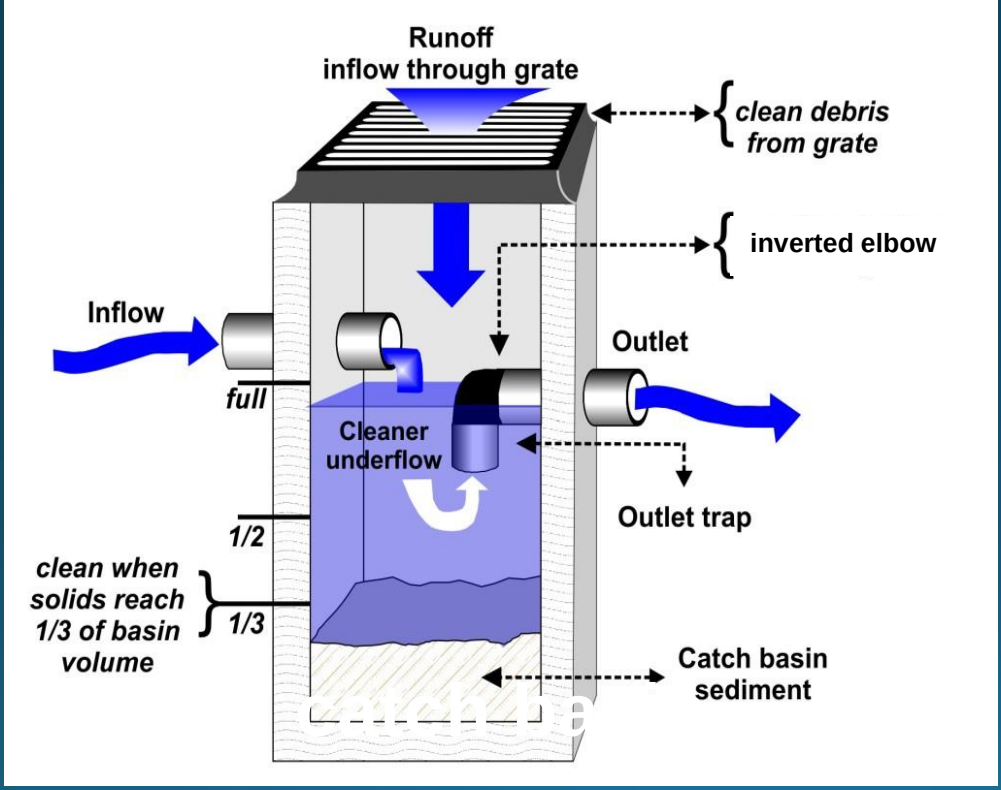


# Conventional Stormwater Management

## catch basin

roadway safety

reduce puddling




water quality is secondary

pre-treatment

# Green Infrastructure

## Engineering with Nature

green

modeled after nature

reduces volume

biological treatment

treats close to source

cost effective

# Negative Effects on the Environment and Community

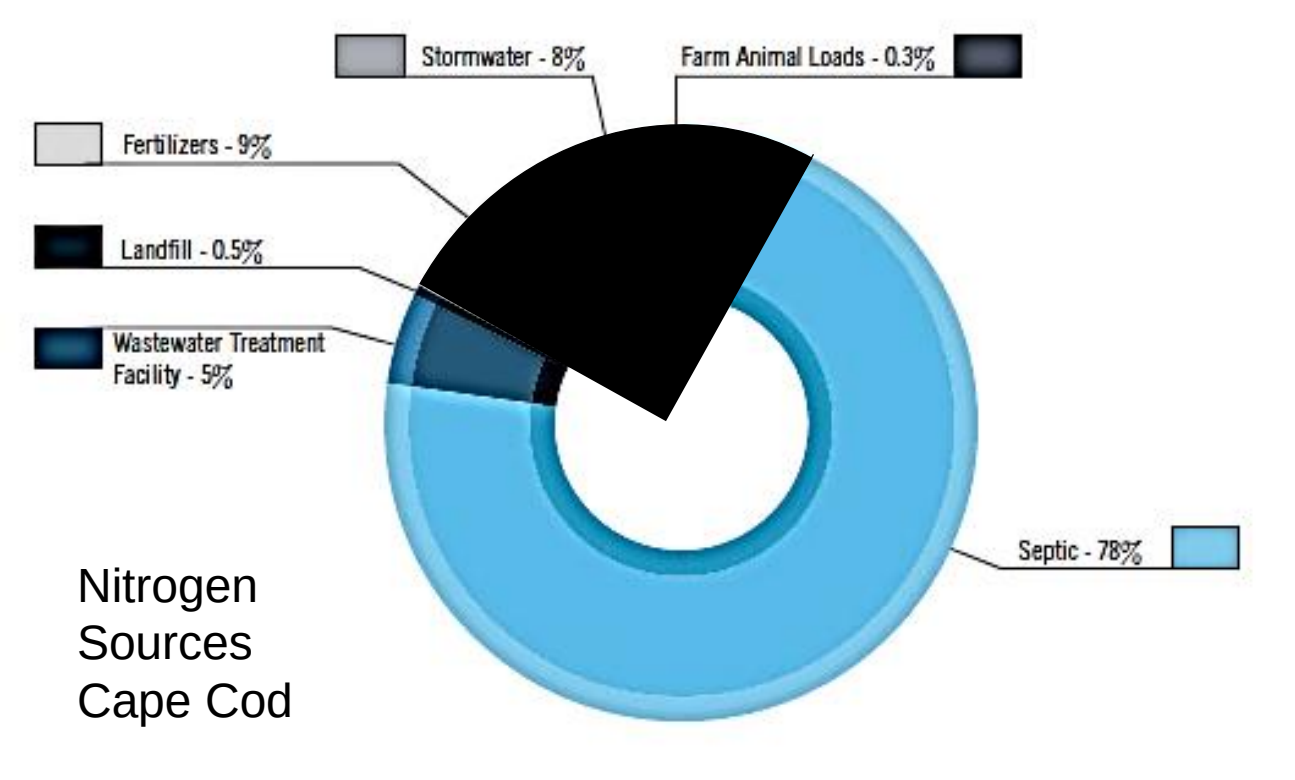



A “blue economy”

*livelihood and sustenance brought forth from the sea*

# Nitrogen and Stormwater

On average 8% of nitrogen in estuaries across the Cape is from stormwater runoff, and 9% from fertilizer use.




Source: Cape Cod Commission 208 Plan

# Project Overview

5 Year Project

Total Cost: $1.2 million

$941,576 from state and federal grants

$301,045 from project team match

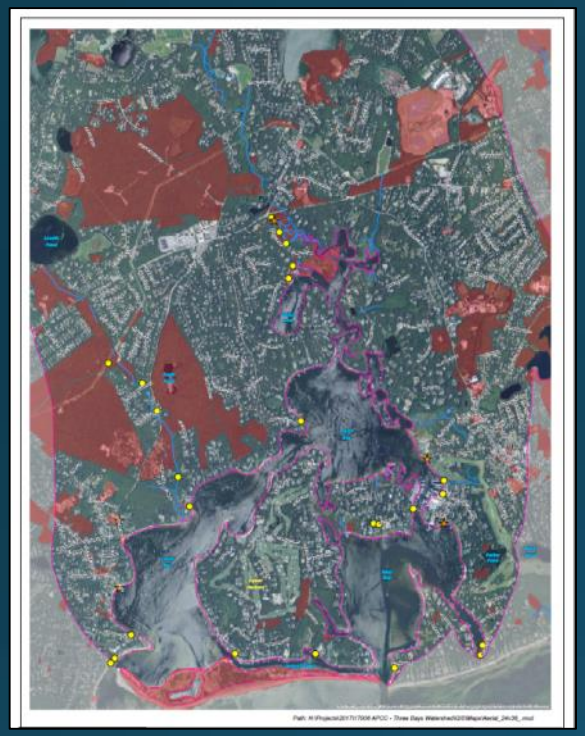
## SHORT-TERM RESULTS

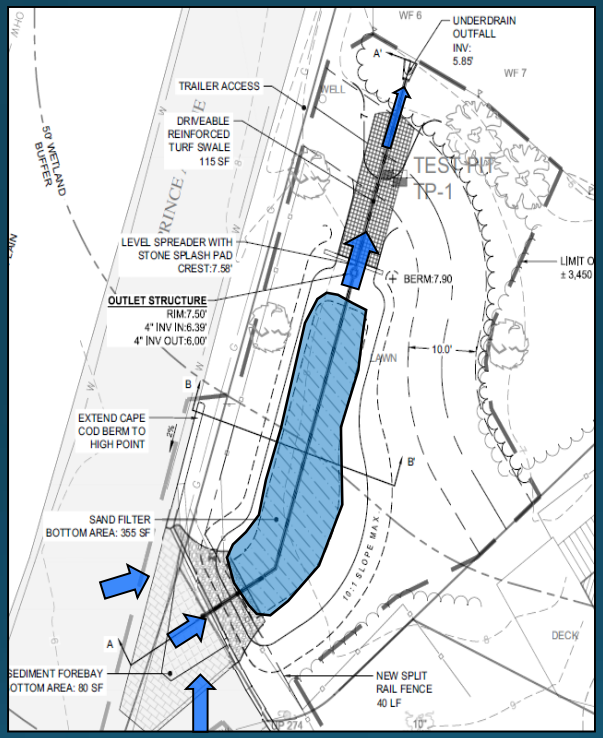
- Complete design and permitting for 8 BMPs
- Install a minimum of 4 BMPs
- Eliminate 70-85% of bacteria and 55% of nitrogen from runoff at retrofit sites
- Provide education and outreach to public and stormwater managers

## LONG-TERM GOALS

- Reduction in beach and shellfish closures
- Reduction of algal blooms and fish kills
- Improve habitat for fish, shellfish and wildlife
- Support commercial and recreational uses
- Develop project model that can be transferred

