Cape Cod 208 Area Water Quality Planning
Wellfleet Harbor & Pamet River Watershed Working Group
Wellfleet Council on Aging
Second Meeting

715 Old King's Hwy, Wellfleet, MA 02667
October 30, 2013
1:00-5:00 p.m.

Agenda

1:00 Welcome, Review 208 goals and Process and the Goals of today's meeting – *Cape Cod Commission*

1:10 Introductions, Agenda Overview, Updates and Action Items– *Facilitator and Working Group*

1:30 Range of Possible Solutions – *Cape Cod Commission and Working Group*
- Technology Matrix
- Technologies Overview
- Survey Questions and Comments
- Additional Questions and Discussion

3:00 Break

3:15 Problem Solving Process and Principles – *Cape Cod Commission and Working Group*
- Overview of 7-steps for Problem-Solving Process
- Examination of Categories of Solutions and their impacts on the Environment, Economy, and Community (triple bottom line)
- Discussion – Identify Considerations and Priorities for Application

4:30 Preparing for Meeting 3 and Beyond – *Cape Cod Commission*
- Review Tools, Alternatives Analysis Approach
- Evaluating Scenarios for Meeting Nitrogen Goals
- Other Process Next Steps

4:45 Public Comments

5:00 Adjourn

Wellfleet Harbor & Pamet River Group

Technologies and Approaches

What is the stakeholder process?

Public Meetings

Watershed Working Groups

Goals, Work Plan & Roles

Affordability, Financing

Baseline Conditions

Technology Options Review

Watershed Scenarios

July

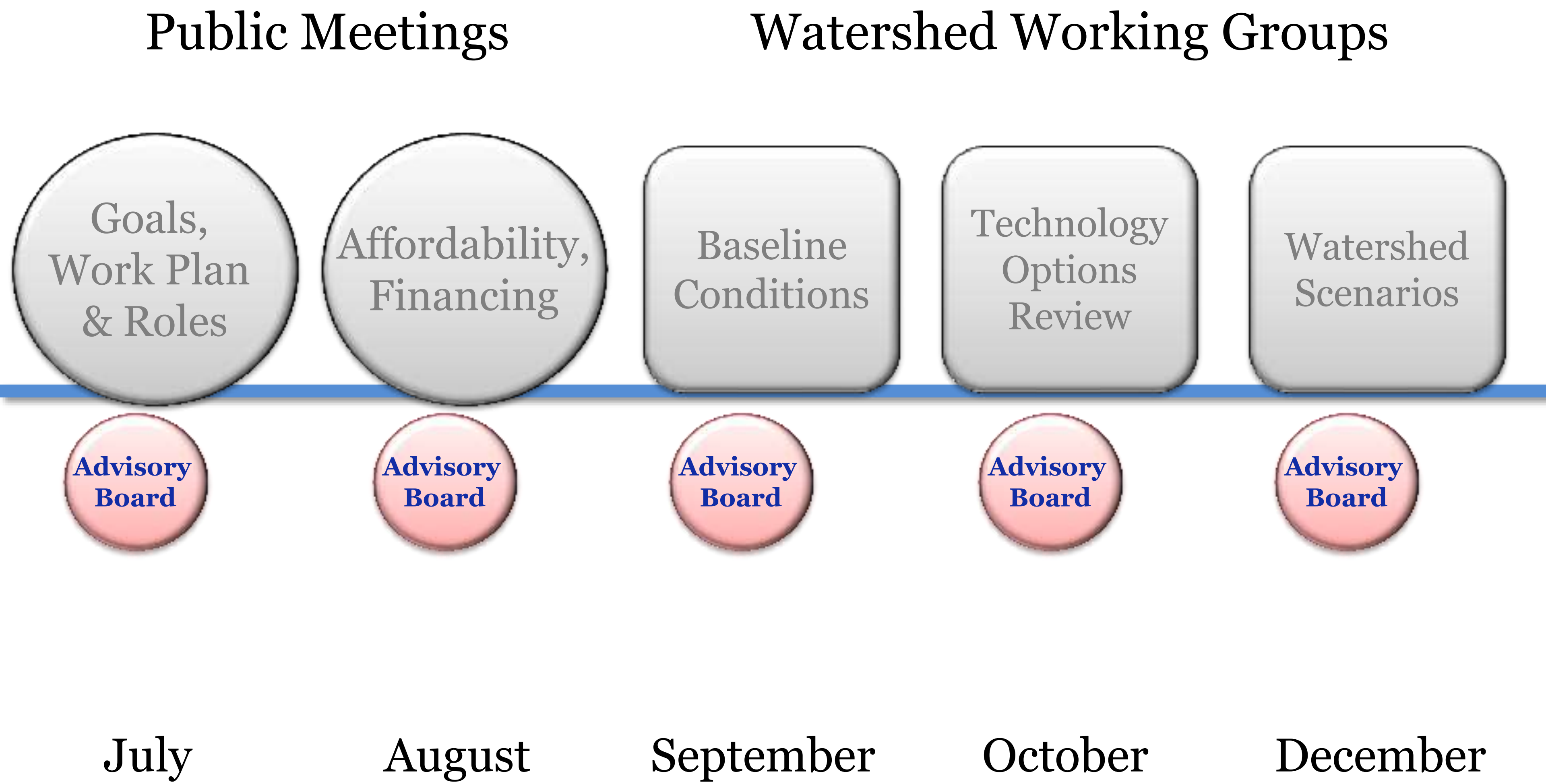
August

September

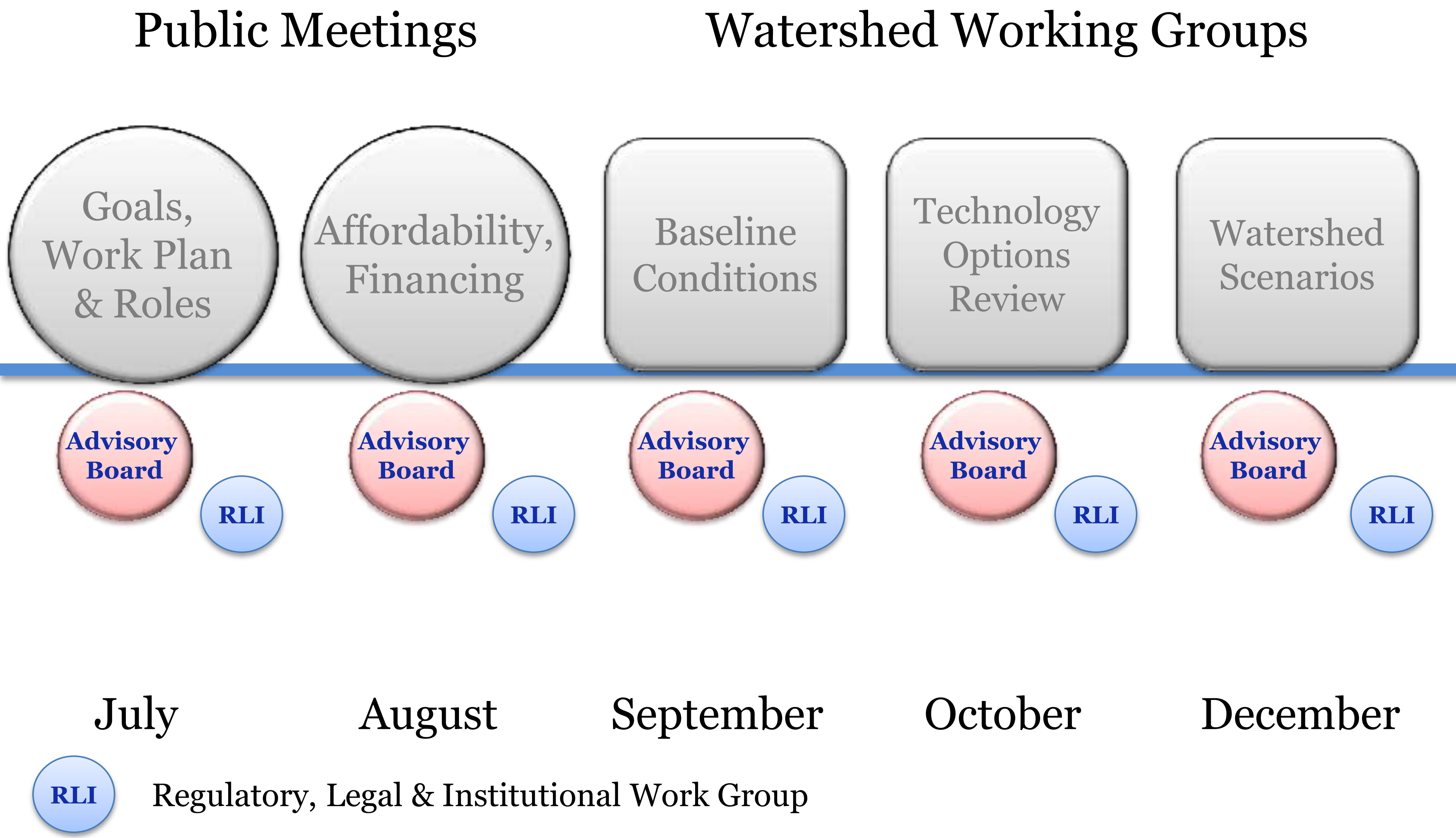
October

December

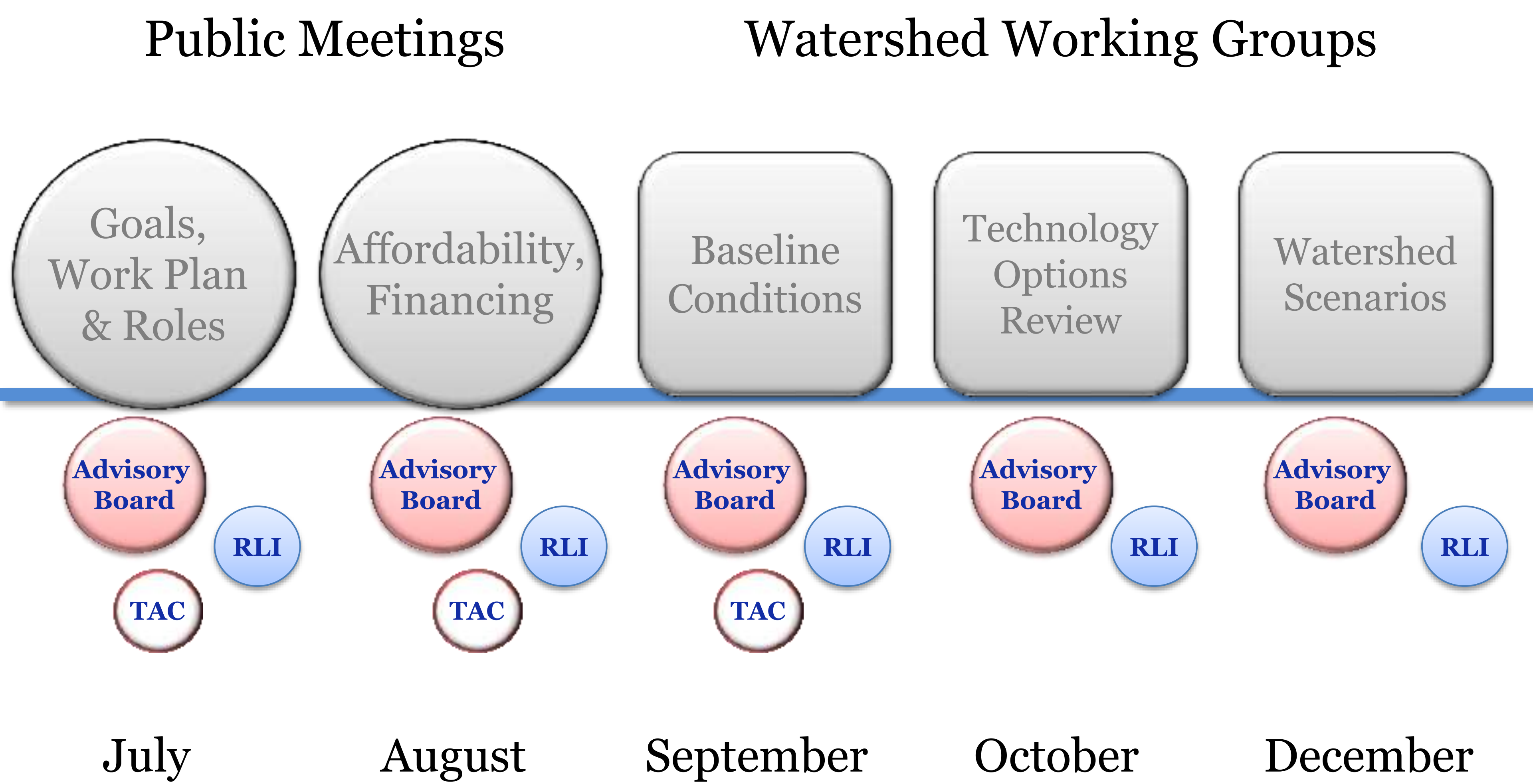
208 Planning Process



208 Planning Process



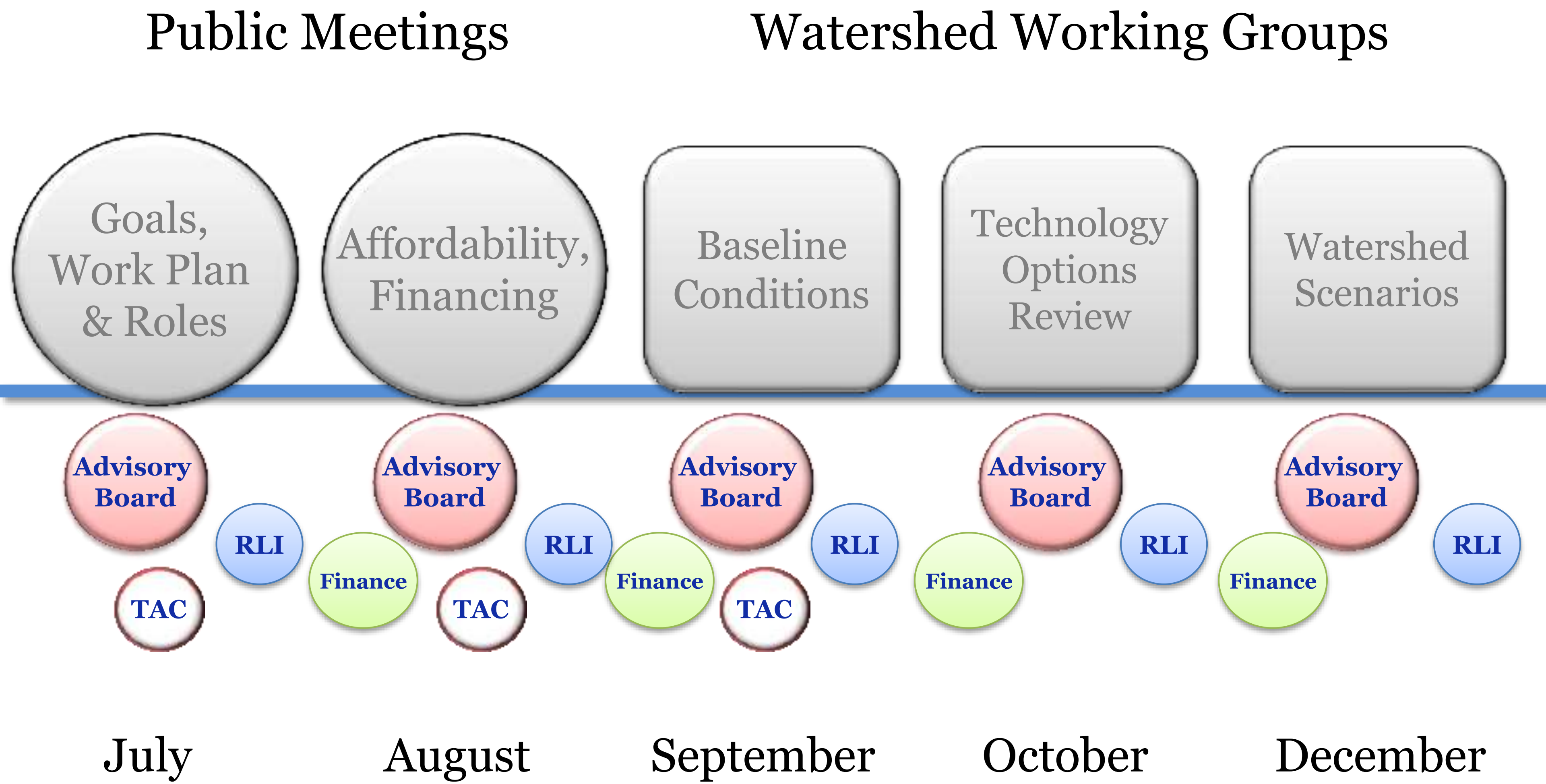
208 Planning Process



RLI — Regulatory, Legal & Institutional Work Group

TAC — Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process



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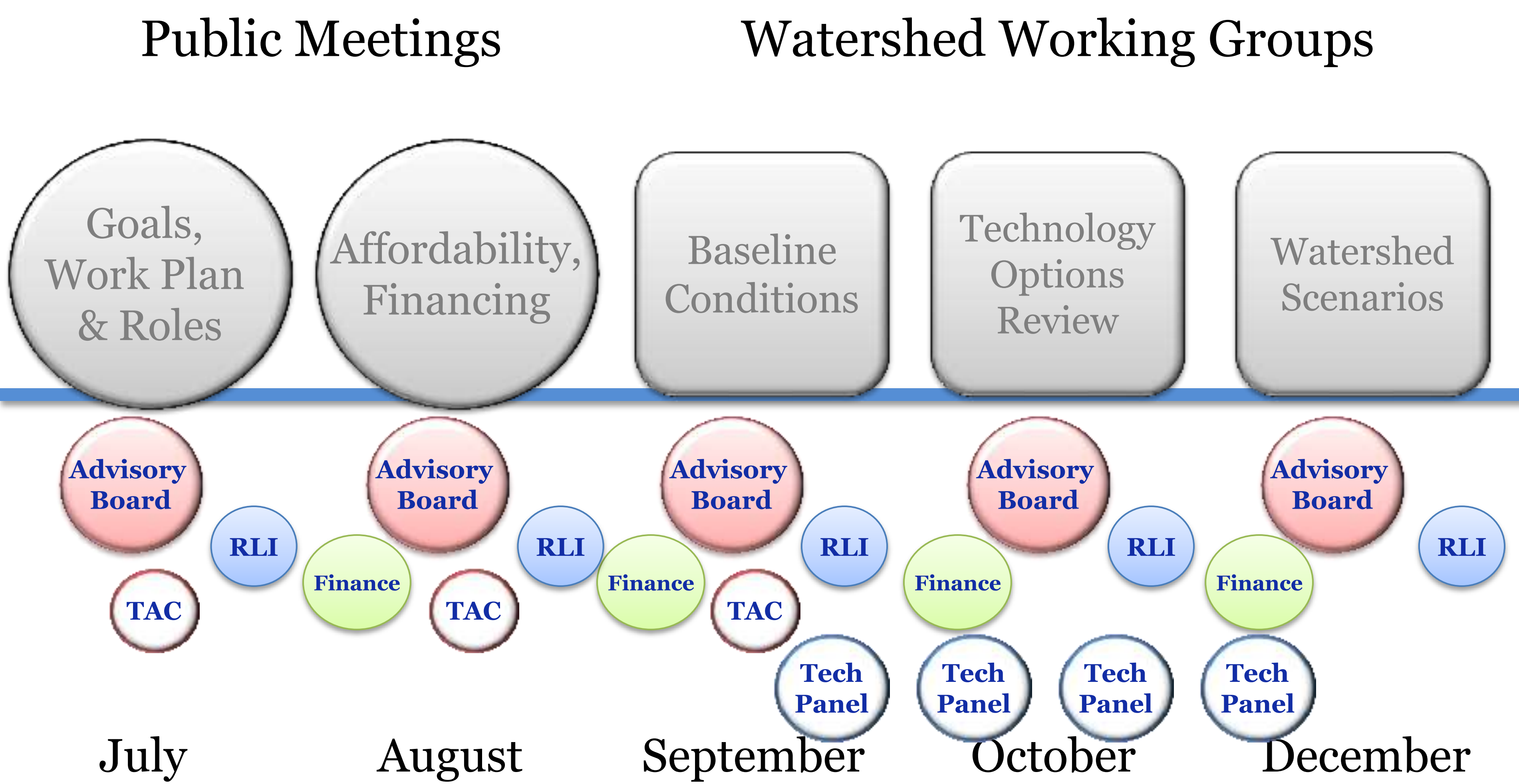

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208 Planning Process

Baseline Conditions

11 Working Group Meetings: Sept 18-27

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

Baseline Conditions

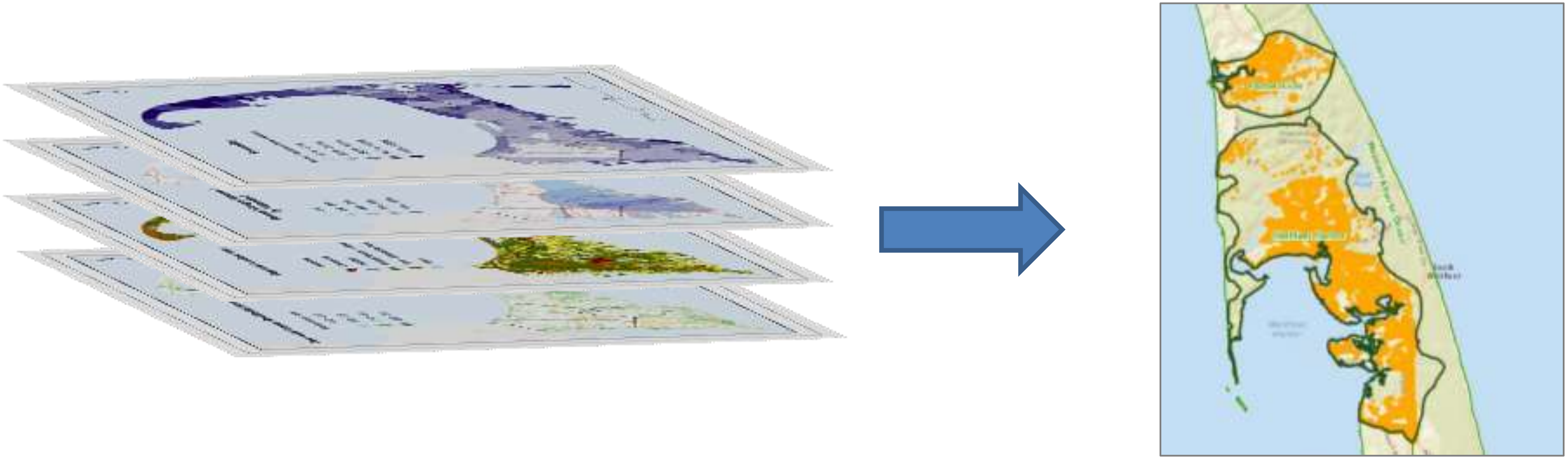
11 Working Group Meetings: Sept 18-27

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

Watershed Event

November 13

Center for the Arts Dennis

Wrap up of Cape2O: ur in charge!

Summary of planning process to date

Outline of second 6 months of the 208 planning process

208 Planning Process

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

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.

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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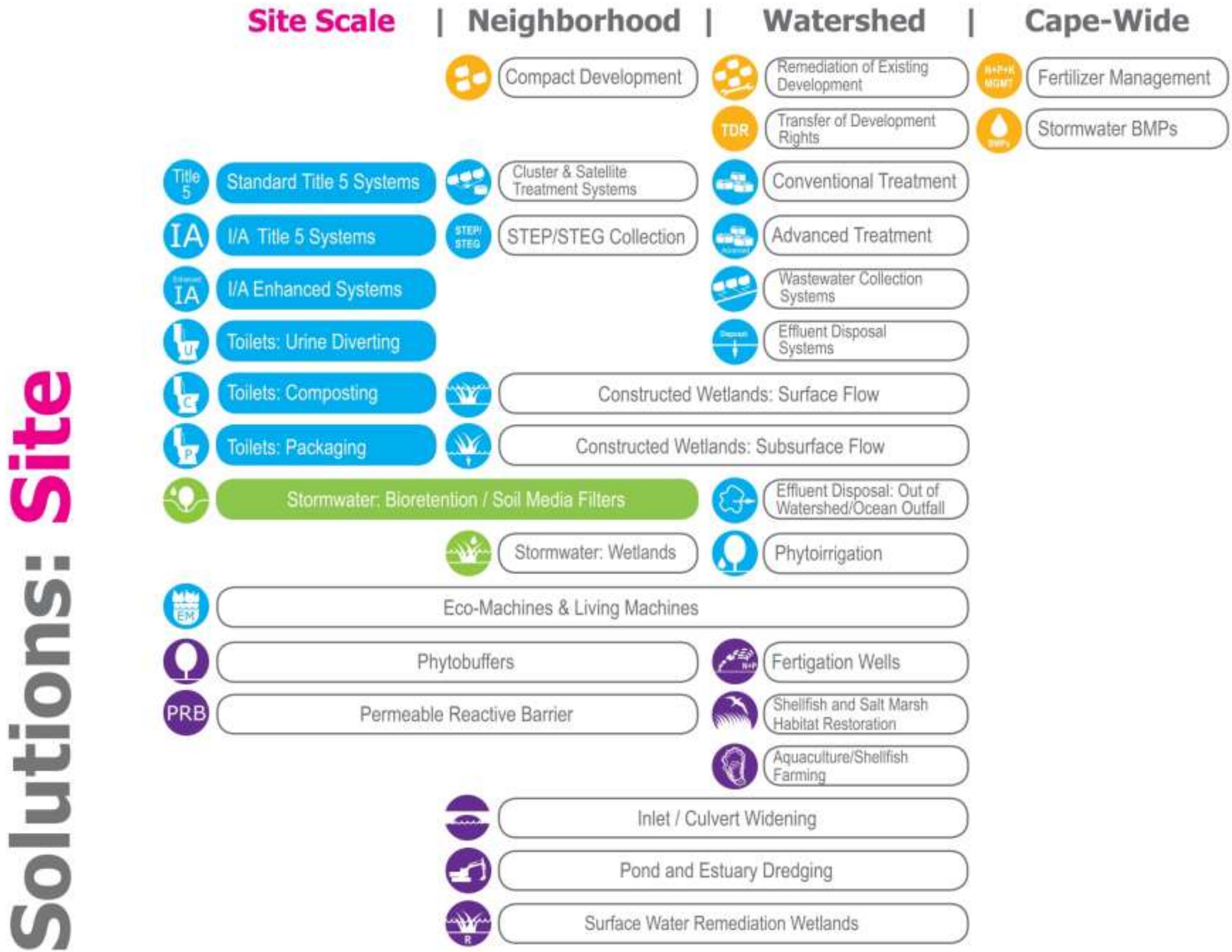
- Certain technologies or approaches will be effective at **preventing** nutrients from entering the water body. Others will be effective at **reducing** or **remediating** nutrients that are already in the groundwater or water body.
- Regulatory programs can address nutrient controls for both existing development and future development.


