Cape Cod 208 Area Water Quality Planning
Pleasant Bay Group Watershed Working Group

Meeting Two
Wednesday, October 23, 2013
Orleans Town Hall, 19 School Road, Orleans, MA 02653
8:30 am - 12:30 pm

8:30 Welcome, Review 208 goals and Process and the Goals of today's meeting – *Cape Cod Commission*

8:40 Introductions, Agenda Overview, Updates and Action Items– *Facilitator and Working Group*

9:00 Range of Possible Solutions – *Cape Cod Commission and Working Group*
- Technology Matrix
- Technologies Overview
- Survey Questions and Comments
- Additional Questions and Discussion

10:30 Break

10:45 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

12:00 Preparing for Meeting 3 and Beyond – *Cape Cod Commission*
- Review Tools, Alternatives Analysis Approach
- Evaluating Scenarios for Meeting Nitrogen Goals
- Other Process Next Steps

12:15 Public Comments

12:30 Adjourn

Pleasant Bay

Technologies and Approaches

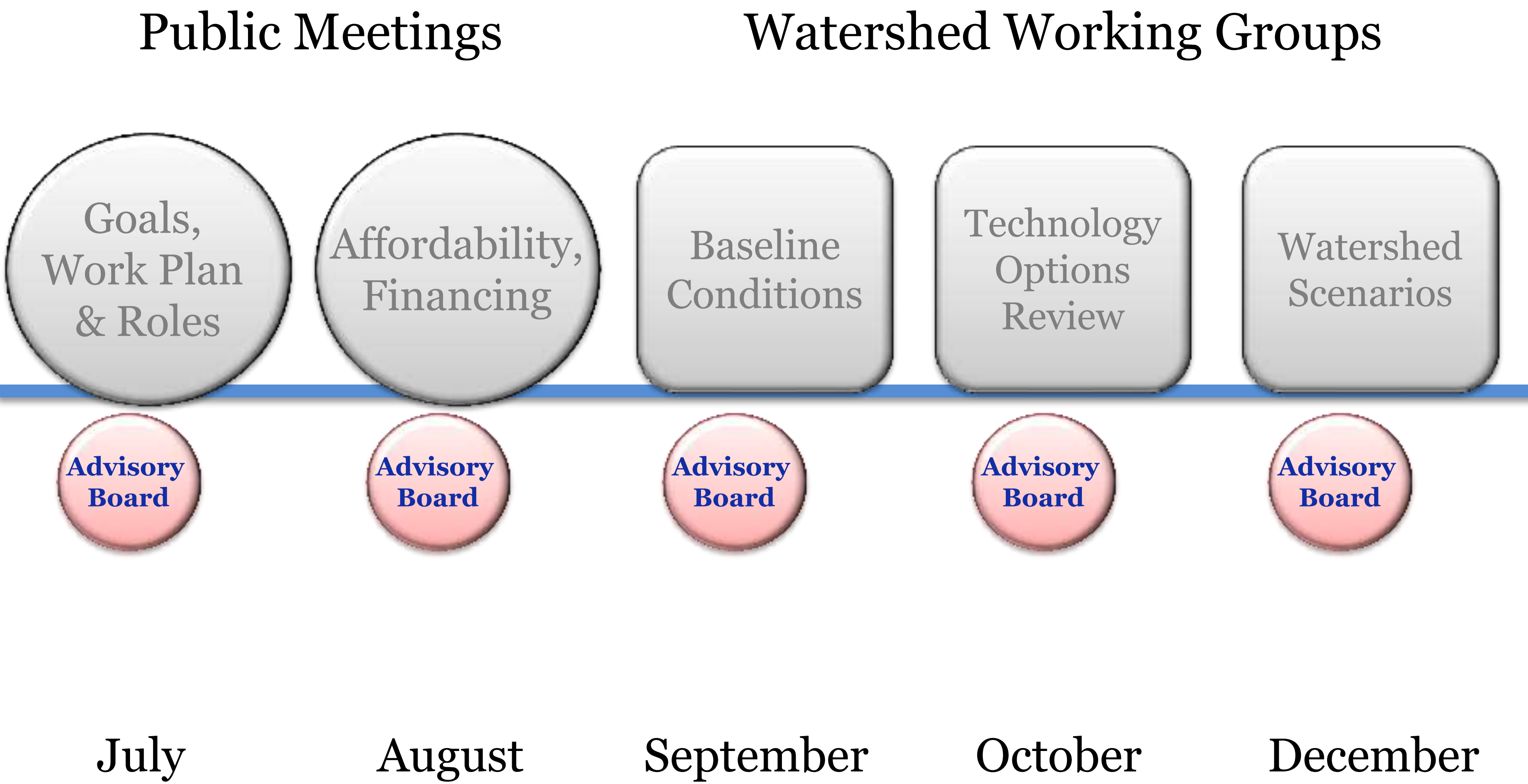
What is the stakeholder process?

Public Meetings

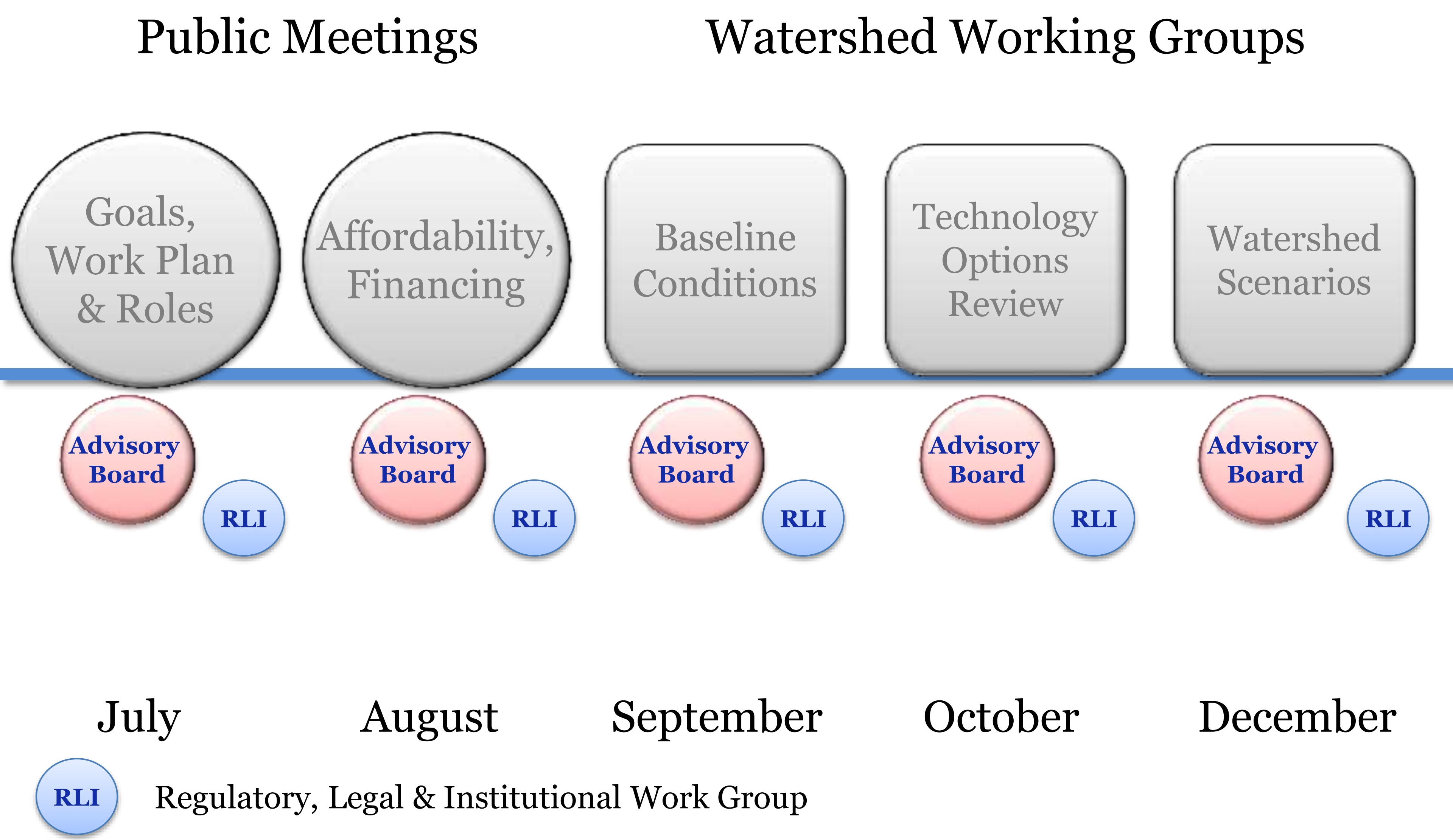
Watershed Working Groups

July	August	September	October	December
Goals, Work Plan & Roles	Affordability, Financing	Baseline Conditions	Technology Options Review	Watershed Scenarios