# Approach





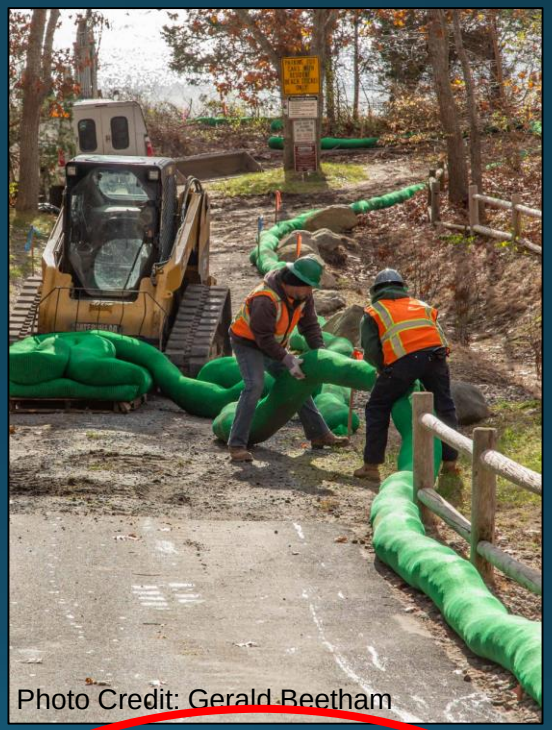



Photo Credit: Gerald Beetham

## Assessment and Prioritization

Phase 1: March – Aug. 2017

## Design and Permitting

Phase 1: 2017 – 2018

## Installation

Phase 1: October 2018 - January 2019

# CW-2: Cordwood Landing

# Existing System Improvements

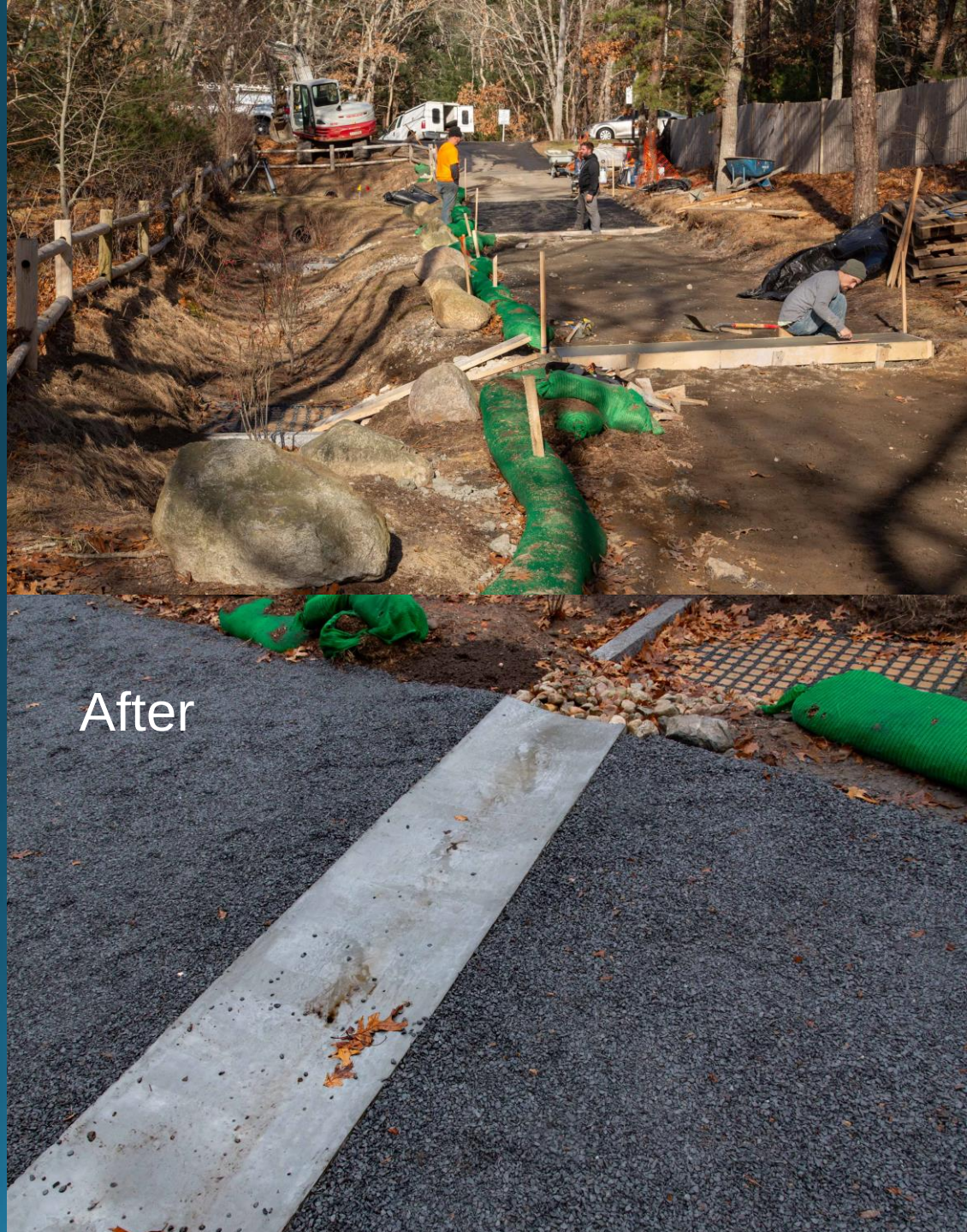




Photo Credits: Gerald Beetham

# New Treatment System – End of Cordwood Landing





Photo Credits: Gerald Beetham

# Cordwood: Site Access and Use

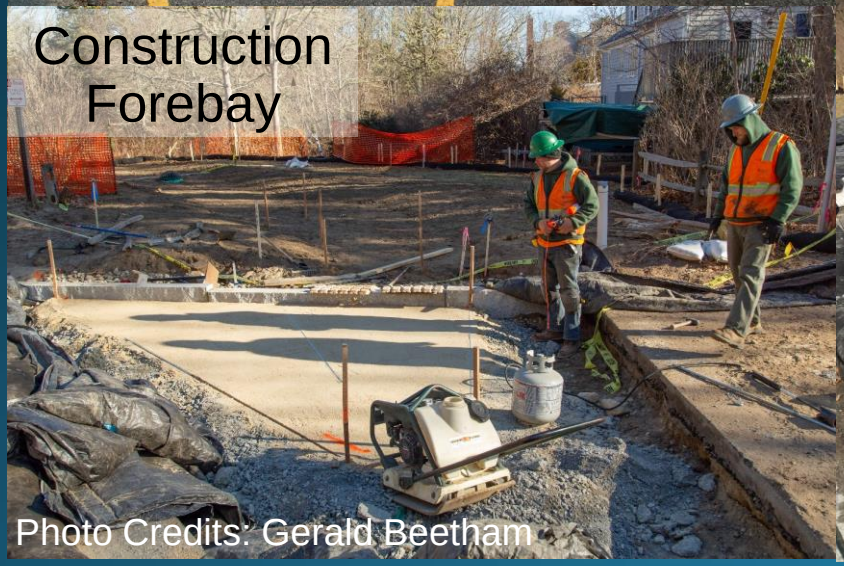

No
Plowing

Photo Credits: Gerald Beetham

# PC-1:  Prince Cove Marina

# Prince Cove Sand Filter






# Ropes Beach Maintenance

# Total Impact of 2018-2019 Work

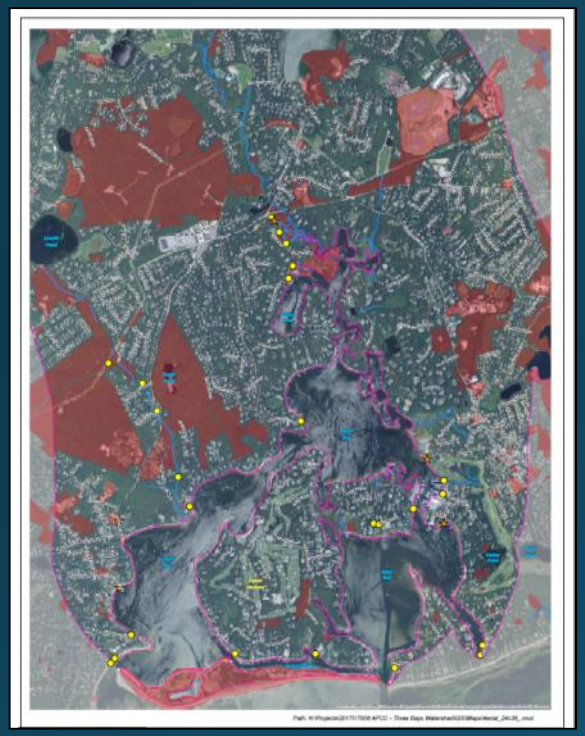
- Maintenance and improvement of 2 existing systems (Cordwood and Ropes)
- Installation of two new systems (Cordwood and Prince Cove Marina)
- Total of 8 Acres of Drainage Addressed
- 55% or greater Nitrogen Removal
- 70% Bacteria Removal
- Maintenance trainings spring and fall 2019