Site Scale | Neighborhood | Watershed | Cape-Wide
Solutions
Compact Development
Remediation of Existing Development
Fertilizer Management
TDR
Transfer of Development Rights
Stormwater BMPs
Title 5
Standard Title 5 Systems
Cluster & Satellite Treatment Systems
Conventional Treatment
IA
I/A Title 5 Systems
STEP/ STEG
STEP/STEG Collection
Advanced Treatment
IA
I/A Enhanced Systems
Wastewater Collection Systems
Toilets: Urine Diverting
Effluent Disposal Systems
Toilets: Composting
Constructed Wetlands: Surface Flow
Toilets: Packaging
Constructed Wetlands: Subsurface Flow
Stormwater: Bioretention / Soil Media Filters
Effluent Disposal: Out of Watershed/Ocean Outfall
Stormwater: Wetlands
Phytoirrigation
EM
Eco-Machines & Living Machines
Phytobuffers
Fertigation Wells
PRB
Permeable Reactive Barrier
Shellfish and Salt Marsh Habitat Restoration
Aquaculture/Shellfish Farming
Inlet / Culvert Widening
Pond and Estuary Dredging
Surface Water Remediation Wetlands


Solutions: Site
Site Scale | Neighborhood | Watershed | Cape-Wide
Compact Development
Remediation of Existing Development
N+P+K MGMT
Fertilizer Management
TDR
Transfer of Development Rights
BMPs
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Title 5
Standard Title 5 Systems
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I/A Title 5 Systems
STEP/ STEG
STEP/STEG Collection
Advanced Treatment
Enhanced IA
I/A Enhanced Systems
Wastewater Collection Systems
U
Toilets: Urine Diverting
Disposal
Effluent Disposal Systems
C
Toilets: Composting
Constructed Wetlands: Surface Flow
P
Toilets: Packaging
Constructed Wetlands: Subsurface Flow
Stormwater: Bioretention / Soil Media Filters
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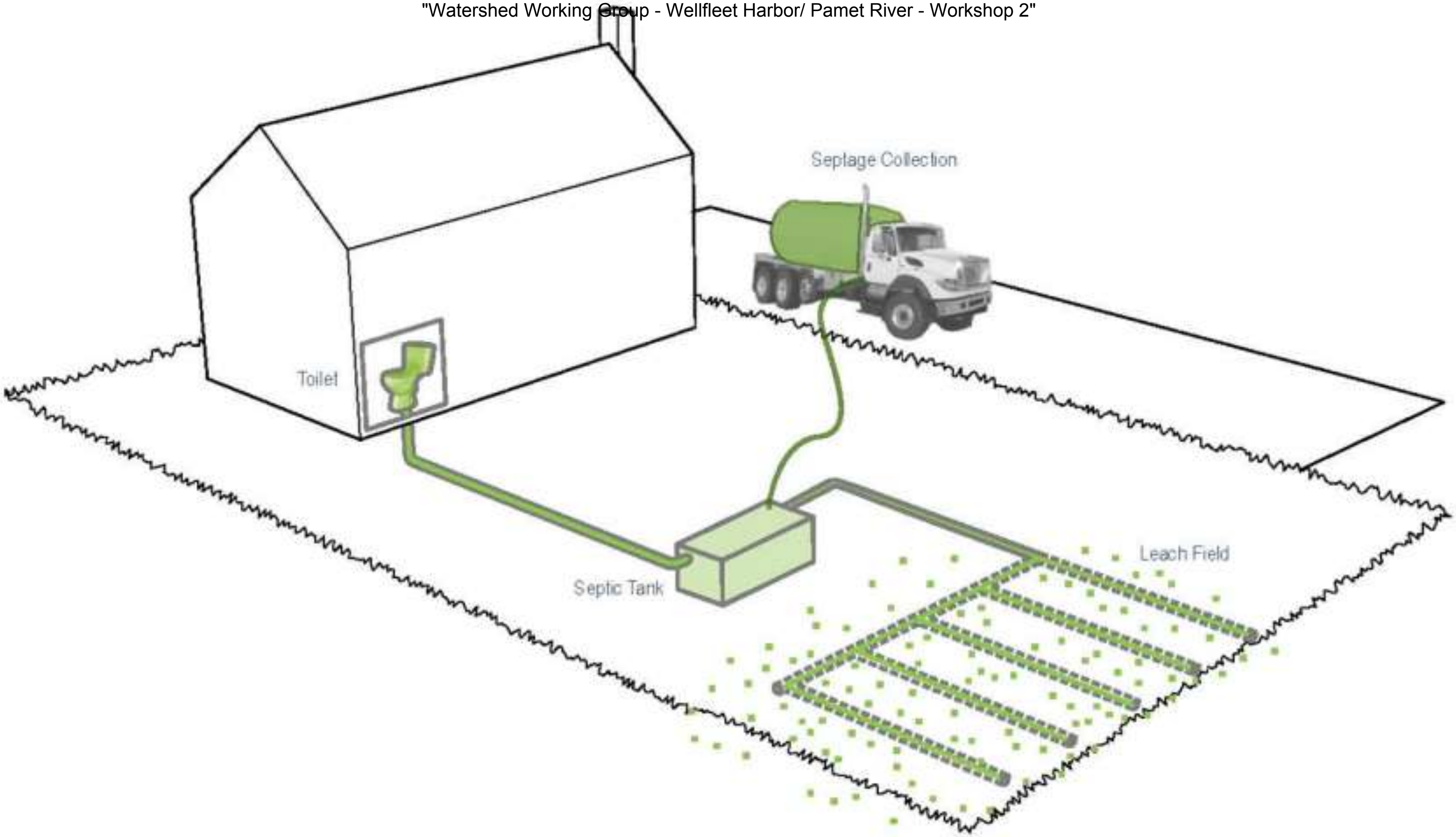
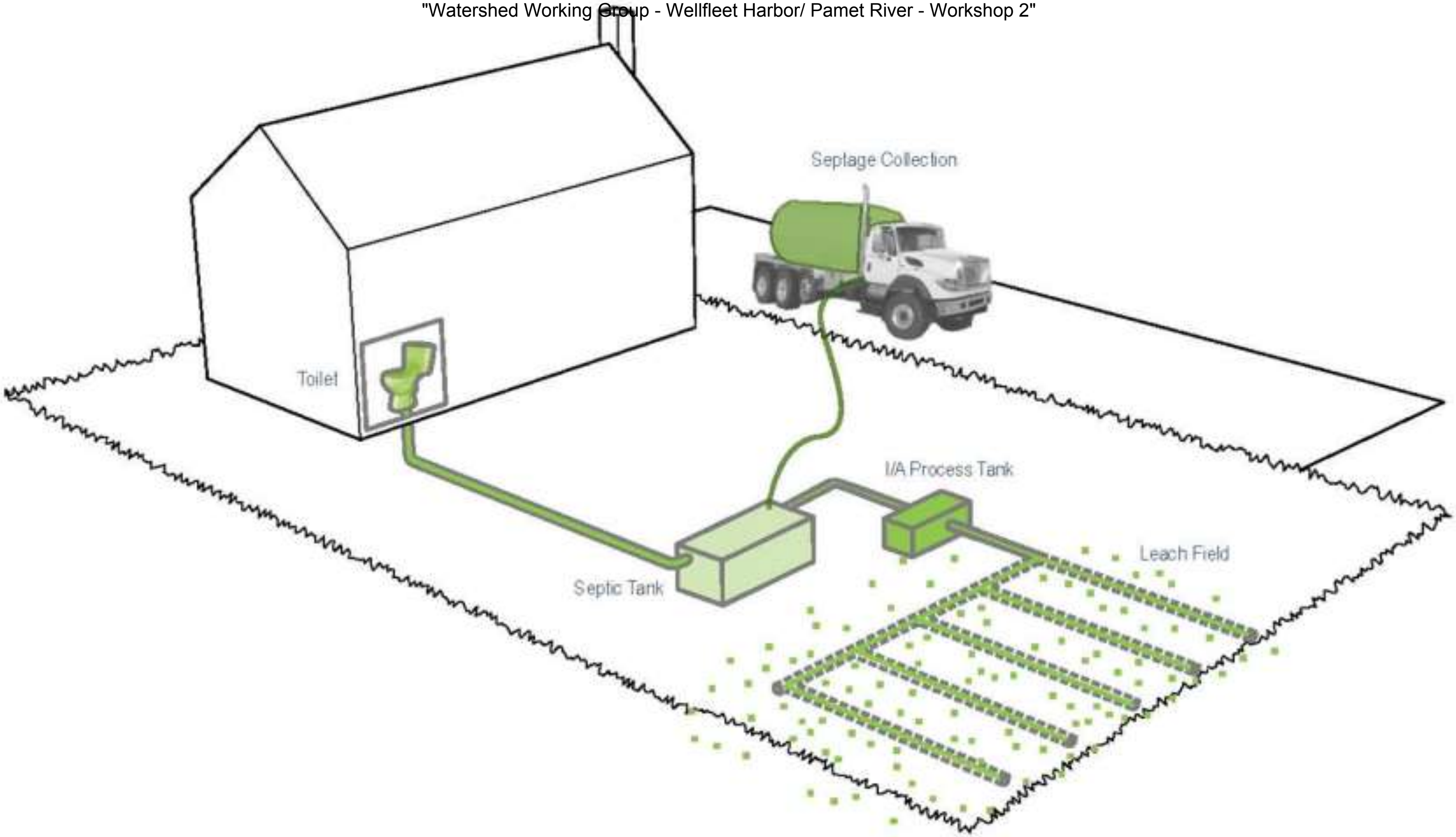


Scale: SITE
Target: WASTEWATER

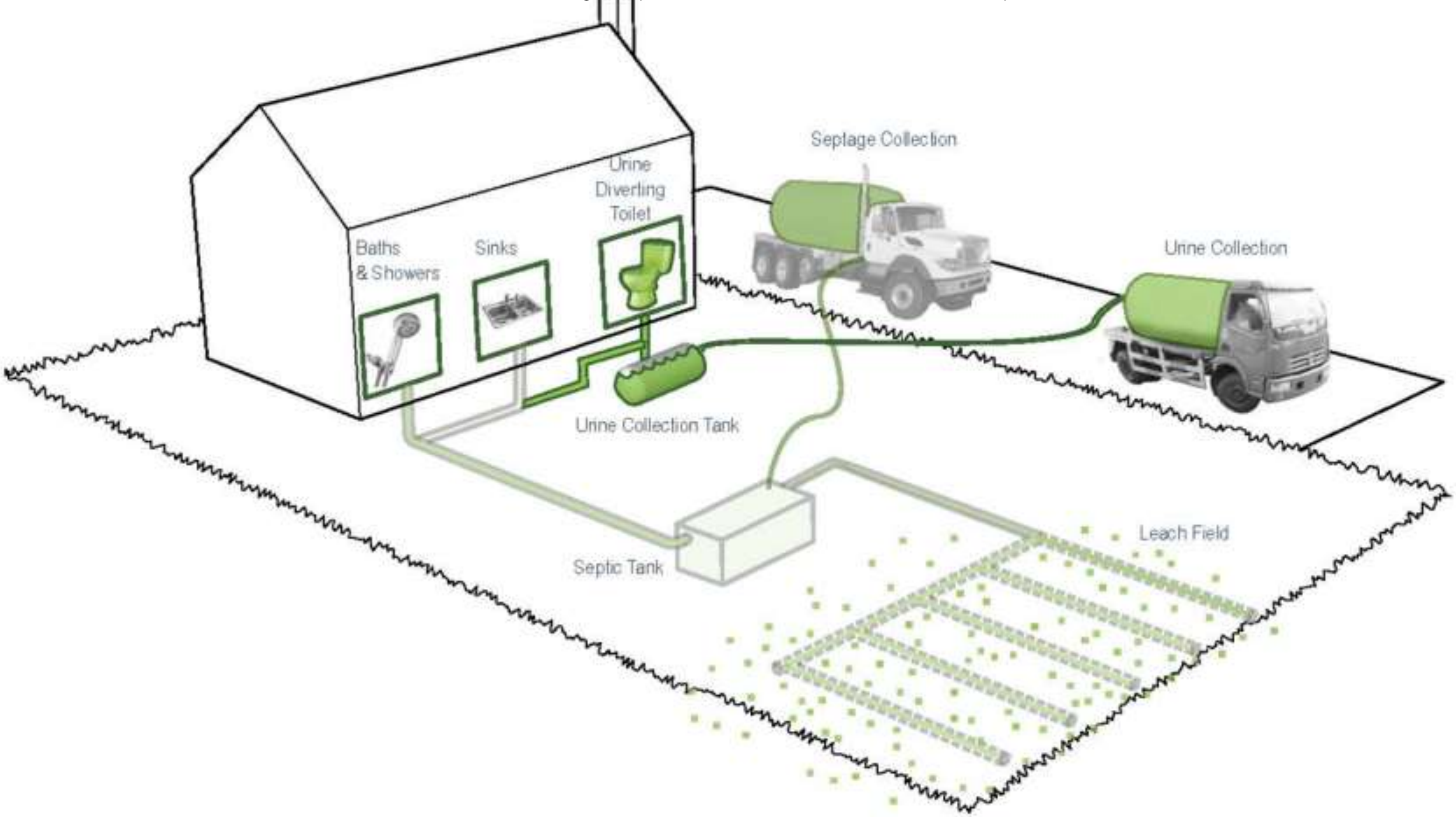
Standard Title 5 Systems

Title 5



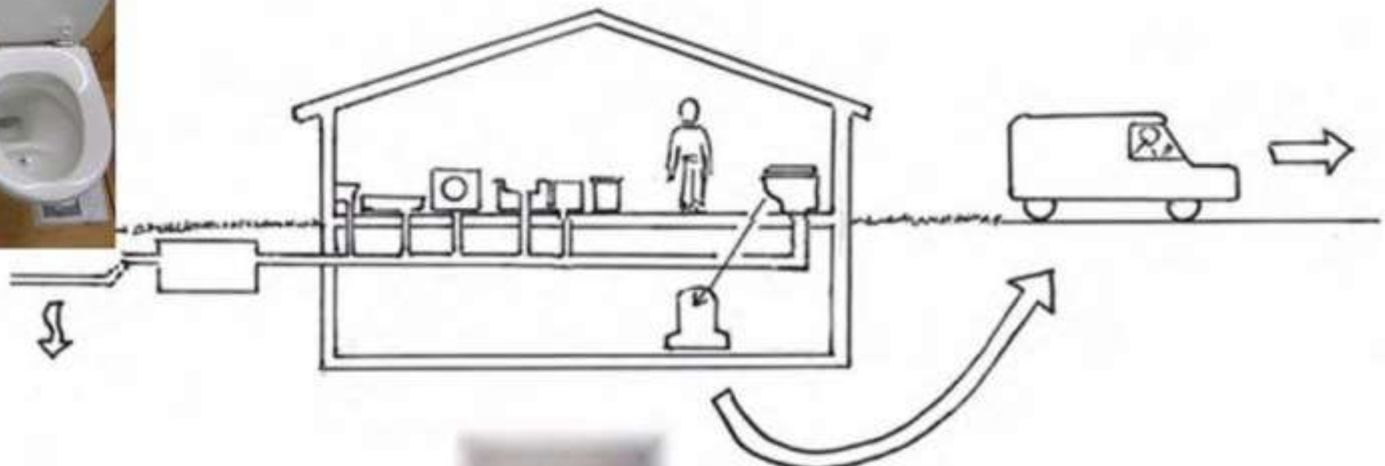
Scale: SITE
Target: WASTEWATER

I/A Title 5 Systems



Scale: SITE
Target: WASTEWATER

Toilets: Urine Diverting



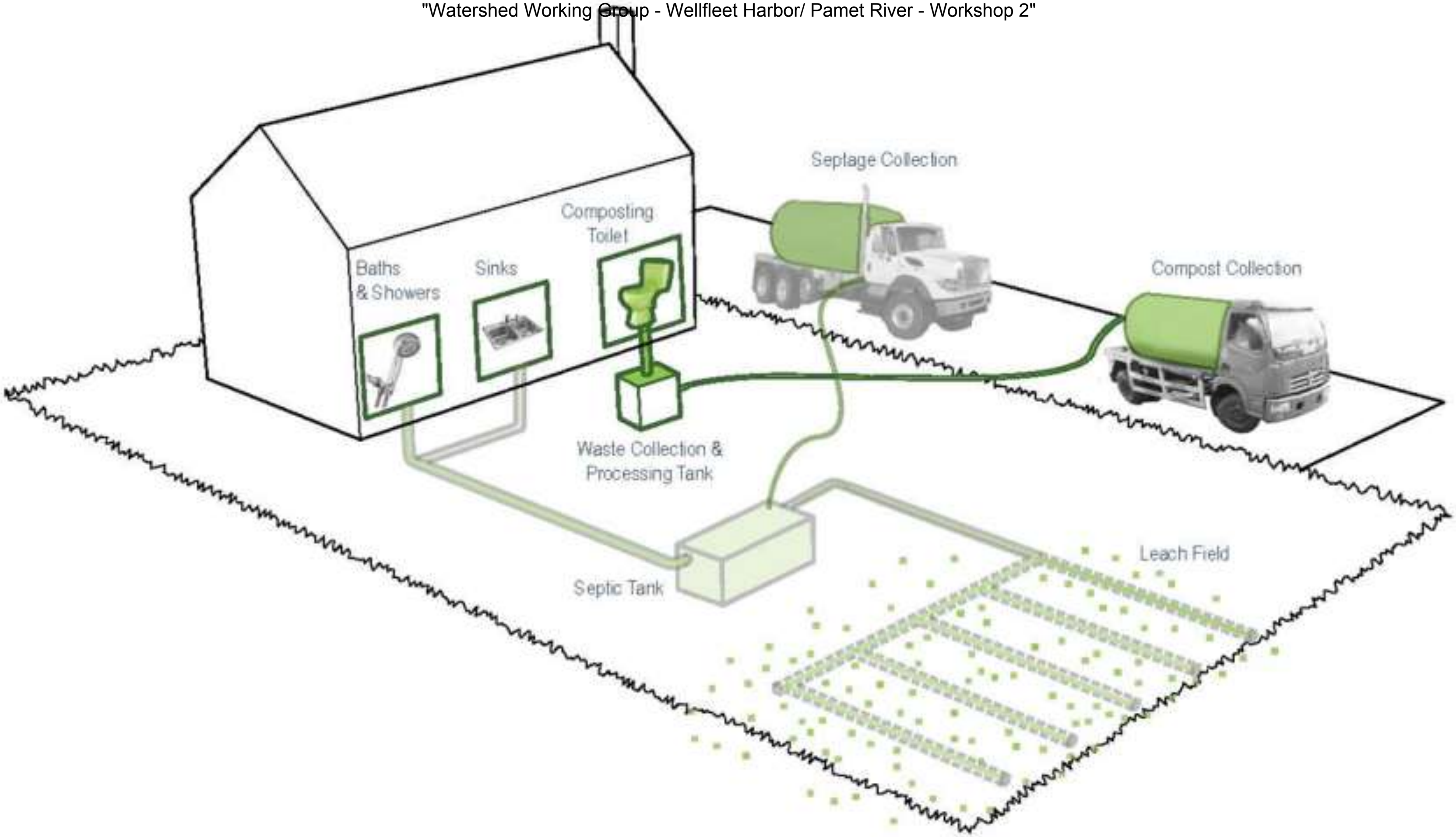
Waterless
Urinal

IBC container
(220 gallons)

40" x 40" x48"

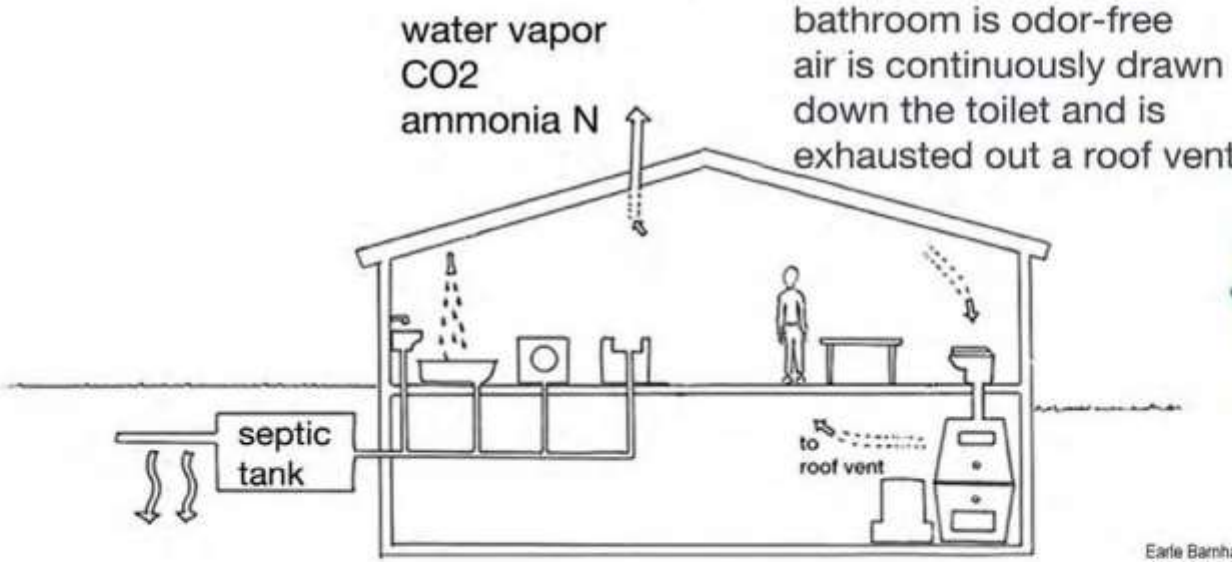
Source: Earle Barnhart, The Green Center Inc. and Horsley-Witten Group Inc.

Toilets: Urine Diverting



Scale: SITE
Target: WASTEWATER

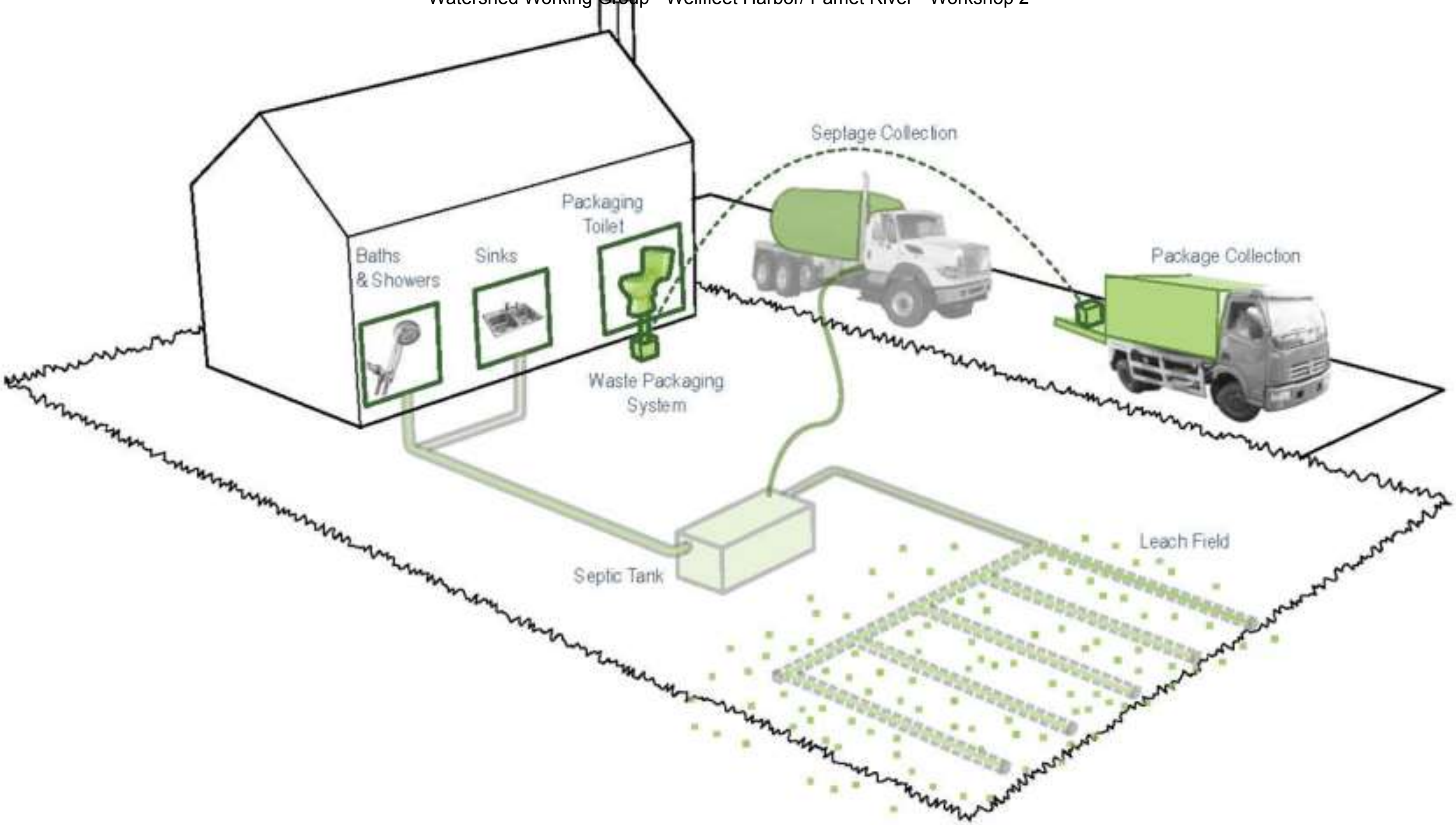
Toilets: Composting



Earle Barnhart
The Green Center, Inc

Source: Earle Barnhart, The Green Center Inc.

Toilets: Composting

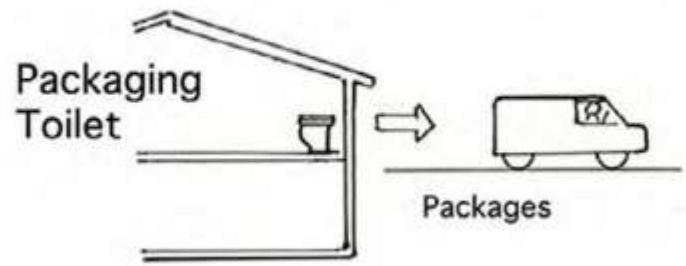


Scale: SITE
Target: WASTEWATER

Toilets: Packaging

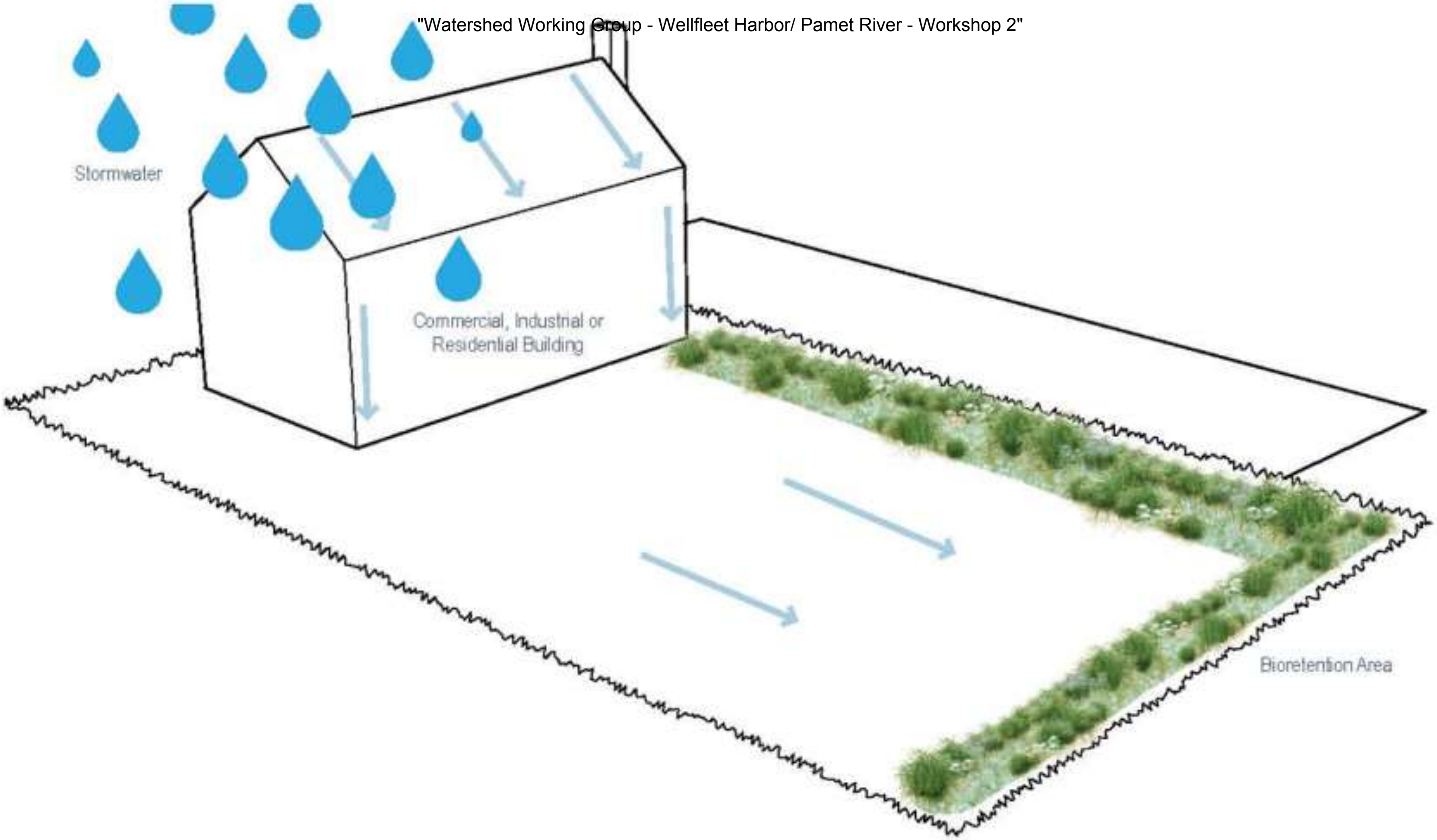
PACTO®

LOOWATT



Source: Earle Barnhart, The Green Center Inc.