208 Planning Process

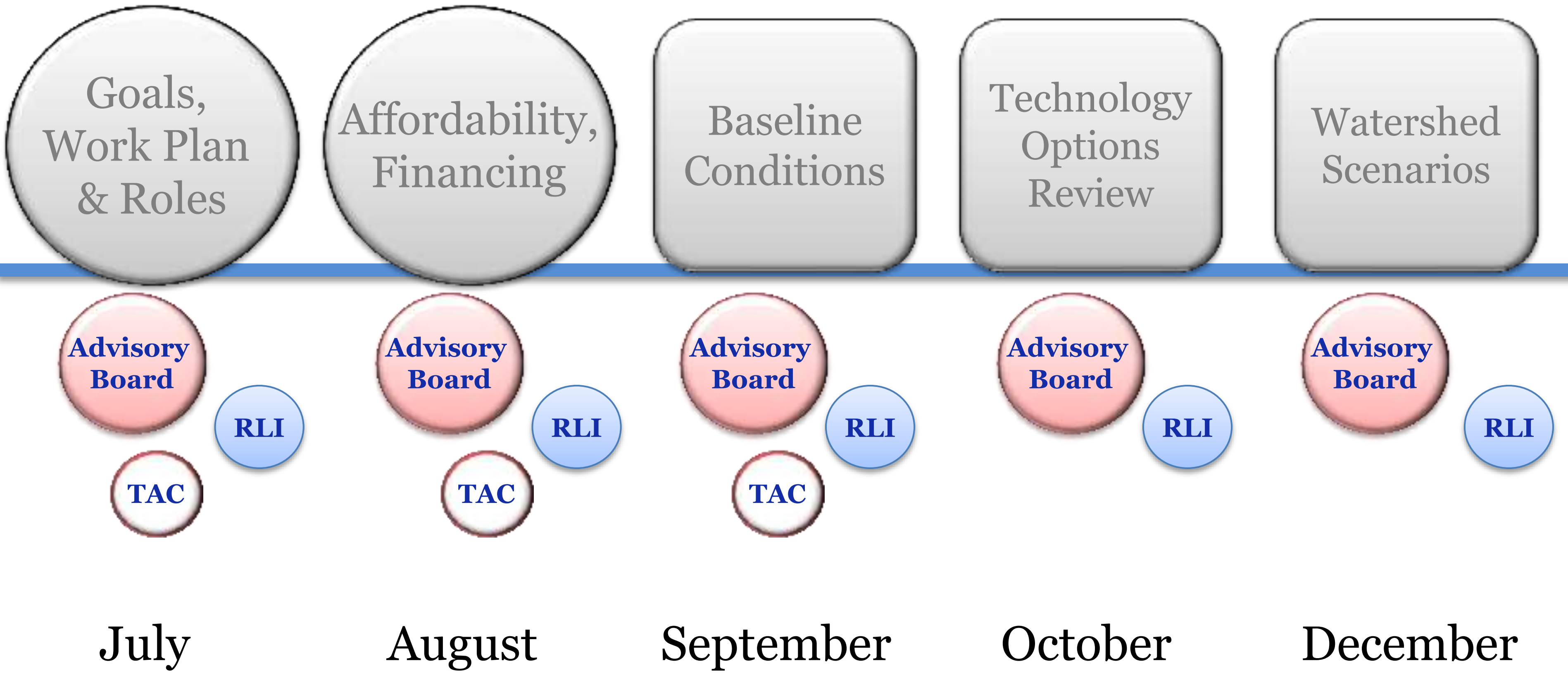


208 Planning Process



208 Planning Process

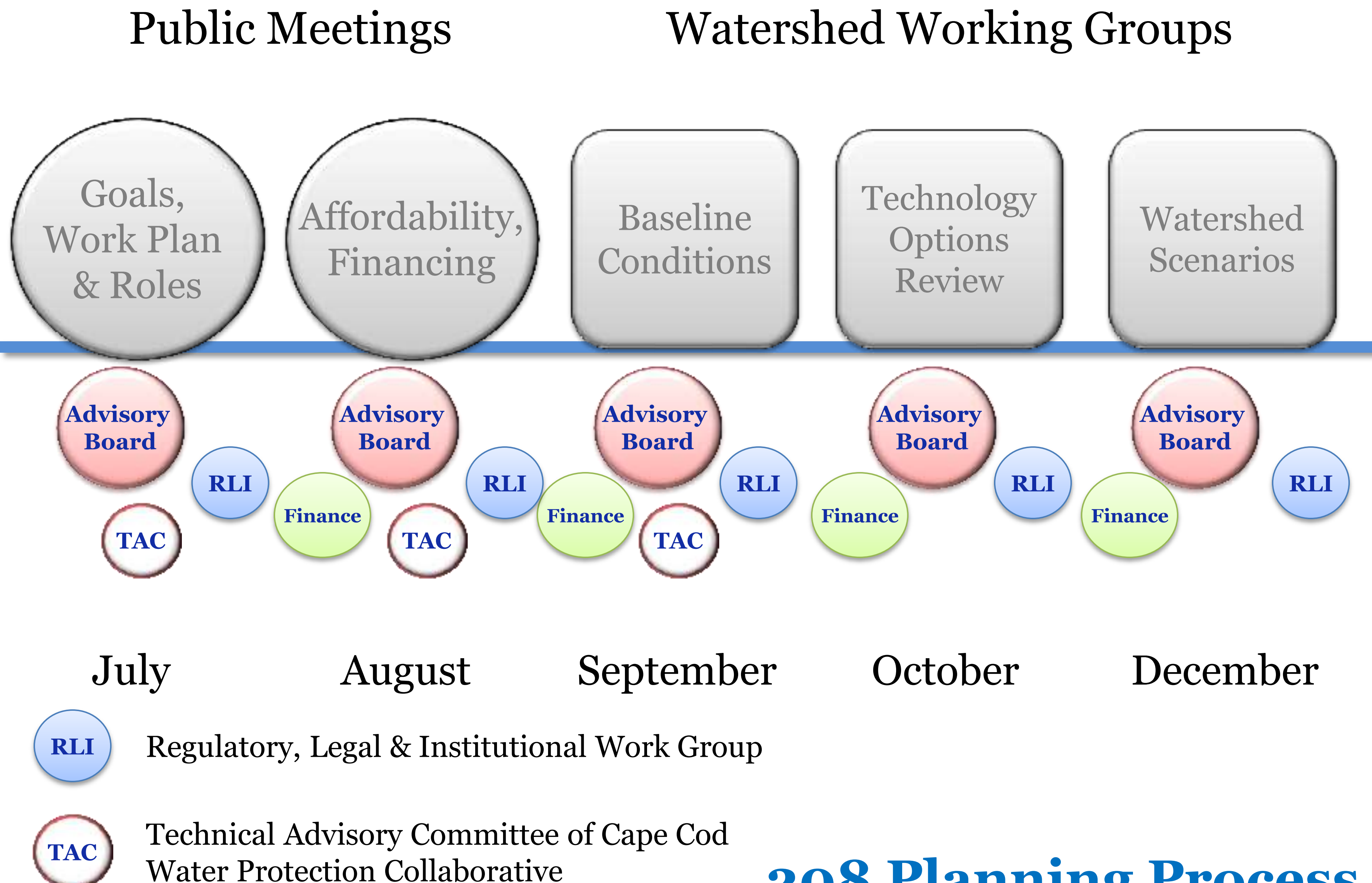
Public Meetings — Watershed Working Groups



RLI — Regulatory, Legal & Institutional Work Group

TAC — Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process



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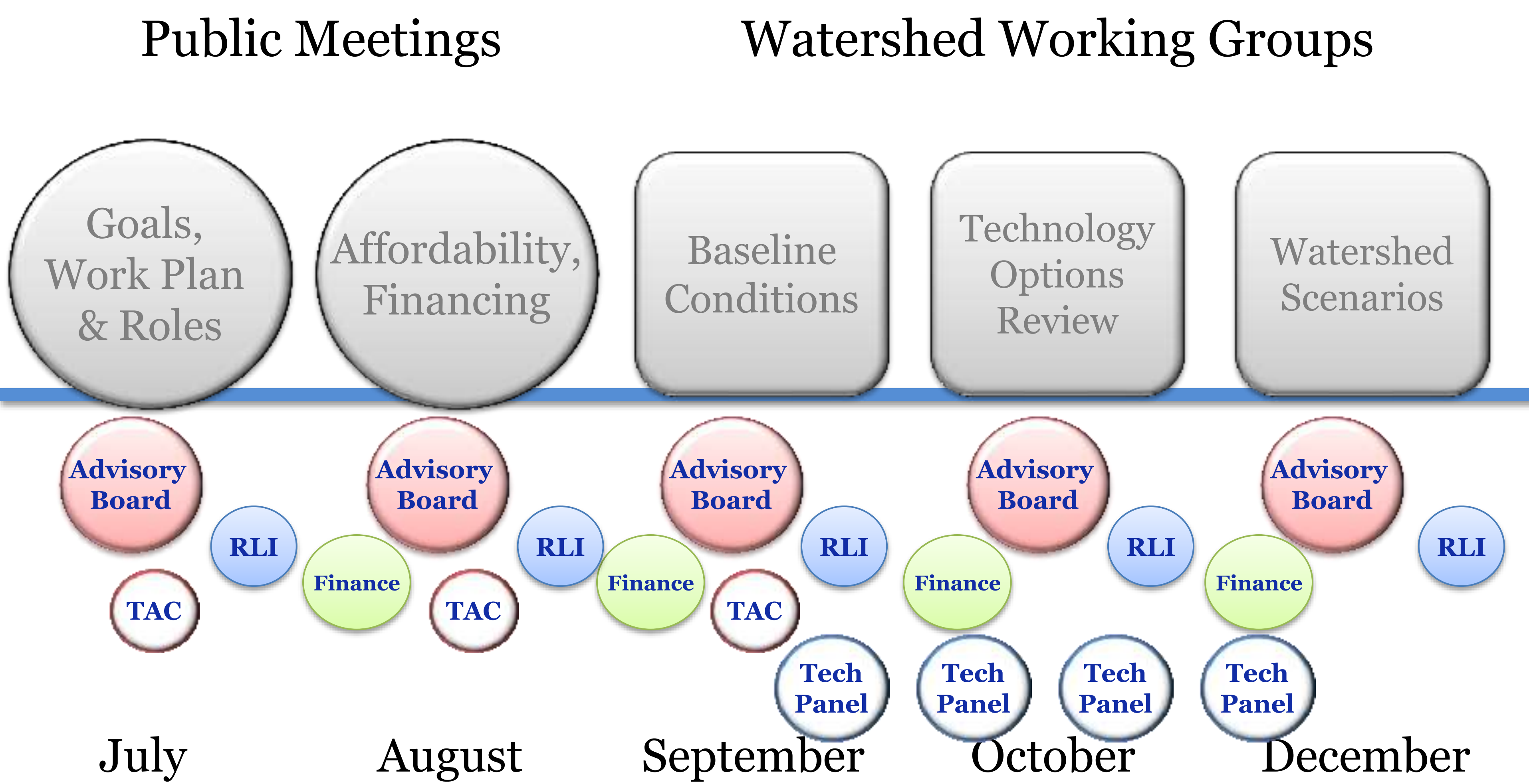


RLI Regulatory, Legal & Institutional Work Group

TAC Technical Advisory Committee of Cape Cod Water Protection Collaborative

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

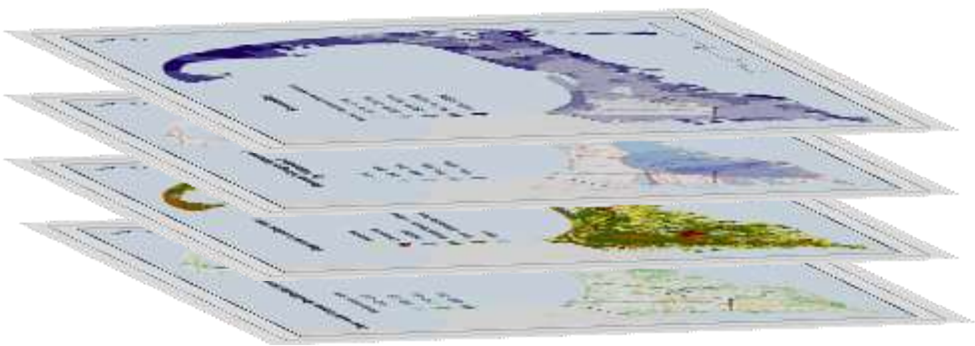
11 Working Group Meetings: Sept 18-27

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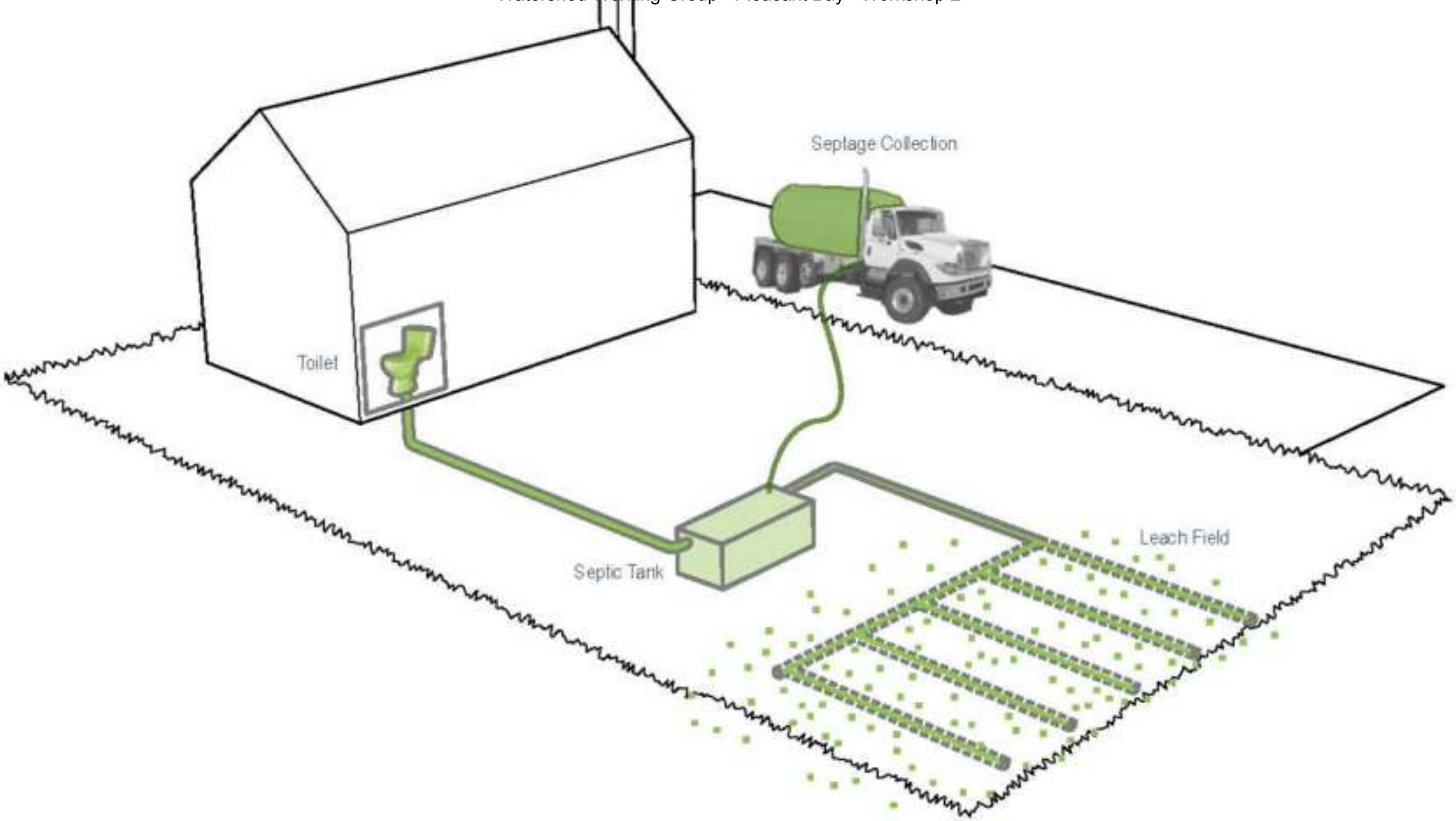
- Certain technologies or approaches will be effective at **preventing** nutrients from entering the water body. Others will be effective at **reducing** or **remediating** nutrients that are already in the groundwater or water body.
- Regulatory programs can address nutrient controls for both existing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