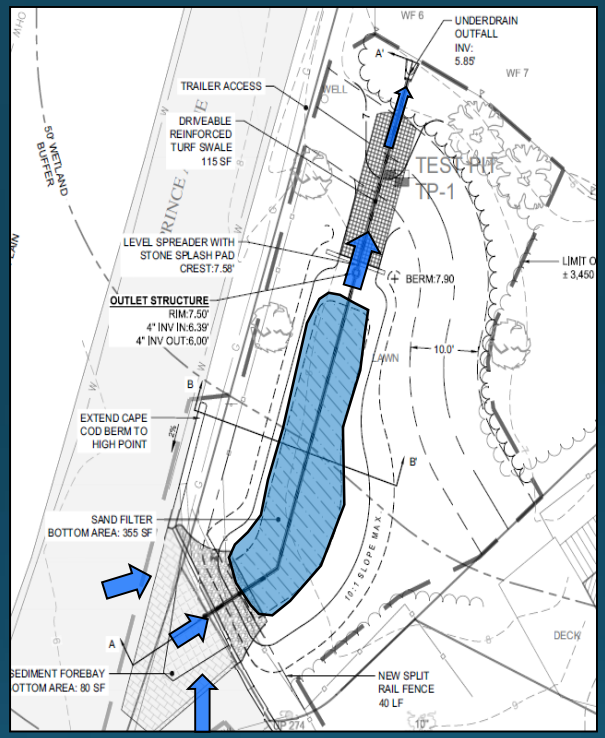




Photo Credits: Barnstable Clean Water Coalition and APCC

# Approach





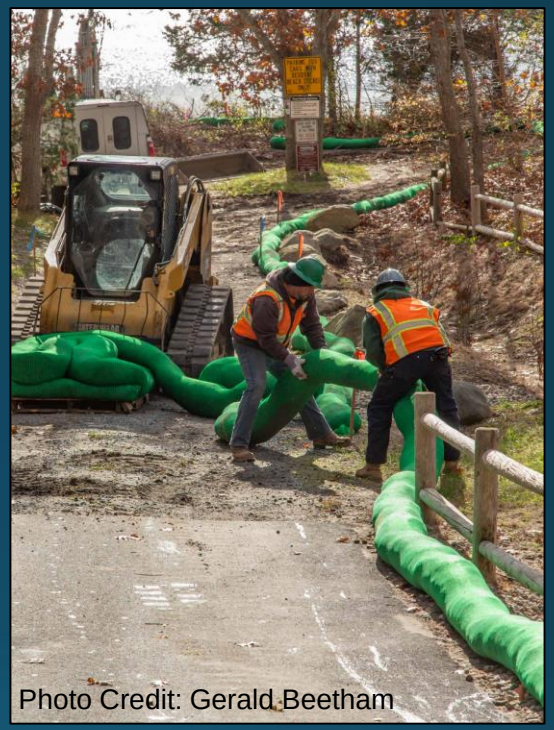



Photo Credit: Gerald Beetham

## Assessment and Prioritization

Phase 1: March – Aug. 2017

Phase 2: September 2018 – February 2019

## Design and Permitting

Phase 1: 2017 – 2018

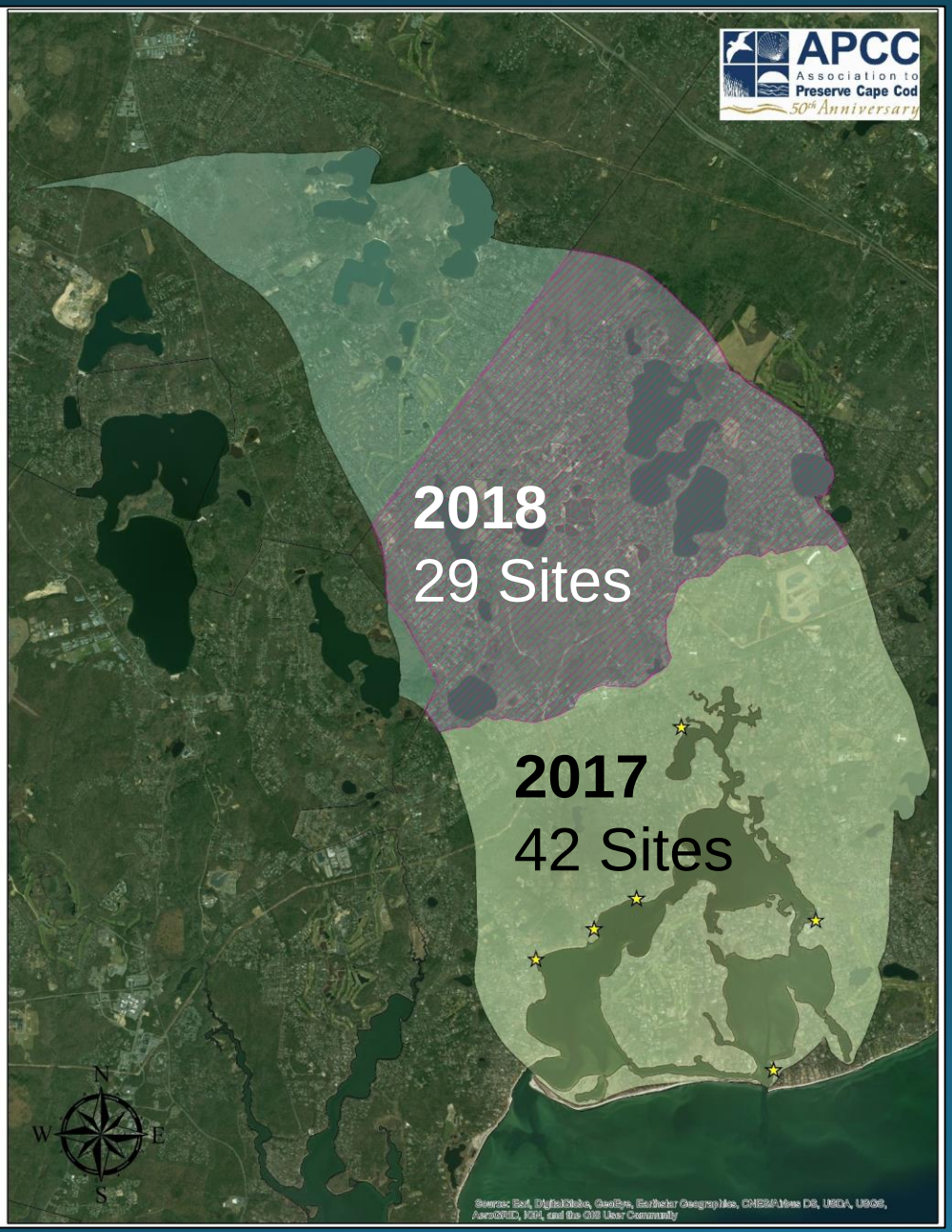
Phase 2: 2019

## Installation

Phase 1: October 2018 - January 2019

Phase 2: Spring 2020

# Project Area




# Field Assessment - Methods

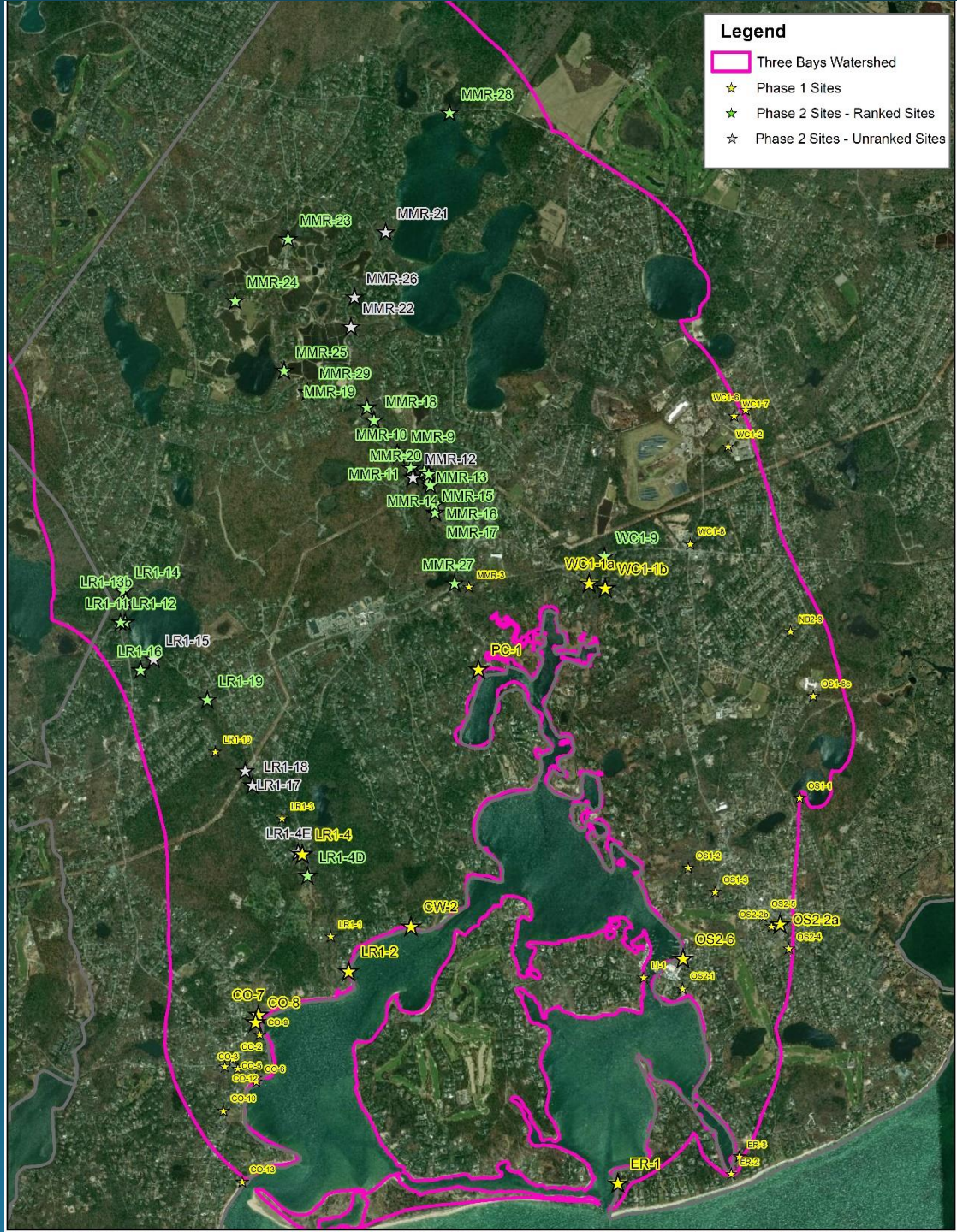
- Collect data on iPads loaded with existing info
- Visit pre-identified areas
- Talk to the experts/locals

# After the Fieldwork…

- Collect additional information
- Perform sizing calculations
- Develop concept designs
- Determine pollutant removal
- Estimate costs

<u>29 ranked sites in addition to 42 ranked sites from Phase 1</u>

*and many more unranked project suggestions!*





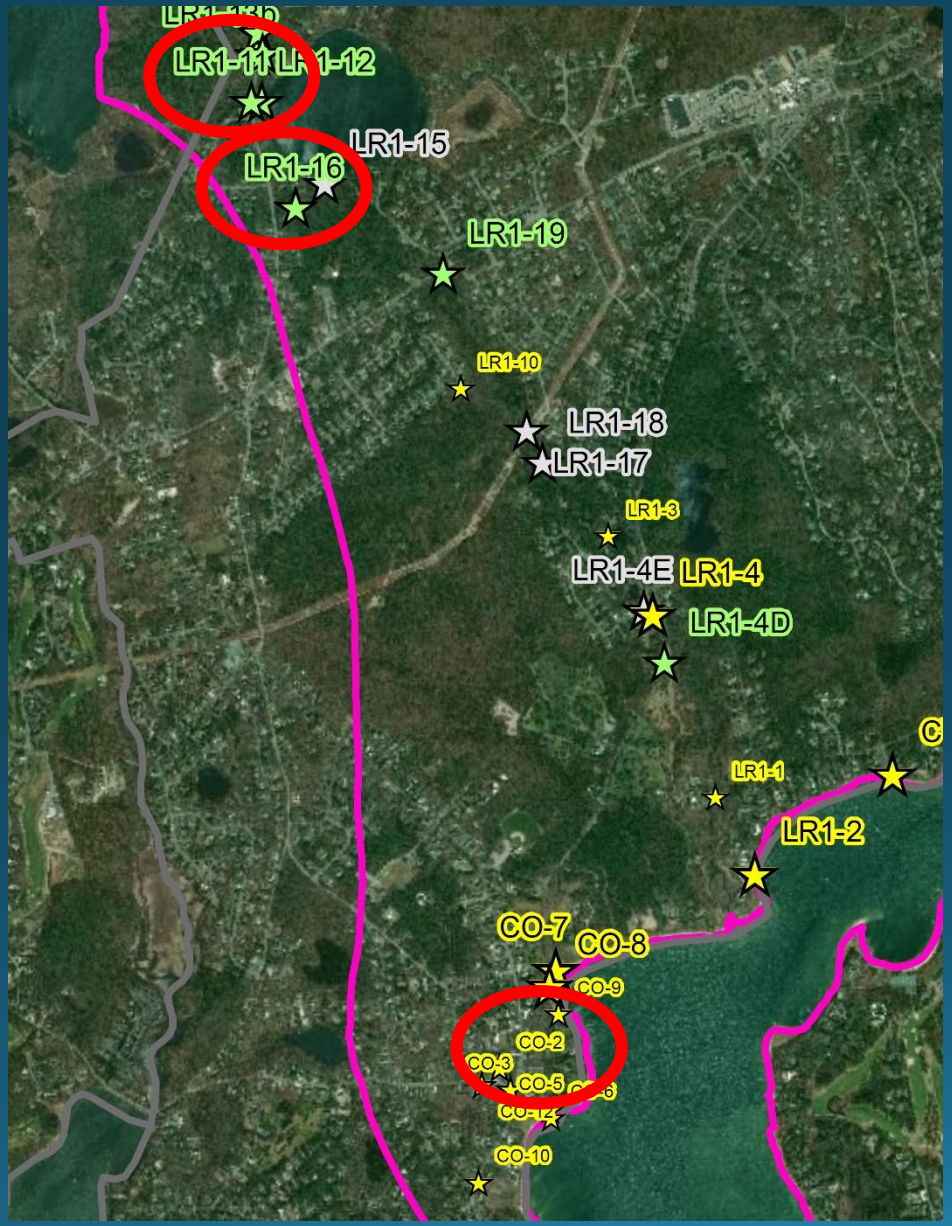


Credit: Three Bays Preservation, Inc.