Toilets: Packaging



Scale: SITE
Target: STORMWATER

Stormwater: Bioretention / Soil Media Filters

Precedent: 12th Ave. Stormwater Project, Portland, OR
Source: City of Portland

Stormwater: Bioretention / Soil Media Filters

Rain Gardens

"Watershed Working Group - Wellfleet Harbor/ Pamet River - Workshop 2"

Solutions: Neighborhood

Site Scale | Neighborhood | Watershed | Cape-Wide

- Compact Development
- Remediation of Existing Development
- Transfer of Development Rights
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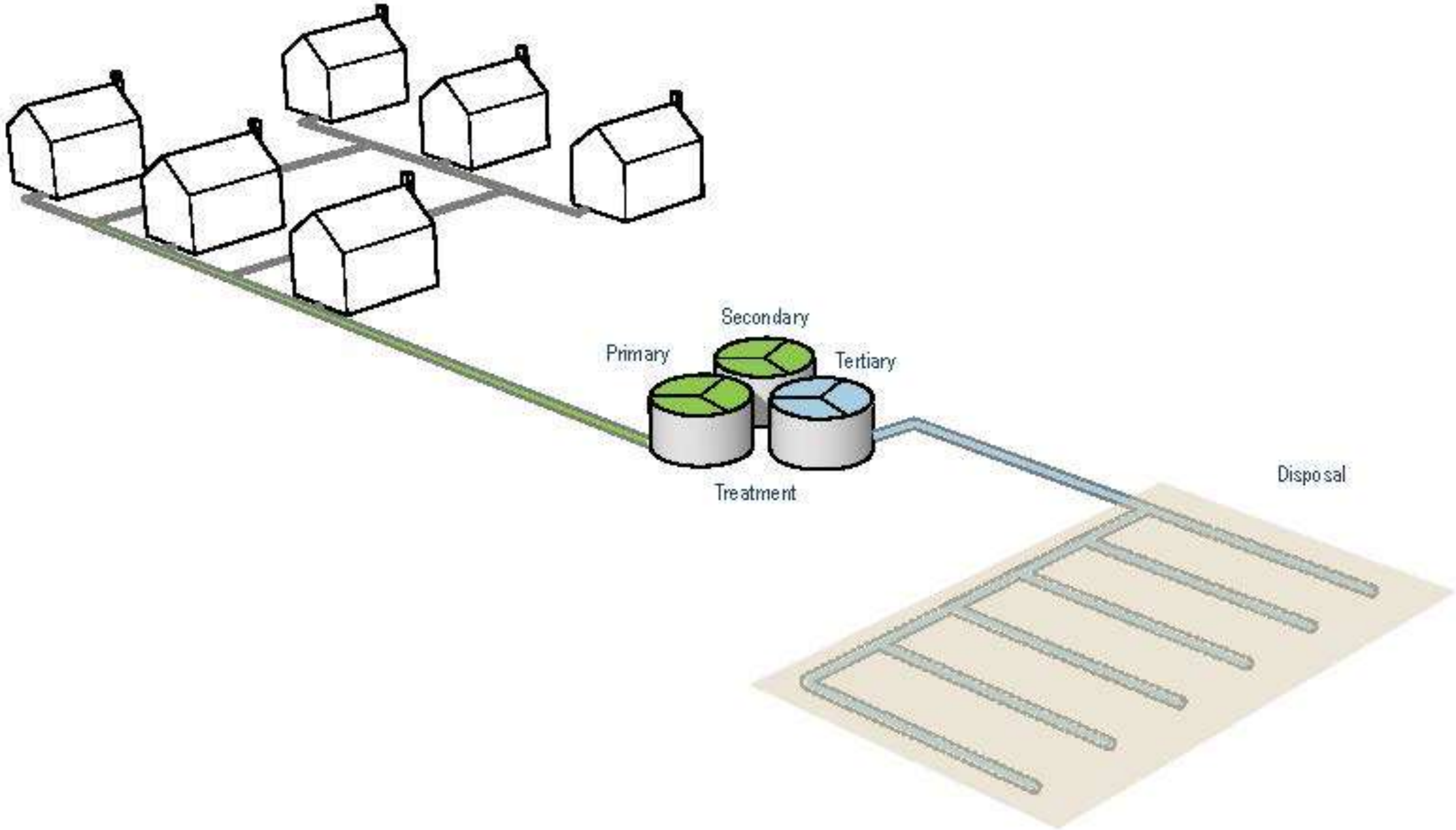
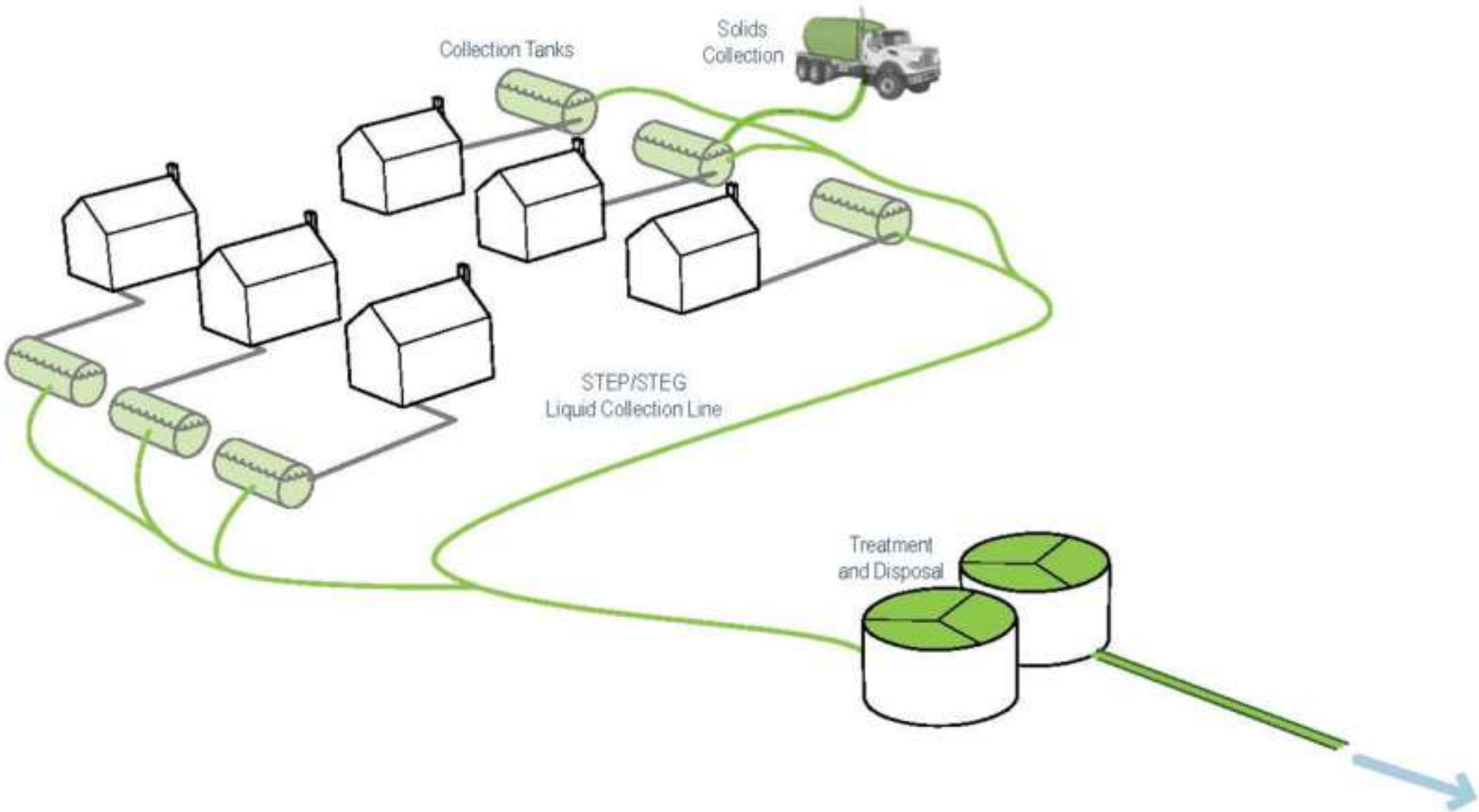


Scale: NEIGHBORHOOD
Target: WASTEWATER

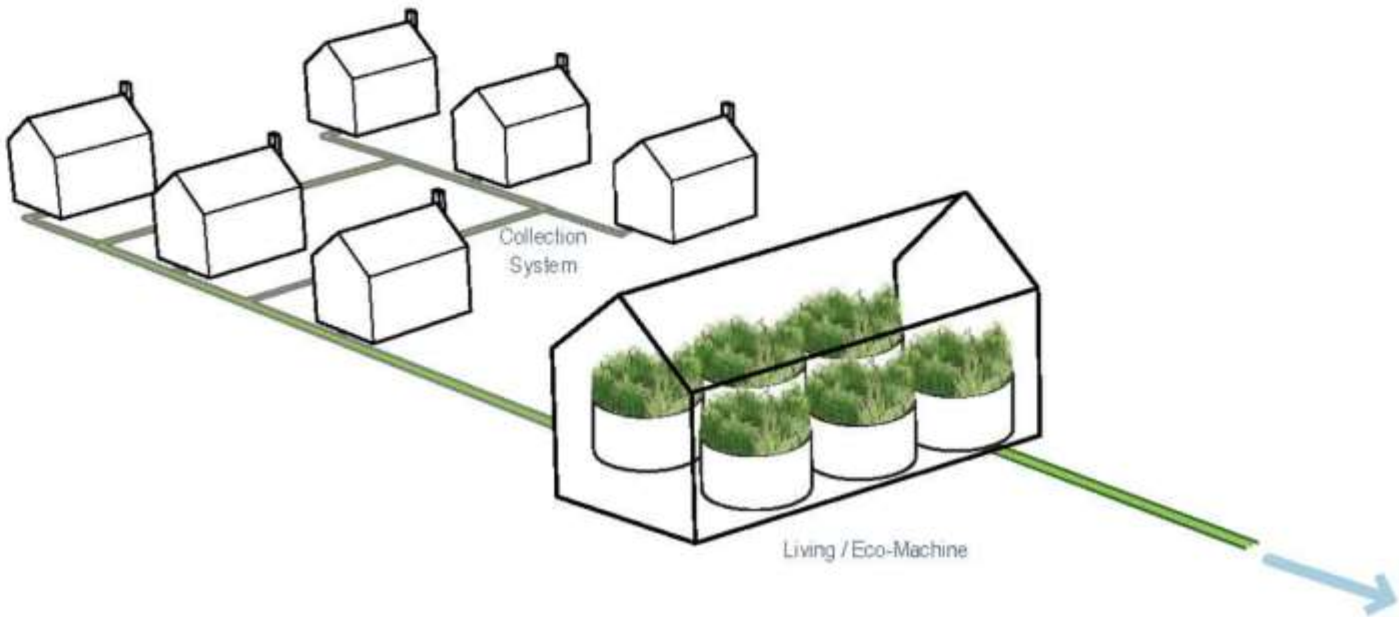
Cluster & Satellite Treatment Systems



Scale: NEIGHBORHOOD
Target: WASTEWATER

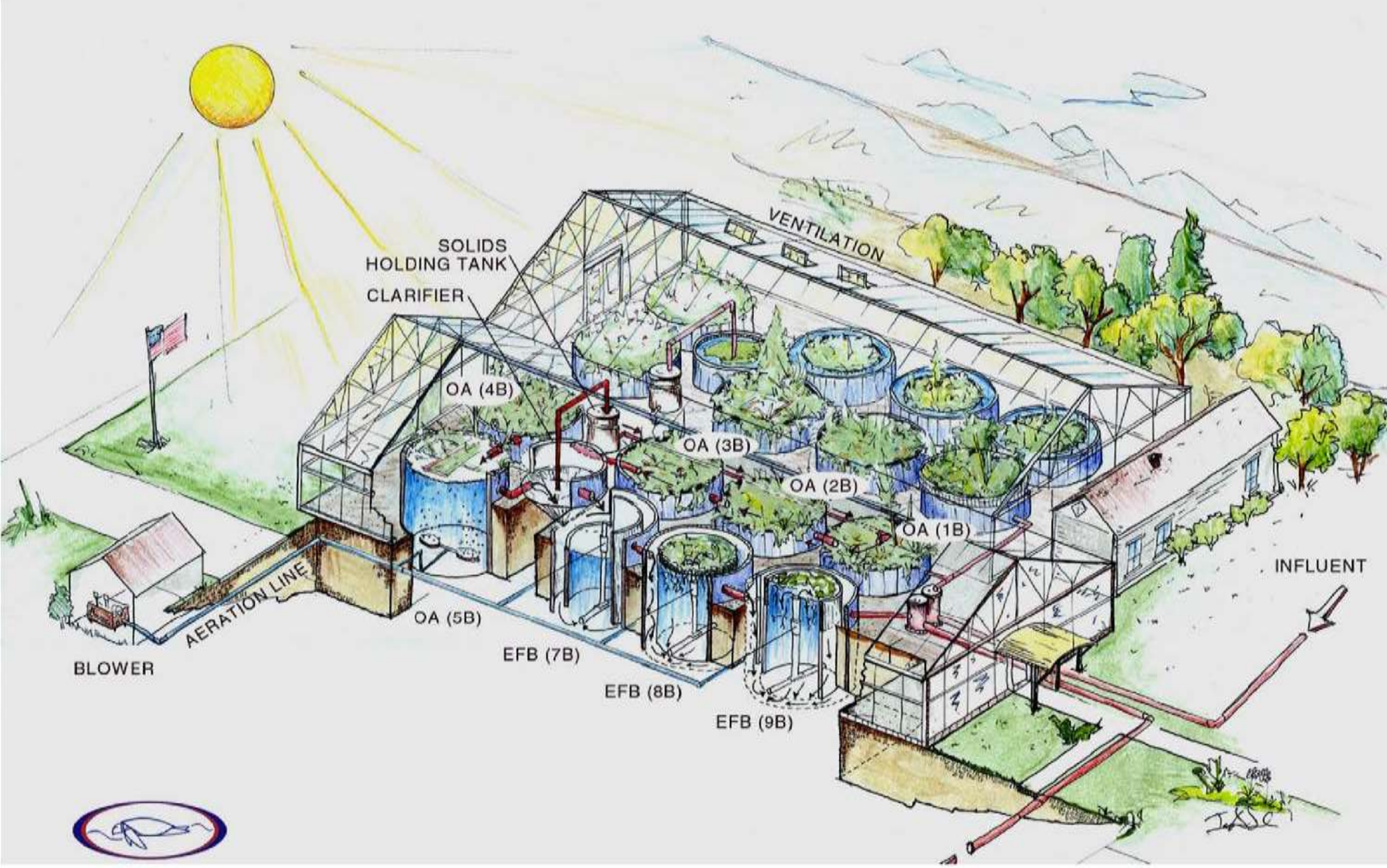
STEP / STEG Collection

STEP/
STEG



Scale: NEIGHBORHOOD
Target: WASTEWATER

Eco-Machines and
Living Machines

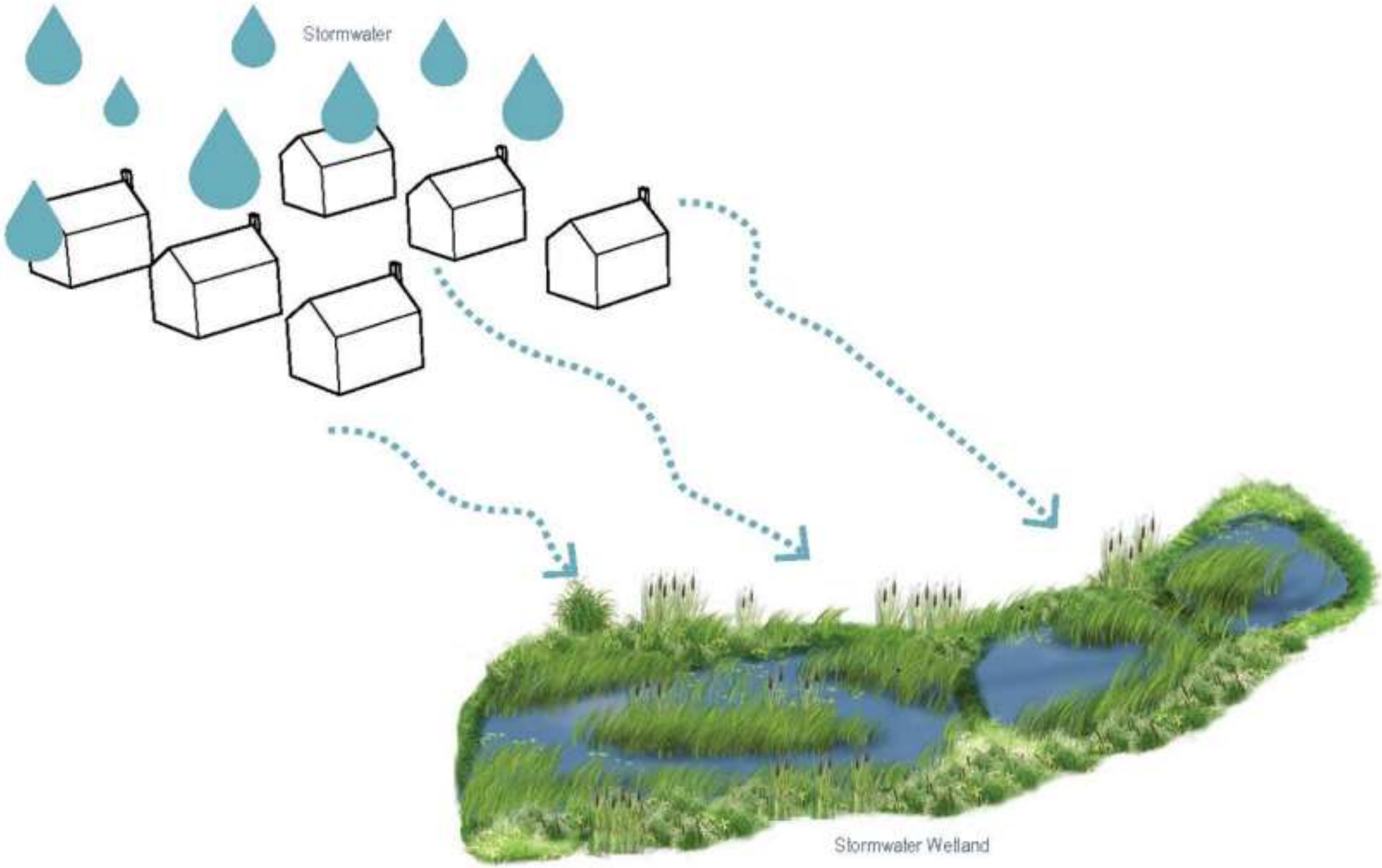


Precedent: Living Machine, South Burlington, VT
Source: Todd Ecological

Eco-Machines and
Living Machines

Precedent: Living Machine - South Burlington, VT + Photobioreactors - Falmouth, MA
Source: Todd Ecological and Tom Cambareri

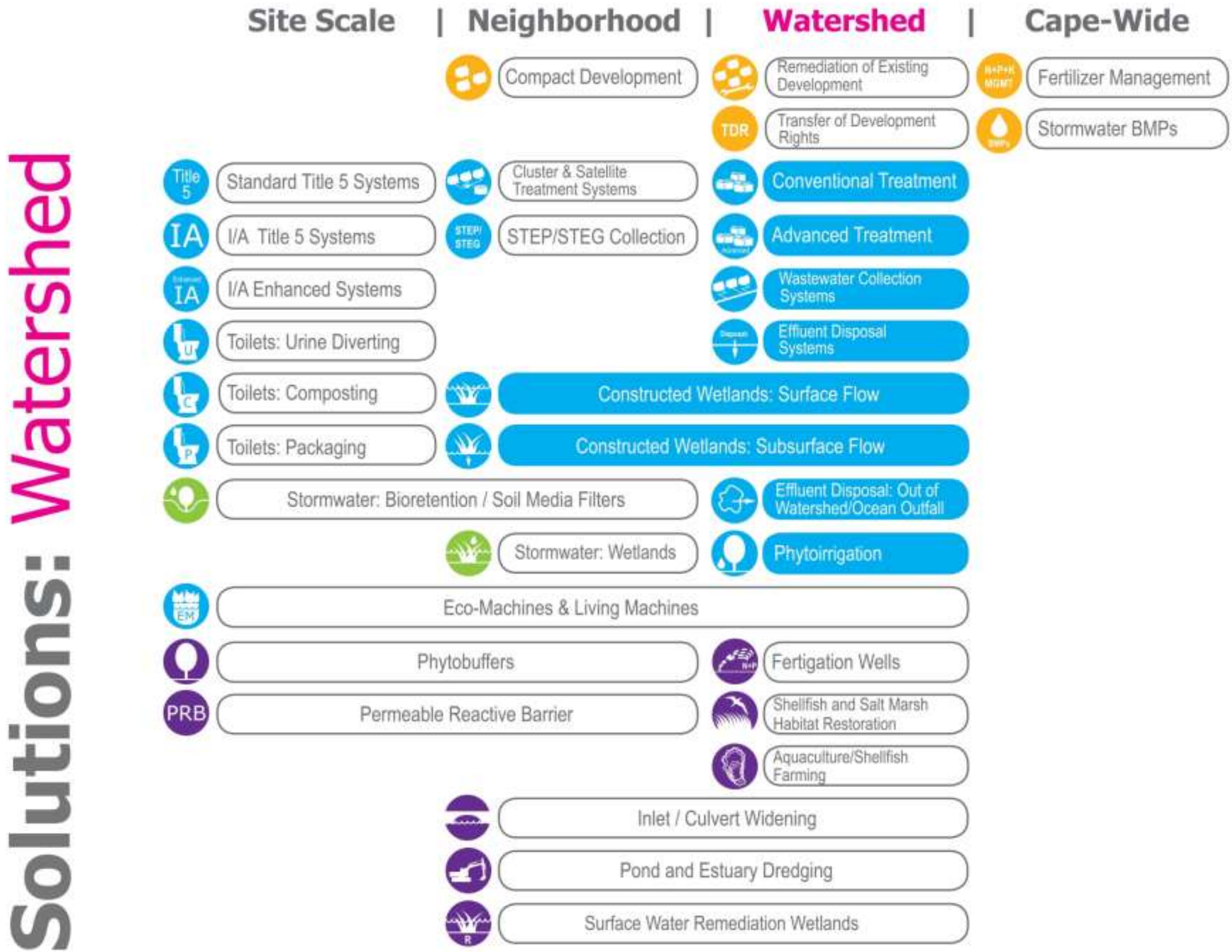
Eco-Machines and Living Machines

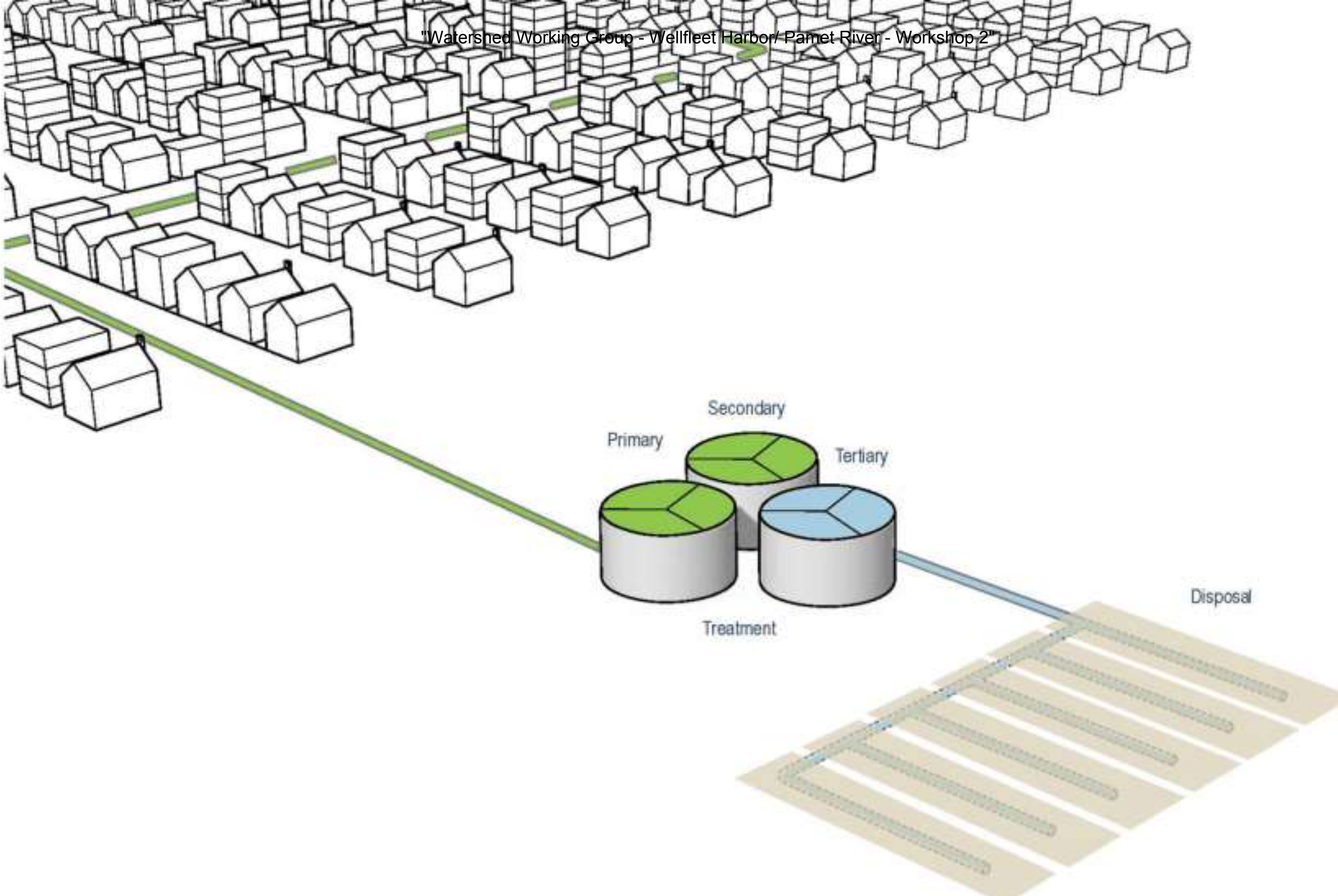


Scale: NEIGHBORHOOD
Target: STORMWATER

Stormwater Wetlands

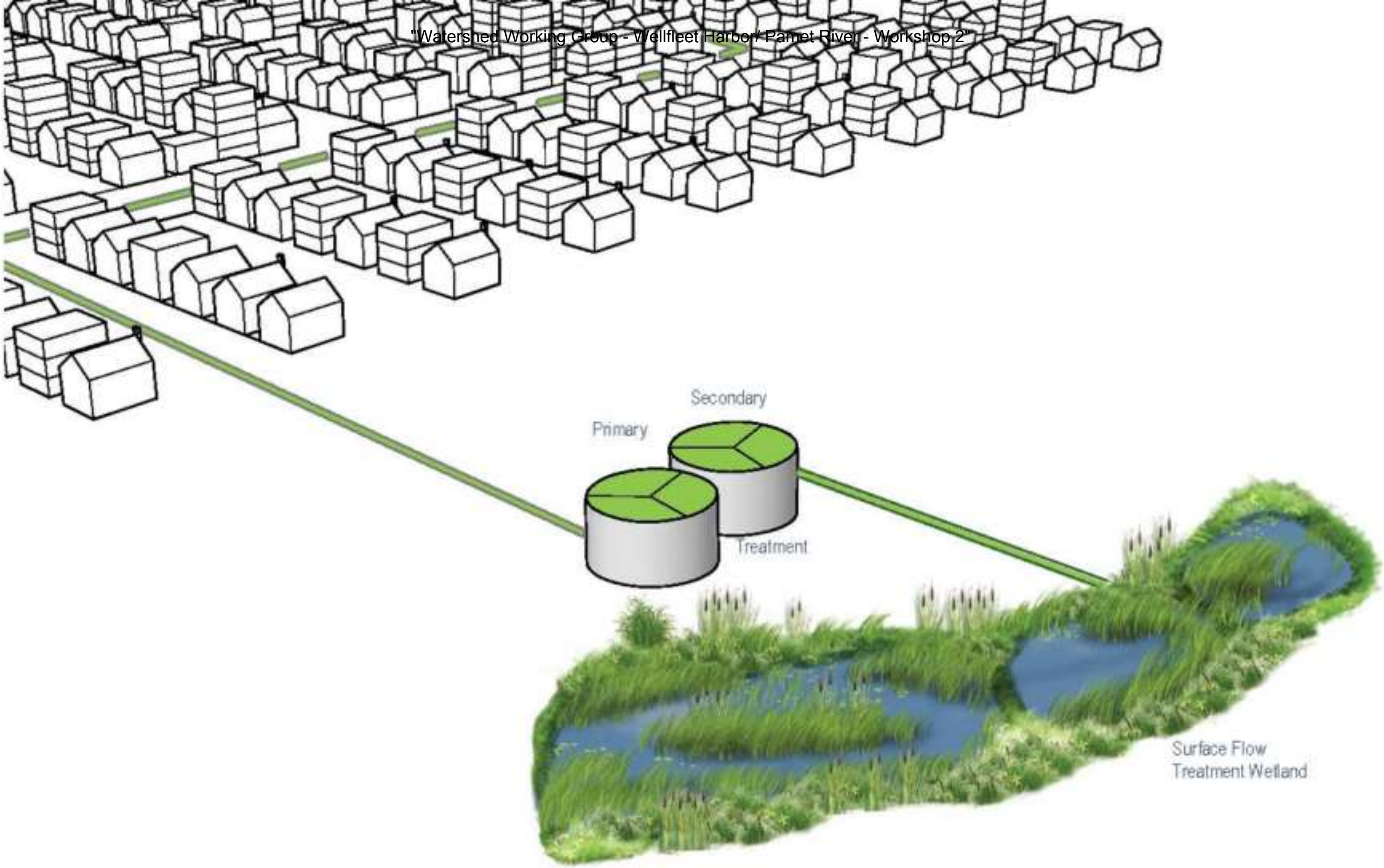
"Watershed Working Group - Wellfleet Harbor/ Pamet River - Workshop 2"