"Watershed Working Group - Pleasant Bay - Workshop 2"

Solutions: Site

Site Scale | Neighborhood | Watershed | Cape-Wide

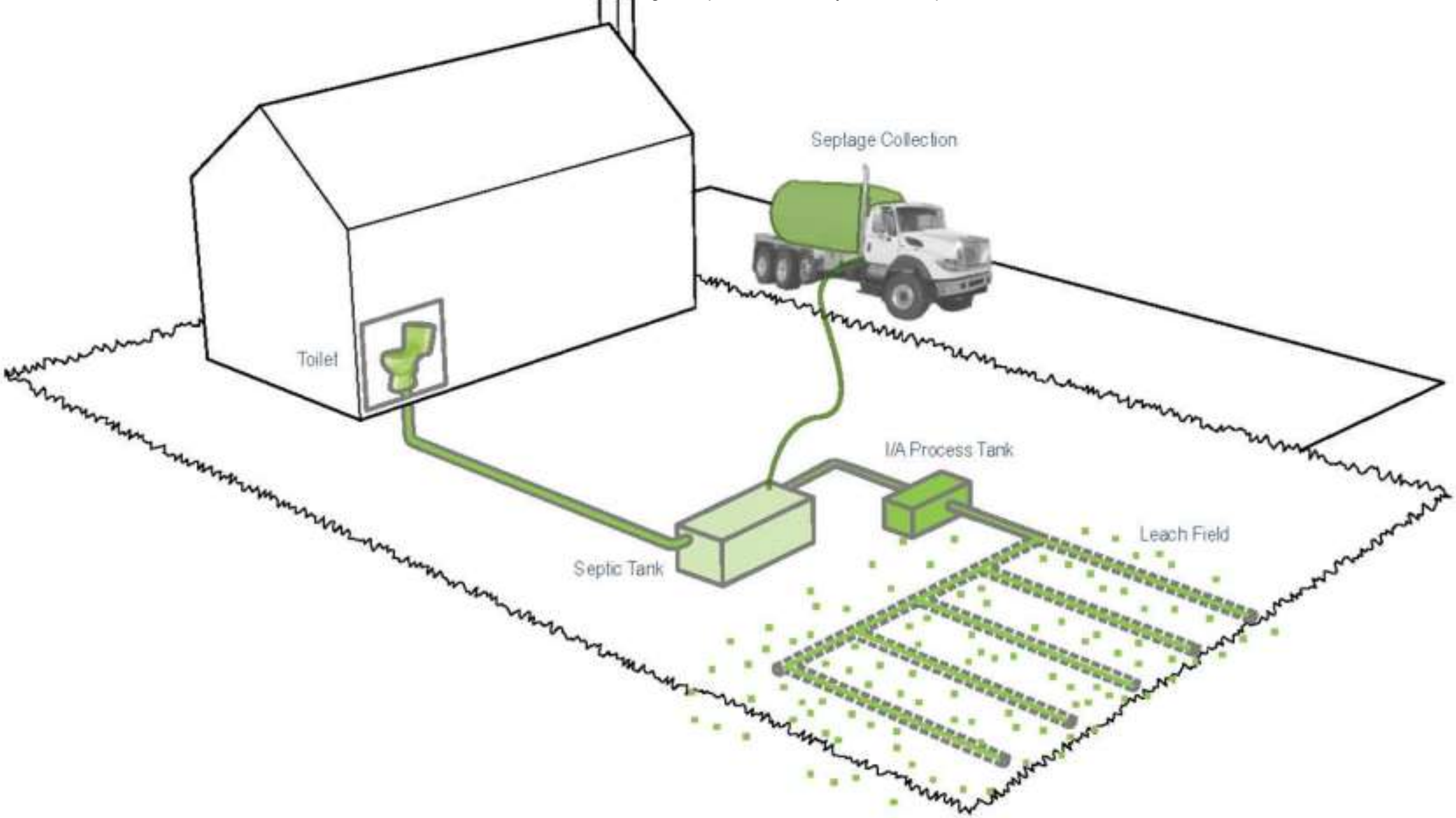
- Compact Development
- Remediation of Existing Development
- Fertilizer Management
- Transfer of Development Rights
- Stormwater BMPs
- Standard Title 5 Systems
- Cluster & Satellite Treatment Systems
- Conventional Treatment
- I/A Title 5 Systems
- STEP/STEG Collection
- Advanced Treatment
- I/A Enhanced 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: SITE
Target: WASTEWATER