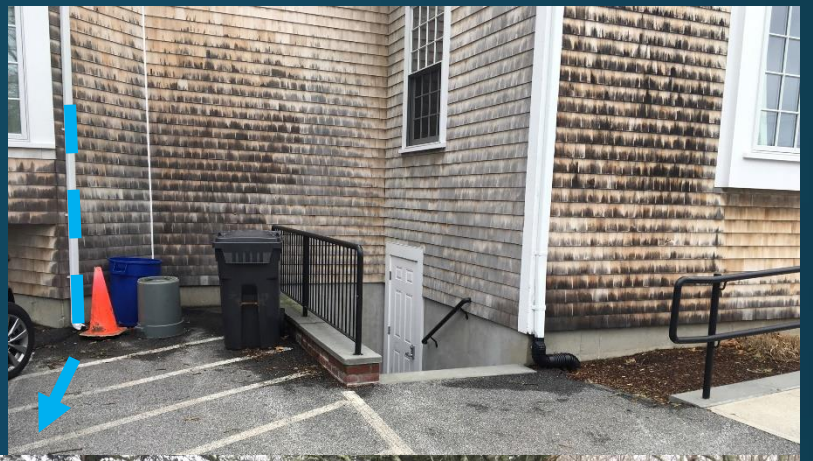
# Prioritization of Sites

- **Pollution Removals**
- **Cost**
- **Ease of Implementation**
- **Additional Benefits:**
  - Public Education
  - Direct benefits to the key resources? (shellfish beds, beaches, fish, discharges to river systems, etc.)
- **10 Priority Sites**

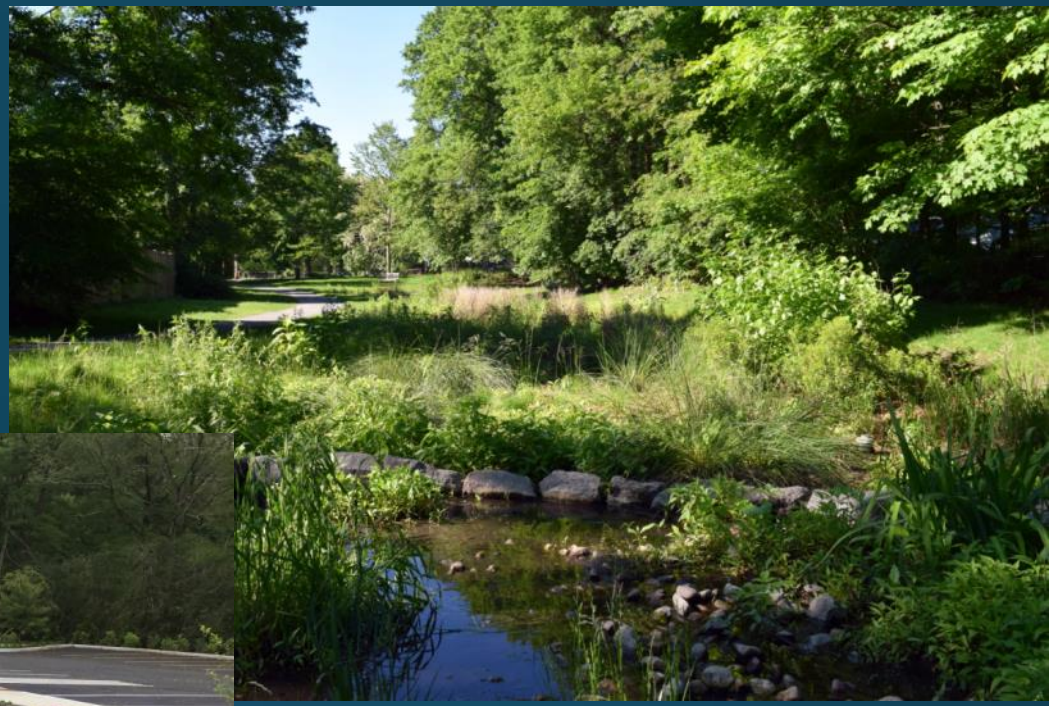
# 3 Cotuit/Little River Sites:



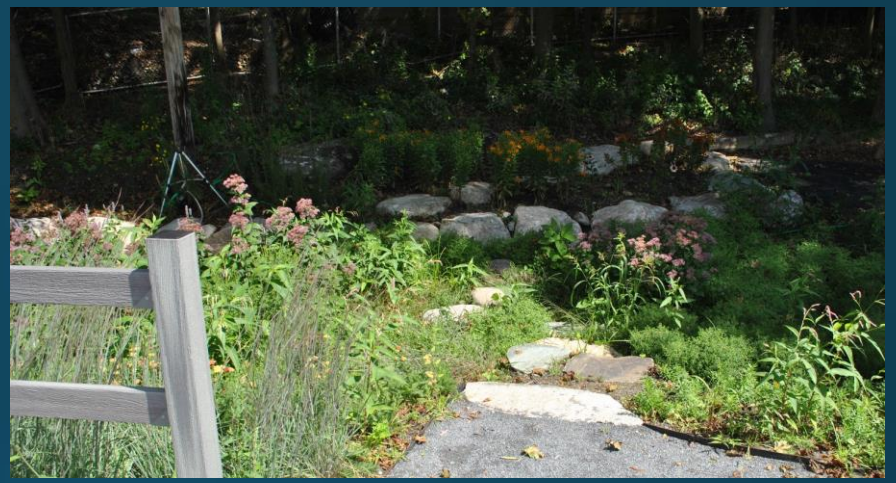
# CO-2 Cotuit Library Bioretention



# Bioretention Area

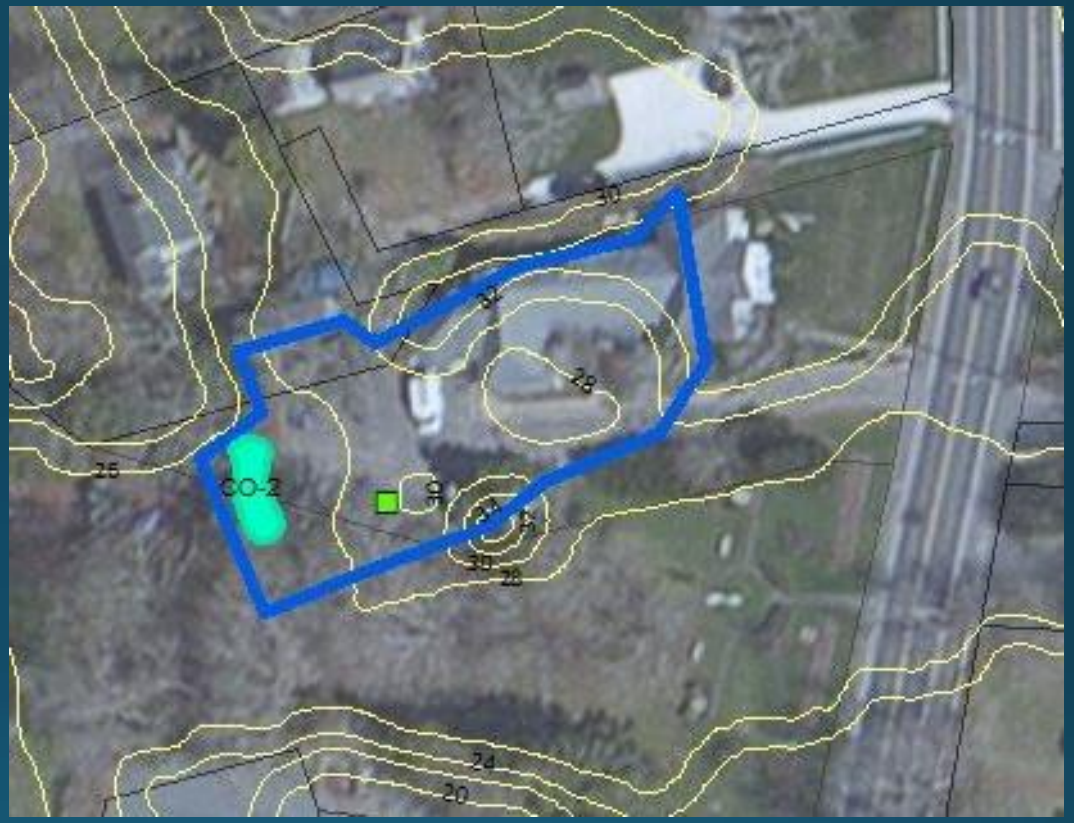


# Artful Design and Educational



## Concept:

- Bioretention
- Public Educational Signage
- 0.3-acre Drainage Area, 0.2 acres impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal



# LR1-11 Lovell's Pond Boat Ramp Bioretention

Remove the inactive treatment shed

Capture and treat runoff from adjacent Santuit-Newtown Rd

## Concept:

- Bioretention
- Public Educational Signage
- 0.2-acre Drainage Area, 70% impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal

# LR1-16 Lovell's Pond Beach Bioretention

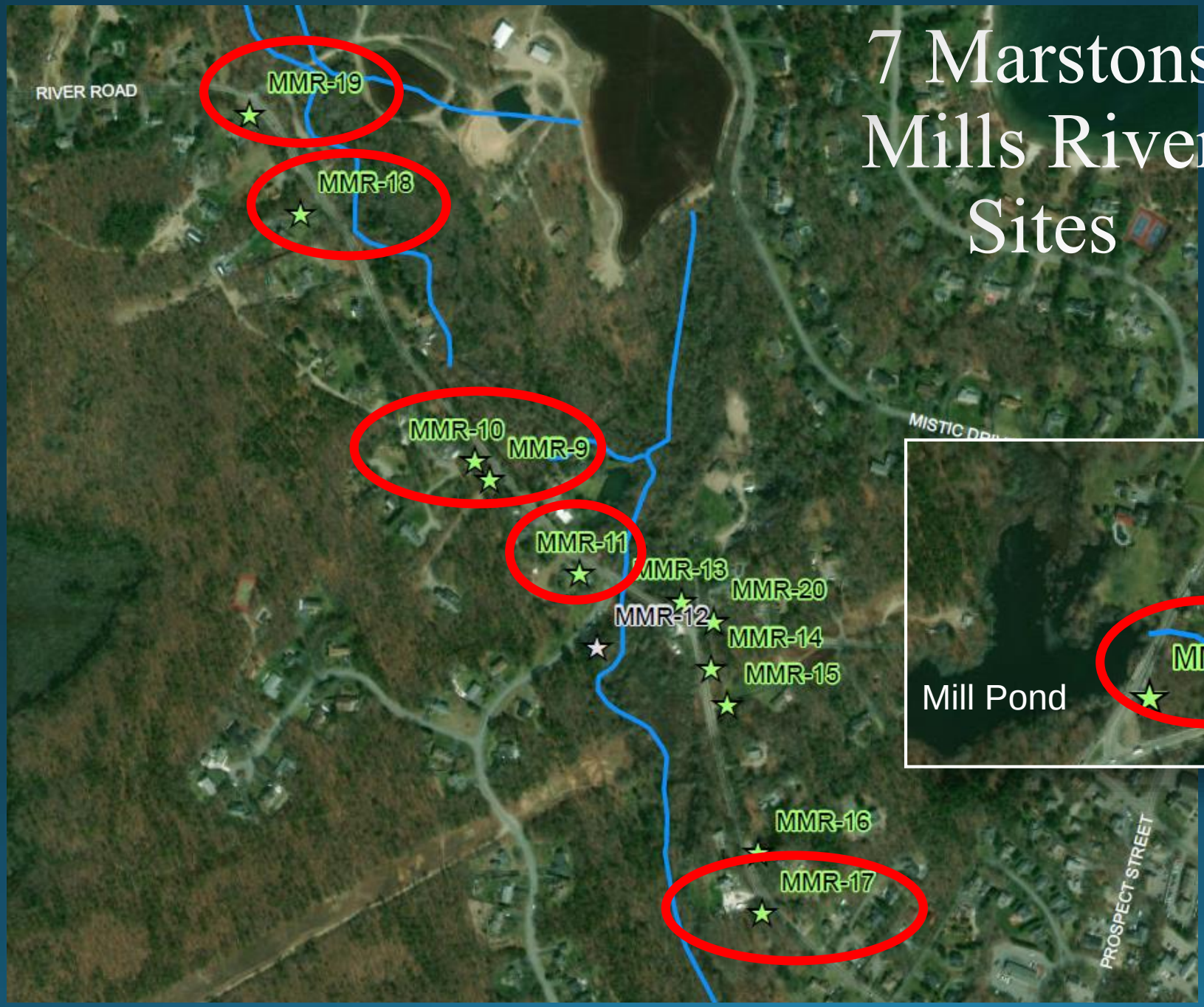
Runoff currently flows from the driveway/parking lot/building into a leaching chamber