Conventional Treatment

Scale: WATERSHED
Target: WASTEWATER

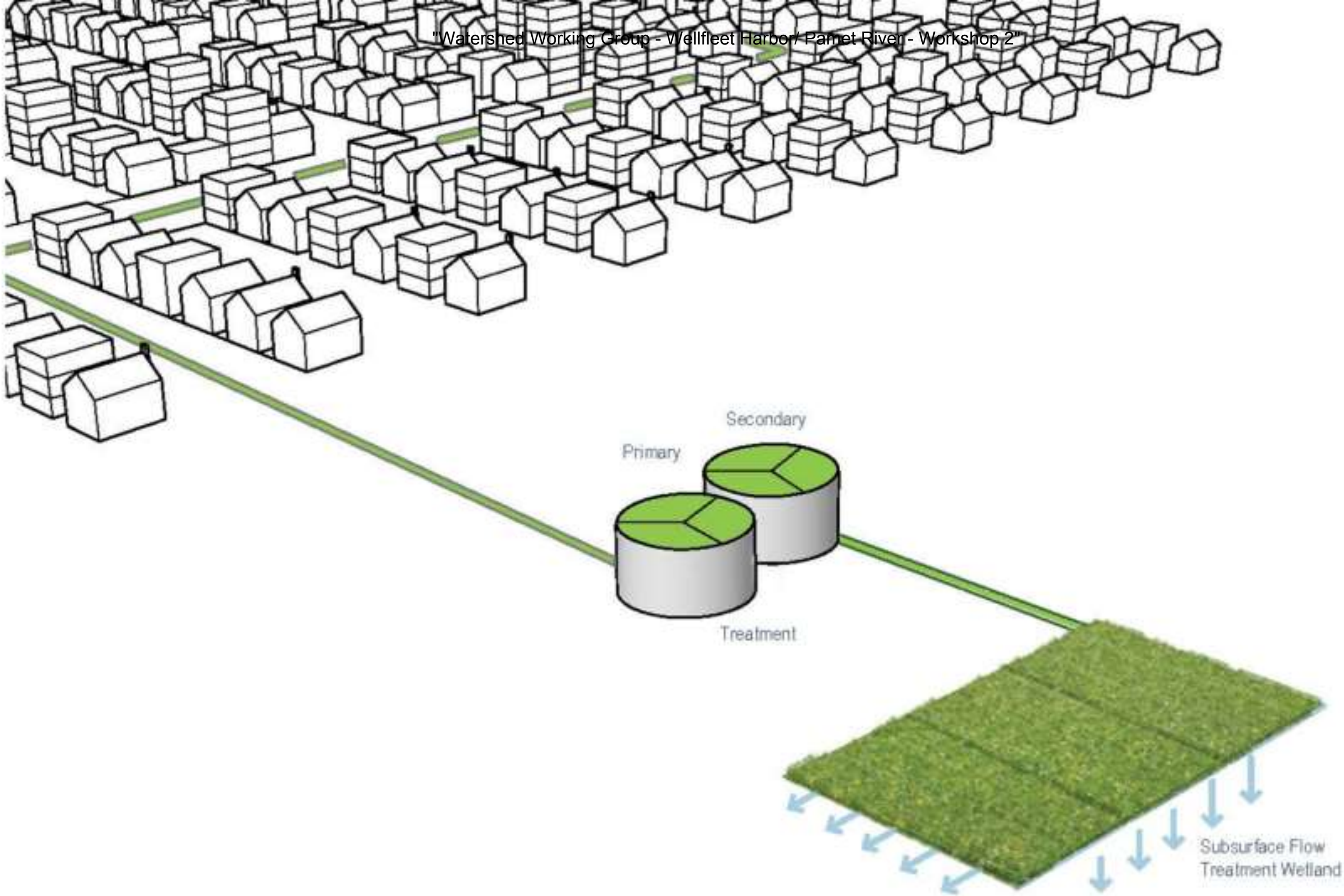


Scale: WATERSHED
Target: WASTEWATER

Constructed Wetlands: Surface Flow

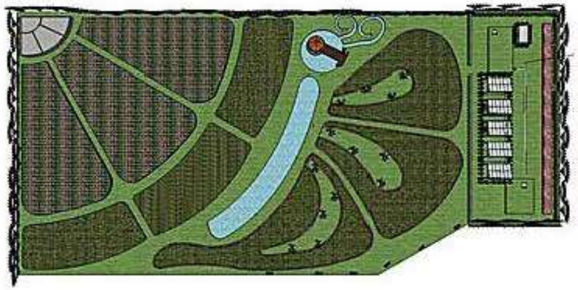
Precedent: Talking Waters Garden - Albany, OR
Source: Kate Kennen

Constructed Wetlands:
Surface Flow



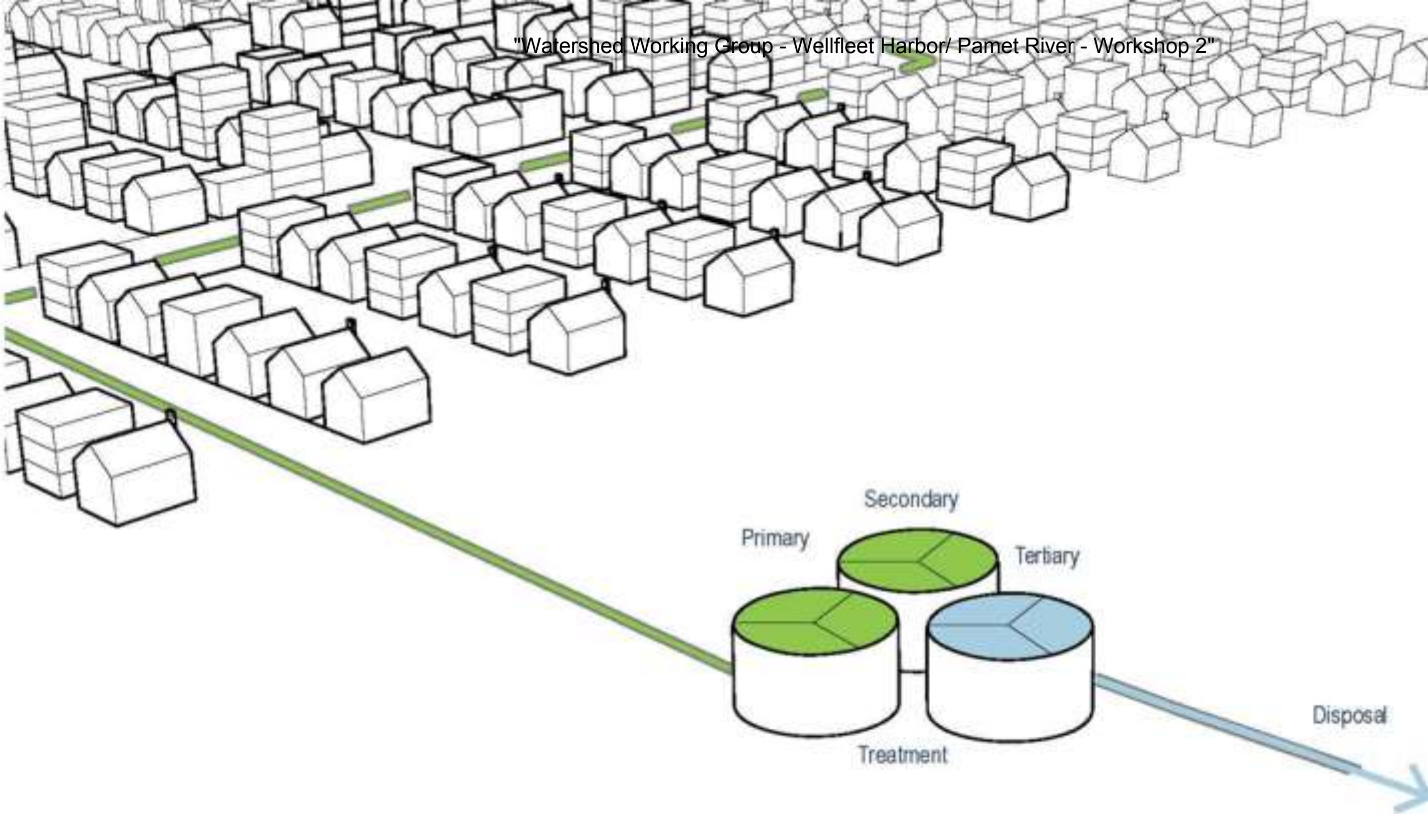
Scale: WATERSHED
Target: WASTEWATER

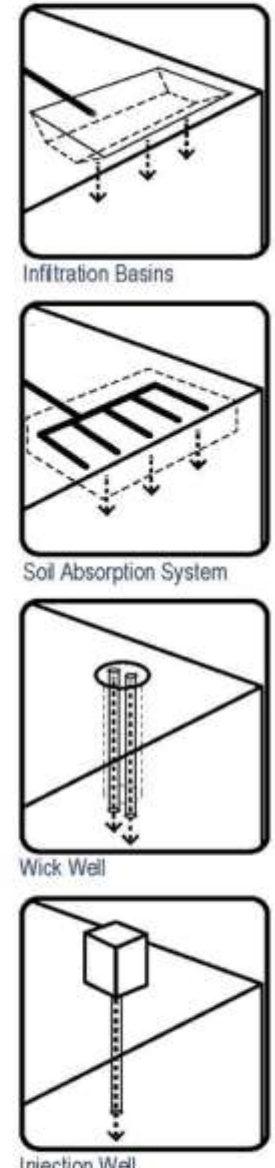
Constructed Wetlands:
Subsurface Flow



Precedent: Koh Phi Phi Treatment Wetland, Thailand
Source: Hans Brix

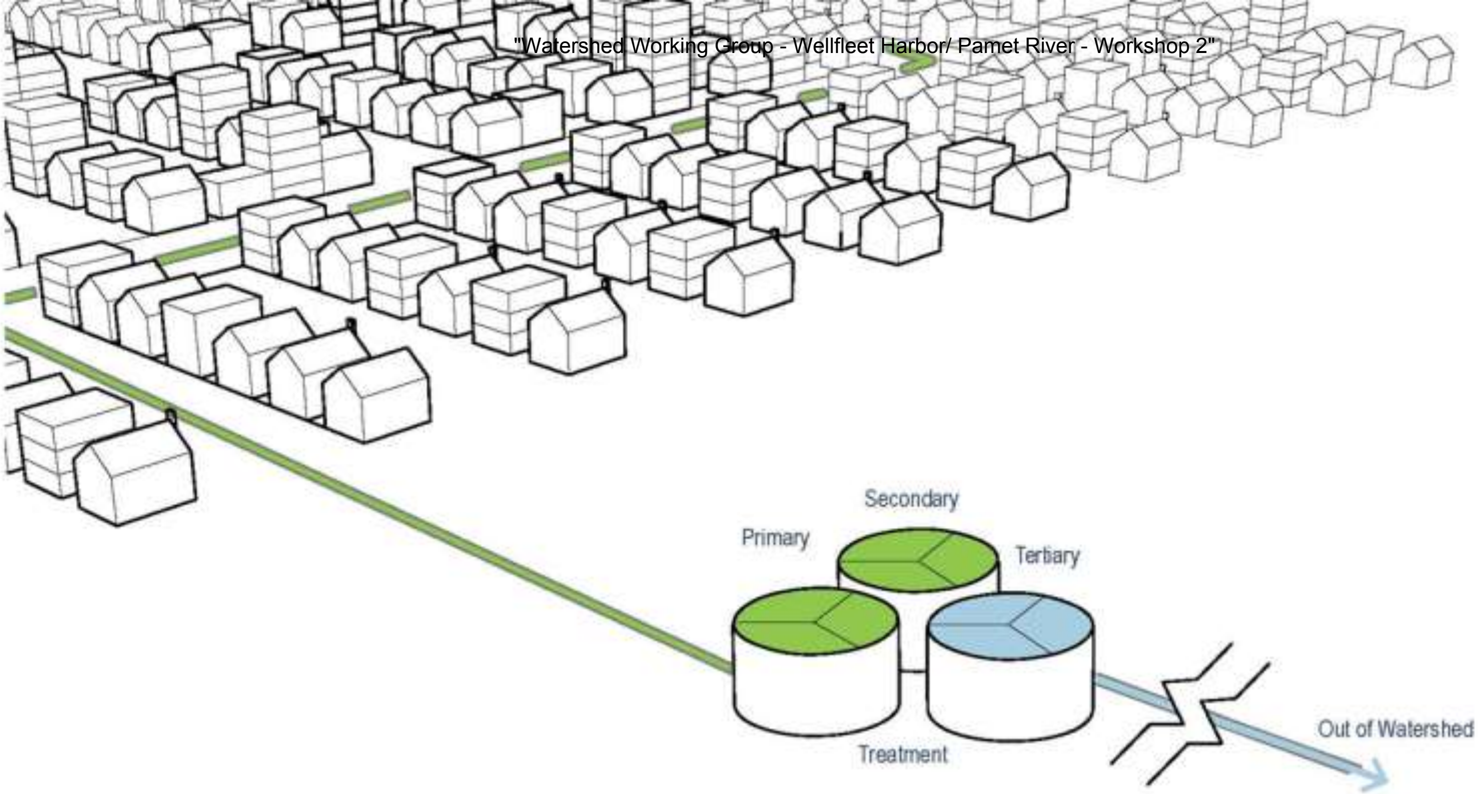
Constructed Wetlands:
Subsurface Flow





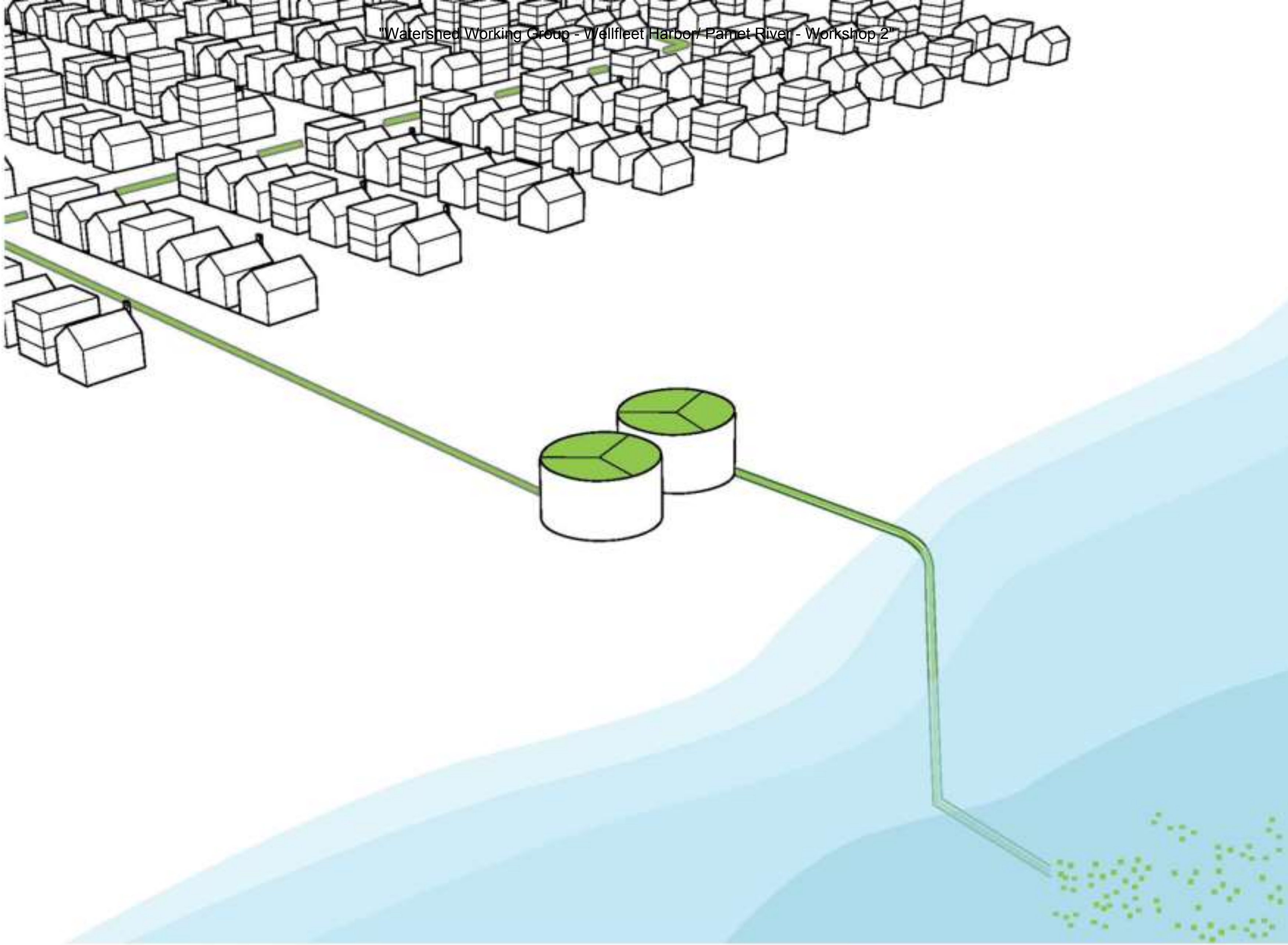
Scale: WATERSHED
Target: WASTEWATER

Effluent Disposal Systems



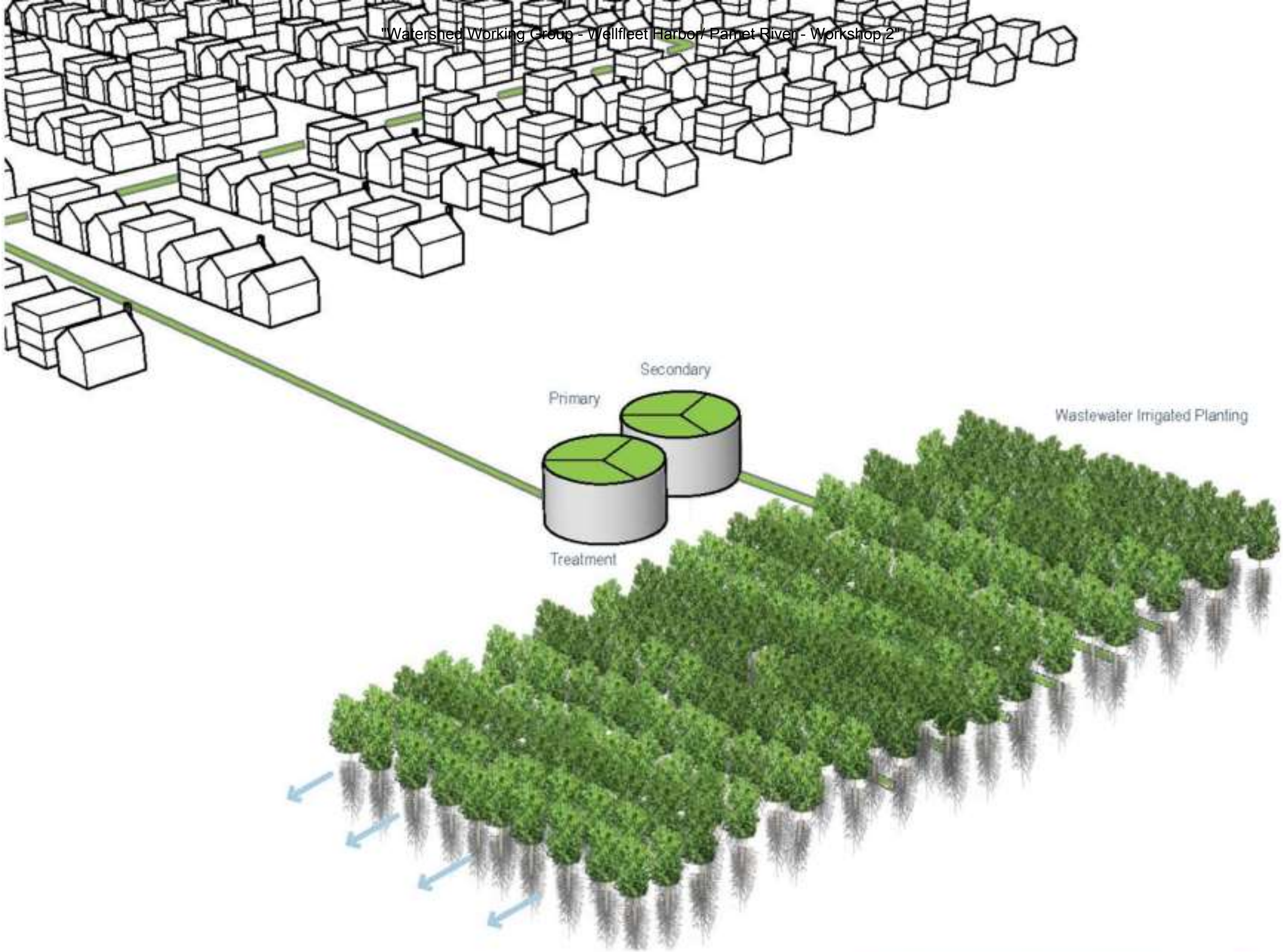
Scale: WATERSHED
Target: WASTEWATER

Effluent Disposal: Out of Watershed



Scale: WATERSHED
Target: WASTEWATER

Effluent Disposal: Ocean Outfall



Scale: WATERSHED
Target: WASTEWATER

Phytoirrigation

Precedent: Woodburn OR, Wastewater Treatment Facility
Source: CH2MHill

Phytoirrigation

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Phytoirrigation

Solutions: Ex. Water

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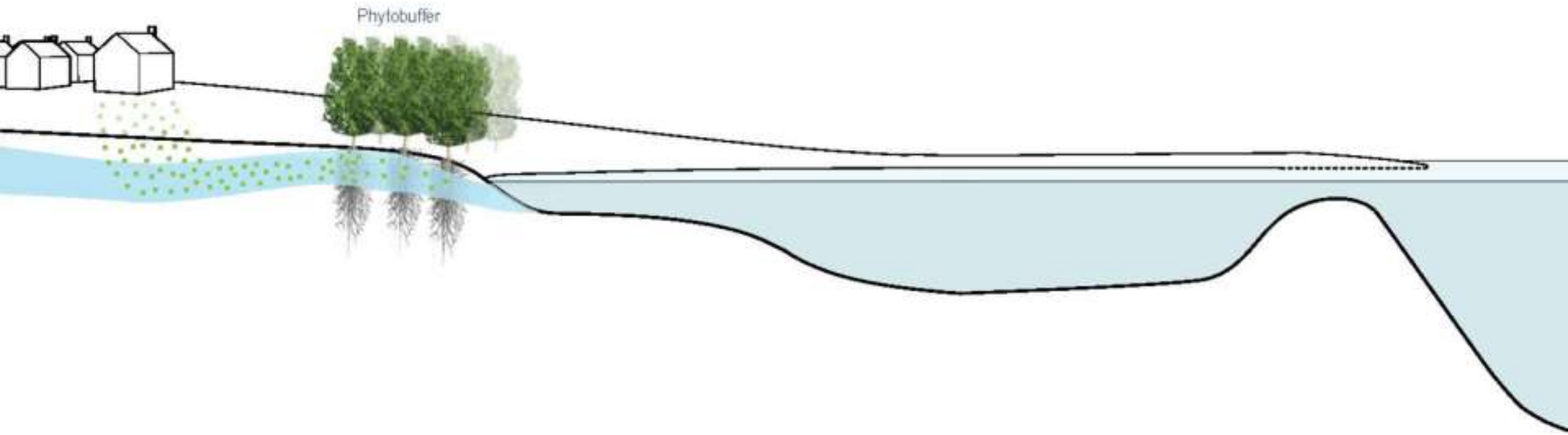
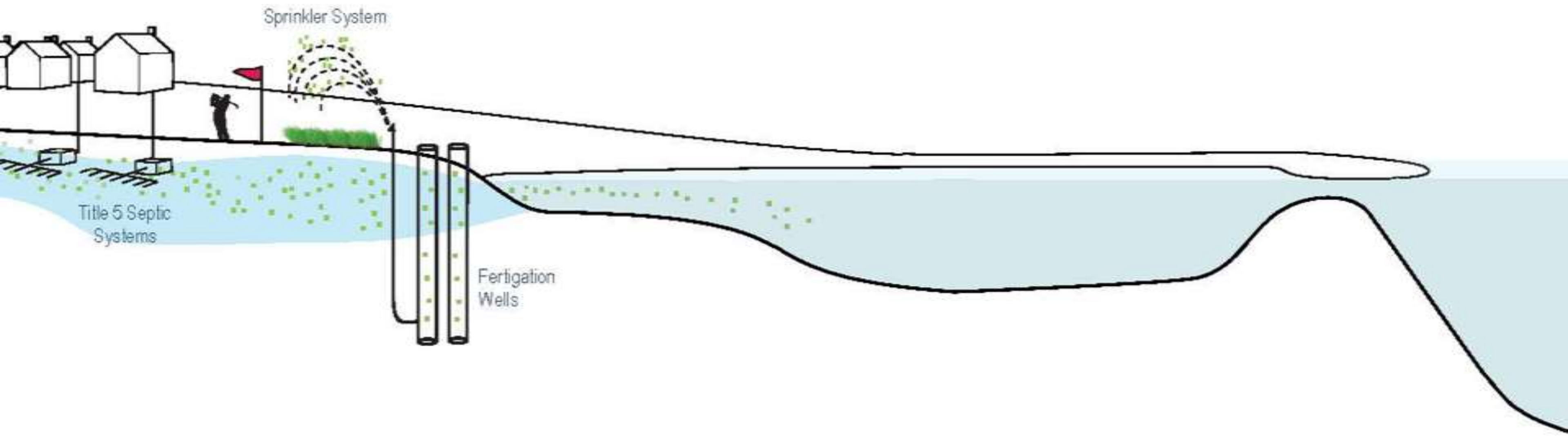


Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Phytobuffers

Precedent: Phytobuffer - Kavcee, WY
Source: Sand Creek Consultants

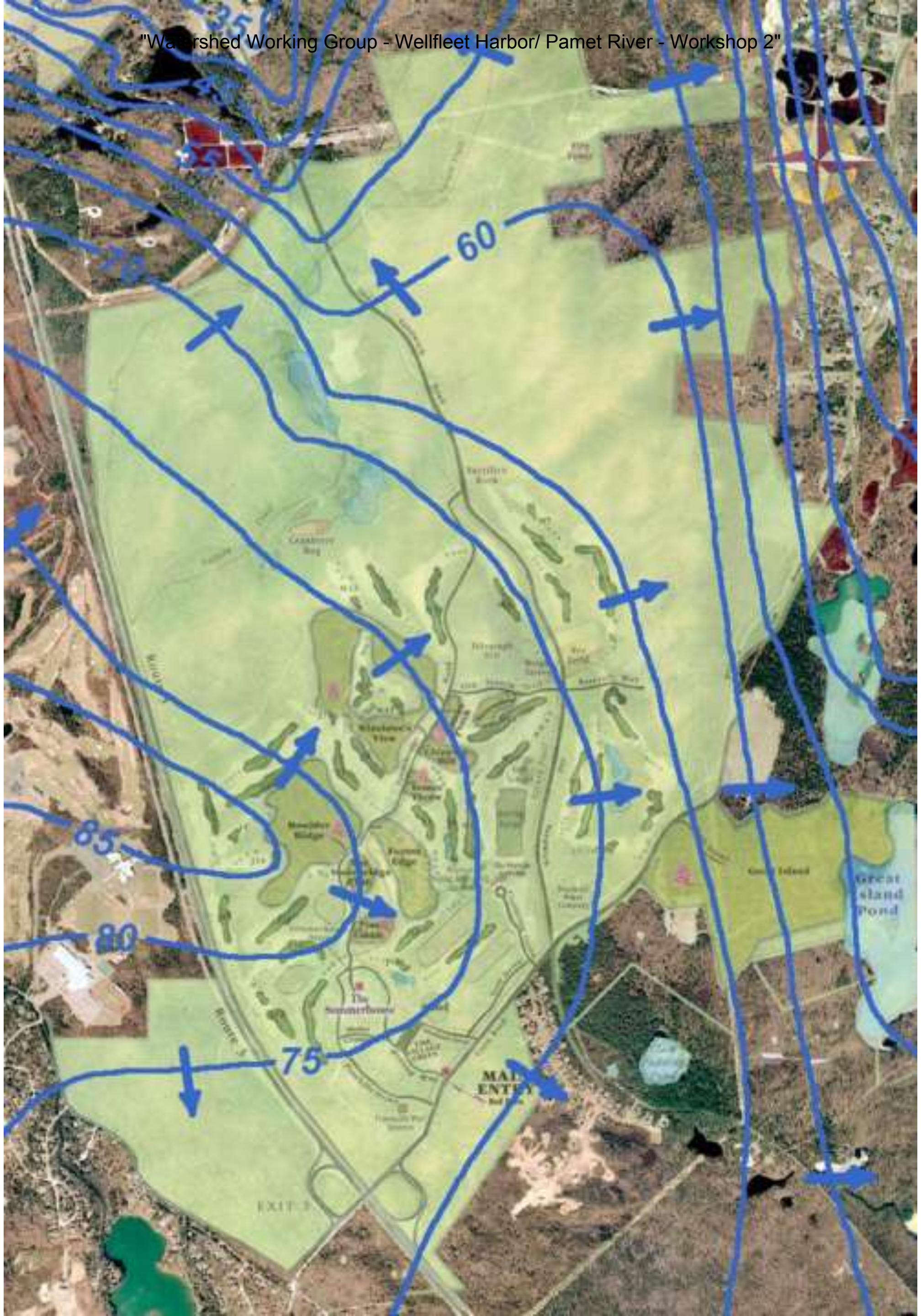
Phytobuffers



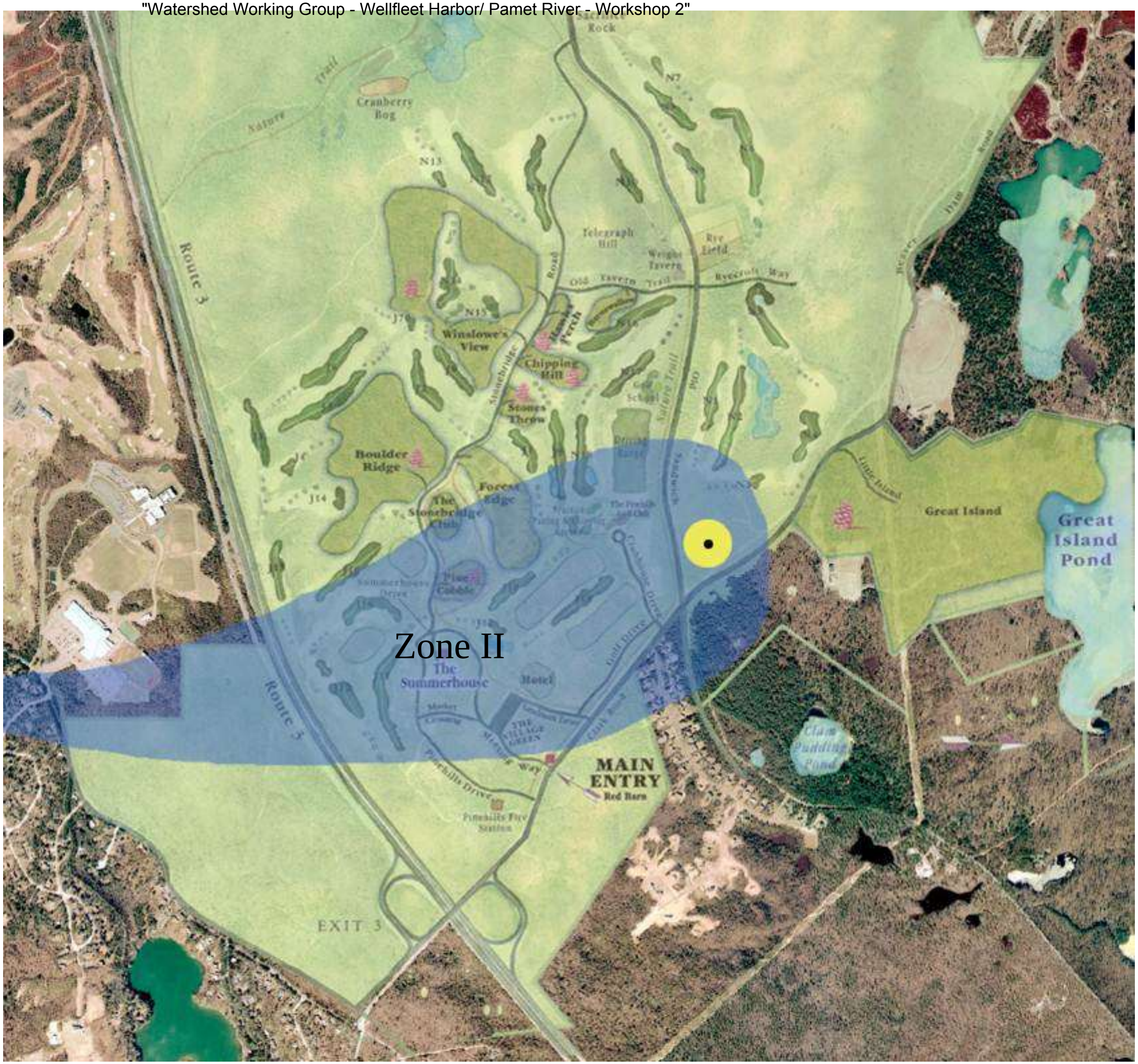
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Fertigation Wells

"Watershed Working Group - Wellfleet Harbor/ Pamet River - Workshop 2"



Precedent:
Pine Hills
Plymouth, MA



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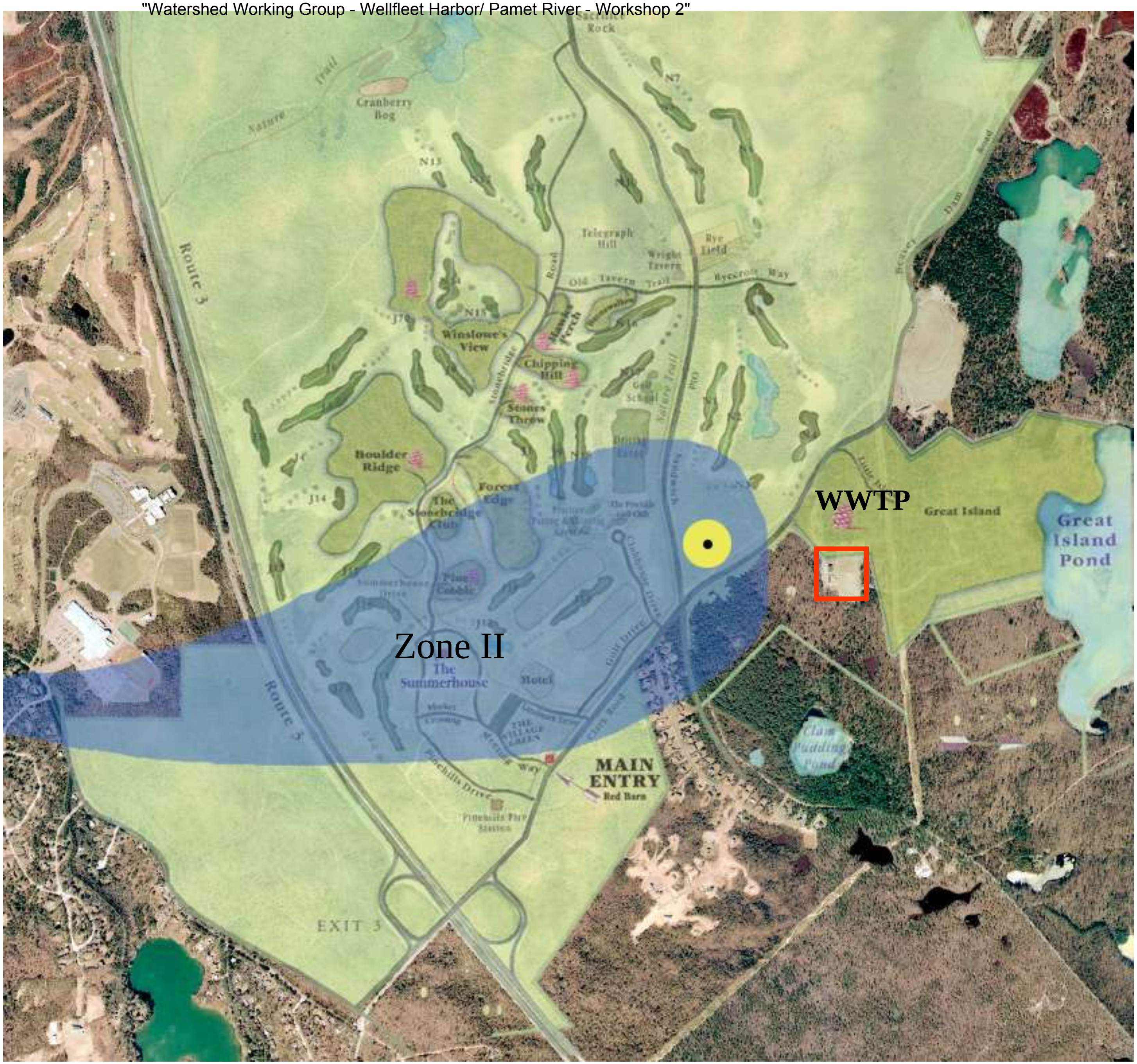

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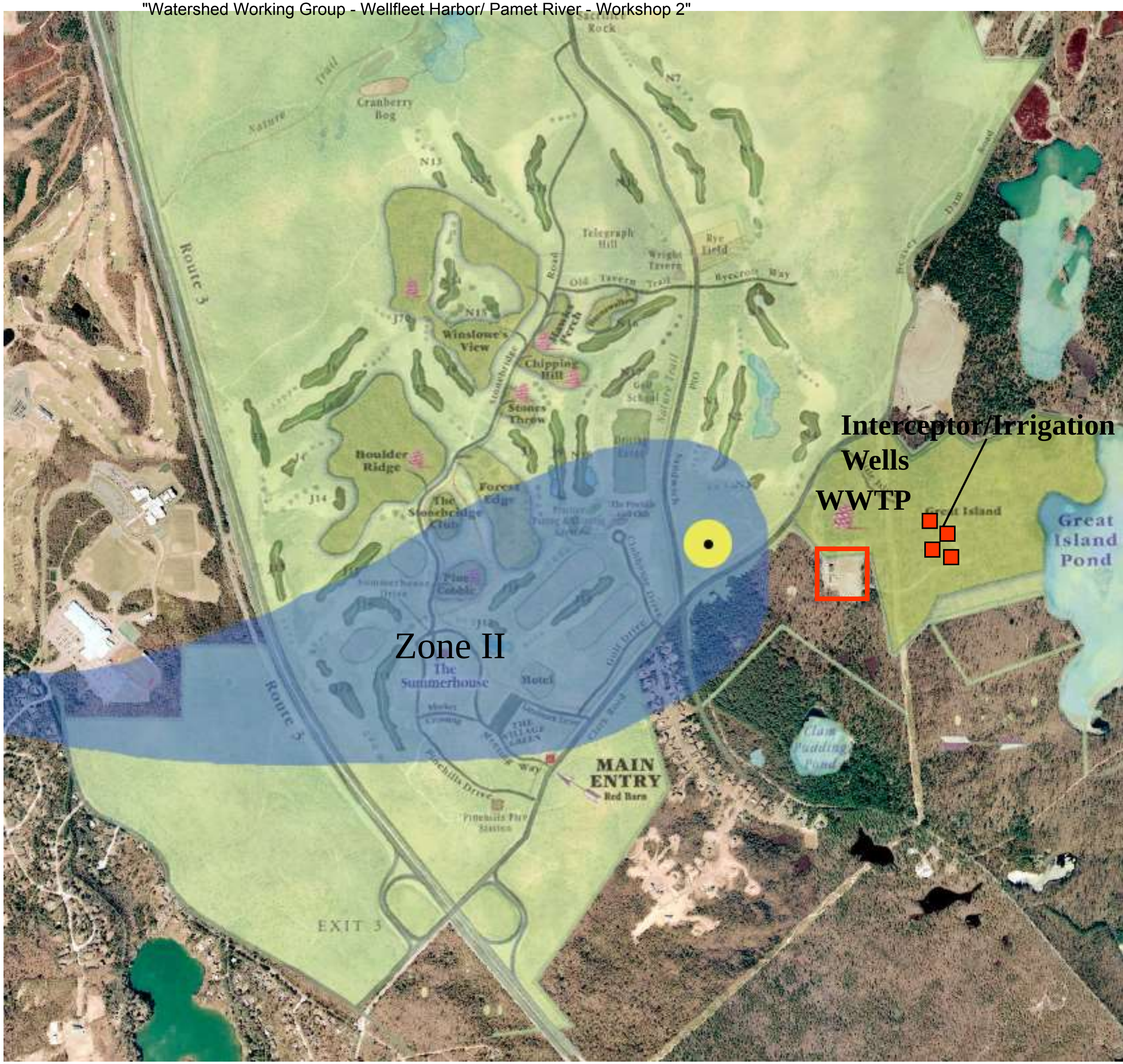
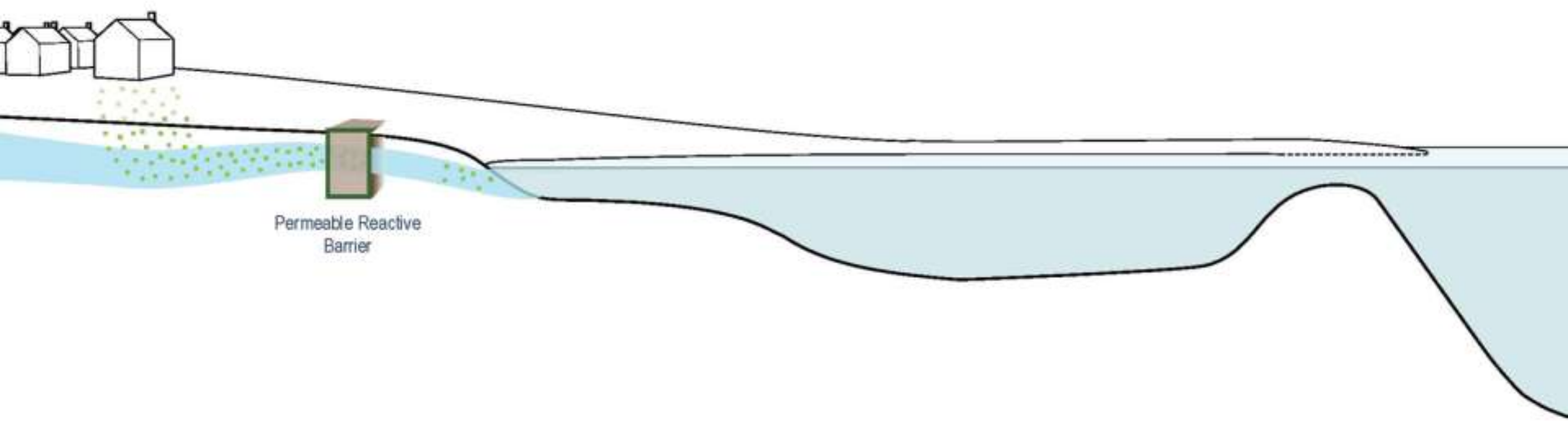


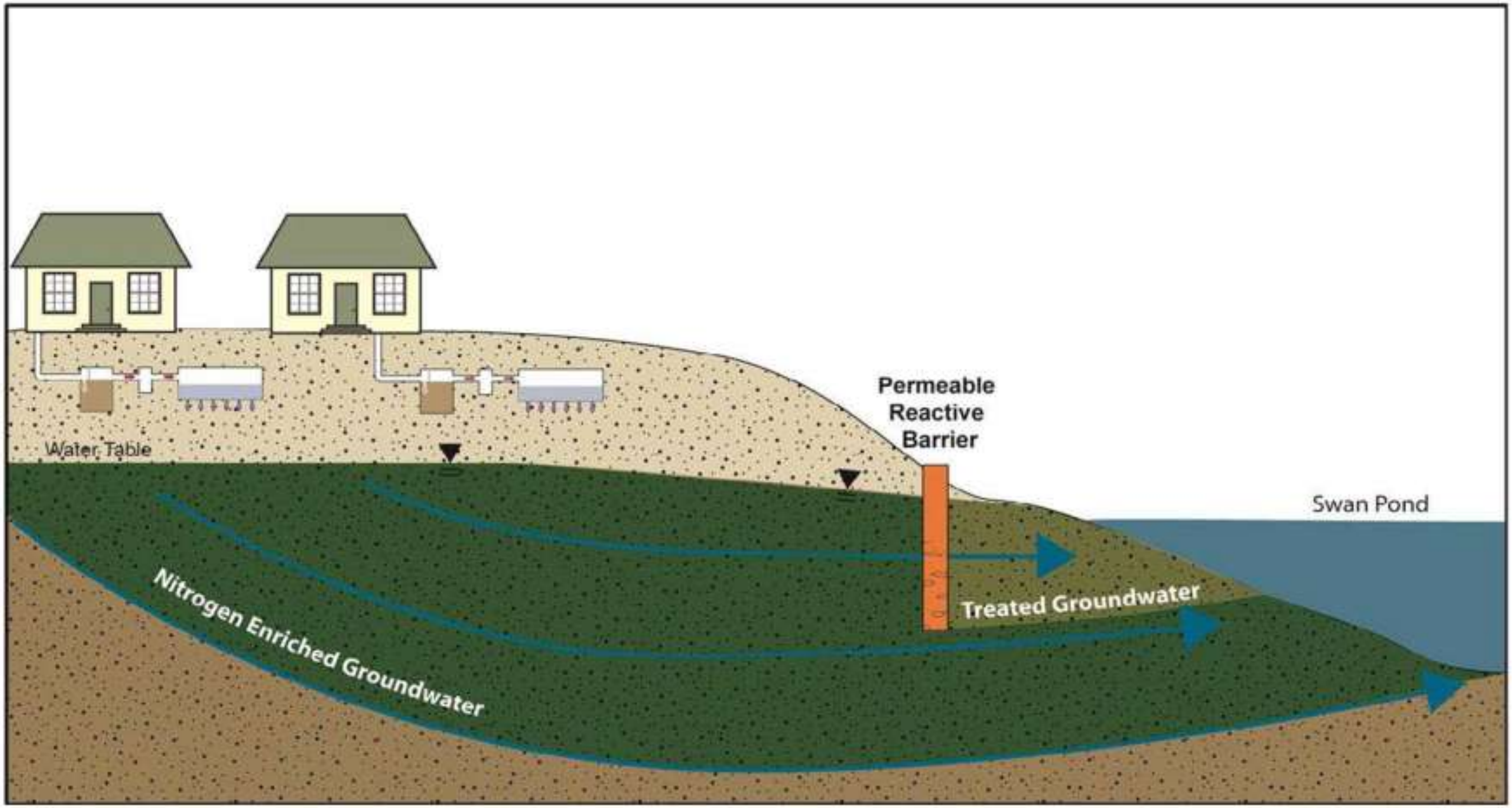
Precedent:
Pine Hills
Plymouth, MA



Scale: SITE / NEIGHBORHOOD / WATERSHED
Target: EXISTING WATER BODIES

Permeable Reactive Barrier

PRB



Precedent: PRB
Source: Horsley Witten Group Inc.

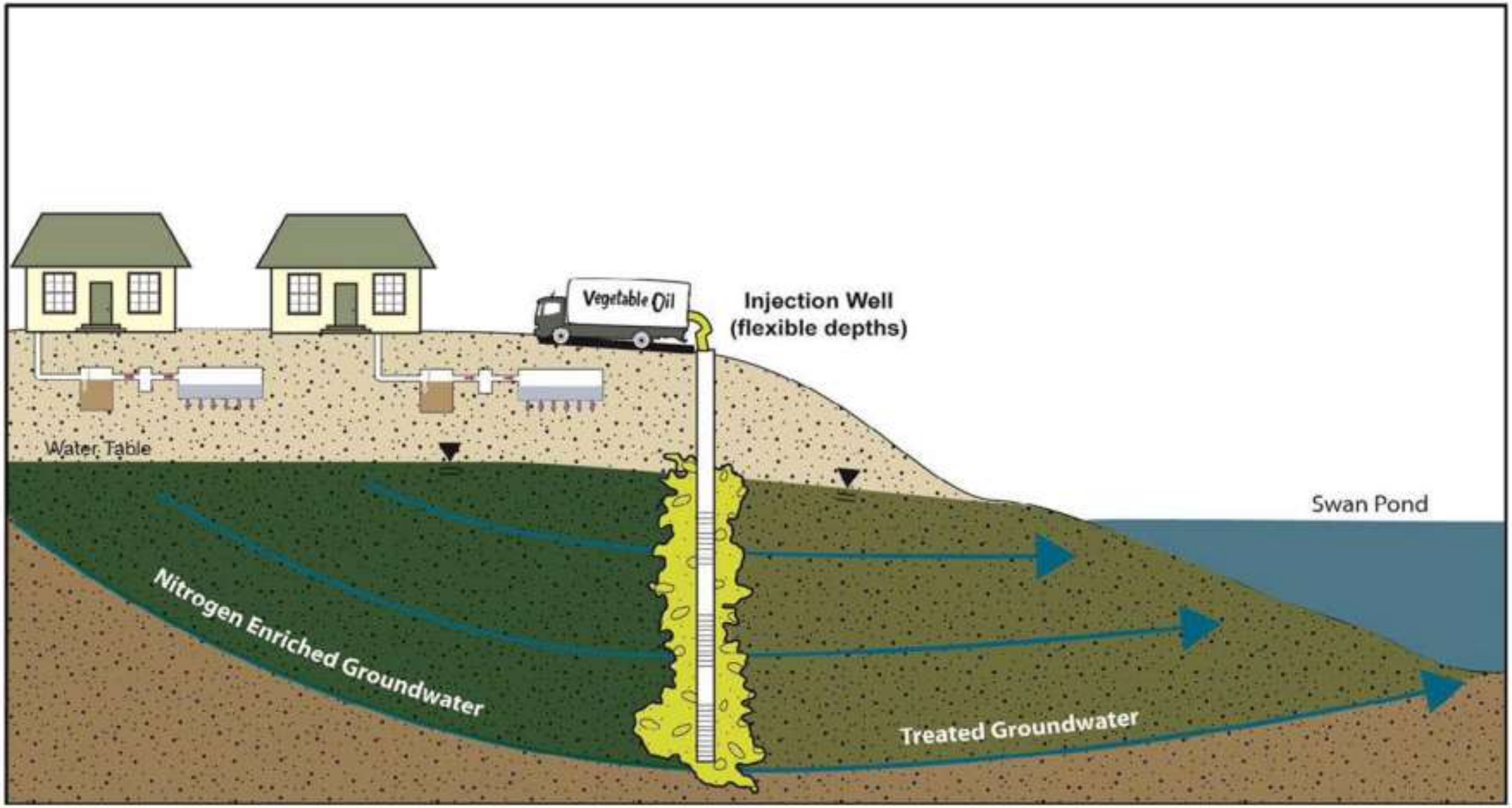
Permeable Reactive Barrier

PRB

Precedent: Falmouth PRB
Source: Mike Domenica

Permeable Reactive Barrier

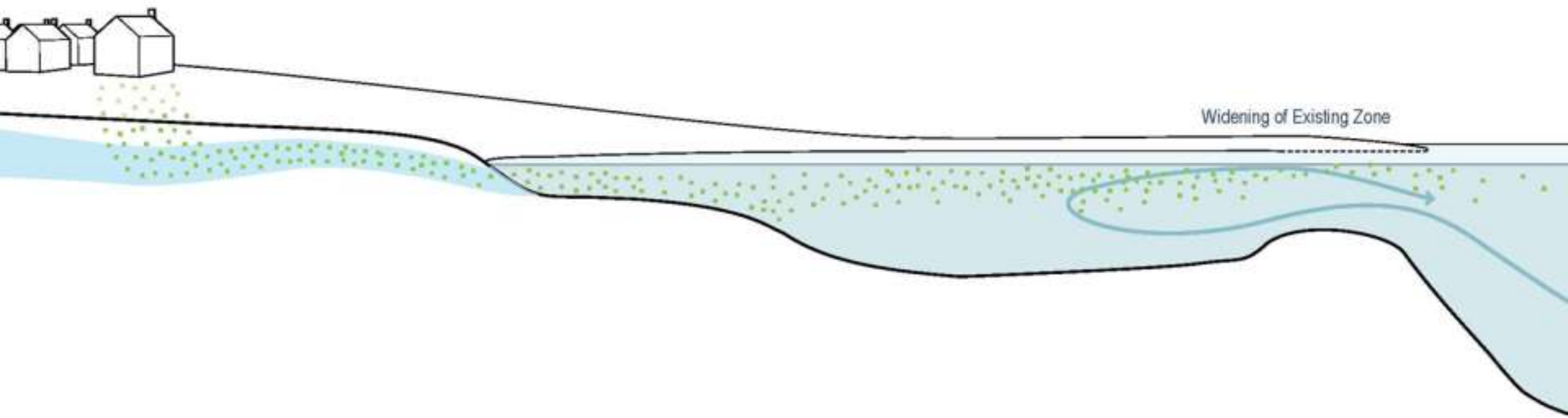
PRB



Precedent: PRB
Source: Horsley Witten Group Inc.