Standard Title 5 Systems

Title 5

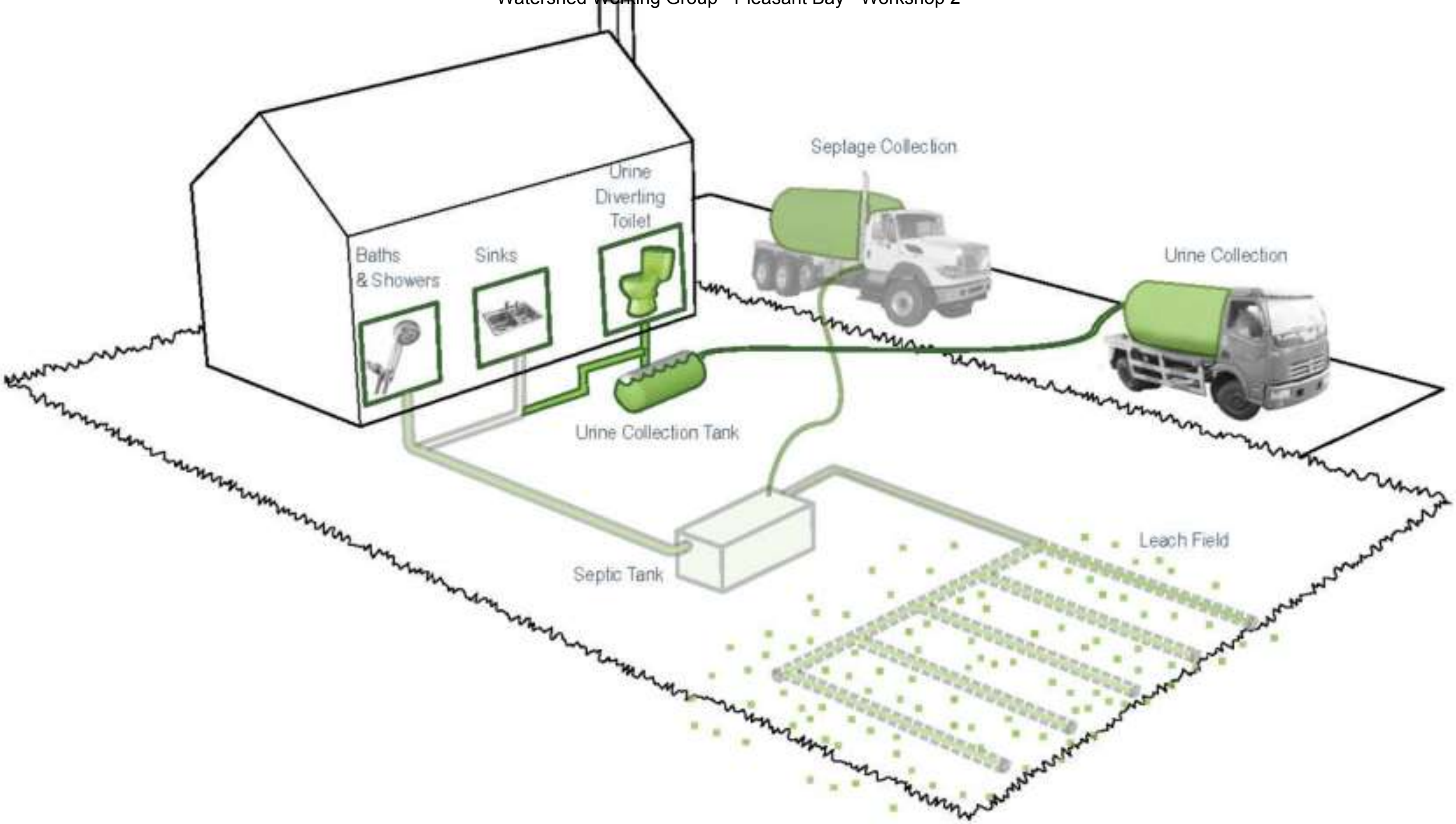


Scale: SITE
Target: WASTEWATER

I/A Title 5 Systems

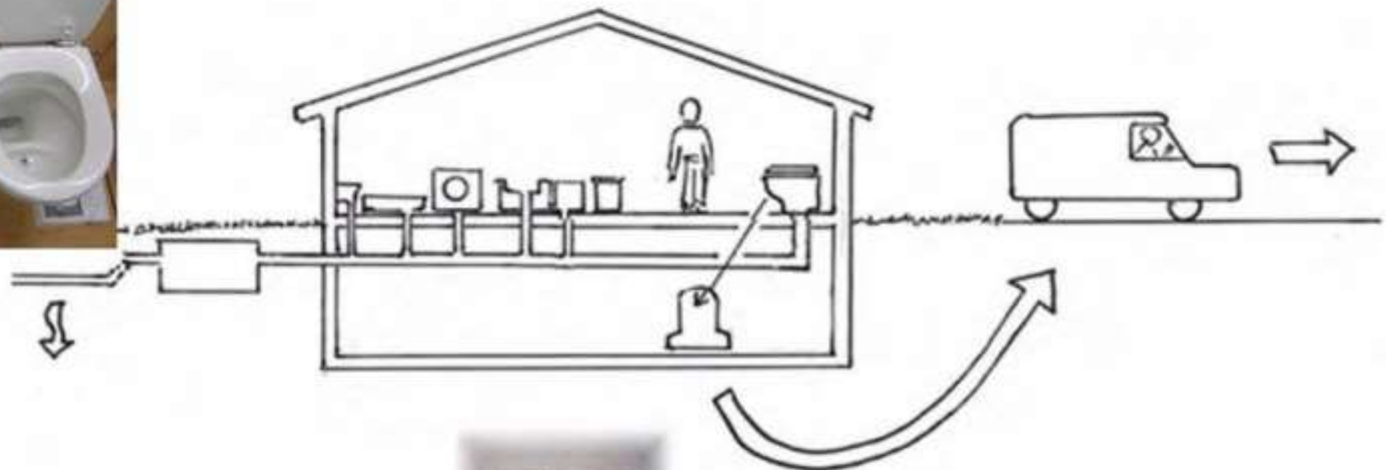
Enhanced IA

IA



Scale: SITE
Target: WASTEWATER

Toilets: Urine Diverting



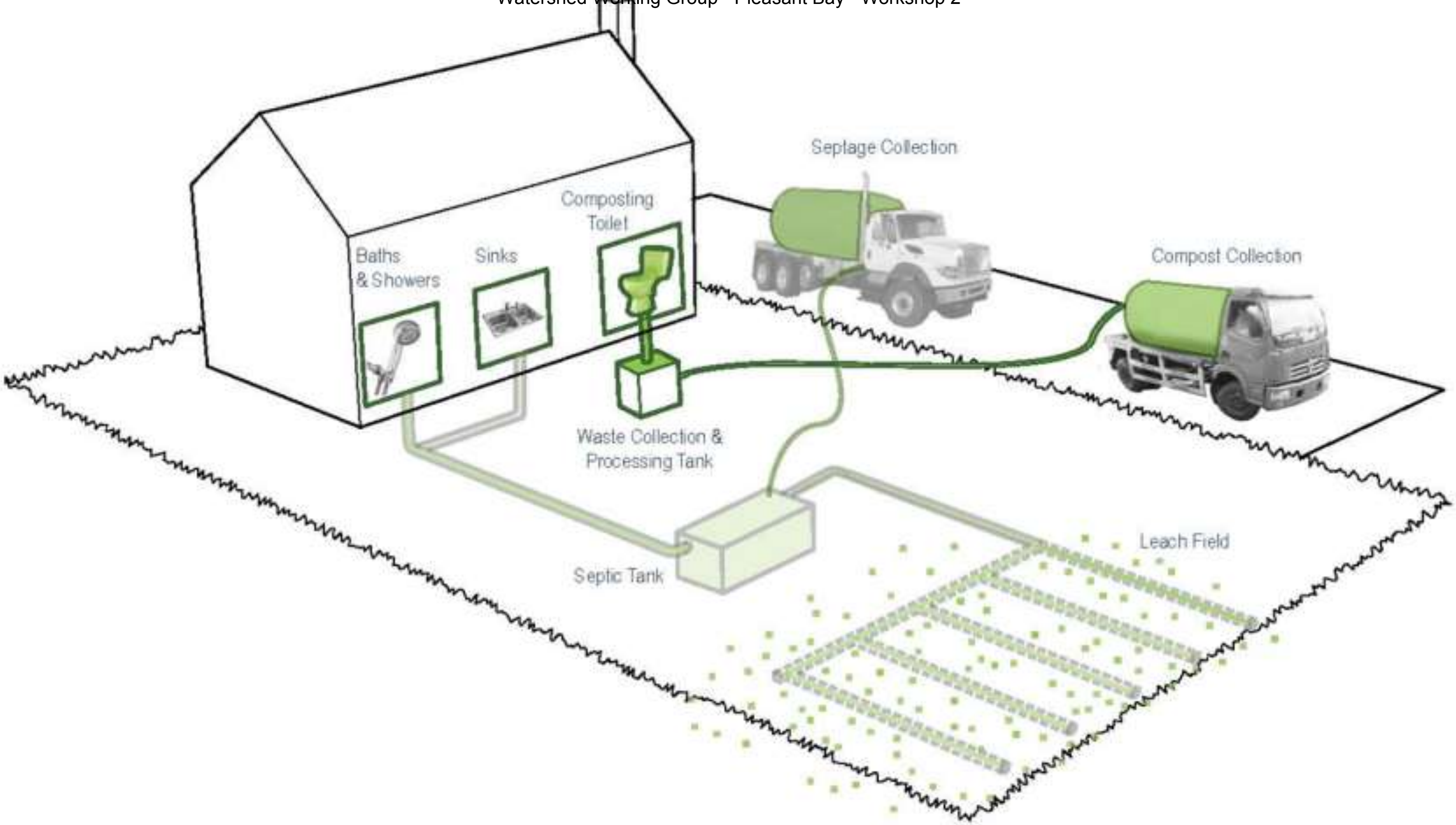
Waterless
Urinal

IBC container
(220 gallons)

40" x 40" x48"

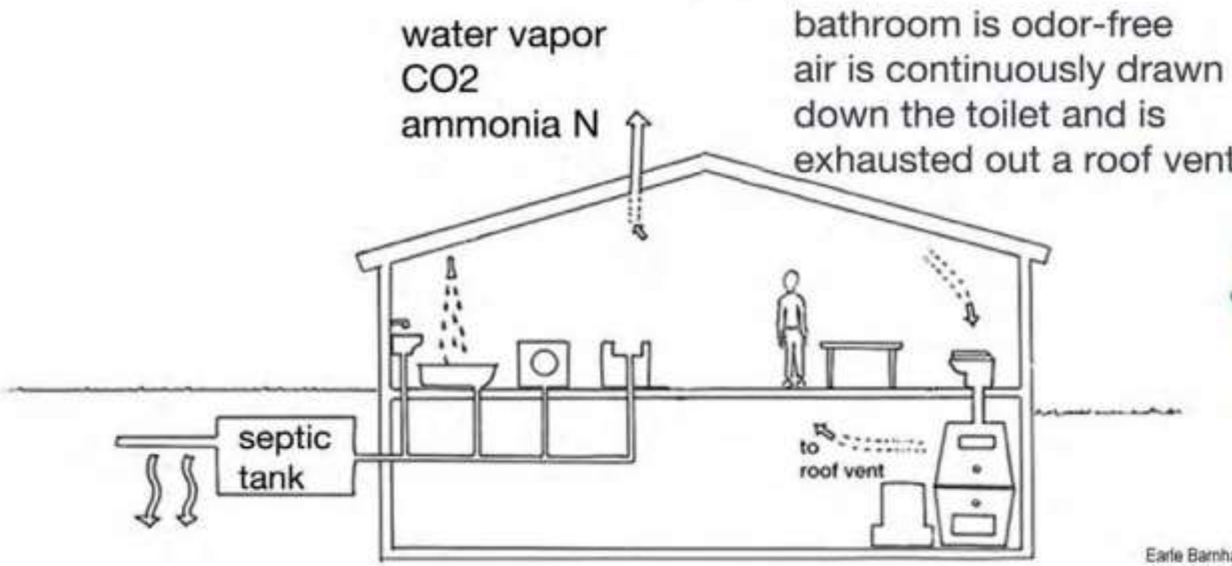
Source: Earle Barnhart, The Green Center Inc. and Horsley-Witten Group Inc.

Toilets: Urine Diverting



Scale: SITE
Target: WASTEWATER

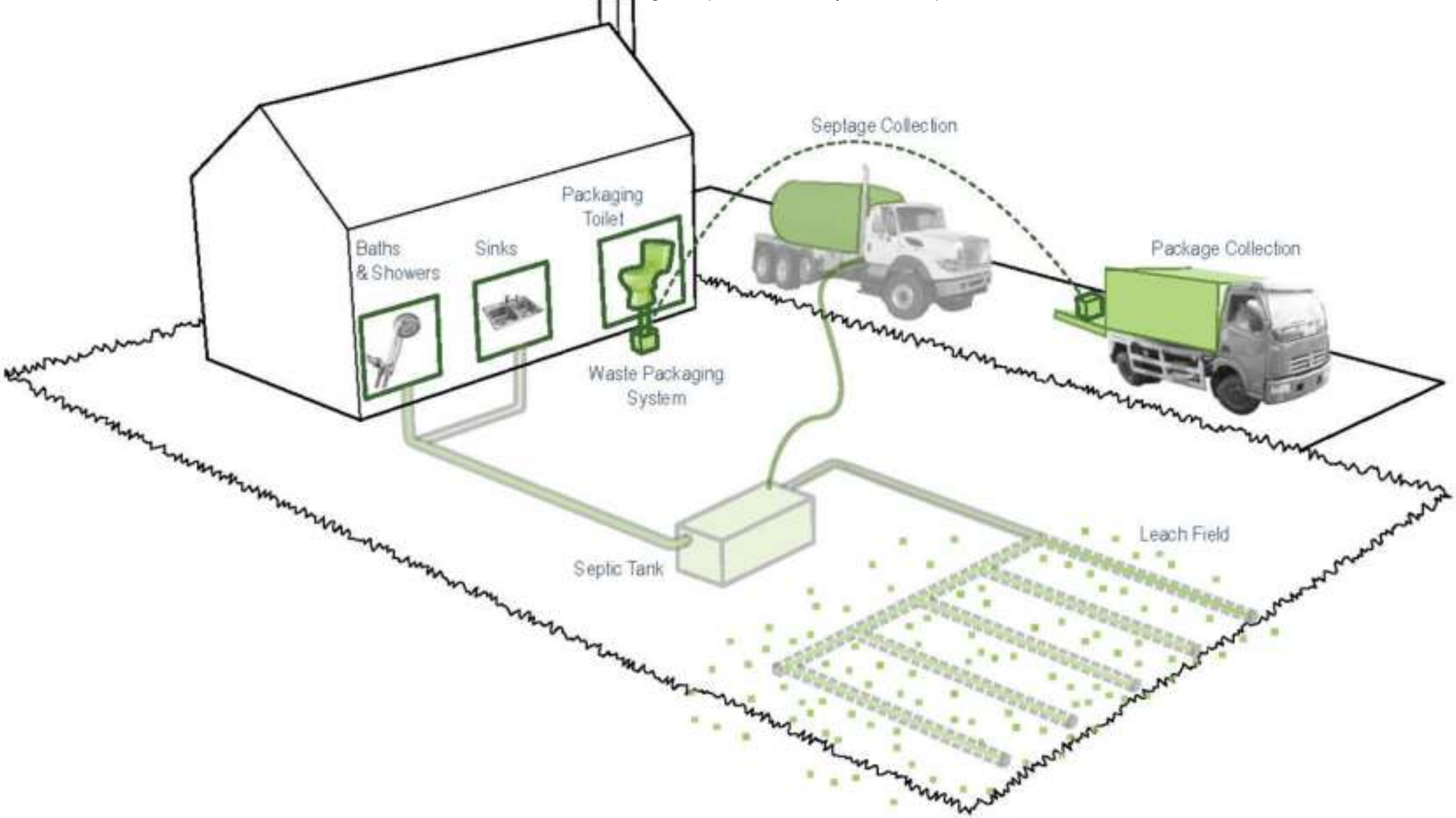
Toilets: Composting



Earle Barnhart
The Green Center, Inc

Source: Earle Barnhart, The Green Center Inc.

Toilets: Composting



Scale: SITE
Target: WASTEWATER

Toilets: Packaging

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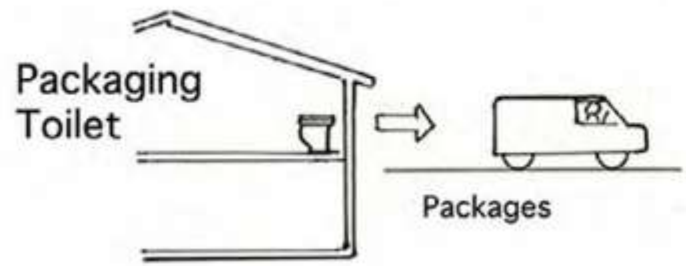
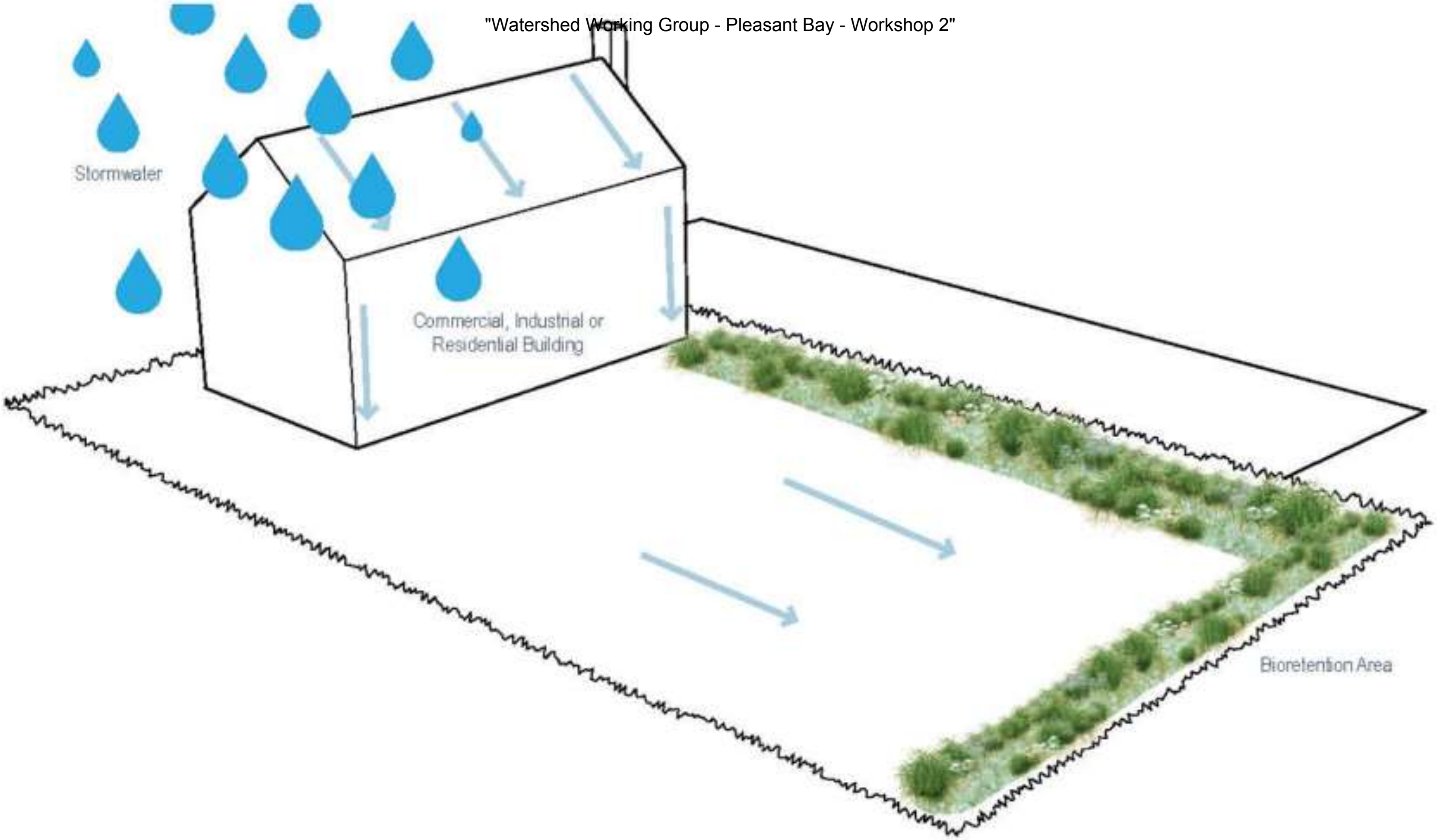