Propose to regrade emergency access to direct runoff into a bioretention

## Concept:

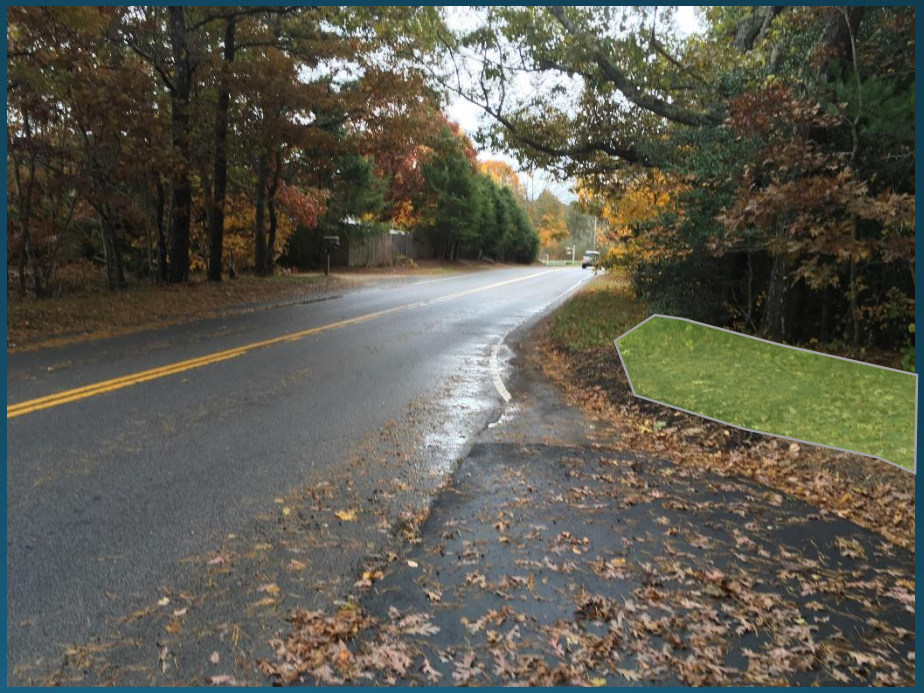
- Bioretention
- Public Educational Signage
- 0.2-acre Drainage Area, 50% impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal

# 7 Marstons Mills River Sites



# MMR-9 Hi River Road Bioretention

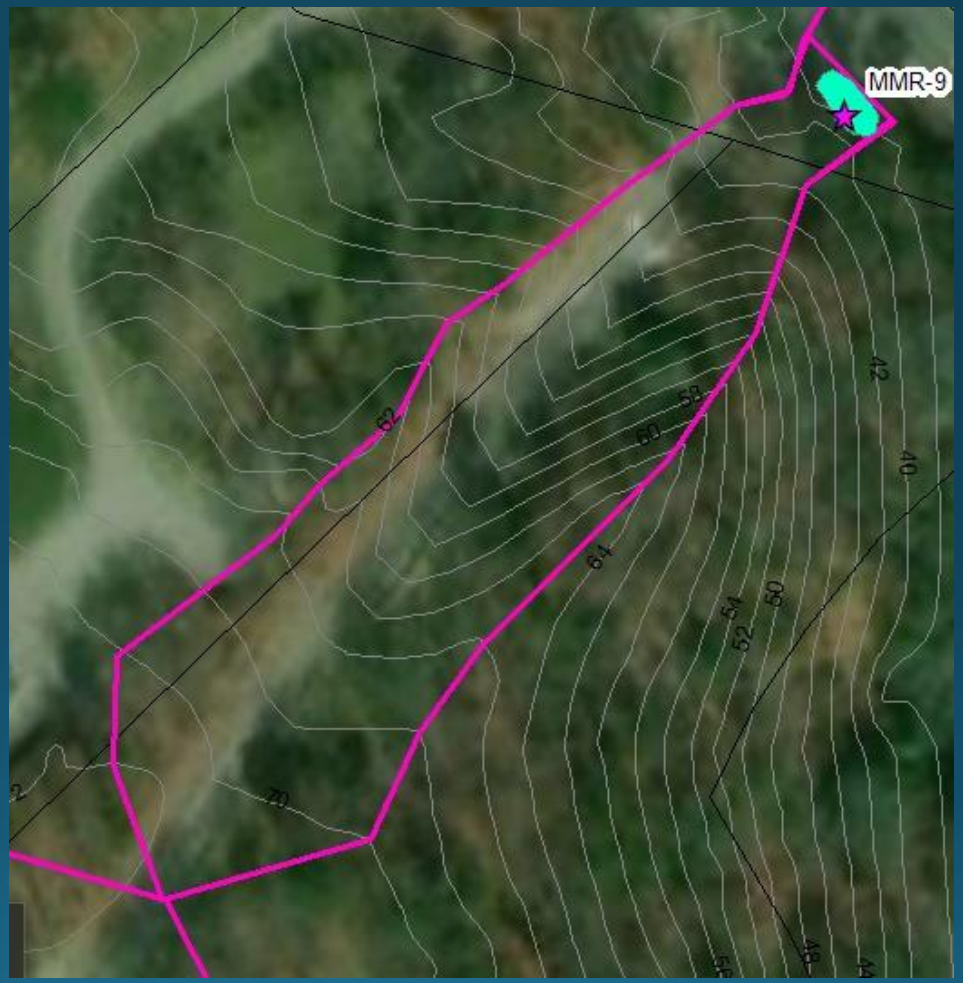
Steep, Unpaved Private Driveway



Intersection of Hi River Road and River Road

## Concept:

- Bioretention with enhanced pretreatment
- 0.5-acre Drainage Area, 0.2 acres impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal

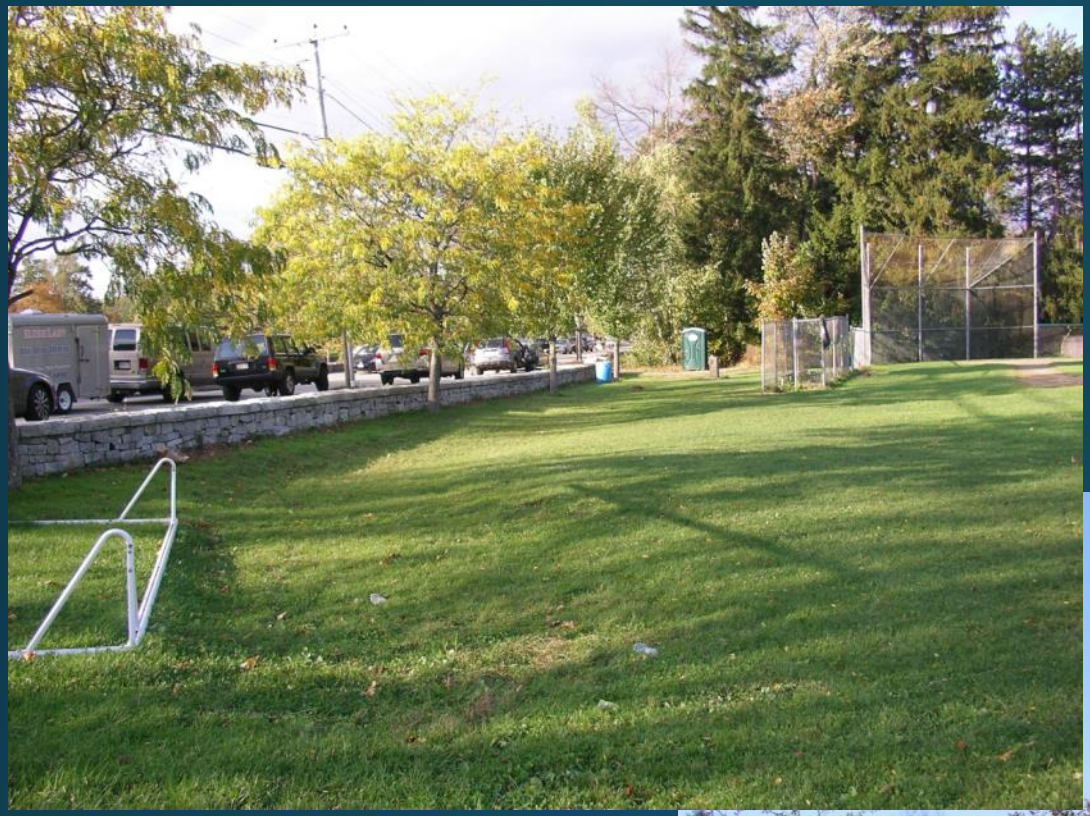


# MMR-10A River Road Dry Swales


Intersection of Hi River Road and River Road

Yard debris on steep slope

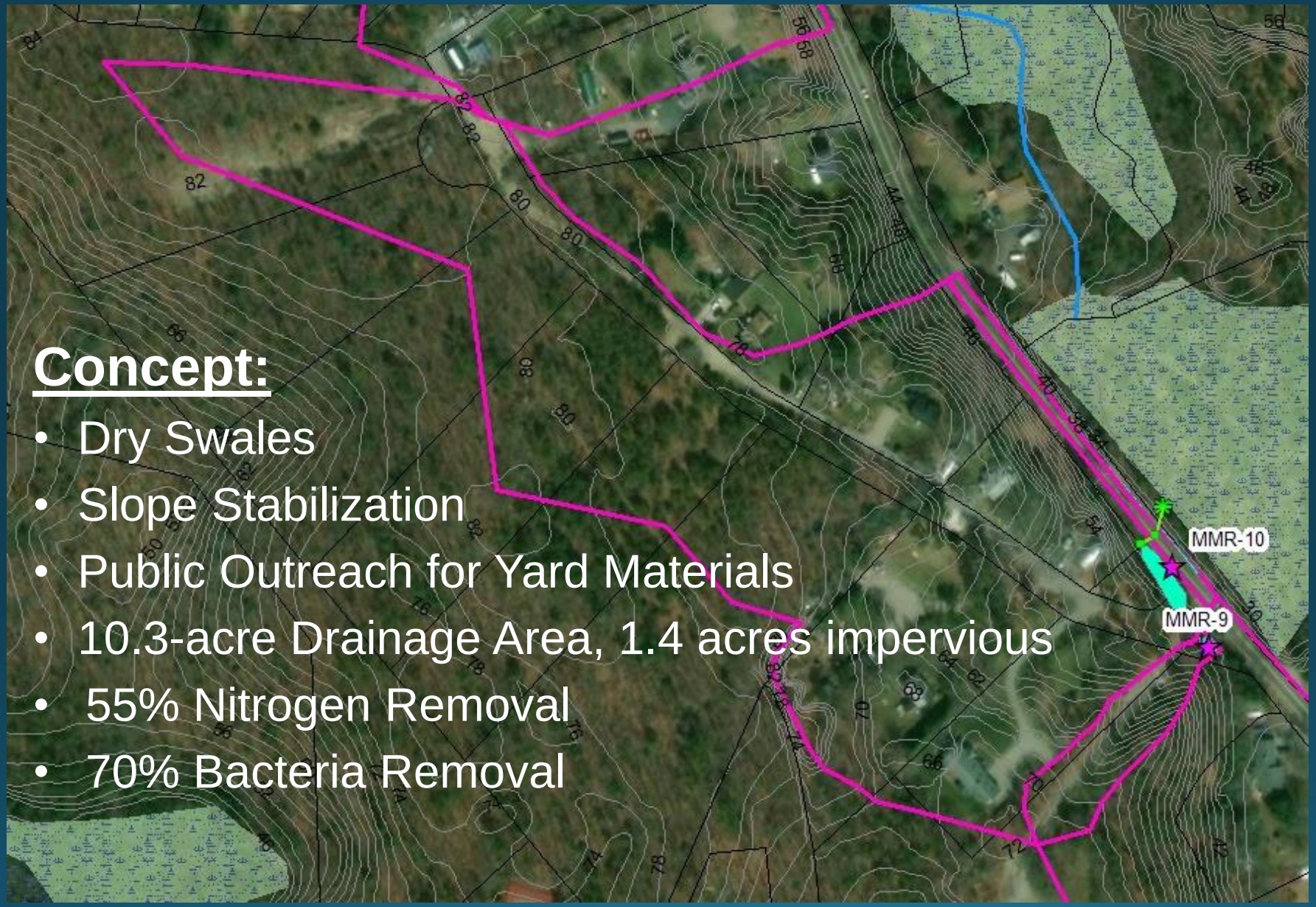
# Dry Swale



# MMR-10B Dry Swale

East side of River Road, looking south


Looking towards MMR-10B from Hi River Rd




**Concept:**

- Dry Swales
- Slope Stabilization
- Public Outreach for Yard Materials
- 10.3-acre Drainage Area, 1.4 acres impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal