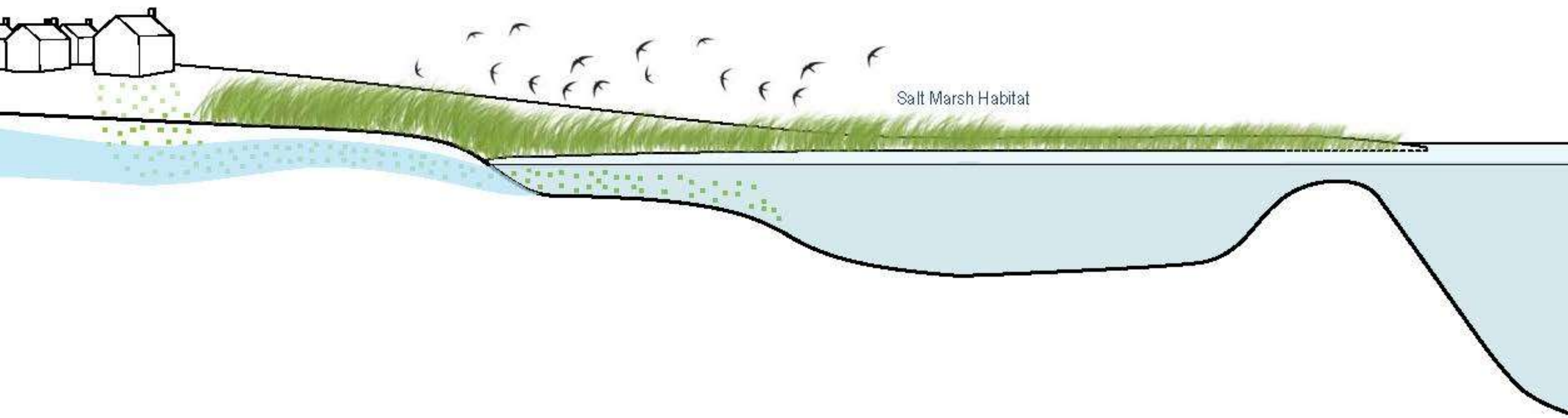
Permeable Reactive Barrier

PRB



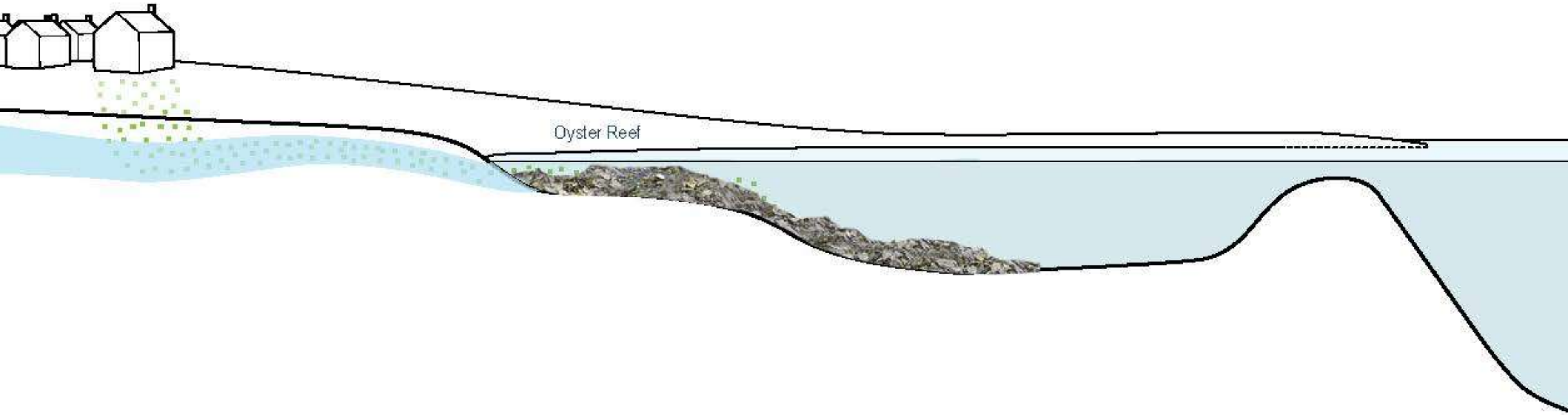
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Inlet and Culvert Widening



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Salt Marsh Habitat Restoration



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Shellfish Habitat Restoration

Precedent: Wellfleet Oyster Restoration Project

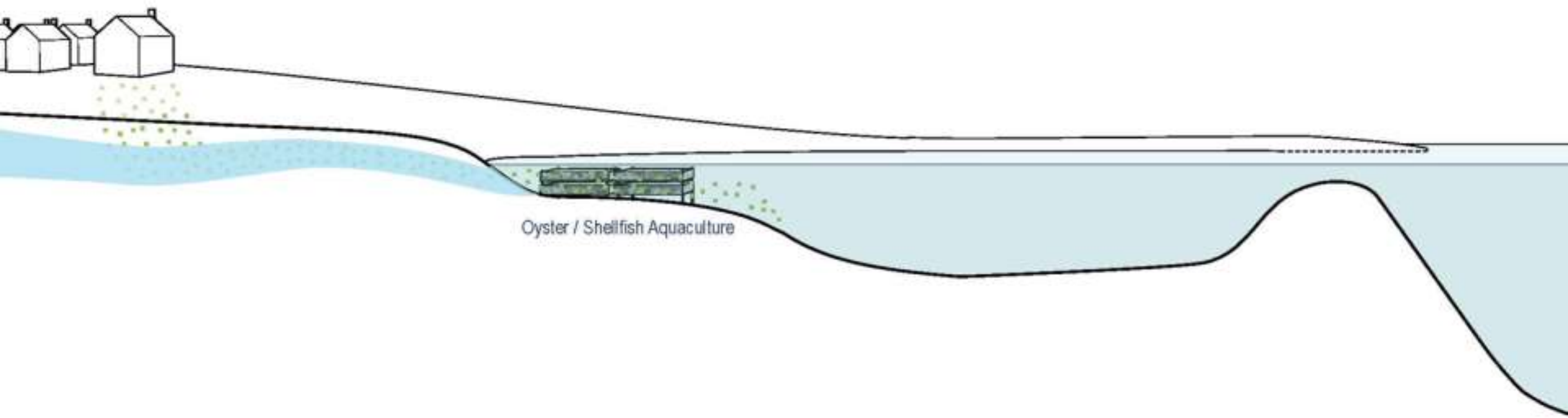
Source: Anamarija Francik

Shellfish Habitat Restoration

Precedent: Wellfleet Oyster Restoration Project

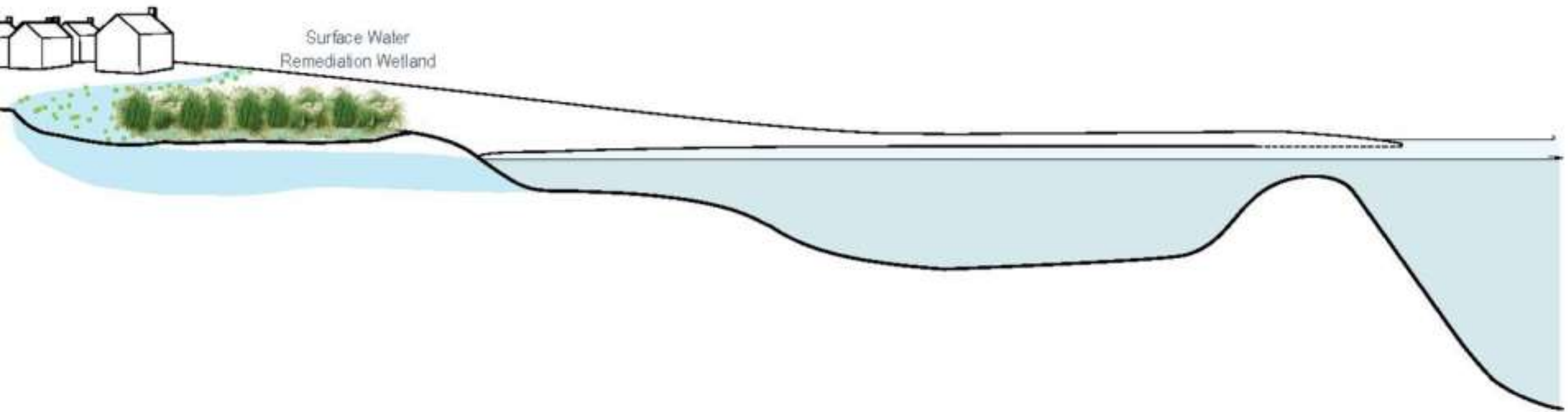
Source: Anamarija Francik

Shellfish Habitat Restoration



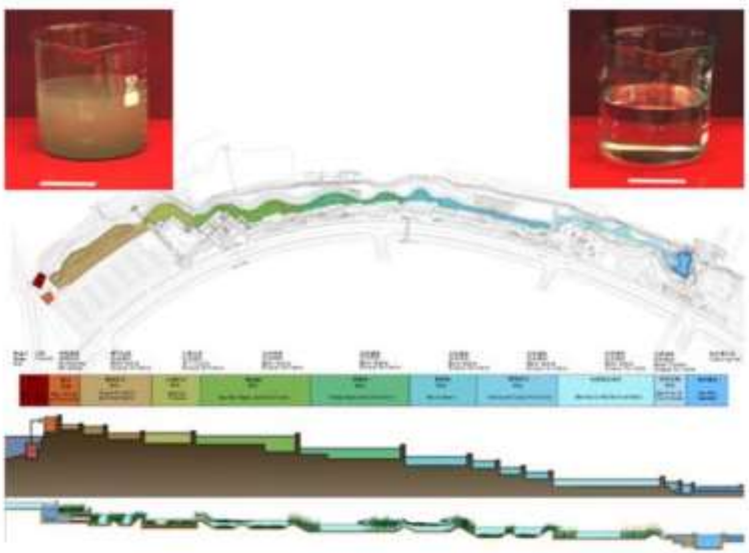
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Aquaculture / Shellfish Farming



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

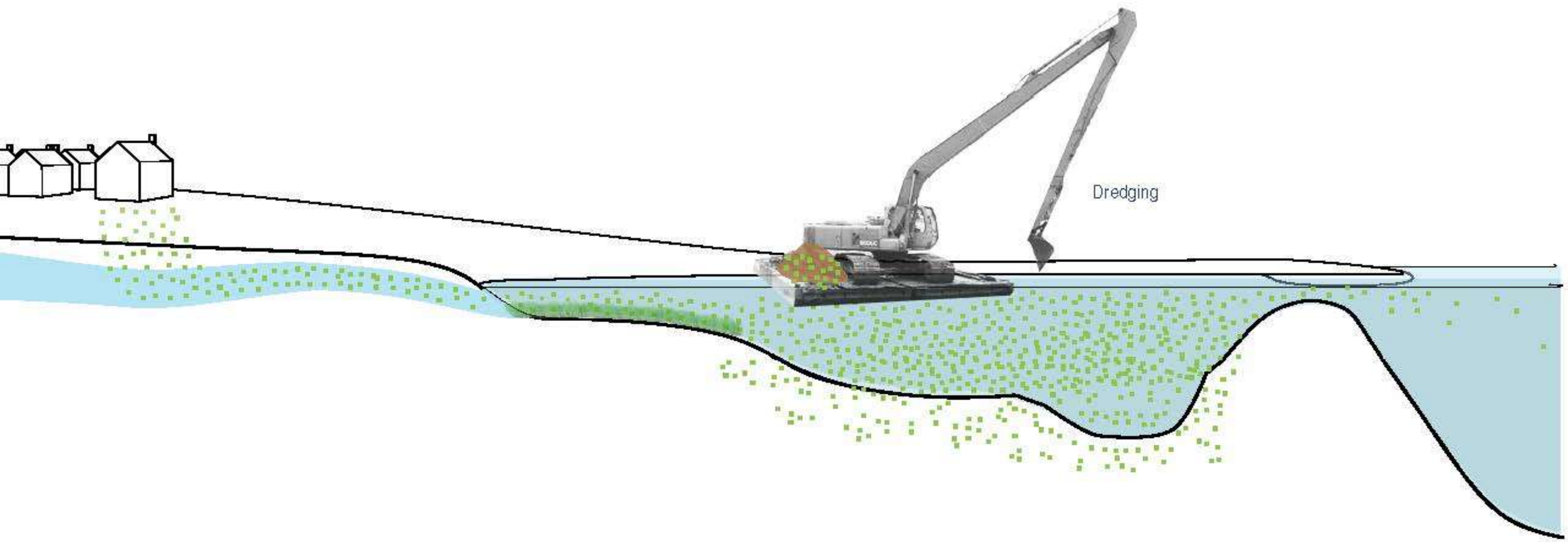
Surface Water
Remediation Wetlands



Precedent: Shanghai Houton Park

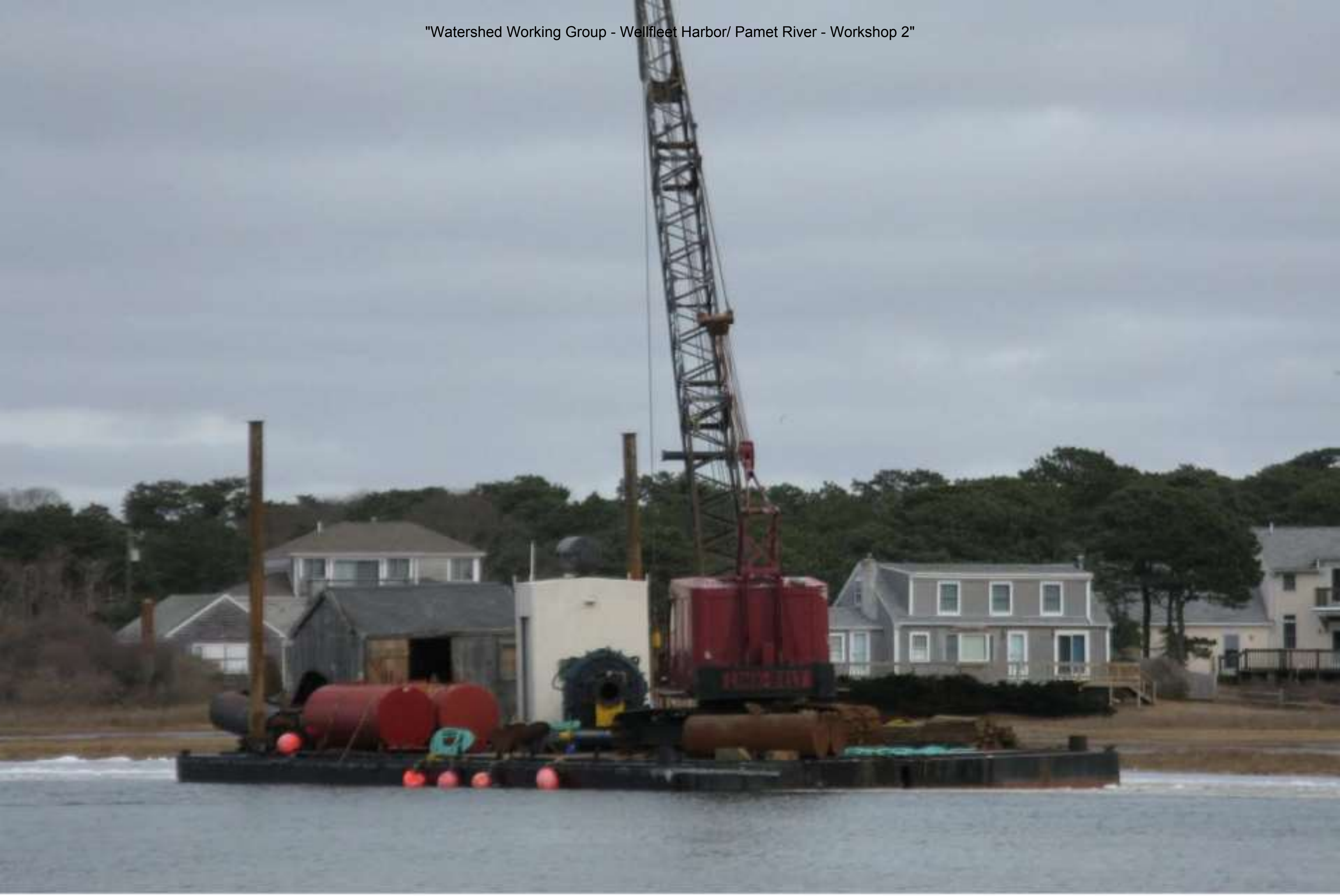
Source: Turenscape

Surface Water Remediation Wetlands



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Pond and Estuary Dredging



Precedent: Pond and Estuary Dredging - Dennis, MA

Source: Cape Cod Times

Solutions: Cape-Wide

Site Scale | Neighborhood | Watershed | Cape-Wide

- Compact Development
- Remediation of Existing Development
- Transfer of Development Rights
- Fertilizer Management
- Stormwater BMPs
- Standard Title 5 Systems
- Cluster & Satellite Treatment Systems
- Conventional Treatment
- I/A Title 5 Systems
- STEP/STEG Collection
- Advanced Treatment
- I/A Enhanced Systems
- Wastewater Collection Systems
- Toilets: Urine Diverting
- Effluent Disposal Systems
- Toilets: Composting
- Constructed Wetlands: Surface Flow
- Toilets: Packaging
- Constructed Wetlands: Subsurface Flow
- Stormwater: Bioretention / Soil Media Filters
- Effluent Disposal: Out of Watershed/Ocean Outfall
- Stormwater: Wetlands
- Phytoirrigation
- Eco-Machines & Living Machines
- Phytobuffers
- Fertigation Wells
- Permeable Reactive Barrier
- Shellfish and Salt Marsh Habitat Restoration
- Aquaculture/Shellfish Farming
- Inlet / Culvert Widening
- Pond and Estuary Dredging
- Surface Water Remediation Wetlands

Scale: CAPE-WIDE
Target: REGULATORY

Compact Development

Scale: CAPE-WIDE
Target: REGULATORY

Fertilizer Management

N+P+K
MGMT

Scale: CAPE-WIDE
Target: REGULATORY

Remediation of Existing Development

Scale: CAPE-WIDE
Target: REGULATORY

Transfer of Development Rights

TDR

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

Scale: CAPE-WIDE
Target: REGULATORY

Stormwater BMPs

Town Consideration of Alternative Technologies & Approaches

Wellfleet- *Coastal habitat restoration & aquaculture*

Mashpee- *Aquaculture & Expanding Existing Systems*

Brewster- *PRB & Bioswales*

Orleans- *Fertilizer Control By-Law*

Harwich &- Chatham *Muddy Creek & Cold Brook Natural Attenuation*

Falmouth- *Aquaculture*
Inlet Widening
Eco-Toilet Demonstration Project
PRBs
Stormwater Management (Little Pond Watershed)
Fertilizer Control By-Law
Subsurface Nitrogen Removal Septic Systems

Solutions

Site Scale | Neighborhood | Watershed | Cape-Wide

Site Scale
- Title 5 — Standard Title 5 Systems
- IA — I/A Title 5 Systems
- Enhanced IA — I/A Enhanced Systems
- Toilets: Urine Diverting
- Toilets: Composting
- Toilets: Packaging
- Stormwater: Bioretention / Soil Media Filters (Site Scale – Neighborhood)
- EM — Eco-Machines & Living Machines (Site Scale – Watershed)
- Phytobuffers (Site Scale – Neighborhood)
- PRB — Permeable Reactive Barrier (Site Scale – Neighborhood)

Neighborhood
- Compact Development
- Cluster & Satellite Treatment Systems
- STEP/STEG — STEP/STEG Collection
- Constructed Wetlands: Surface Flow (Neighborhood – Watershed)
- Constructed Wetlands: Subsurface Flow (Neighborhood – Watershed)
- Stormwater: Wetlands
- Inlet / Culvert Widening (Neighborhood – Watershed)
- Pond and Estuary Dredging (Neighborhood – Watershed)
- R — Surface Water Remediation Wetlands (Neighborhood – Watershed)

Watershed
- Remediation of Existing Development
- TDR — Transfer of Development Rights
- Conventional Treatment
- Advanced Treatment
- Wastewater Collection Systems
- Disposal — Effluent Disposal Systems
- Effluent Disposal: Out of Watershed/Ocean Outfall
- Phytoirrigation
- N+P — Fertigation Wells
- Shellfish and Salt Marsh Habitat Restoration
- Aquaculture/Shellfish Farming

Cape-Wide
- N+P+K MGMT — Fertilizer Management
- BMPs — Stormwater BMPs

Problem Solving Approach

Wastewater | Existing Water Bodies | Regulatory

1 Targets/Reduction Goals

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

2 Other Wastewater Management Needs

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

3 Low Barrier to Implementation

A. Fertilizer Management
B. Stormwater Mitigation

4 Watershed/Embayment Options

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

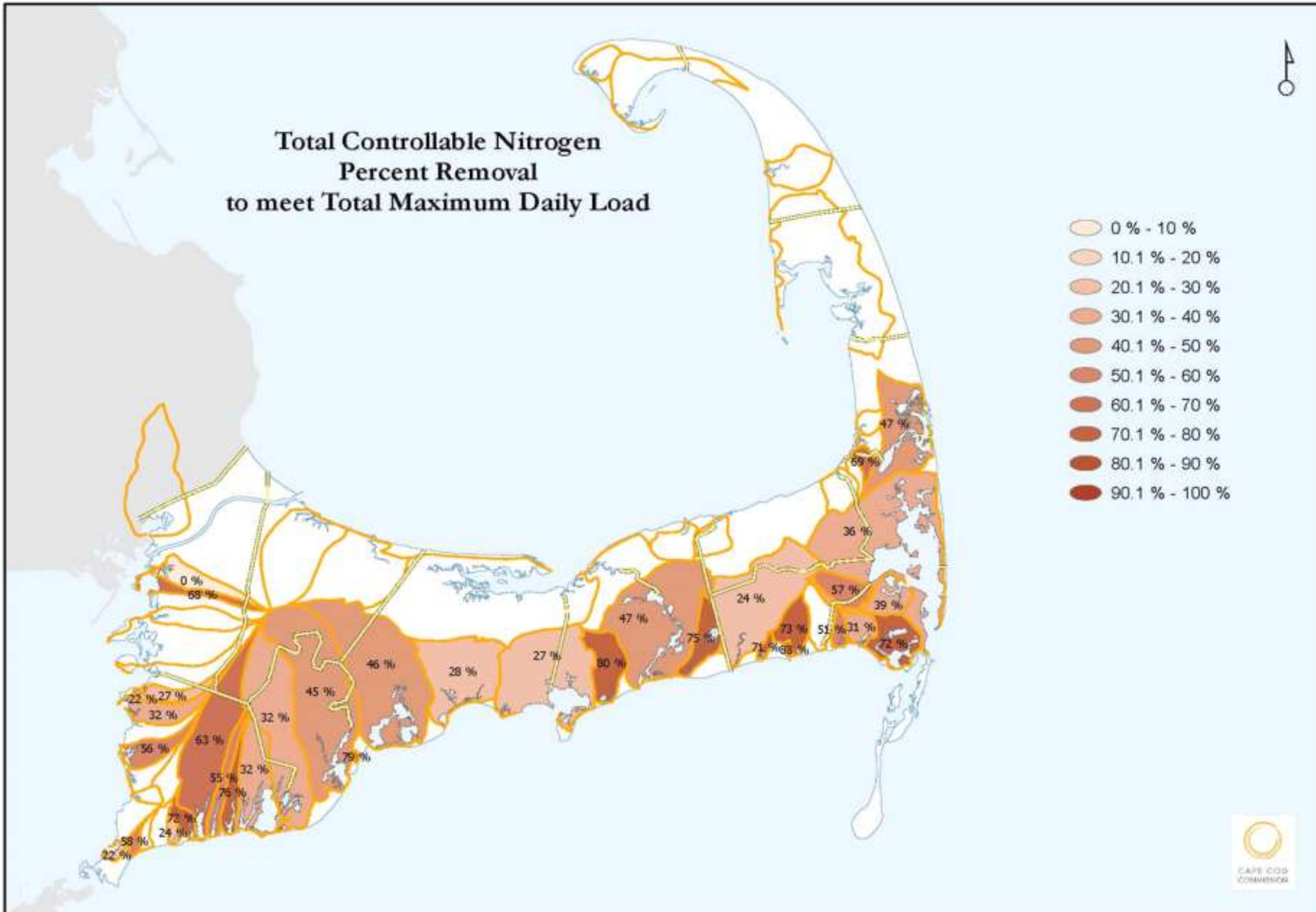
5 Alternative On-Site Options

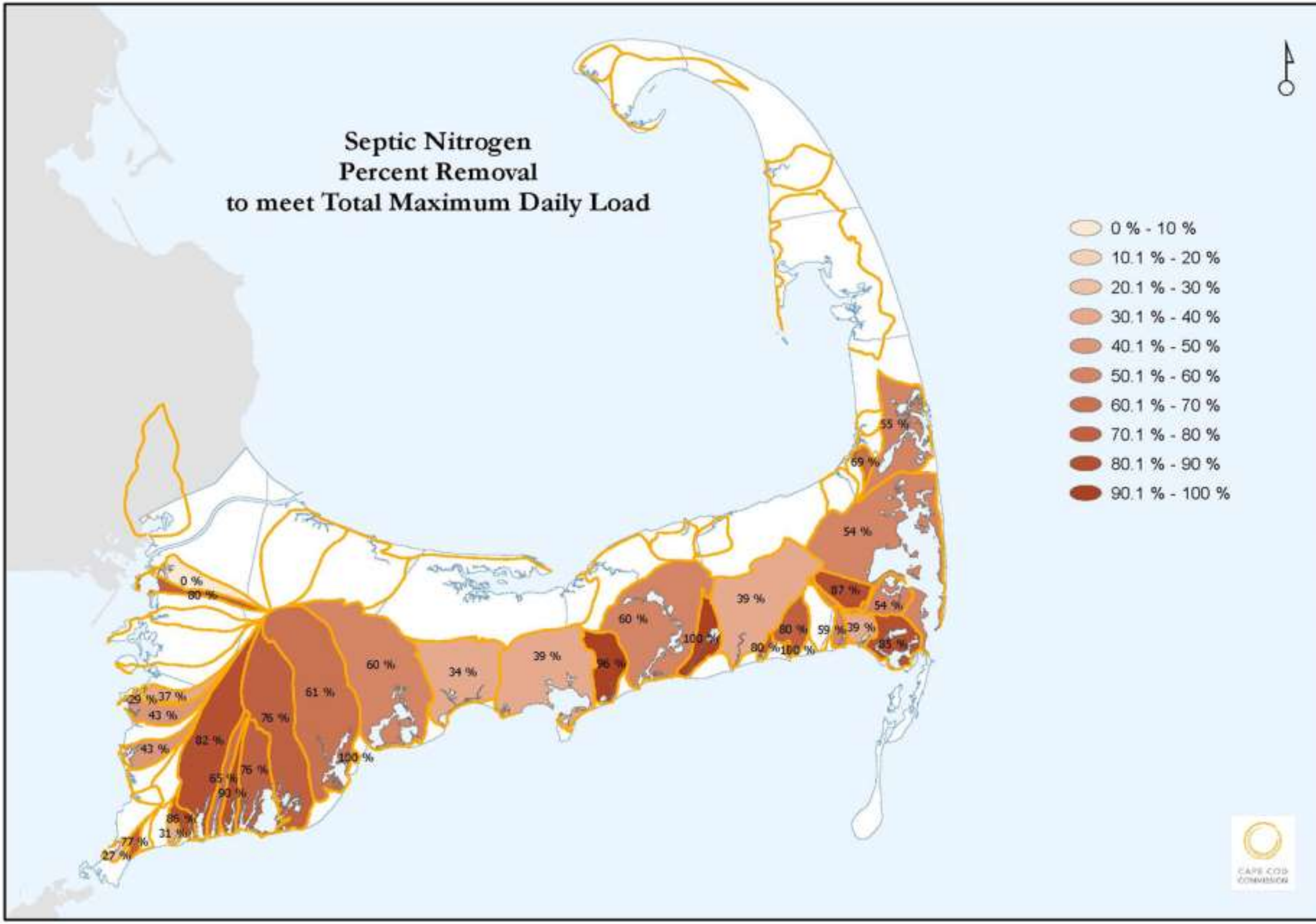
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems

6 Priority Collection/High-Density Areas

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

7 Supplemental Sewering


Total Controllable Nitrogen
Percent Removal
to meet Total Maximum Daily Load
0 % - 10 %
10.1 % - 20 %
20.1 % - 30 %
30.1 % - 40 %
40.1 % - 50 %
50.1 % - 60 %
60.1 % - 70 %
70.1 % - 80 %
80.1 % - 90 %
90.1 % - 100 %


Septic Nitrogen
Percent Removal
to meet Total Maximum Daily Load
0 % - 10 %
10.1 % - 20 %
20.1 % - 30 %
30.1 % - 40 %
40.1 % - 50 %
50.1 % - 60 %
60.1 % - 70 %
70.1 % - 80 %
80.1 % - 90 %
90.1 % - 100 %
55 %
69 %
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87 %
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31 %
77 %
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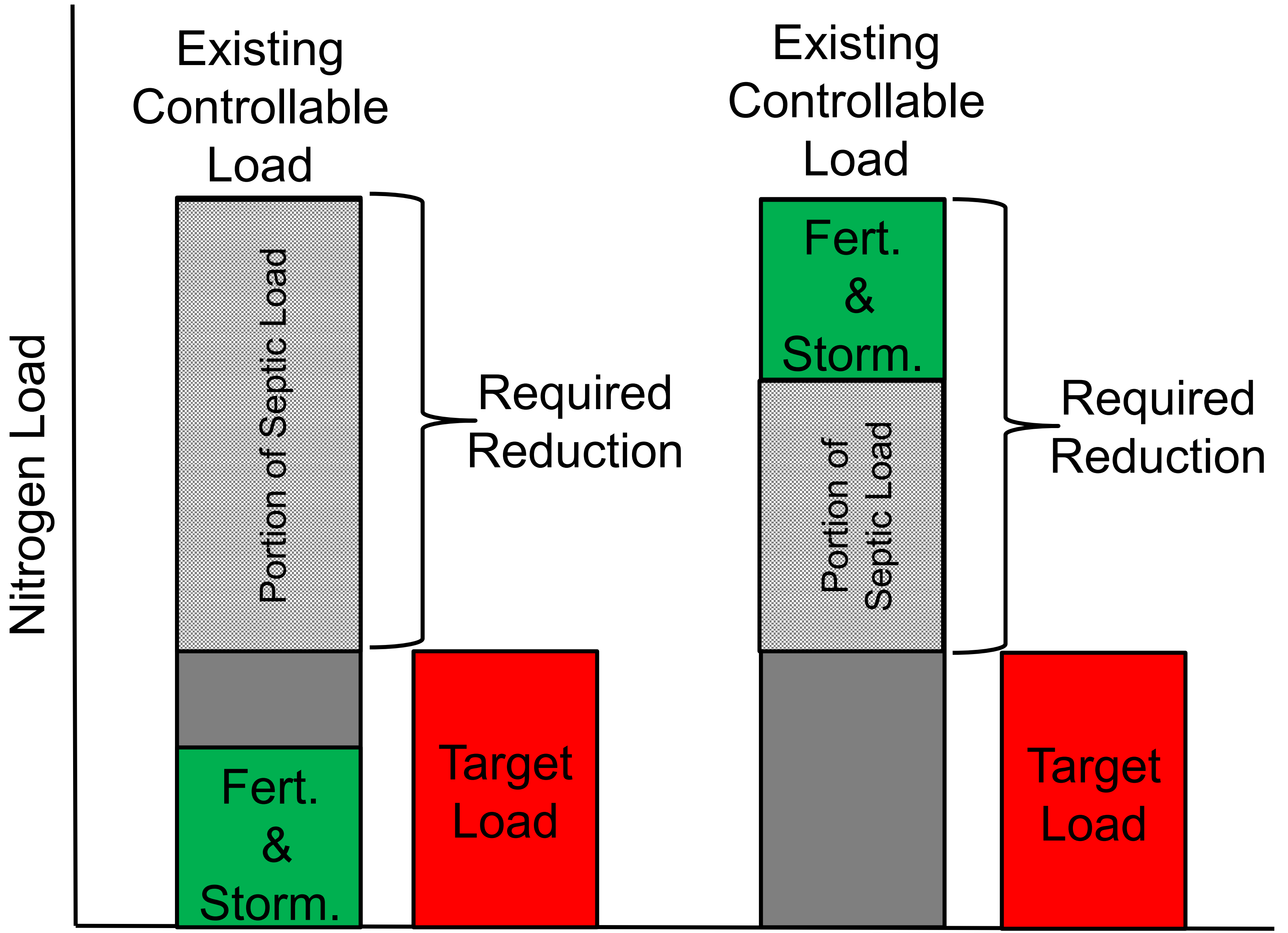
Nitrogen Load
Existing Controllable Load
Portion of Septic Load
Fert. & Storm.
Required Reduction
Target Load
Existing Controllable Load
Fert. & Storm.
Portion of Septic Load
Required Reduction
Target Load

Problem Solving Approach

Wastewater | Existing Water Bodies | Regulatory

1 Targets/Reduction Goals

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

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B. Village Centers
C. Economic Centers
D. Growth Incentive Zones

7 Supplemental Sewering

Triple Bottom Line

Impacts of Technologies and Approaches

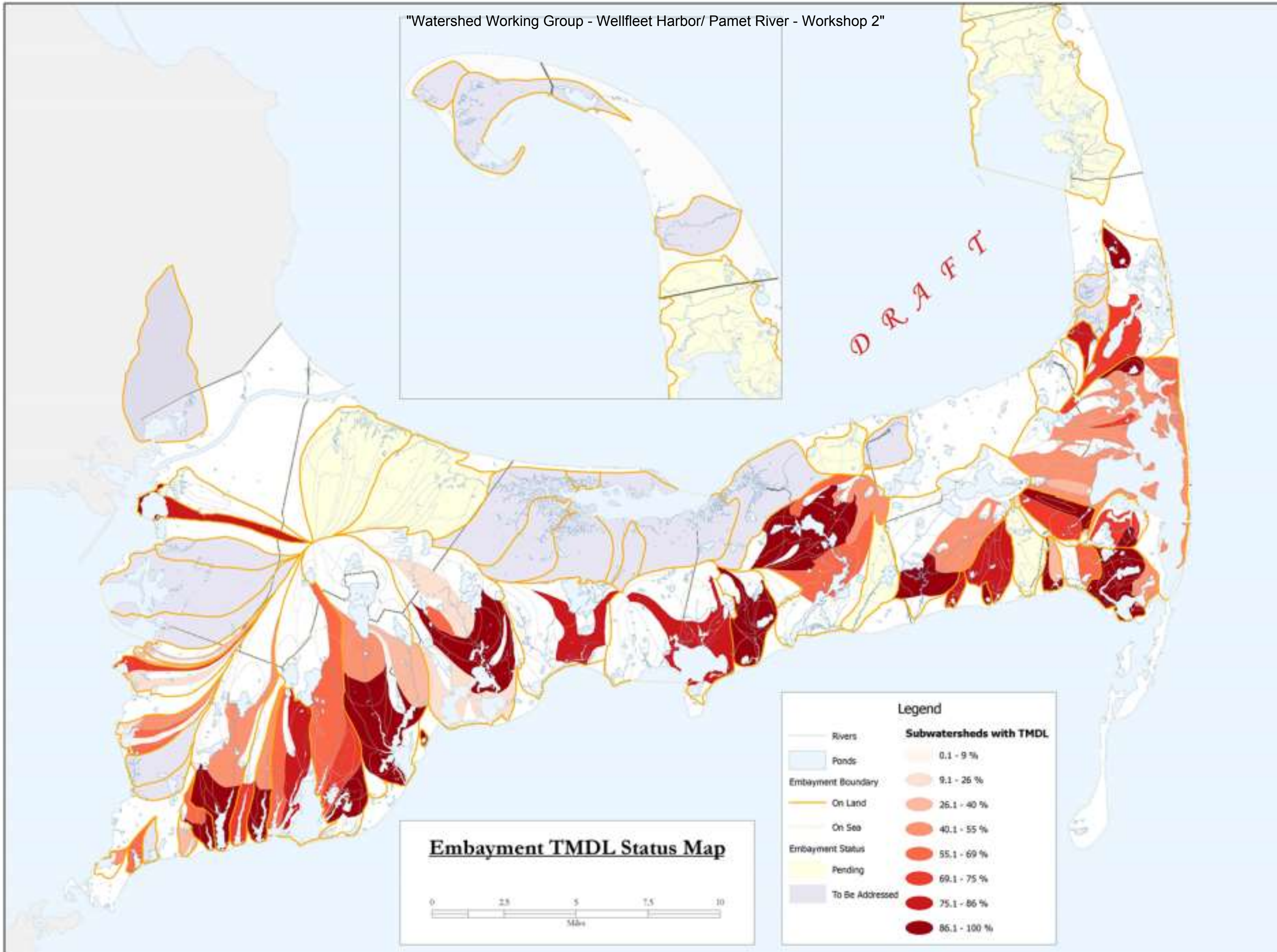
Environmental

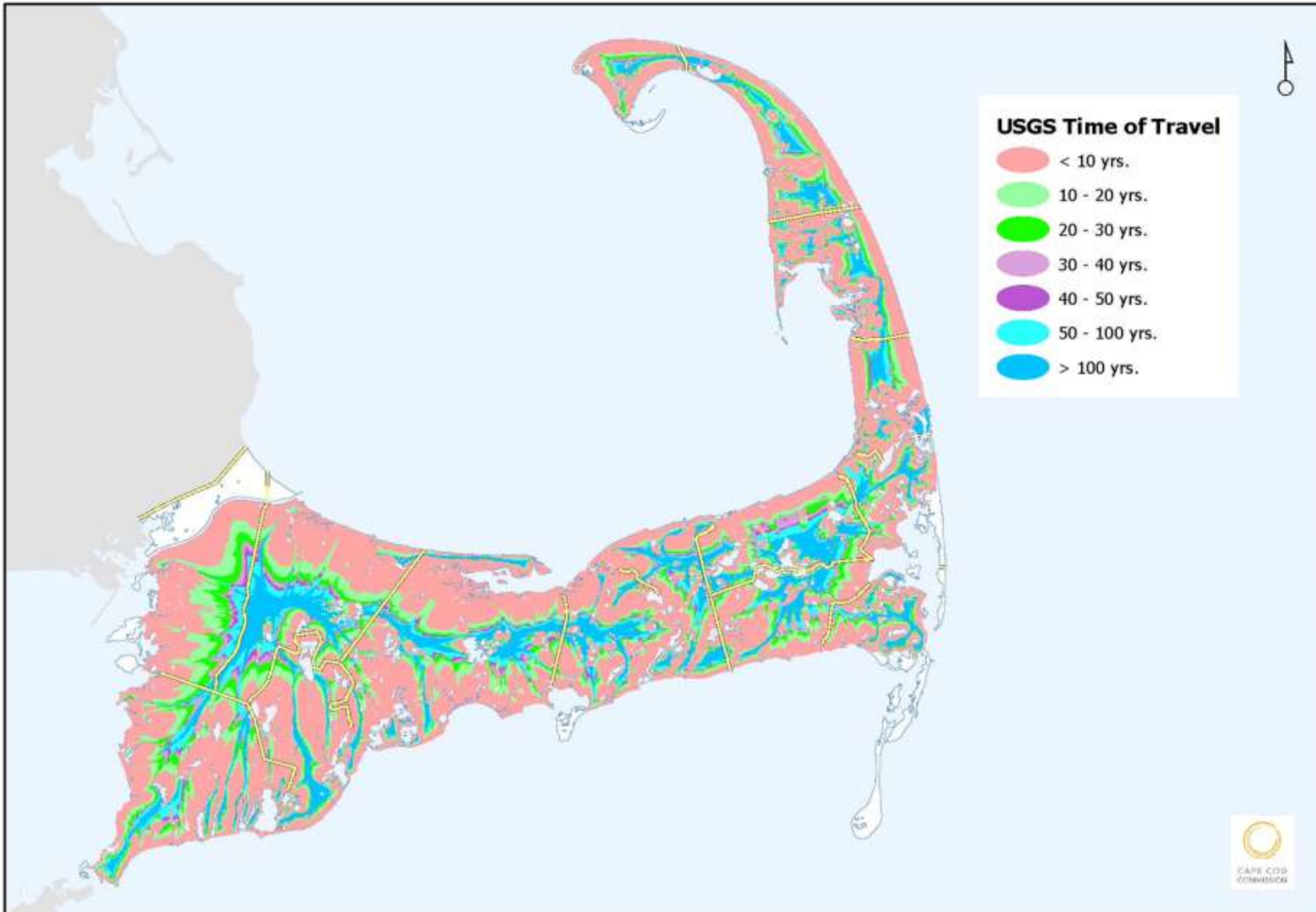
Economic

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


"Watershed Working Group - Wellfleet Harbor/ Pamet River - Workshop 2"
DRAFT
Embayment TMDL Status Map
0
2.5
5
7.5
10
Miles
Legend
Rivers
Ponds
Embayment Boundary
On Land
On Sea
Embayment Status
Pending
To Be Addressed
Subwatersheds with TMDL
0.1 - 9 %
9.1 - 26 %
26.1 - 40 %
40.1 - 55 %
55.1 - 69 %
69.1 - 75 %
75.1 - 86 %
86.1 - 100 %


USGS Time of Travel
< 10 yrs.
10 - 20 yrs.
20 - 30 yrs.
30 - 40 yrs.
40 - 50 yrs.
50 - 100 yrs.
> 100 yrs.

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

Cape Cod 208 Area Water Quality Planning
Wellfleet Harbor and Pamet River Watershed Working Group

Meeting Two
Wednesday, October 30, 2013
1:00 – 5:00 pm
Wellfleet Council on Aging

Meeting Summary Prepared by the Consensus Building Institute

I. ACTION ITEMS

Working Group

- Next meeting: Meeting Three
  Monday, December 2, 2013
  1:00 – 5:00 pm
  Wellfleet Council on Aging, 715 Old King's Highway, Wellfleet, MA 02667
- Send Kate any additional comments on Meeting One Summary
- Continue to prepare thoughts about which technologies/approaches they would like to learn more about for application in the Wellfleet Harbor and Pamet River Watershed. Different scenarios and options will be discussed during Meeting Three.

Consensus Building Institute

- Send link with presentation to participants
- Finalize Meeting One summary
- Draft and solicit feedback from Working Group on Meeting Two summary.

Cape Cod Commission

- Share Technology Matrix with Working Groups
- Share updated Chronologies with Working Groups
- Compile information about I/A systems from EPA's and MA DEP's websites.

II. WELCOME, REVIEW 208 GOALS AND PROCESS AND THE GOALS OF MEETING

Erin Perry, Special Projects Coordinator at the Cape Cod Commission, welcomed participants and offered an overview of the 208 Update stakeholder process.[1] In July, public meetings were held across the Cape to present the 208 Plan Update goals, work plan, and participant roles. Public meetings were also held in August to present information on the affordability and financing of the updated comprehensive 208 Plan. The first meetings of the eleven Watershed Working Groups were held in September and focused on baseline conditions in each of the

[1] The PowerPoint Presentation made at this meeting is available at: http://watersheds.capecodcommission.org/index.php/watersheds/outer-cape/wellfleet-harbor-pamet-river

watersheds. The second meetings of the Watershed Working Groups will be held in October and early November and are focused on exploring technology options and approaches. The third meetings of the Watershed Working Groups will be held in December and focus on evaluating watershed scenarios which will be informed by Working Groups' discussions about baseline conditions, priority areas, and technology options/approaches. This conversation will also be informed by information shared in the Technology Matrix, which was developed by the Cape Cod Commission with technical input from the Technology Panel. The Technology Matrix builds on the information presented in the Technology Fact Sheets, which Working Group members reviewed in advance of the meeting[2]. Once it is finalized by the Cape Cod Commission, the Technology Matrix will be shared with Working Group Members.

Ms. Perry, shared 208 Plan team's progress since Meeting One which includes:

- Meeting materials distributed to stakeholders and available at http://watersheds.capecodcommission.org
- GIS data layers accessible at: http://watersheds.capecodcommission.org
- Chronologies are being updated and will be made available soon

Ms. Perry also shared that the second round of Cape2O game is launching on October 22. She noted that over 400 people registered for the first round of the Cape2O game and encouraged Working Group members to participate in the interactive, online game which provides valuable education and input to the Cape Cod Commission.

Ms. Perry announced that there will also be a Cape Cod wide event on November 13 at the Cape Cod Center for the Arts in Dennis. Participants from across the eleven Watershed Working Groups and the public are invited to attend the event which will include: Wrap up of Cape2O: ur in charge!; a summary of planning process to date; discussion of the stakeholder role in the second 6 months of the 208 planning process.

Dan Milz, a doctoral candidate at the University of Illinois at Chicago, introduced himself and explained that he would like to videotape the meeting for purposes of his dissertation research. He indicated that, although the meeting is public, the recording would be kept private and that he would withhold names and affiliations in his work.

Ms. Perry reviewed the goal of the 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.

[2] Technology Fact Sheets are available at: http://watersheds.capecodcommission.org/index.php/watersheds/outer-cape/wellfleet-harbor-pamet-river

Kate Harvey, the facilitator from the Consensus Building Institute, reviewed the agenda and led introductions. A participant list can be found in Appendix A. She also requested that, if anybody has any additional comments or edits to the Round 1 meeting summary, they send them to her.

III. RANGE OF POSSIBLE SOLUTIONS

Scott Horsley, Area Manager for the Wellfleet and Pamet River Working Group, led the discussion of the range of possible solutions. As Working Groups learn more and consider the pros and cons of the technologies and approaches, he encouraged participants keep in mind that:

- The Cape Cod Commission has engaged in a comprehensive analysis of nutrient control technologies and approaches. This analysis is distilled into: the Technology Fact Sheets, which present various information on the technologies being considered; the Technology Matrix, which includes additional information on site requirements, construction, project and operation and maintenance costs, reference information, and regulatory comments; and ongoing input from stakeholders on the public acceptance of technology options and approaches.
- Not all of the technologies and approaches will be applicable to Cape Cod.
- Some technologies are so promising that we should identify them for demonstration and pilot projects.
- Workshop 3 will embark on hands on problem solving in each watershed to meet target load reductions.
- Certain technologies or approaches will be effective at preventing nutrients from entering the water body. Others will be effective at reducing or remediating nutrients that are already in the groundwater or water body.
- Regulatory programs can address nutrient controls for both existing development and future development.

Mr. Horsley offered a brief overview of the technologies and approaches. The following section briefly describes each technology. Participants' questions and comments about the technologies are also discussed below *(in italics)*:

Site level technologies/approaches

<u>Standard Title V System</u>*:* This is a standard septic system that consists of a septic tank and soil adsorption system (leaching field). The system was primarily designed to address public health concerns related to waste in drinking water (e.g. coliform bacteria); they were not designed to remove nutrients (e.g. nitrogen).

<u>I/A title V System:</u> Innovative/Alternative (I/A) on-site nutrient reducing systems typically consist of standard septic system components augmented to remove more nutrients than a

standard Title 5. I/A systems refer to a class of systems intended to be designed as recirculating sand filter (RSF) equivalents by meeting the same treatment limits in a smaller footprint.

- *Responding to a statement from Mr. Horsley that I/A systems can capture up to 80% of controllable nitrogen, a working group member emphasized that the 80% figure refers to controllable nitrogen, not the entire nitrogen load. It misses what the environment can actually absorb. In Orleans recently, the harbor basin was removed from TMDL requirements because 95% of nitrogen was coming in on the tide. When you're looking at costs and start looking at trade-offs, 60-95% of the problem comes from birds and other natural sources. We need to be very clear about the messaging around this.*
- *A working group member noted that Title V requirements, which were written in the 1970s, were not good enough to capture the nitrate building up in the groundwater. Title V was a good rule for Massachusetts as a whole, but it was not a good rule for the Cape because our soils are so sandy. On the Cape, you also need to put carbon into the ground to encourage bacterial growth in the ground. Back in the 1970s, Title V was very contentious, with people saying that they could not afford to install a system that cost so much money. The state implemented Title V anyways. It is important that MA DEP and EPA recognize that some of today's problem stem from these old regulations.*
    - Mr. Horsley responded that Title V was designed to remove pathogens and control public health, but it was not written to control nutrients. With regards to the carbon source: a lot of I/A systems work to introduce carbon sources into the ground to encourage bacterial growth under the ground. There is more information available about I/A systems on EPA's and MA DEP's websites, and the Cape Cod Commission will compile some information for all of you. The performance data on I/A systems is very variable, and a key factor in how well these systems perform is how well the homeowner maintains these technologies. For example, a common challenge that we have seen is that homeowners will unplug a methane pump in order to save on electricity and, without a functioning methane pump, the I/A system does not work very well.

<u>Urine Diverting Toilets</u>: Urine diversion systems send urine into a holding tank where the urine is stored and periodically collected by a servicing company. The servicing company empties the tank for disposal or recycling such as conversion to a fertilizer. Through these means, the nitrogen may be removed from the watershed. With urine diverting toilets, the remainder of the human waste and all other water uses (sink and shower) continue to go to the septic system. (Case example, Falmouth, MA).

<u>Composting toilets</u>: A toilet system which separates human waste from shower, sink and other household water uses. The composting toilets use no or minimal water. The human waste captured by the composting toilets is decomposed and turned into compost. The compost generated is removed from the site and nutrients can be recycled. Composting toilets require the replacement of existing toilet(s) and room in the basement for a container to capture and compost the human waste. Household water use (sink and shower uses) continue to flow to the septic system. (Case example, Falmouth, MA).

- *Why is there such a large difference in nitrogen-removal efficiency between urine-diversion and composting toilets?*
  - Mr. Horsley said that this issue needs further investigation.
- *With a composting toilet, you would need to pump the septic system much less frequently. There would still be some food waste going into it, but not sewage waste.*

<u>Packaging toilets</u>: A packaging toilet encapsulates human waste in a durable material for removal from the site. The package is stored beneath the toilet and removed and taken away when full. The nutrients can be recycled by the servicing company that picks up the packages.

<u>Stormwater bioretention</u>: Bioretention systems utilize natural plant and soil functions to capture and treat stormwater runoff for a variety of contaminants including nutrients. A typical system consists of an underdrain/gravel layer, a layer of bioretention soil mix (a mix of sand, compost, woodchips and loam), and a surface layer containing appropriate plantings. The treated water can be discharged into a water body or used for open space irrigation after treatment. The reclaimed water can also be discharged into a subsurface infiltration system for discharge to the groundwater. (Case example, Portland, OR).

- *Chatham has installed some of these systems, correct?*
  - Mr. Horsley responded that every town on the Cape has implemented quite a few of these systems. Towns have been retrofitting parking lots. These systems remove pathogens and also remove nitrogen and phosphorus.

Neighborhood level technologies/approaches

<u>Cluster and satellite treatment systems</u>: A cluster or satellite system is a collection and treatment system treating wastewater flows from multiple properties.

<u>STEP/STEG collection</u>: Septic Tank Effluent Pumping (STEP) and Septic Tank Effluent Gravity (STEG) systems convey liquid wastewater from on-site septic tanks to sewer systems. Only the liquid component of the wastewater may be conveyed by pumps or by gravity.

- *Why does the nitrogen removal for this system say "NA" on the fact sheet?*
  - Mr. Horsley explained that STEP/STEG collection is basically a cost-saving measure that collects waste from Title V systems. It does not add any additional treatment to the septic treatment technology.

<u>Eco machines and living machines</u>: Living or Eco-Machines are natural systems that treat septic tank effluent or primarily treated wastewater. In these systems, aeration and clarification chambers are combined with constructed wetlands to treat the influent. The wetlands are a series of chambers allowing for microbial communities to engage with and treat the wastewater. Plants are often suspended on racks with their roots systems doing the work. Solids removal is generally onsite, after which water is pumped through the gravel filled cells (similar to subsurface wetlands.) This process transfers more oxygen to the wastewater and completes the pollutant removal process. (Case example, South Burlington, VT).

Stormwater wetlands: Constructed wetlands provide aerobic chambers followed by subsurface anaerobic chambers that facilitate nitrification followed by denitrification, respectively. This process mimics that of natural systems coupled with engineering design guaranteeing residence time within a chamber containing anaerobic conditions. (Case example, China).

- *Do the constructed wetlands have concrete at the bottom?*
    - The can have many different designs. They can be large or small, and they can be constructed in the water table, in which case they would not need to be lined, or they can be higher than the water table, in which case they would need to be built with some sort of lining material to retain water. Wetlands are very flexible in how they work.
- *Has there been any conversation about changing the MA DEP regulations around natural wetlands? In some places in the South, some people are running stormwater directly to natural wetlands and monitoring the health of the wetlands to make sure that this is not causing any adverse effects.*
    - Mr. Horsley noted that Massachusetts' wetlands regulations were enacted in 1995. He added that he has not heard any discussion about the state changing those regulations. The current policy says that "no untreated discharge" can be sent to wetlands, meaning that stormwater would have to undergo some primary treatment before it is sent to natural wetlands. This regulation would be difficult to change in Massachusetts as the wetlands-protection constituency is pretty satisfied with the current system.

Watershed level technologies/approaches

Conventional treatment: A conventional wastewater treatment facility typically treats wastewater collected from homes and businesses. A groundwater discharge permit is required. Treatment generally results in less than 10 mg/L Nitrogen.

Constructed wetlands: surface flow: After primary treatment in a septic tank or wastewater treatment facility or secondary treatment at a wastewater treatment facility, water is fed into a surface flow constructed wetland. Surface flow constructed wetlands closely mimic the ecosystem of a natural wetland by utilizing water loving plants to filter wastewater through their root zone, a planted medium, and open water zones. Surface flow wetlands are systems where open water is exposed much like in a natural marsh. The reclaimed water from the wetland can be discharged into a water body or used for open space irrigation after treatment as well as discharged into a leach field. (Case example, Albany, OR).