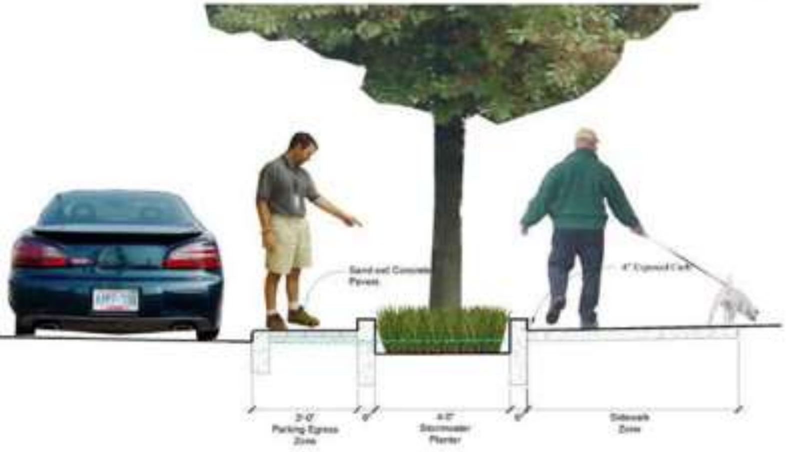
Source: Earle Barnhart, The Green Center Inc.

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

Solutions: Neighborhood

Site Scale | Neighborhood | Watershed | Cape-Wide

- Compact Development
- Remediation of Existing Development
- Fertilizer Management (N+P+K MGMT)
- Transfer of Development Rights (TDR)
- Stormwater BMPs
- Standard Title 5 Systems (Title 5)
- Cluster & Satellite Treatment Systems
- Conventional Treatment
- I/A Title 5 Systems (IA)
- STEP/STEG Collection
- Advanced Treatment
- I/A Enhanced Systems
- Wastewater Collection Systems
- Toilets: Urine Diverting
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- Toilets: Composting
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- Constructed Wetlands: Subsurface Flow
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- Eco-Machines & Living Machines (EM)
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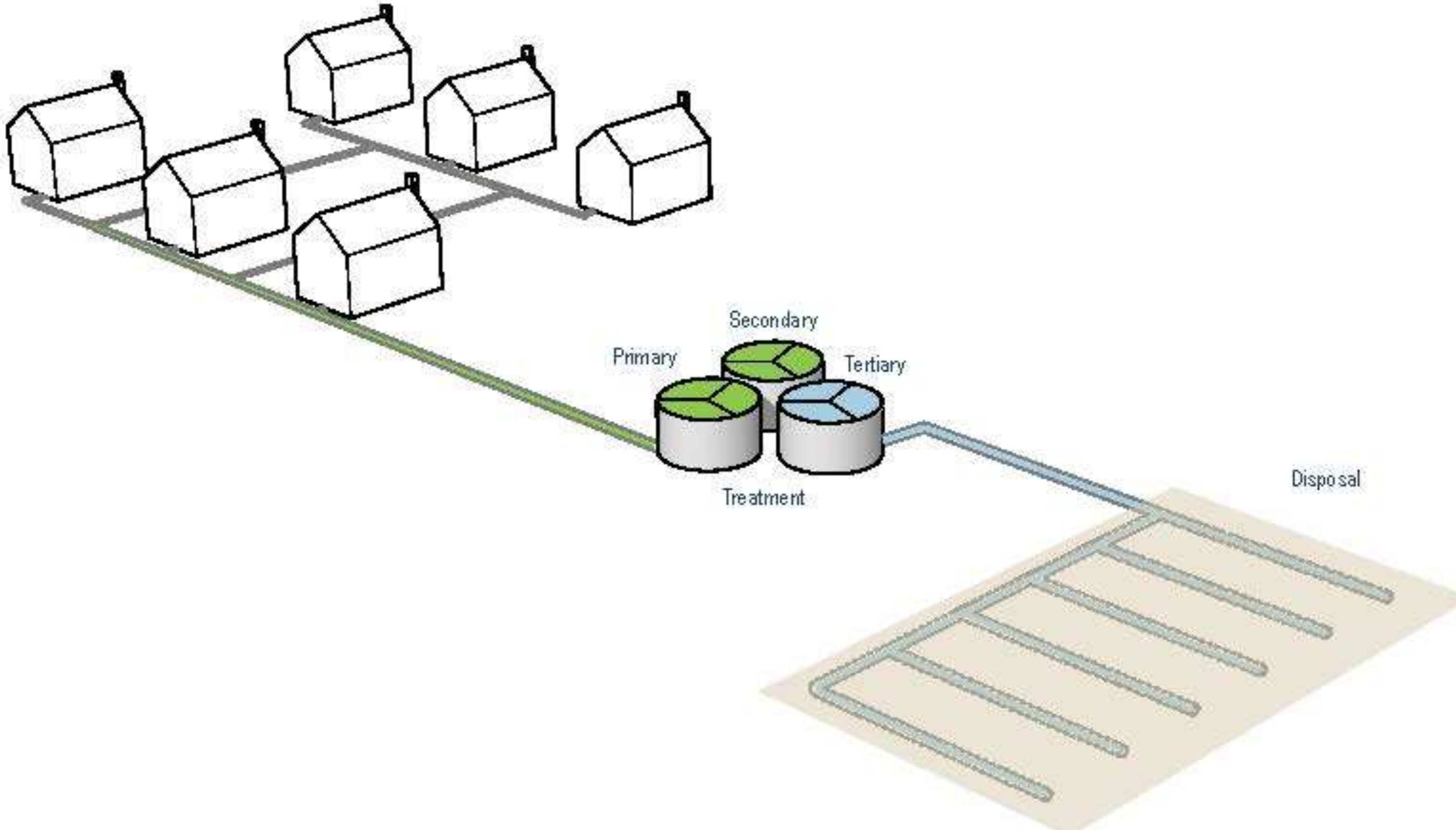
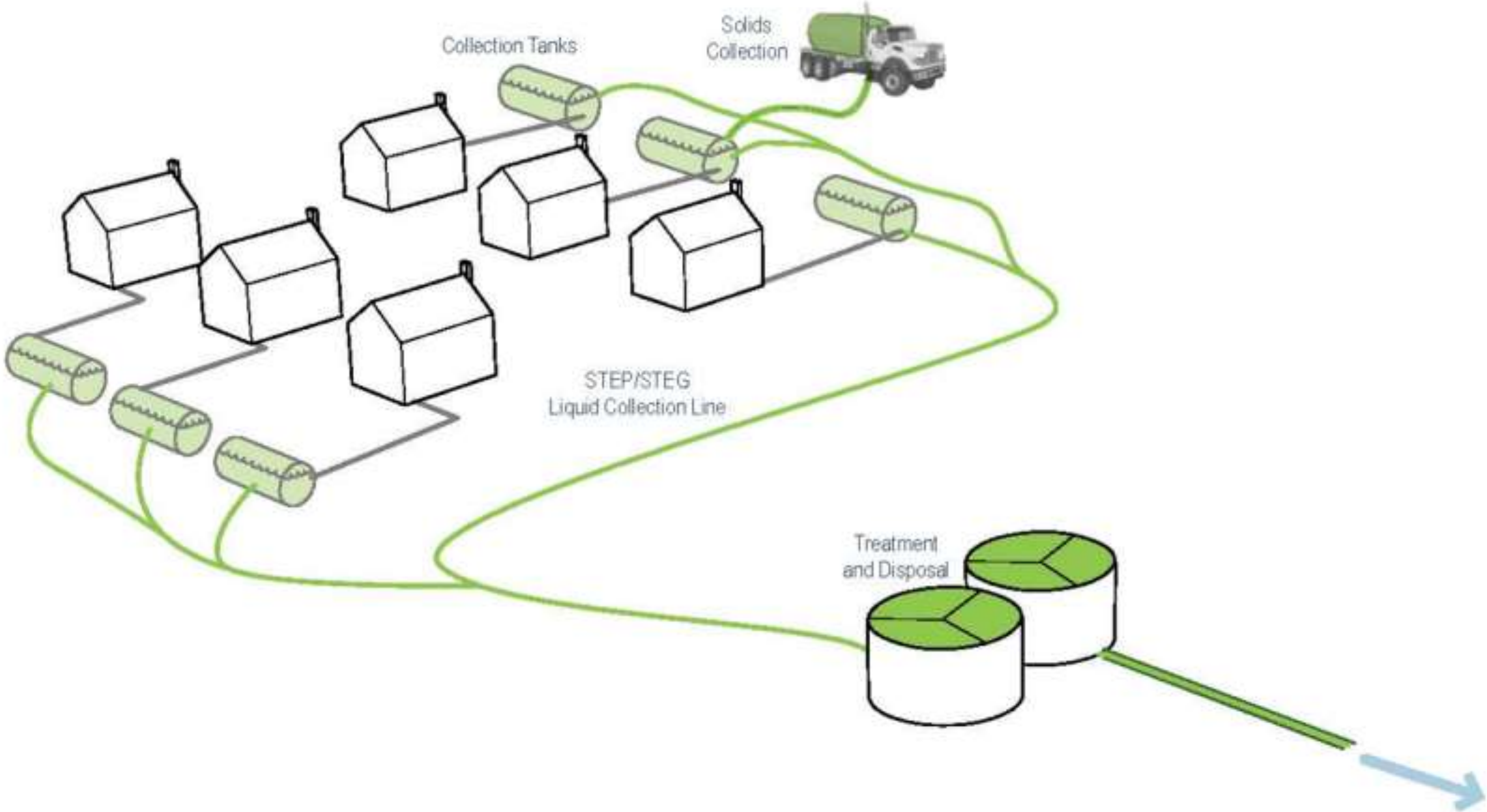