# MMR-11 River Road Dry Swales

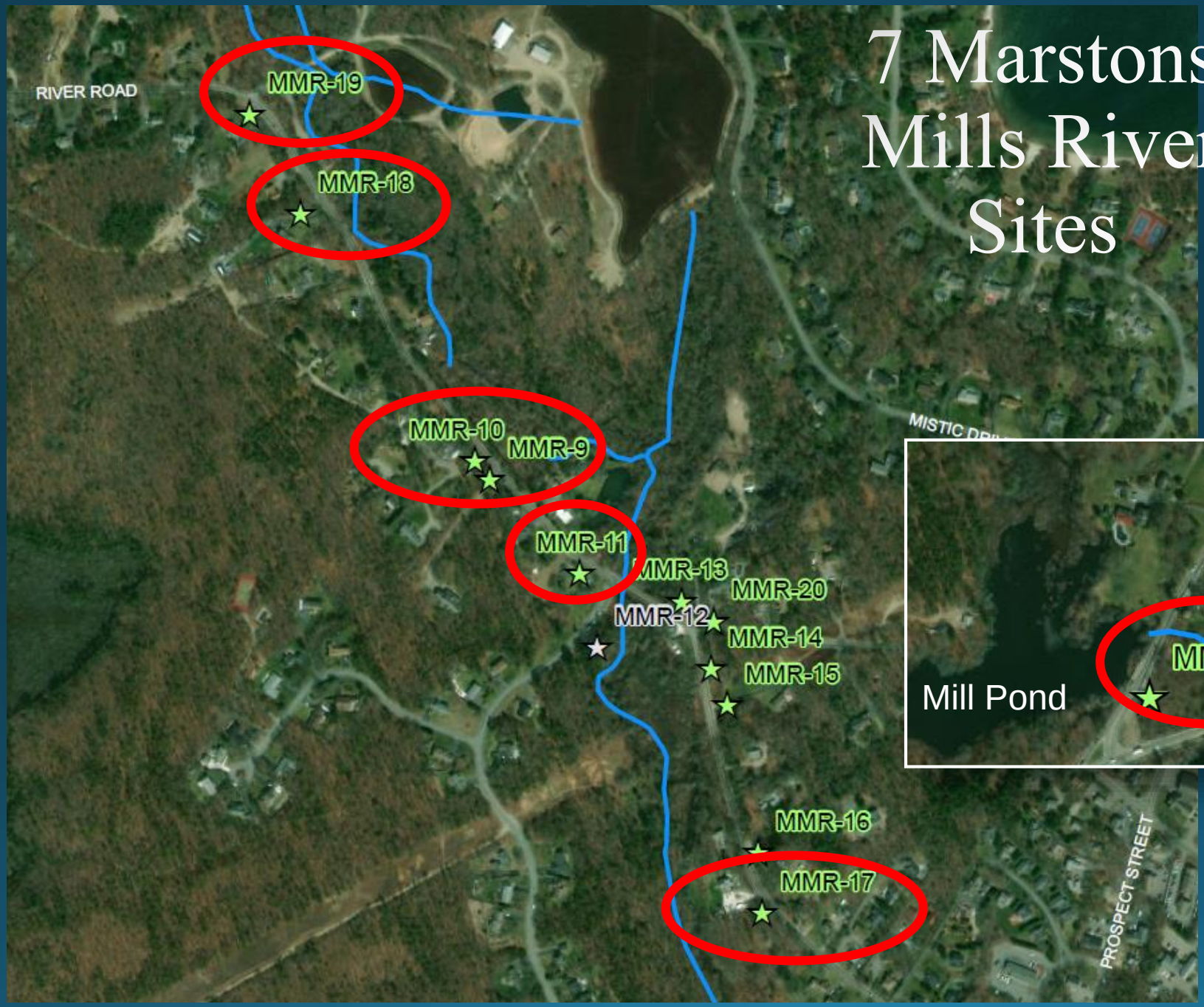
Northeast side of River Road


Southwest side of River Road

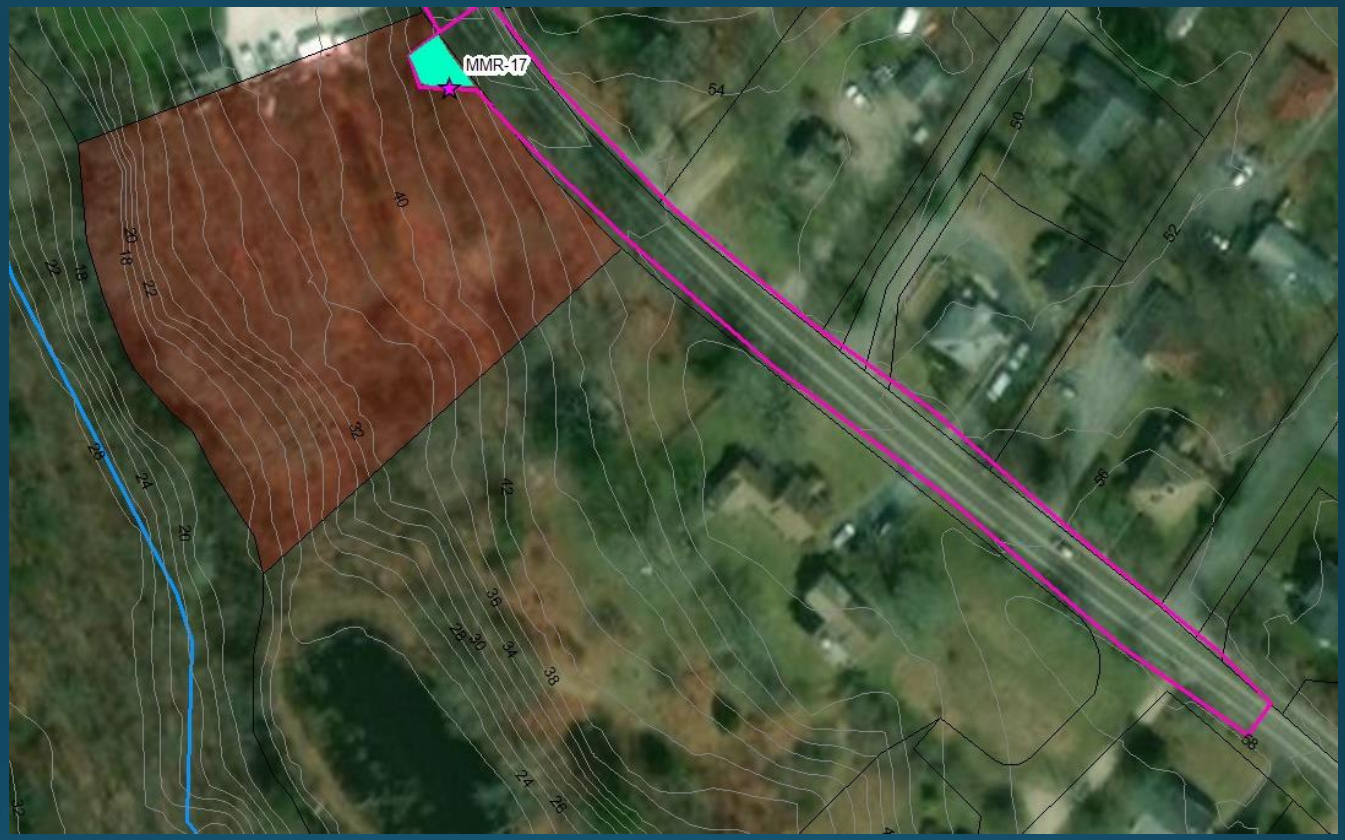
## Concept:

- Dry Swales
- 3.6-acre Drainage Area, 0.5 acres Impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal

# 7 Marstons Mills River Sites



# MMR-17 River Road Bioretention


## Concept:

- Bioretention
- 0.5-acre Drainage Area, 84% impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal

# MMR-18a/b River Road Options

Concept A – Dry Swale

Concept B – Wet Swale

# Wet Swale

## Concept A:

- Dry Swale in ROW
- 1.4-acre Drainage Area, 0.4 acres impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal


## Concept B:

- Wet Swale (Drainage Easement Required)
- 4.2-acre Drainage Area, 0.43 acres impervious
- 30% Nitrogen Removal
- 60% Bacteria Removal

# MMR-19 River Road Dry Swale

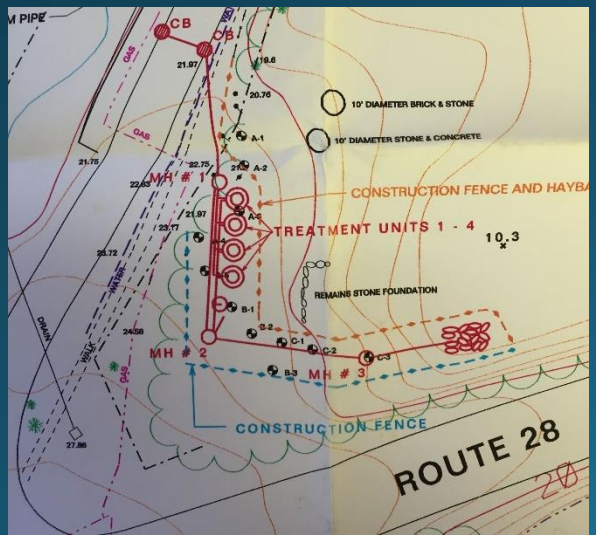
## Concept:

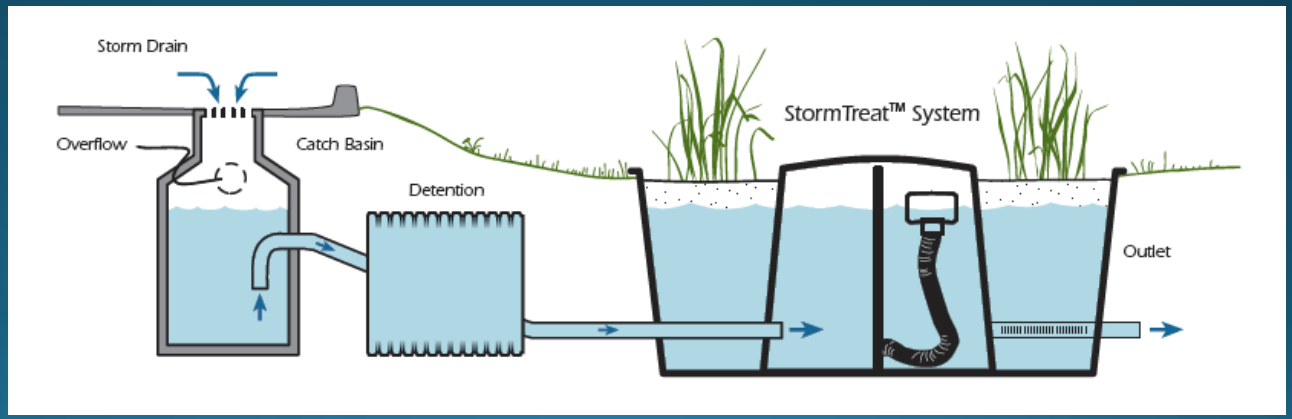
- Dry Swale in Right of Way
- 1.5-acre Drainage Area, 0.45 acres impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal

# MMR-27 StormTreat Maintenance

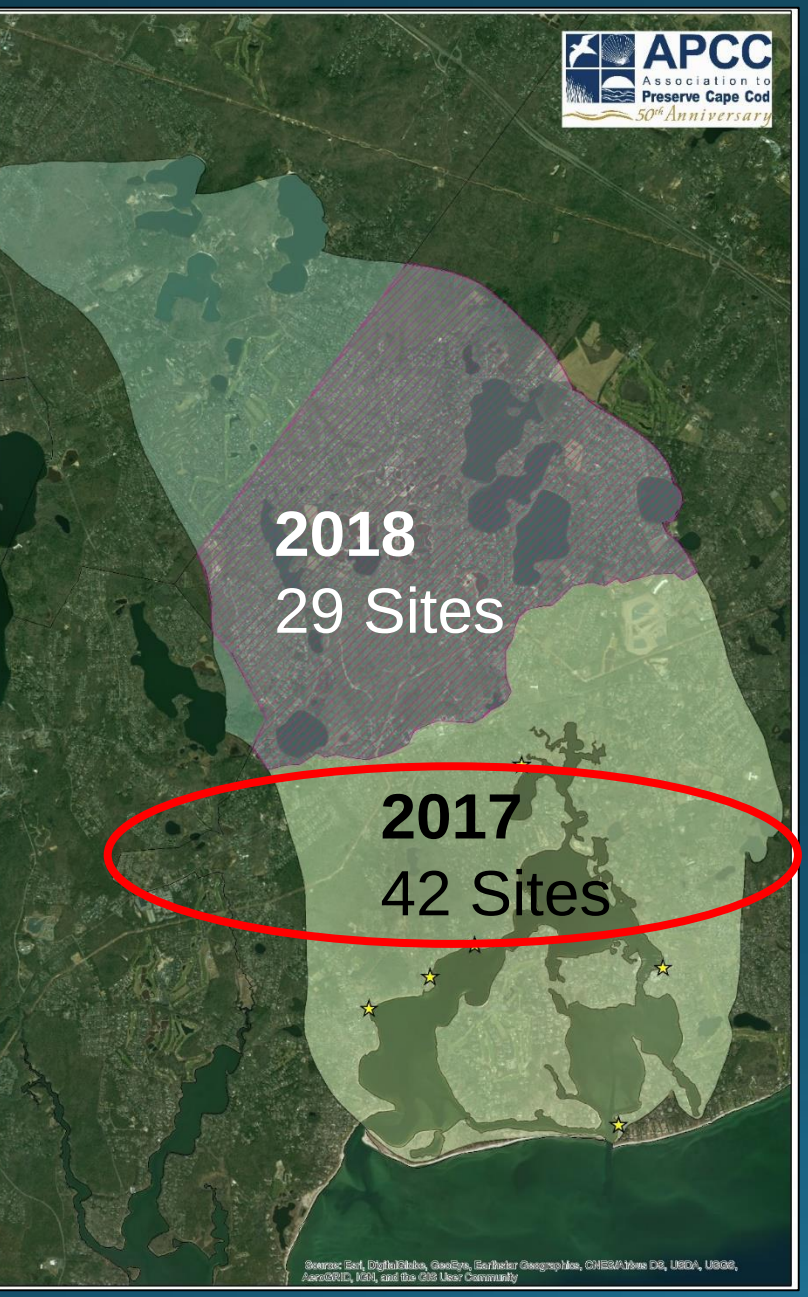
## Concept:

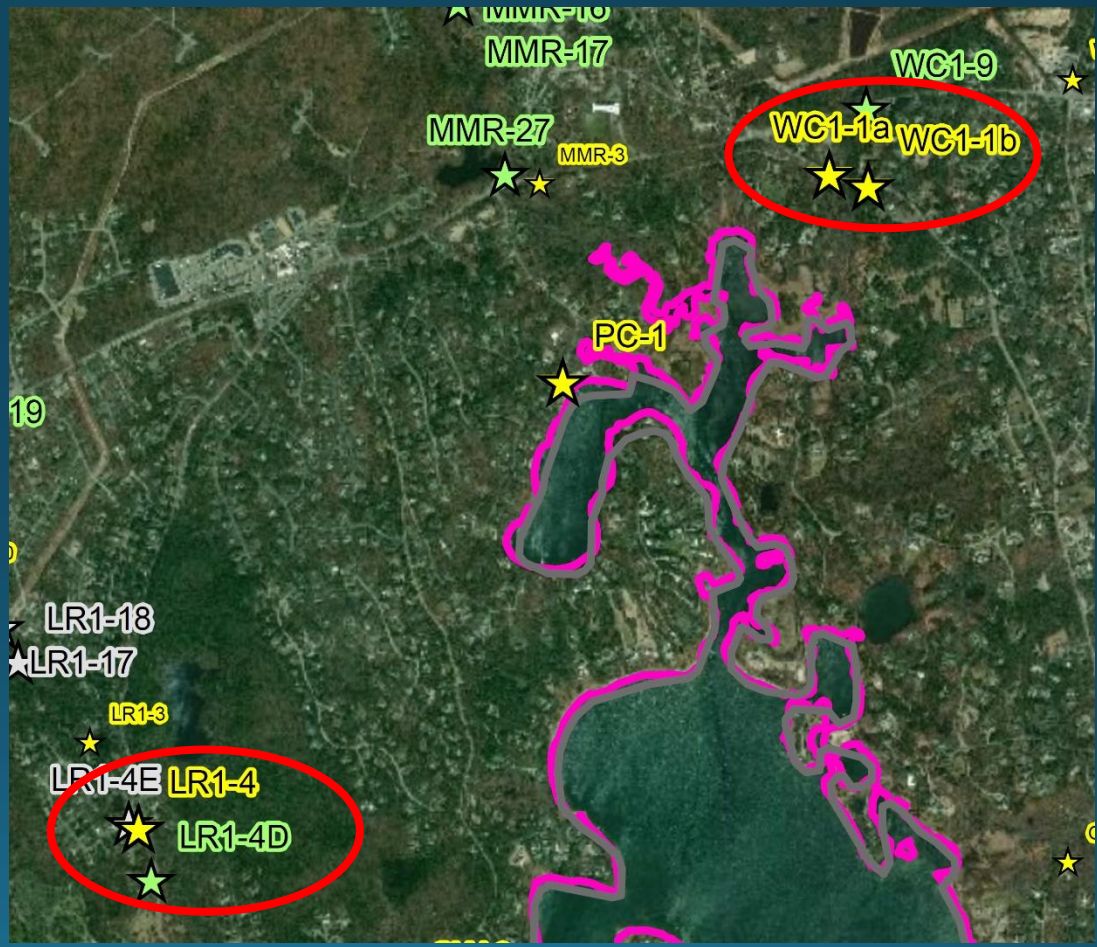
- Cleanout/repair/enhance system as needed
- 0.7-acre Drainage Area, 0.3 acres impervious
- 55% Nitrogen Removal
- 85% Bacteria Removal