Constructed wetlands: subsurface flow: After primary treatment in a septic tank or wastewater treatment facility or secondary treatment at a wastewater treatment facility, wastewater is treated by pumping water slowly through subsurface gravel beds where it is filtered through plant root zones and soil media. Water flows 3-8" under the surface to prevent public exposure to wastewater and mosquito breeding. A combination of horizontal and vertical flow subsurface systems must be utilized to provide total nitrogen removal. This solution can also offer opportunities for recreation activities on land above the subsurface system. (Case example, Thailand).

- *Due to Cape Cod's very sandy soils, we do not have a whole lot of soil that holds water. Particularly in Eastham, but also other places on the Cape, I cannot think of many places where there is standing water that is not part of the natural water table. I understand that MA DEP and EPA want us to look at all of these options, but I hope that they are not thinking that we will have the resources to build a watertight wetland.*
    - Mr. Horsley responded that wetlands can be constructed in the water table, in which case they would not need to be lined, or they can be higher than the water table, in which case they would need to be built with some sort of lining material to retain water. The unlined wetlands would be cheaper to construct.
- *I like that we are looking at a number of different options as having this many options before us presents a "Chinese menu" of various options that we could be looking at in terms of best management practices.*

Effluent disposal: out of watershed: Effluent disposal can take a variety of forms, including infiltration basins, a Soil Absorption System, Injection Wells or Wick Wells. These disposal methods place highly treated effluent back into groundwater. Effluent Transport out of the watershed has the advantage of removing the nitrogen load to another watershed. Transport to another watershed requires the receiving watershed to be able to accommodate the additional nitrogen load.

Effluent disposal: ocean outfall: Similar to out of watershed effluent disposal, highly treated effluent is transported out of the watershed and into the ocean. This solution requires a high level of regulatory oversight. The solution is considered due to limited land availability for disposal on Cape Cod.

Phytoirrigation: After secondary treatment, wastewater treatment facility effluent is irrigated onto plants to remove nutrients and other contaminates. Fast growing poplar and willow trees are typically used. (Case example, Woodburn, OR).

- *How far below the surface is the groundwater in the Woodburn example?*
    - Mr. Horsley responded that, in this case, the depth of the groundwater would not matter since the trees are being watered with enriched water, but that in some cases groundwater depth would have to be taken into consideration.

Neighborhood or Watershed level technologies/approaches

Phytobuffers: Using trees with a deep root system to capture nutrients in the soil, particularly willows and poplars. Green plants with deep tap roots are planted as a buffer to intercept existing groundwater. The plants and their associated microorganisms reduce contamination in soils and ground water. Often phytohydraulics causes the groundwater plume to be redirected and pulled towards the plants. (Case example, Kavcee, WY).

Fertigation wells: Fertigation wells can capture nutrient enriched groundwater, typically from a wastewater treatment facility discharge, and recycle it back to irrigated and fertilized turf grass areas. These irrigated areas include golf courses, athletic fields and lawns. Fertigation can significantly reduce nutrient loads to downgradient surface waters while reducing fertilizer costs to the irrigated areas. (Case example, Plymouth, MA).

- *There is a plume near Truro that could be captured using this sort of technology.*
    - Mr. Horsley noted that one would have to be careful about the source of the plume because it would be dangerous to return metals and other wastes if the plume comes from a landfill.
- *How does this technology work during the winter?*
    - Mr. Horsley responded that the wells would be shut off during the winter, but noted that groundwater flows about a foot per year on the Cape, and when the wells are turned back on during the spring, they capture all of the water that flowed past during the winter.
    - *A member of the public added that, for untreated water flows, fertigation wells must be placed at a sufficient distance from the source to allow water to flow for two years underground so that pathogens are killed before they are picked up by the wells.*

Permeable reactive barrier (PRB): 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, microbes in the groundwater uptake the nitrogen, denitrifying the groundwater. PRB systems typically use vertical trenches, sequences of bored columns or injection methods to introduce the carbon source into the groundwater to reduce the nitrogen load to an estuary, removing it from the watershed. (Case example, Falmouth, MA).

- *What are some examples of carbon-containing fluids besides gasoline?*
    - Waste oils, cooking oil, and beer-brewery by-products are all examples. Any substance that has carbon but does not have contaminants would work.
- *PRBs do not sound like a good idea to me. It sounds like you are introducing something unnatural into the ground.*
    - Mr. Horsley responded by thanking the commenter and saying that those are the types of reactions that the Commission is looking for from these working group meetings. PRBs would definitely need to be explained to the public to win public acceptance. PRBs would not be installed upstream of a drinking water source in case something goes awry.
- *This technology leads me to wonder whether anyone use woodchips to enhance Title V systems?*
    - Yes, that practice is definitely done. For example, you could install a layer of wood chips to enhance the nitrogen-processing ability of a leach field.

Inlet and culvert widening: Re-engineering and reconstruction of bridge or culvert openings to increase the tidal flux through the culvert or inlet. This solution generally works better with a larger tidal range but could be feasible on both the Cape Cod Bay side (approximately nine feet tidal range) and Nantucket Sound side (approximately 3 feet of tidal range).

Salt marsh habitat restoration: Salt marsh is one of the most productive ecosystems in the world, surpassing rainforest in productivity per acre. Approximately 65% of historic salt marsh has been lost in MA. Salt marshes cycle and remove nitrogen as well as provide critical habitat and spawning sanctuary for a wide variety of birds, mammals and marine life in addition to hosting a range of plant species and important biogeochemical processes. The capacity of salt marsh to intercept nitrogen is significant and well researched worldwide. Substantial areas of former salt marsh on the Cape are either under consideration for restoration or could be restored providing storm surge and coastal flooding protection in addition to water quality benefits in certain watersheds.

Shellfish habitat restoration: Oyster reefs were historically one of the main consumers and recyclers of nitrogen in the coastal environment on Cape Cod. According to the Nature Conservancy, populations have declined by 95%. In conjunction with the natural transition from land to sea in estuaries, bays and inlets; salt marsh, oyster reef and eel grass function as critical buffer that can reduce eutrophication. Restoring Oyster populations leads to increased shellfish productivity as well as improved commercial and recreational fisheries for other species, increased protection from shoreline erosion and flooding, and buffering from ocean acidification. (Case example, Wellfleet, MA).

Aquaculture / shellfish farming: Oysters, has been proposed as a potential method for reducing nitrogen levels and eutrophication in estuaries. Nitrogen removal rates from Oysters have been well documented and the harvest of oysters physically removes the nitrogen they sequester in addition to the nitrogen removed by their biological cycling which puts nitrogen directly back into the atmosphere. Aquaculture can be done on man-made structures (e.g. cages, floating bags) or natural reefs.

- *The Board of Selectmen in Wellfleet just signed a Sanctuary provision for the harbor. As a result, the shellfish population in Wellfleet Harbor is protected from harvesting.*
- *A big part of the reason for the Board's decision for Wellfleet Harbor is that some residents and tourists do not like the aesthetic effects of an active shellfishing industry due to the cages that are placed in the water and the restrictions on access and use, etc.*
- *Even without a shellfish farming industry, a healthy shellfish bed can still significantly reduce nitrogen loads. Nitrogen is sequestered in the shells of shellfish, and this stays sequestered even when the shellfish die. Microbiota eat the dead body mass, and so in a sanctuary area, nitrogen removal can be 2 or 3 times as significant as in an area without shellfish, largely because of the ecosystem that a healthy shellfish bed supports.*
- *It is important to think beyond oysters since they are not suitable for all habitats. Clam beds have almost as much nitrogen-removal impact as oyster beds.*

Surface water remediation wetlands: Constructed to aid in water quality improvements to surface water bodies, usually streams or rivers. Water is pumped or allowed to flow naturally through treatment cells containing wetlands Surface water remediation wetlands are often used in combination with groundwater recharge or potable water reuse systems. Surface water remediation wetlands are generally used with Free-Water Surface wetlands due to their larger size, and lower capital and O+M Costs. (Case example, China).

Pond and estuary dredging: Lakes, ponds, streams and estuaries store nutrients within their sediments. These sediments tend to accumulate over time. Subsequently, these nutrients can be release into the overlying water column and can become a major source of nitrogen and phosphorus. Dredging and removing these sediments and accumulated nutrients removes the nutrients from the water body and potentially the watershed. (Case example, Dennis, MA).

- *Time of year restrictions on dredging would present a challenge to using this technology.*
    - Mr. Horsley noted that, of all of the approaches that are being presented to the working groups, dredging is likely the most highly-regulated approach. The Commission's rule of thumb is to pursue dredging only when absolutely necessary. That being said, dredging can work.

Cape-wide level technologies/approaches

Compact development: Both Compact Development and Open Space Residential Development (OSRD) of subdivisions result in smaller lots and less maintained lawn acres. The higher density development reduces wastewater collection costs while providing a common disposal area. Compact development is also referred to as "Smart Growth".

Fertilizer management: 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. The Cape Cod Commission designated a cape-wide Fertilizer Management District of Critical Planning Concern (DCPC) which authorizes the towns to adopt local fertilizer management regulations (state law prohibits local fertilizer management except under the DCPC). The DCPC does not require towns to adopt fertilizer regulations, but paves the way for their adoption. Barnstable County will be conducting a public education process around fertilizer use.

Remediation of existing development: Existing developments or schools with excess wastewater treatment capacity allow existing nearby developments to connect to their underutilized wastewater treatment infrastructure. A town can operate the wastewater treatment facility if the existing owner prefers to not take the responsibility for treating the off-site wastewater. An example of this is the Kingman Marina in Bourne, which was permitted to expand its development footprint in exchange for hooking up adjacent, existing homes to its wastewater treatment facility.

Transfer of development rights: A regulatory strategy that transfers development and development rights from one property (sending area) to another (receiving area) to direct growth and associated nutrient loading away from sensitive receiving watersheds or water bodies. The protected parcels (sending areas) receive a deed restriction that limits the level of future development. The deed restriction can limit the number of homes or tie development to the availability to future wastewater treatment facility infrastructure.

- *Responding to Mr. Horsley's comment that this mechanism would not require zoning changes, a working group member said that there would have to be zoning changes in the receiving area to accept the additional growth.*
    - Mr. Horsley agreed and acknowledged that the receiving area would have to agree to accept additional density. He added that there would not have to be zoning changes made in the sending area, where downzoning is usually the really difficult thing to do.
- *The growth-receiving areas would need to have sufficient infrastructure, or would need to invest in infrastructure, to handle the additional growth.*
- *In Truro and Wellfleet, we are land-poor. A lot of our land is in the National Seashore area. We have very little developable land here because any open land is part of the National Seashore.*
- *In Wellfleet and in many other towns, one of the big challenges would be that people think of their town as a "traditional fishing village" and would be opposed to three-story buildings.*
    - Mr. Horsley responded that many people think of density as a negative thing or have an image in their minds of what density would look like. For example, increased density in Wellfleet would not necessarily need to include any three-story buildings. But the Association to Preserve Cape Cod created visuals of what greater density, sensitively done, could look like on the Cape and people liked the visuals more than the status quo. The Urban Land Institute came out with a coffee table book called Visualizing Density that shows what ½-acre density could look like, 1-acre density could look like, what a village center can actually look like, and visuals of this sort help to allay a lot of concerns that people have about greater density.

Stormwater best management practices (BMP): Non-Structural Stormwater strategies include: street sweeping, maintenance of stormwater utilities, education and public outreach programs, land use planning, and impervious cover reduction and control.

General questions and comments:

- *When trying to protect a freshwater system, year-round protection is important. Eutrophication is more of an issue during the summer, however, so you nitrogen uptake is not as much of a concern during the winter. Seasonality can work in our favor, depending on the watershed.*

- *A number of working group members expressed appreciation for the slideshow, presentation, and fact sheets, as they really helped to explain the different technologies.*

- *Developers could be incentivized to include features such as bioswales, rainwater collection, stormwater management, nitrogen mitigation technologies, etc., and also to site develop more efficiently, such as in clusters.*

- *We seem to be going through a regulatory cycle in which EPA is putting greater emphasis on stormwater runoff. Some of this has to do with a new computer modeling program that makes it easier for towns to evaluate runoff levels. Will EPA's focus on stormwater runoff intersect with our effort to deal with nutrients?*
    - Mr. Horsley responded that EPA does have new regulations in place for stormwater runoff in urban areas and the next iteration of EPA's program is likely to cover all areas, including the Wellfleet Harbor and Pamet River Watershed. Correcting stormwater problems, as some of the proposals would do, and simultaneously reducing nutrient loads, would address both issues simultaneously.
    - *A working group member added that many of the stormwater issues in Cape communities actually come from state highways.*
        - Cape Cod Commission staff members discussed their efforts to communicate with the Massachusetts Department of Transportation around this issue and possibilities for the Commission and Cape communities to address these concerns during the Section 208 process.

- *Downtown Wellfleet is installing infrastructure to address excess nitrogen from underground drinking water sources. This issue should not be constrained to coastal waters.*
    - Mr. Horsley responded that, while the regulations for coastal waters with regards to allowable nitrogen levels are much more stringent than they are for subsurface freshwater, the interventions should not ignore freshwater resources.

IV. PROBLEM SOLVING PROCESS AND PRINCIPLES

Overview of 7-steps for Problem-Solving Process

Mr. Horsley reiterated that the goal the Working Groups is to develop remediation options that would achieve water quality targets with a focus on first targeting low cost, low barrier options to reduce nitrogen and then considering more costly and traditional options later (e.g. sewering). He then described the alternatives screening process the group will apply. The process is as follows:

1) Establish targets and articulate project goals.
2) Identify priority geographic areas (e.g. high nitrogen reduction areas, Title V problem areas, pond recharge areas).
3) Determine which management activities should definitely be implemented. These might be the easiest and least costly management activities that should be undertaken regardless of other management actions (e.g. fertilizer management and stormwater mitigation – two approaches that Cape Cod towns are already actively pursuing).
4) Assess alternative options to implement at the watershed or embayment scale (e.g. innovative and lower-cost solutions)
5) Assess options to implement at the site-level
6) Examine priority collection/high density areas
7) Consider traditional sewering or other grey infrastructure management options

He further explained that the Working Groups will focus on total controllable nitrogen load. The technologies and approaches selected should aim to reduce the total controllable nitrogen load by identifying options that reduce the portion of *septic* load that needs to be reduced. For example, the portion of septic load that needs to be reduced could be made smaller if Cape Cod takes on fertilizer and stormwater solutions first. Additionally, the percentages of controllable nitrogen that need to be removed to meet TMDLs change depending on the characteristics of the watershed.

He noted that in many instances, one of the solutions may not achieve the TMDL, but if you pair multiple solutions you may be able to reach the goal. For example, many towns are already using and pairing some of the technology options and approaches:

- Wellfleet- *Coastal habitat restoration & aquaculture*
- Mashpee- *Aquaculture & Expanding Existing Systems*
- Brewster- *PRB & Bioswales*
- Orleans- *Fertilizer Control By-Law*
- Harwich- *Muddy Creek & Cold Brook Natural Attenuation*
- Falmouth- *Aquaculture, Inlet Widening, Eco-Toilet Demonstration Project, PRBs, Stormwater Management (Little Pond Watershed), Fertilizer Control By-Law, Subsurface Nitrogen Removal Septic System*

- *Wellfleet also has a huge stormwater management system and has the highest number* *of I/A systems per capita in the entire Cape.*

- *Truro also has two restoration projects going on near Eagle Nut Creek.*
    - Mr. Horsley noted that the presented technologies in the towns are only examples and that all of the towns also have other projects in place.

Categories of Solutions and their Impacts on the Environment, Economy, and Community

Mr. Horsley commented that evaluation of the technologies and approaches would be informed by their impacts (positive and negative) on the environment, economy, and community (Triple Bottom Line). Ms. Harvey asked participants to consider the environmental, economic, and community impacts of the possible technologies and approaches and asked them what evaluation criteria/factors they might consider in guiding evaluation of the range of possible solutions. Working Group members offered the following suggestions:

Environmental

- *Secondary impacts, including to wildlife:* Different approaches will have various secondary impacts on the environment (beyond the primary nutrient-mitigation effects), and these should be taken into account.
- *Environmental co-benefits:* Potential environmental co-benefits, such as reducing or capturing greenhouse gas emissions, restoring wetlands and estuaries, enhancing hazard resilience, etc. should be taken into account when considering different approaches.
- *Contaminants of emerging concern (CECs)*: Will additional measures have to be taken in the future to deal with contaminants other than nitrogen? Is there some way to plan for these proactive? Technologies that address CECs might be worth considering.
- *Timeframe of impact:* Different approaches address the problem in different ways and at different sites, with some addressing nutrients before they enter the groundwater and others reducing the impact of nutrients that are already present in the embayments. It may be important to implement a mixture of these approaches. In addition, current challenges really need to be dealt with quickly. Mucky fishing areas and smelly areas impact people directly.

Economic

- *Return revenue opportunities & co-benefits:* Some of the technologies and approaches have the potential to generate revenue and provide other economic benefits, such as providing business opportunities. These factors should definitely be factored into the process of evaluating different approaches.
- *Costs:* Costs will always be important. It might be worth pursing options with the least cost first. Or exploring options that have a lower cost per unit of nitrogen removed. The value of the infrastructure over time, and the payback period, should also be considered. Cape Codders may also be particularly cost sensitive at present because they are also facing higher insurance costs as a result of revised FEMA flood-risk maps.

- *Allocation of costs:* How will costs and benefits of different approaches be allocated? Can these be allocated fairly? Will costs be shared across a community, a set of communities, or across the entire Cape?
- *Alignment with priorities of other actors:* If a particular approach or proposal for nitrogen mitigation aligns with the interests or priorities of bodies such as federal or state agencies, they may be willing to pay for a portion of the cost. Participants suggested looking beyond EPA to include USDA, US Army Corps of Engineers, NOAA, etc.
- *Job opportunities:* Different remediation approaches may create job opportunities for local residents in terms of the implementation of the technology, operations and maintenance, and from co-benefits and related industries.
- *Operations and maintenance (O&M)*: In addition to installation costs, the long term costs for O&M should be considered because towns might not be able to support costly O&M.
- *Efficiency*: Stakeholders noted that technologies should be efficient in terms of cost, impact, and resources used. Towns will not support options that are not efficient over the long and short term.
- *Impact on homeowners and purchasers*: Infrastructure investments and requirements for homeowners may have a number of impacts on homeowners and the real estate business. For example, they may impact home maintenance costs, may increase costs for real estate sellers as they prepare to sell, may discourage purchasers who shy away from new regulations, and may make it harder for people to bear the costs of homeownership due to higher maintenance costs and taxes.
- *Boating conflicts*: Some approaches, such as aquaculture, may cause conflicts with boaters.
- *Unintended consequences*: There may be unintended consequences to residents and businesses, such as disruption to tourism from construction, which should be anticipated, to the extent possible.

Social

- *Secondary benefits/opportunities*: It might be valuable to explore options that create useful secondary benefits for communities, such as additional recreational space or conservation area, that can be beneficial both for local residents and for the tourism industry.
- *Personal responsibility*: Maintaining personal responsibility, for example, for the maintenance of Title V I/A systems, is important.
- *Aesthetic impacts*: The aesthetic impacts, both positive and negative, of different approaches should be considered. For example, aesthetics of installing infrastructure. For example, some residents may be opposed to infrastructure related to aquaculture such as cages, trucking, etc.
- *Heart and soul characteristics of communities*: Maintaining the key community characteristics that residents value, with regards to issues such as greater density of development, is important.

- *Leadership by example*: Public buildings could implement alternative technologies, such as I/A systems, to help expose residents to promising approaches and help them understand how they work.
- *Education and public buy-in:* Ensuring public buy-in to whatever approaches are pursued is critical. Public messaging cannot be top-down. Buy-in has to come from the bottom-up and from community members themselves. The press can be an ally in communicating with the public, but they need to cover the process fairly and not only focus on controversy.

<u>Implementation</u>

- *Retrofit or New Requirements*: To what extent will technologies be retrofits or be required for new construction? At what cost and what are the mechanisms for implementation?
- *Seasonal variability*: How do the technologies work with seasonal variability (e.g. I/A systems don't work as well if they are not run regularly).
- *Regulatory considerations*: The difficulty of regulatory approval for different approaches should be taken into consideration.
- *Self-sustainability:* Approaches that require ongoing upkeep and maintenance, whether by municipalities or individuals, require more resources and effort than approaches that are more self-sustaining.
- *Unintended consequences*: Unintended and negative impacts on other priorities, such as drinking water quality, should be avoided.

<u>Siting</u>

- *Environmental Factors:* Some of these technologies may not work under all environmental conditions. For example, some may not work if the soils are of inappropriate chemistry, the water table is either too high or too low, etc..
- *Impact on property values:* The potential positive and negative impacts of different approaches on property values should be considered.
- *Abutters*: The potential impacts and reactions of abutters to specific technologies should be considered. Some may be opposed to land clearing or hard infrastructure.
- *Long-term buildout and land use*: The impact of technologies on land use and build out should be considered. There may be unintended consequences (positive and negative) that could result from certain technologies (e.g. smart growth, sprawl, growth neutral, etc.). Future growth should be managed in line with community desires and vision.

Priorities for this Watershed

Ms. Harvey asked participants to hone in on the specific environmental, economic, and social trade-offs or consequences that they felt would be important to consider for this watershed? Working Group members offered the following suggestions:

- *Framing of the issue:* This issue seems to be overly-focused on reducing nutrients as the goal. The focus should really be on environmental quality and water quality. One of the reasons that this issue has been so difficult to deal with is because the public does not see, feel, or smell nitrogen. On the other hand, the public does have a connection to their watersheds and the embayments, and so the issue could be framed around "observable water quality." People really care about habitat quality and, particularly, the aesthetic value of the environment. For example, are the beaches nice? These broad environmental concerns should be the focus of this process.

- *Costs:* Costs will always be important. It might be worth pursing options with the least cost first. Or exploring options that have a lower cost per unit of nitrogen removed. The value of the infrastructure over time, and the payback period, should also be considered. Cape Codders may also be particularly cost sensitive at present because they are also facing higher insurance costs as a result of revised FEMA flood-risk maps.

- *Timeframe of impact:* Different approaches address the problem in different ways and at different sites, with some addressing nutrients before they enter the groundwater and others reducing the impact of nutrients that are already present in the embayments. It may be important to implement a mixture of these approaches. In addition, current challenges really need to be dealt with quickly. Mucky fishing areas and smelly areas impact people directly.

- *Environmental co-benefits:* Potential environmental co-benefits, such as reducing or capturing greenhouse gas emissions, restoring wetlands and estuaries, enhancing hazard resilience, etc. should be taken into account when considering different approaches.

- *Long-term buildout and land use*: The impact of technologies on land use and build out should be considered. There may be unintended consequences (positive and negative) that could result from certain technologies (e.g. smart growth, sprawl, growth neutral, etc.). Future growth should be managed in line with community desires and vision.

- *Managing change:* Change is difficult for communities to go through. They must be managed gently throughout this process.

Technology Selection: Process and Principles

Mr. Horsley noted that the Working Group had identified many of the principles that the Cape Cod Commission hoped would guide technology/approaches selection. These process and principles include:

- *100% septic removal subwatershed*: Combinations of technologies can be used to reduce septic load that needs to be removed.
- *Scale: On-Site vs. Collection System vs. Natural System*: There will be tradeoffs between

the scale of systems that can be used. On-site, collection, and natural systems all have their pros and cons and all require different levels of investment and infrastructure. These tradeoffs will be important from an implementation and public acceptance point of view.

- *Nutrient intervention and time of travel*: Some technologies/approaches intercept nutrients at their point of entry into the system, while others deal with it later on (e.g. once it is in the watershed). There are pros/cons to each approach which need to be considered.
- *Permitting Status*: The level of effort required to permit technologies will be a consideration.
- *Land use and Impacts of Growth*: Unintended consequences and opportunities for planned growth are important to consider.

Additional Questions and Comments from Working Group Members

Responding to a suggestion from Mr. Horsley that the Commission is considering proposing "Plan A / Plan B" approaches to the regulatory agencies (in which Plan A would be more innovative and Plan B would be a proven fallback option, such as sewering), a working group member asked why the Commission believed that a Plan A / Plan B approach is more likely to win approval from MA DEP.

- In response, Mr. Horsley explained that, generally, this is consistent with how MA DEP has operated in the past. For example, in order to receive permission to install a composting toilet, the applicant would also have to show DEP that he or she has the space to install a full Title 5 system if the toilet does not work. The plan has to be adaptive and has to have some fallback positions that DEP has confidence in. For example, DEP knows that sewering works but the agency does not have the same level of confidence in aquaculture.
- *A working group member added that, last fall, EPA and DEP said for the first time that they would consider shellfish as part of a permitting proposal. Until then, that idea was not on the table. This Section 208 process is the first time that there has been an opening for these sorts of alternative and innovative approaches from the permitting agencies.*
- Mr. Horsley added that the robustness of Cape Cod's Section 208 process, which includes public participation of various kinds, the Technology Panel, and the various other resources being dedicated to the process, is compelling EPA and DEP to consider alternatives that they have never before considered.

Are Martha's Vinyard and Nantucket engaged in a similar process as the Cape is and are they considering similar solutions?

- Ms. Erin Perry said that, generally, the nutrient challenges faced in those communities are not as severe as those facing the Cape and that they have less data about the health of their water bodies, meaning that they do not have goals that are as stringent as those on the Cape. Martha's Vinyard has a commission that works similarly to the Cape Cod

Commission and that has expressed interest in coordinating and collaborating with the Cape Cod Commission on the Section 208 process. The Commissions will be coordinating more closely in Years 2 and 3 of the Section 208 process.

V. PLANNING FOR THE NEXT MEETING

Meeting Three will be held:
Monday, December 2, 2013
1:00 – 5:00 pm
Wellfleet Council on Aging, 715 Old King's Highway, Wellfleet, MA 02667

During this meeting the Working Groups will examine various scenarios (i.e. combinations of solutions) and their potential impacts (e.g. nutrient reduction, economic impacts, environmental impacts, social impacts, etc.). During the meeting, the Cape Cod Commission will use tools to calculate ideas/options and their impacts. Working Group participants should come prepared to offer their ideas about what solutions they'd like to explore further given their understanding of the baseline conditions, issues, and priorities in this watershed.

VI. PUBLIC COMMENTS

No public comments were made.

APPENDIX ONE: MEETING PARTICIPANTS

Name	Affiliation
Working Group Members	
Joanna Buffington	Eastham Board of Health
Aimee Eckman	Eastham Selectman
Curt Felix	Comprehensive Wastewater Planning Committee, Wellfleet
Deborah Freeman	Wellfleet Conservation Trust
Charleen Greenhalgh	Town Planner, Truro
Mike Guzowski	Water Management Committee, Eastham
Charles Harris	Water Management Committee, Eastham
Ned Hitchcock	Wastewater Committee, Wellfleet
Sheila Lyons	Wellfleet
Lauren McKean	National Parks Service
John Morrissey	Selectman, Wellfleet
Patricia Pajaron	Health Agent, Truro
Tracey Rose	Real Estate Agent, Thomas D. Brown Real Estate Agency
May Ruth Seidel	Wellfleet Non-Resident Taxpayer Association
Robert Weinstein	Planning Board, Truro
Bill Worthington	Planning Board, Truro
Staff	
Kate Harvey	Consensus Building Institute
Tushar Kansal	Consensus Building Institute
Scott Horsley	Cape Cod Commission
Anne McGuire	Cape Cod Commission
Erin Perry	Cape Cod Commission
James Sherrard	Cape Cod Commission
Observers	
Elizabeth Migliore	CCNS Americorps
Dan Milz	PhD Candidate, University of Chicago
Ed Nash	Golf Course Superintendents Association of Cape Cod
Jean Schaefer	Wellfleet Non-Resident Taxpayer Association
Joseph Bateau	Truro Energy Committee (Provincetown WG member)