Scale: NEIGHBORHOOD
Target: WASTEWATER

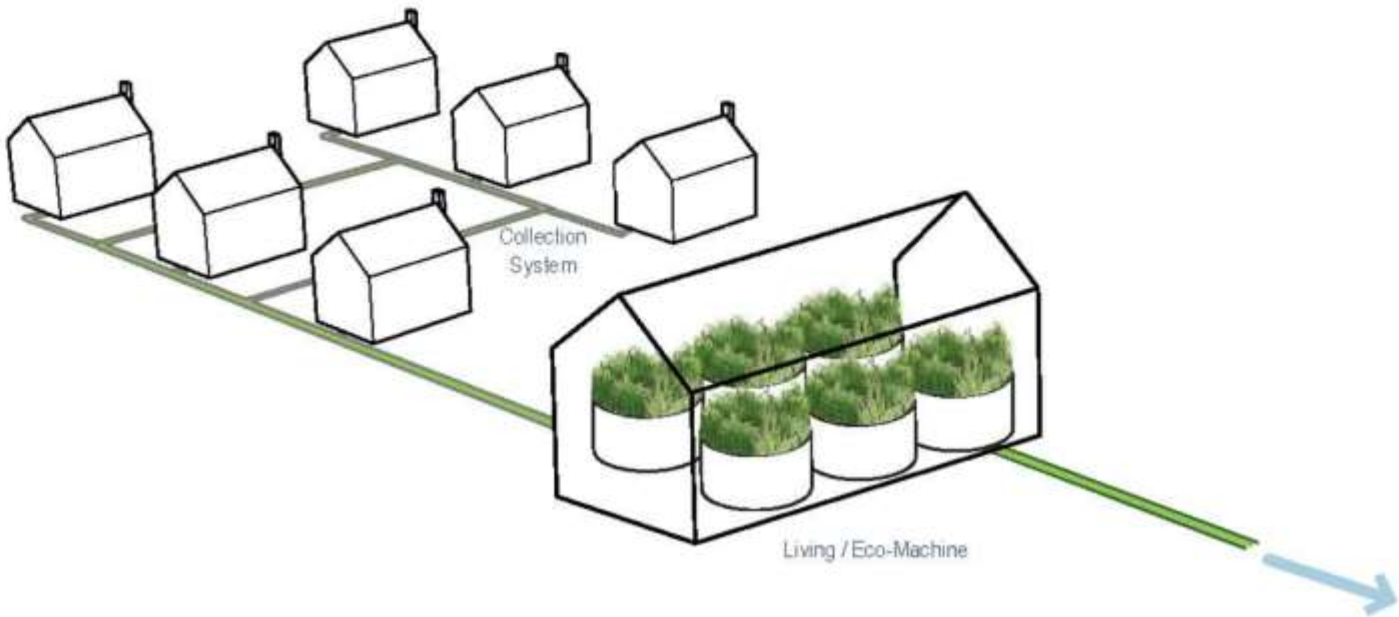
Cluster & Satellite Treatment Systems



Scale: NEIGHBORHOOD
Target: WASTEWATER

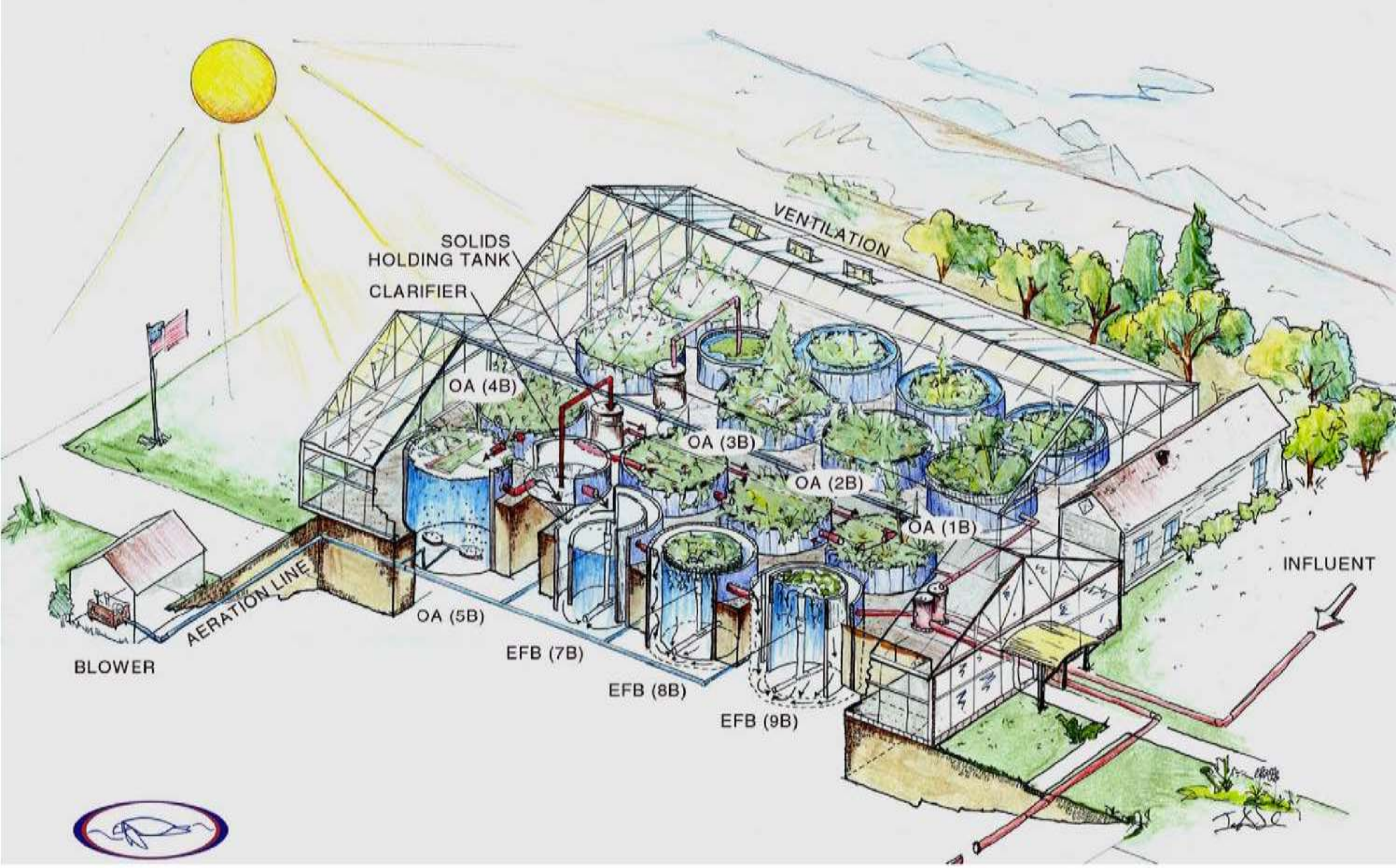
STEP / STEG Collection

STEP/
STEG



Scale: NEIGHBORHOOD
Target: WASTEWATER

Eco-Machines and
Living Machines

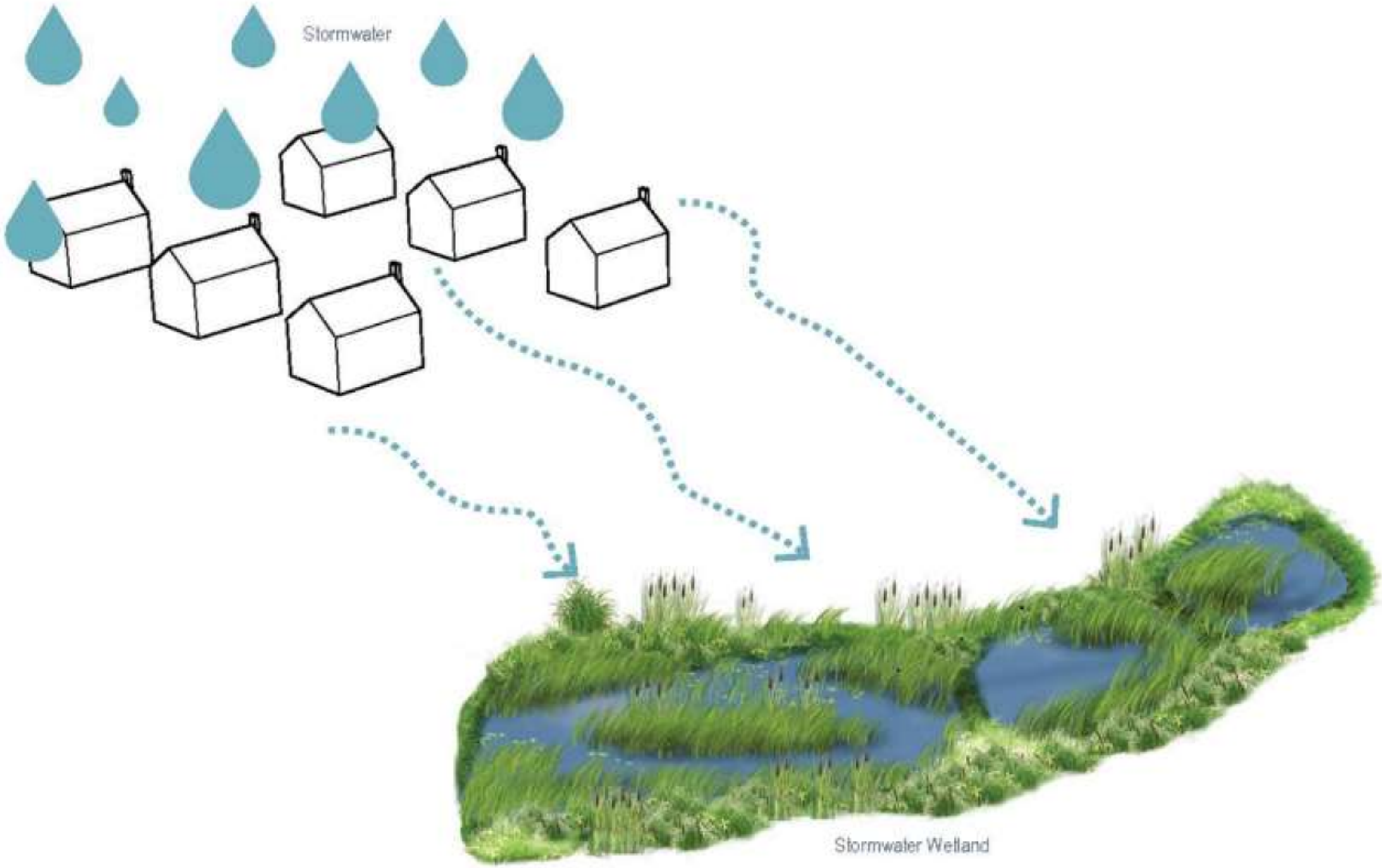


Precedent: Living Machine, South Burlington, VT
Source: Todd Ecological

Eco-Machines and Living Machines

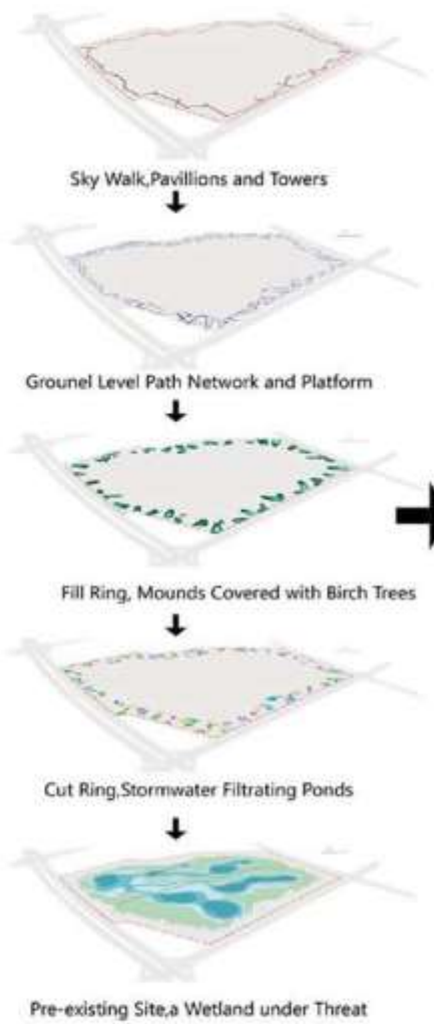
Precedent: Living Machine - South Burlington, VT + Photobioreactors - Falmouth, MA
Source: Todd Ecological and Tom Cambareri