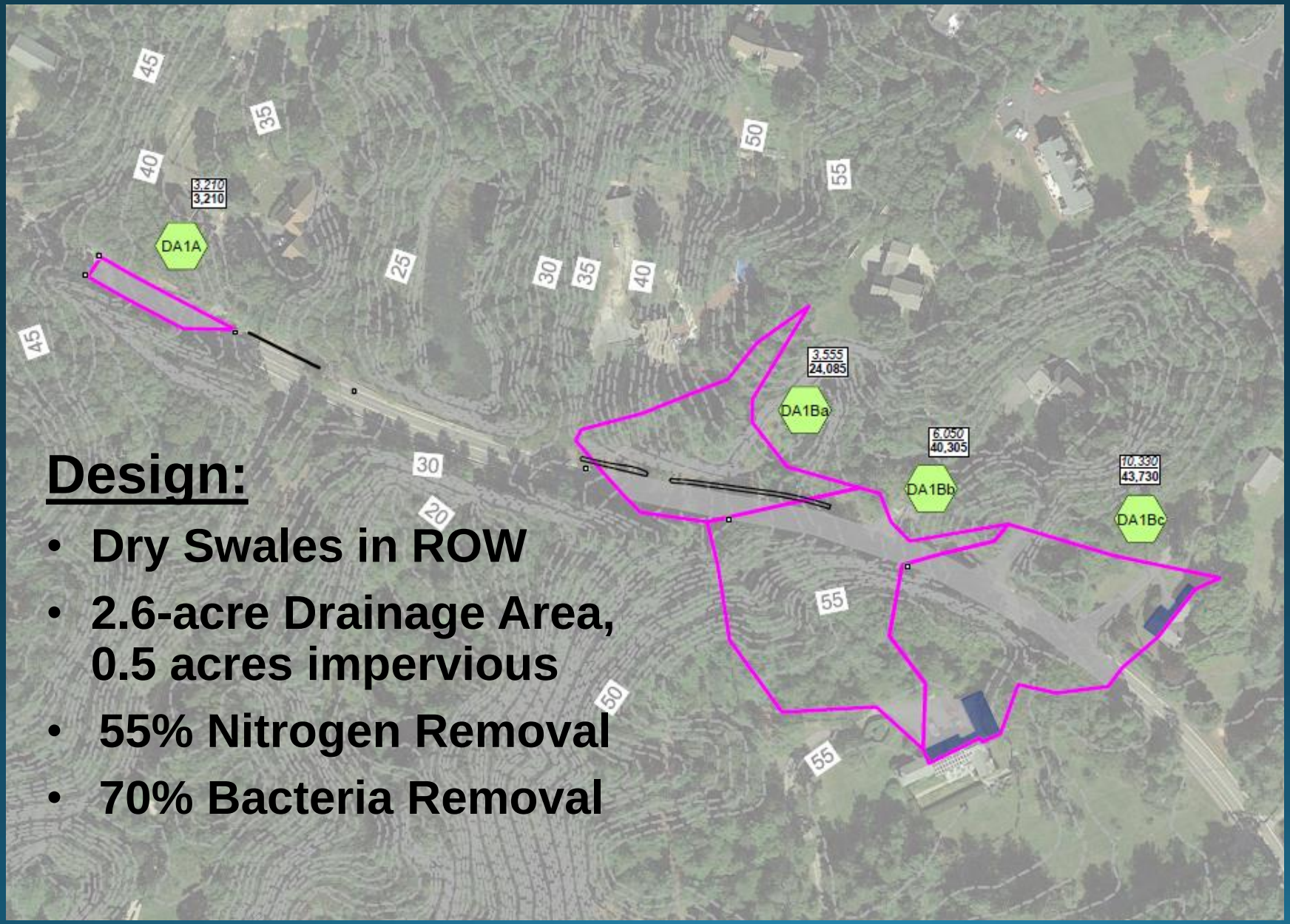



# 25%-Level Designs



# WC1-1A/1B South County Road

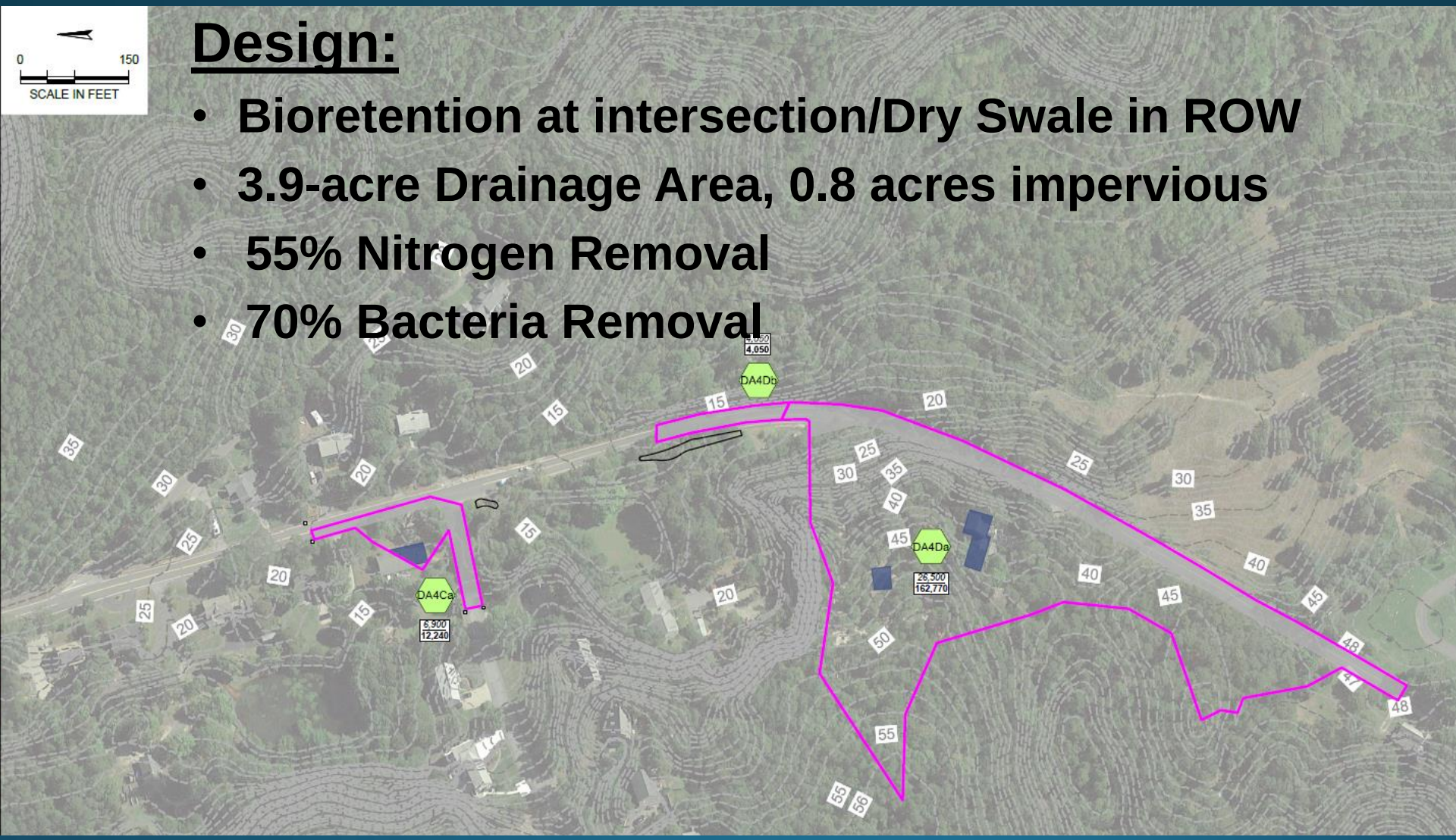



**Design:**

- **Dry Swales in ROW**
- **2.6-acre Drainage Area, 0.5 acres impervious**
- **55% Nitrogen Removal**
- **70% Bacteria Removal**

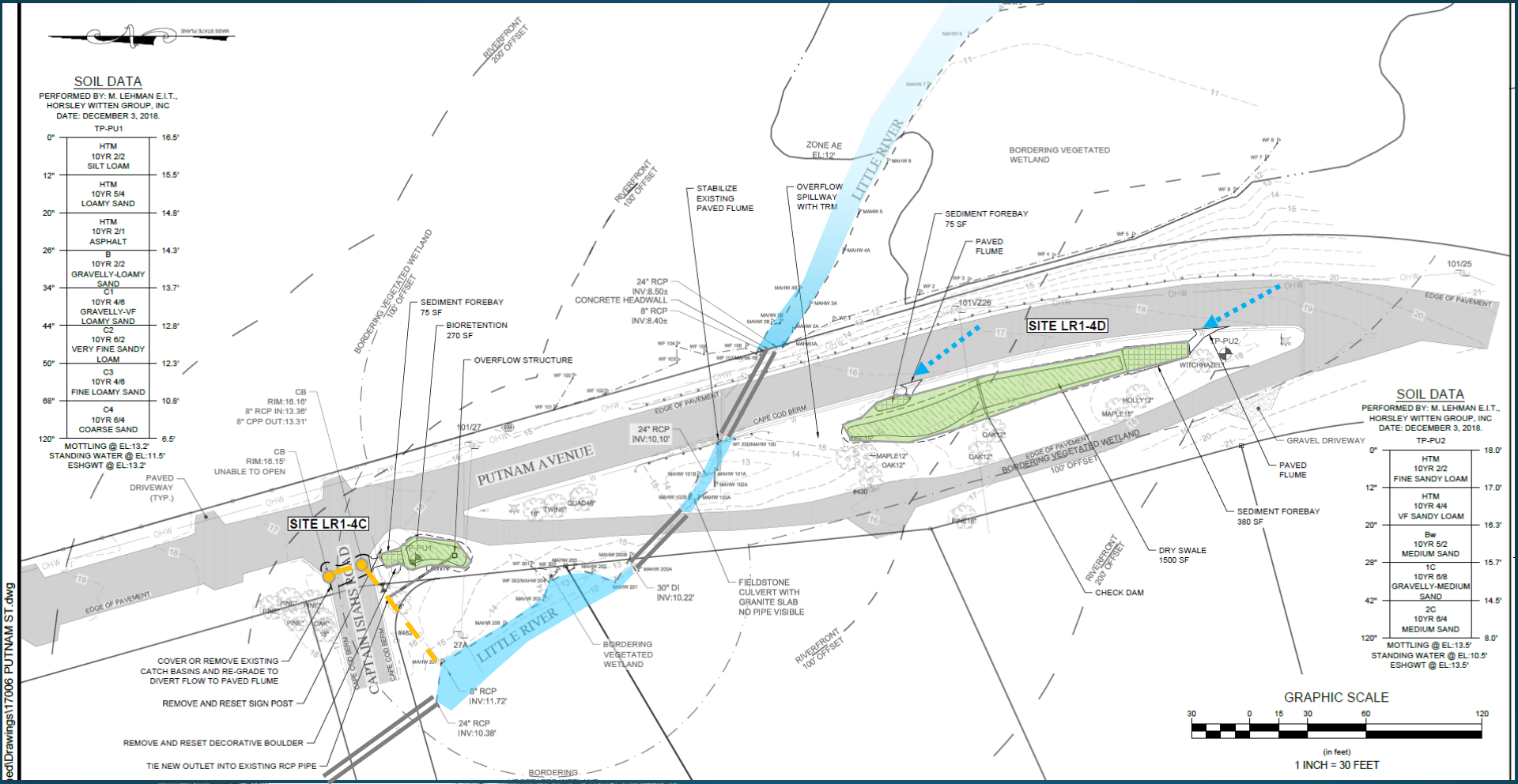

SITE WC1-1A
PAVED FLUME
FOREBAY
60 SF
CHECK DAM
DRY SWALE
120 SF
OUTLET
STRUCTURE
CB
RIM:36.96'
WOODED
AREA
LEACHING
BASIN
RIVERFRONT
100' OFFSET
PROPRIETARY
WATER QUALITY
STRUCTURE
CONCRETE
HEADWALL
CB
RIM:32.19'
DEEP
MARSH/
POND
VERTICAL GRANITE CURB
CAPE COD BERM
BITUMINOUS SIDEWALK
BORDERING VEGETATED WETLAND
100' OFFSET
18" RCP
INV:20.51'
CONCRETE
HEADWALL
24" RCP
INV:20.83'
BORDERING
VEGETATED
WETLAND
SITE WC1-1B
LEACHING
BASIN
OUTLET STRUCTURE
CHECK DAM
DRY SWALE
325 SF
FOREBAY
105 SF
PIPE OUTFALL
CHECK DAMS
DRY SWALE
670 SF
FOREBAY
160 SF
PIPE OUTFALL
PAVED FLUME
24PINE
INV OUT:≤ 36.10'
DIVERSION WEIR
INV OUT:≤ 44.60'
DIVERSION WEIR
GRAPHIC SCALE
30 0 15 30 60 120
(in feet)
1 INCH = 30 FEET

# LR1-4C/4D Putnam Avenue




## Design:

- Bioretention at intersection/Dry Swale in ROW
- 3.9-acre Drainage Area, 0.8 acres impervious
- 55% Nitrogen Removal
- 70% Bacteria Removal

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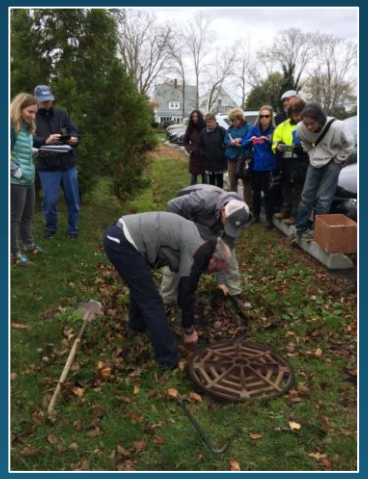
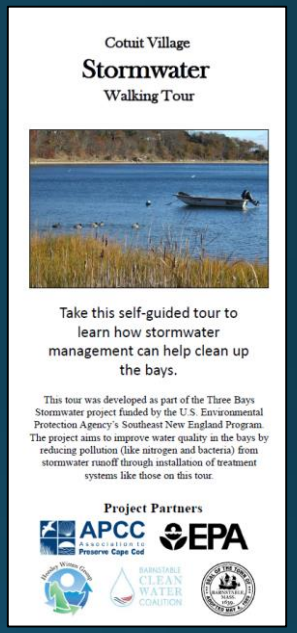
# Education and Outreach

- Rain Garden Workshop
- Cotuit Stormwater Walking Tour
- O&M Workshops
- Videos
- “Green” Your Yard Campaign - Survey
- Public Meeting - August


Photo Credit: Horsley Witten Group






# Eco-Landscape Lecture Series

## Kill Your Lawn

Thursday, May 16th at 2pm

Mashpee Library

Mark Richardson

Director of Horticulture at Tower Hill

## Pollinators

Thursday, June 13th at 2pm

Mashpee Library

Emily May

Pollinator Conservation Specialist, Xerces Society


APCC Association to Preserve Cape Cod
Preserving the Very Nature of Cape Cod

United States Environmental Protection Agency

Massachusetts Office of Coastal Zone Management

Seal of the Town of Barnstable, Mass. 1639. Adopted May 4, 1869

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