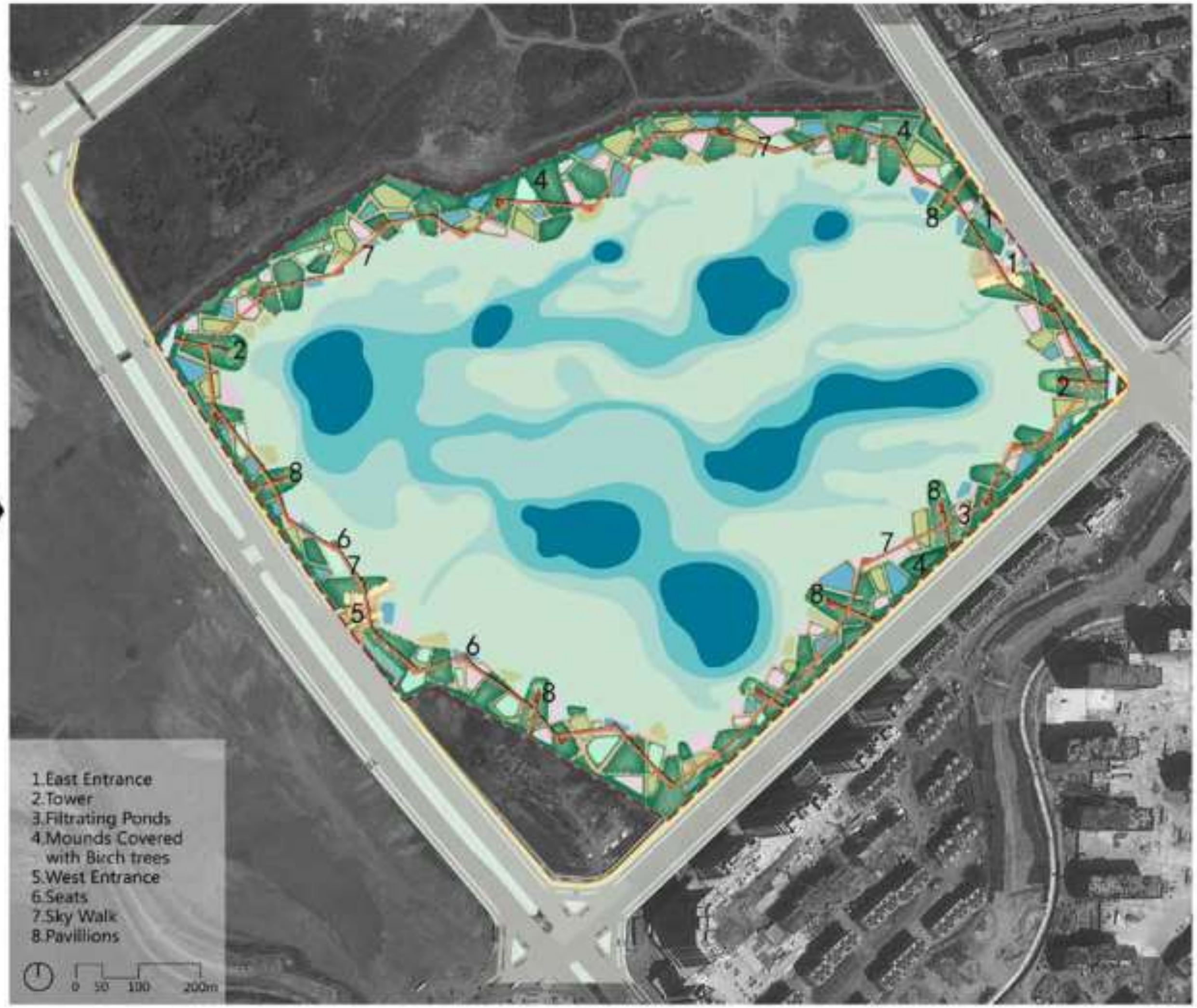
Eco-Machines and
Living Machines



Scale: NEIGHBORHOOD
Target: STORMWATER

Stormwater Wetlands





Precedent: Quinli Stormwater Park, China

Source: Turenscape

Stormwater Wetlands

Stormwater Wetlands

"Watershed Working Group - Pleasant Bay - Workshop 2"

Solutions: Watershed

Site Scale | Neighborhood | Watershed | Cape-Wide

Compact Development

Remediation of Existing Development

Fertilizer Management

Transfer of Development Rights

Stormwater BMPs

Standard Title 5 Systems

Cluster & Satellite Treatment Systems

Conventional Treatment

I/A Title 5 Systems

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Phytoirrigation

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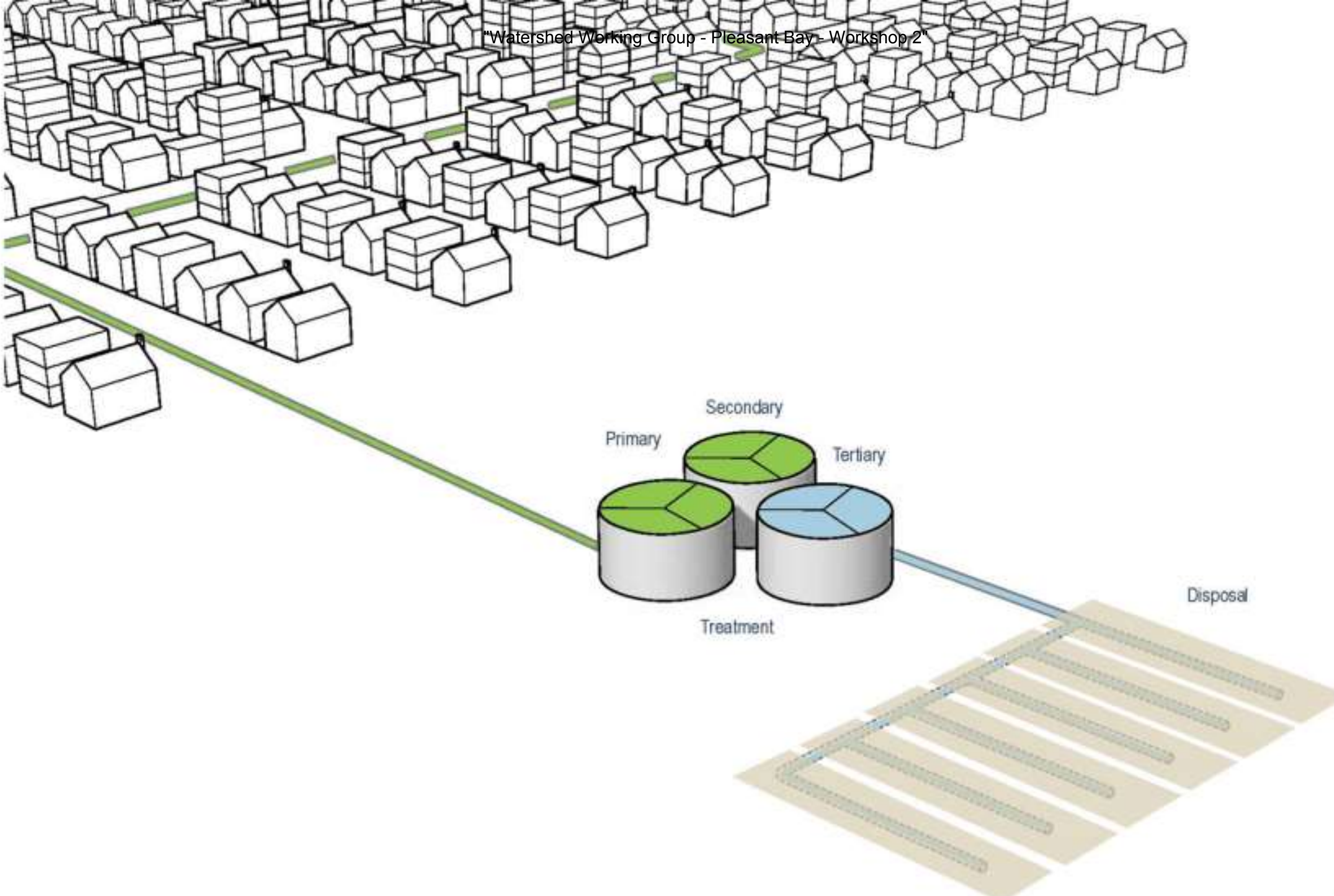
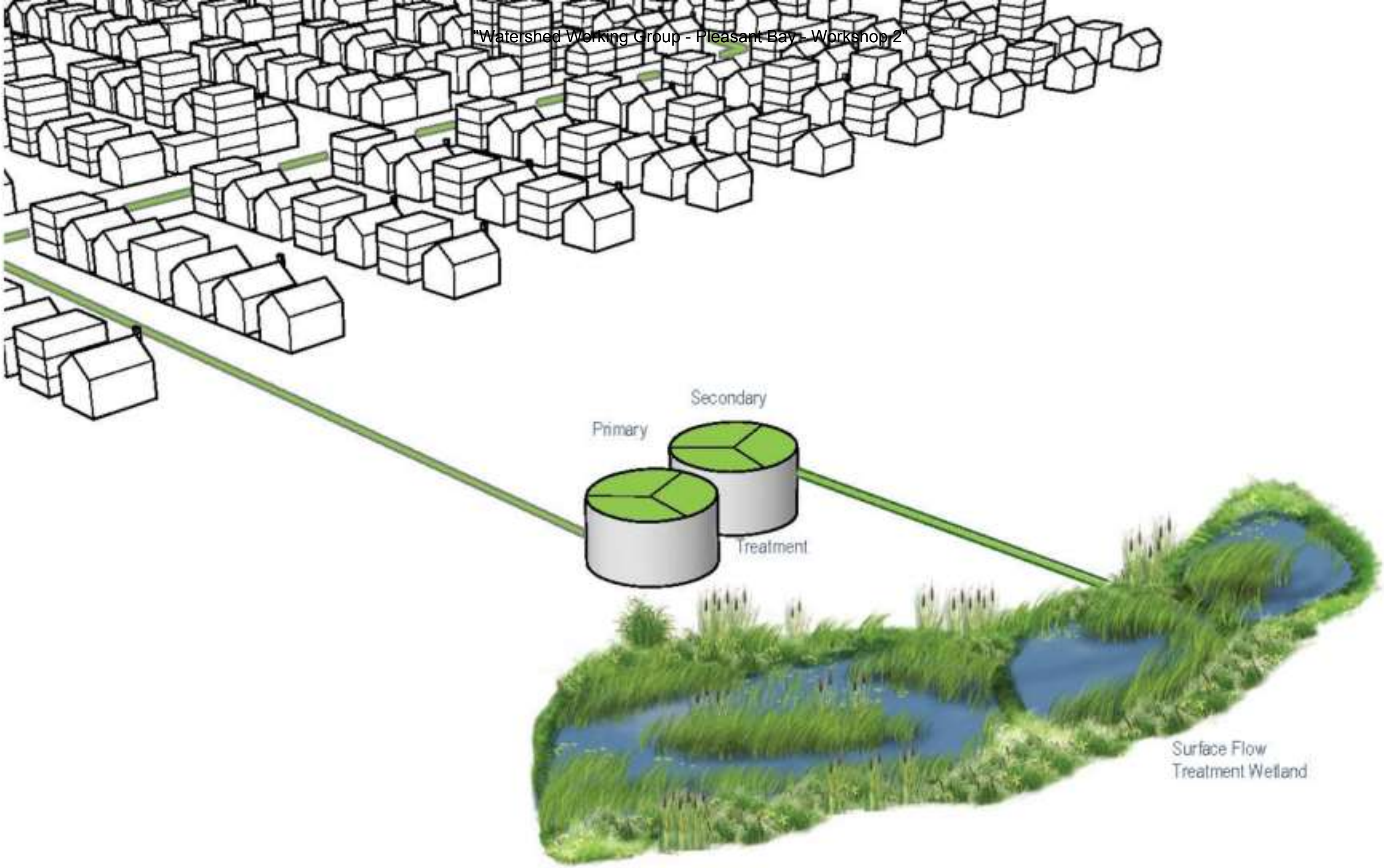


Scale: WATERSHED
Target: WASTEWATER

Conventional Treatment

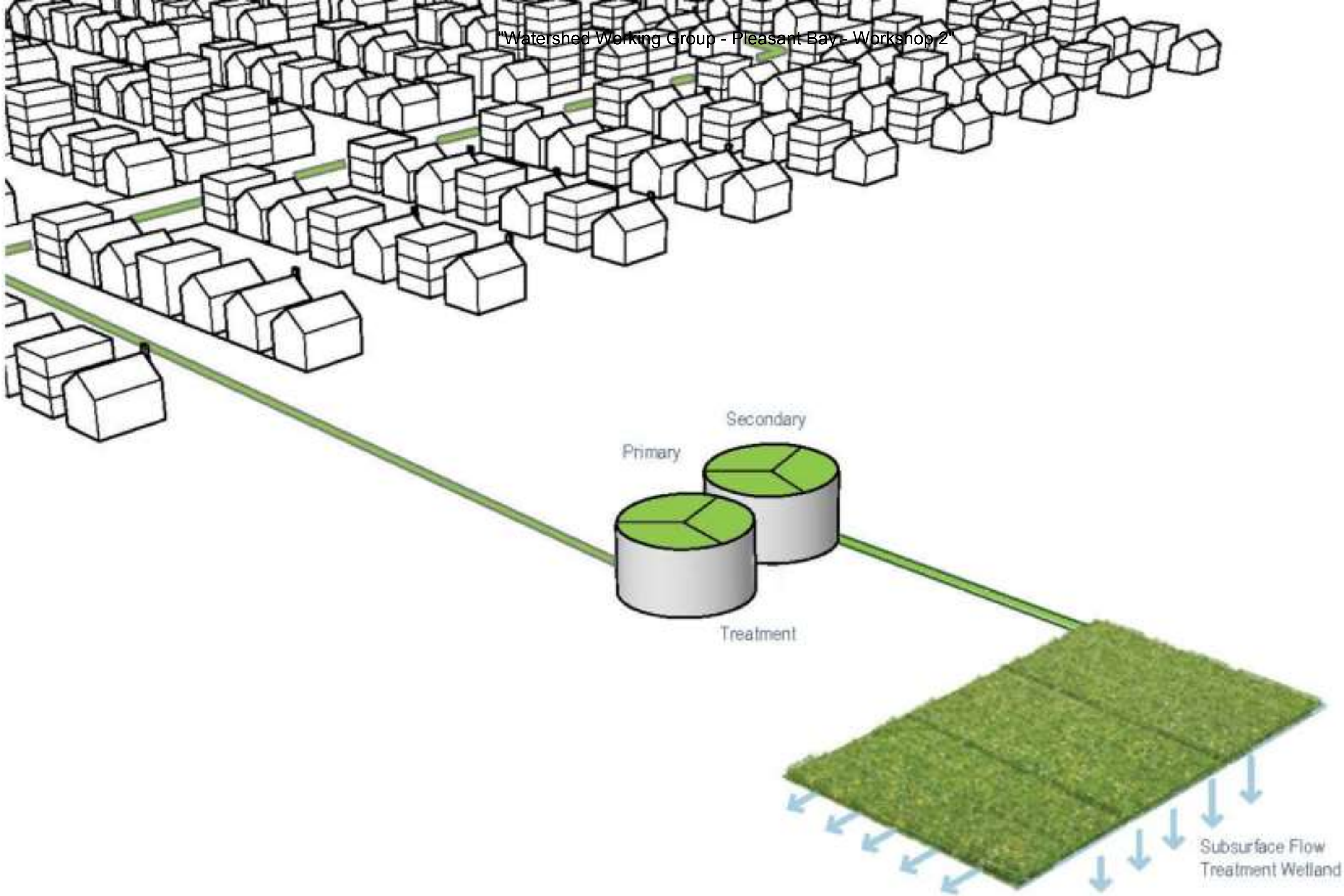


Scale: WATERSHED
Target: WASTEWATER

Constructed Wetlands:
Surface Flow

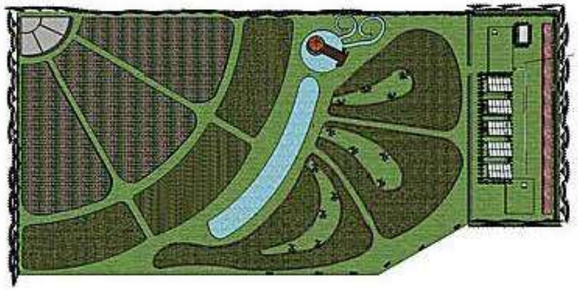
Precedent: Talking Waters Garden - Albany, OR
Source: Kate Kennen

Constructed Wetlands: Surface Flow



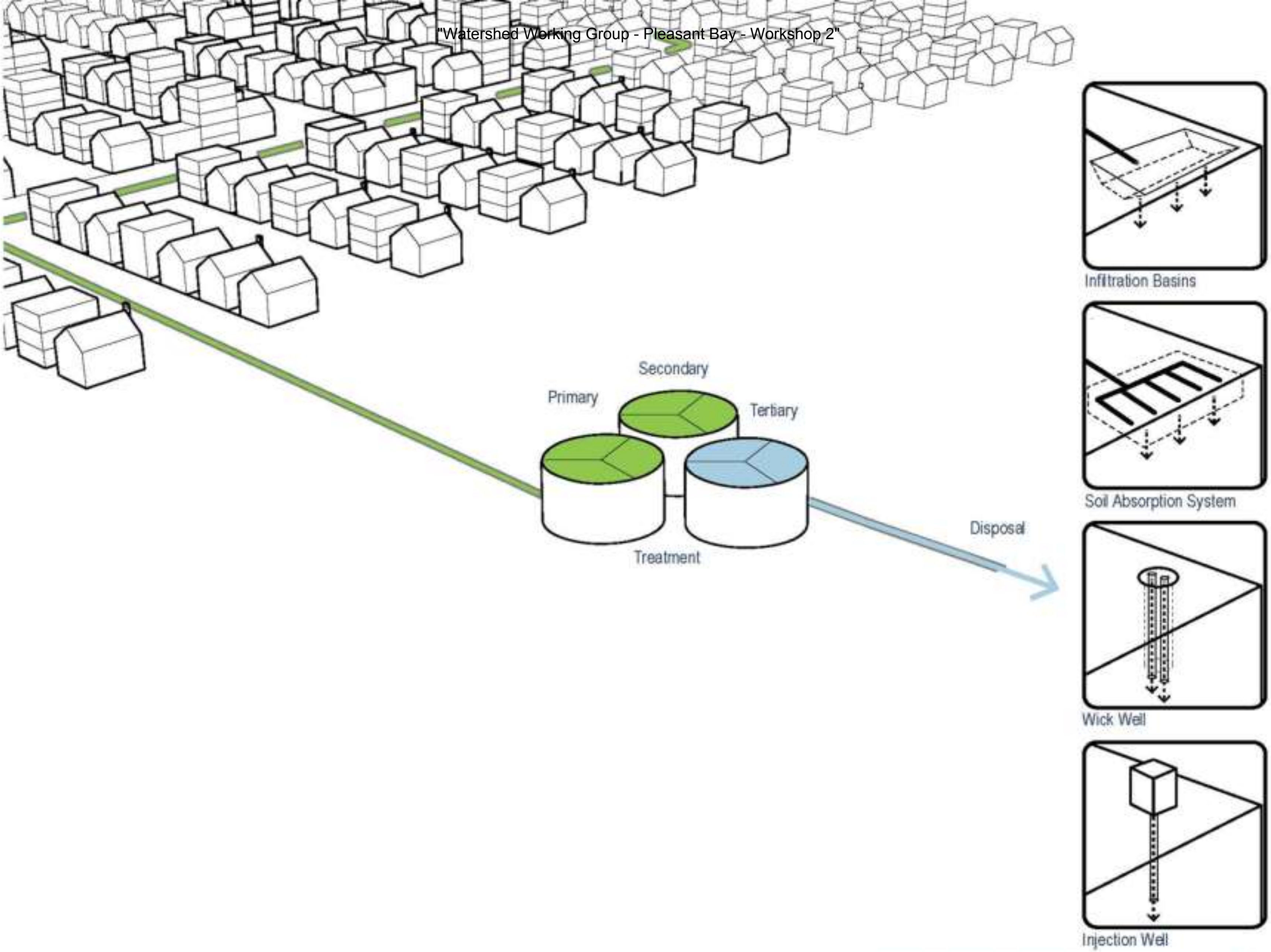
Scale: WATERSHED
Target: WASTEWATER

Constructed Wetlands:
Subsurface Flow



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

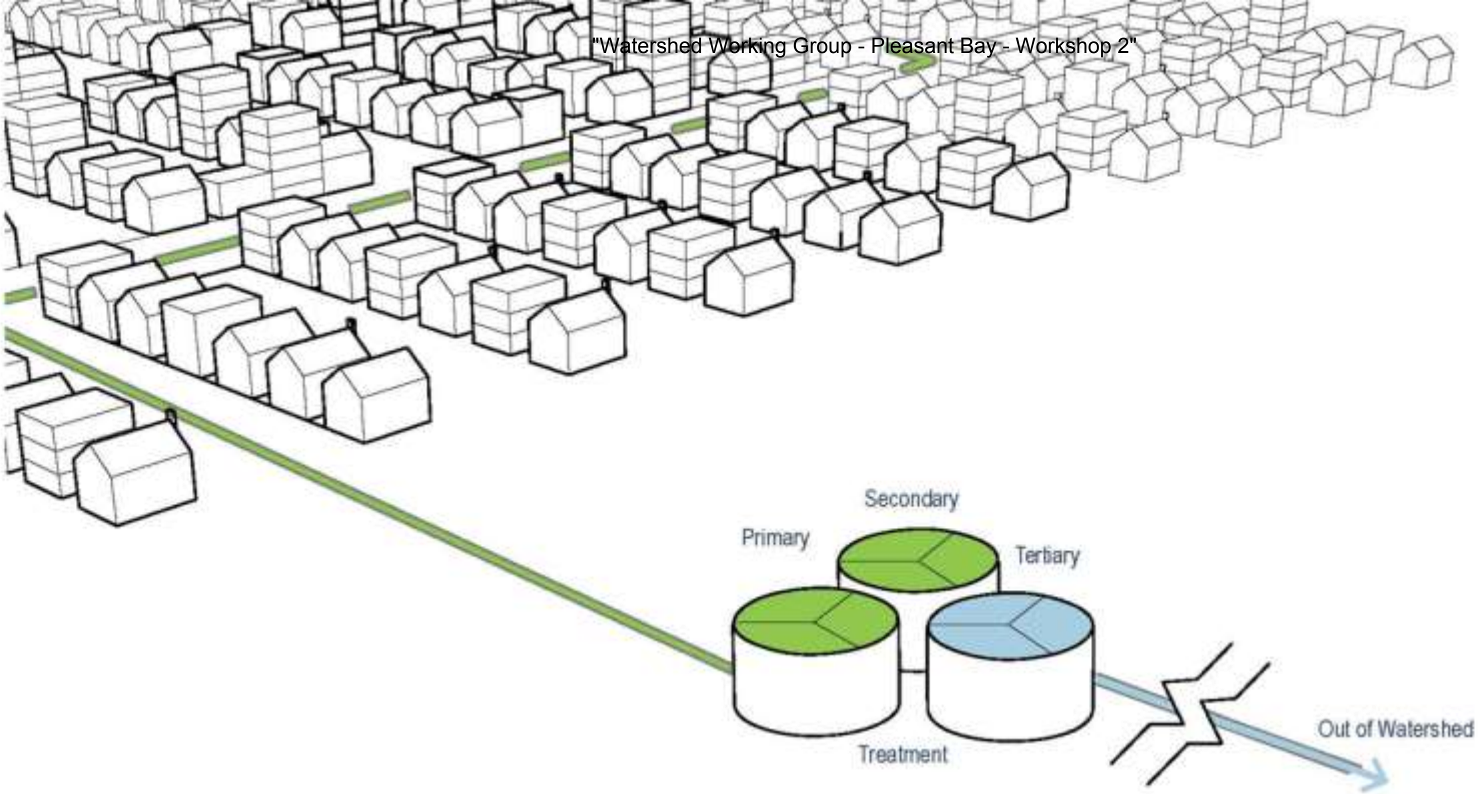
Constructed Wetlands: Subsurface Flow



Scale: WATERSHED
Target: WASTEWATER

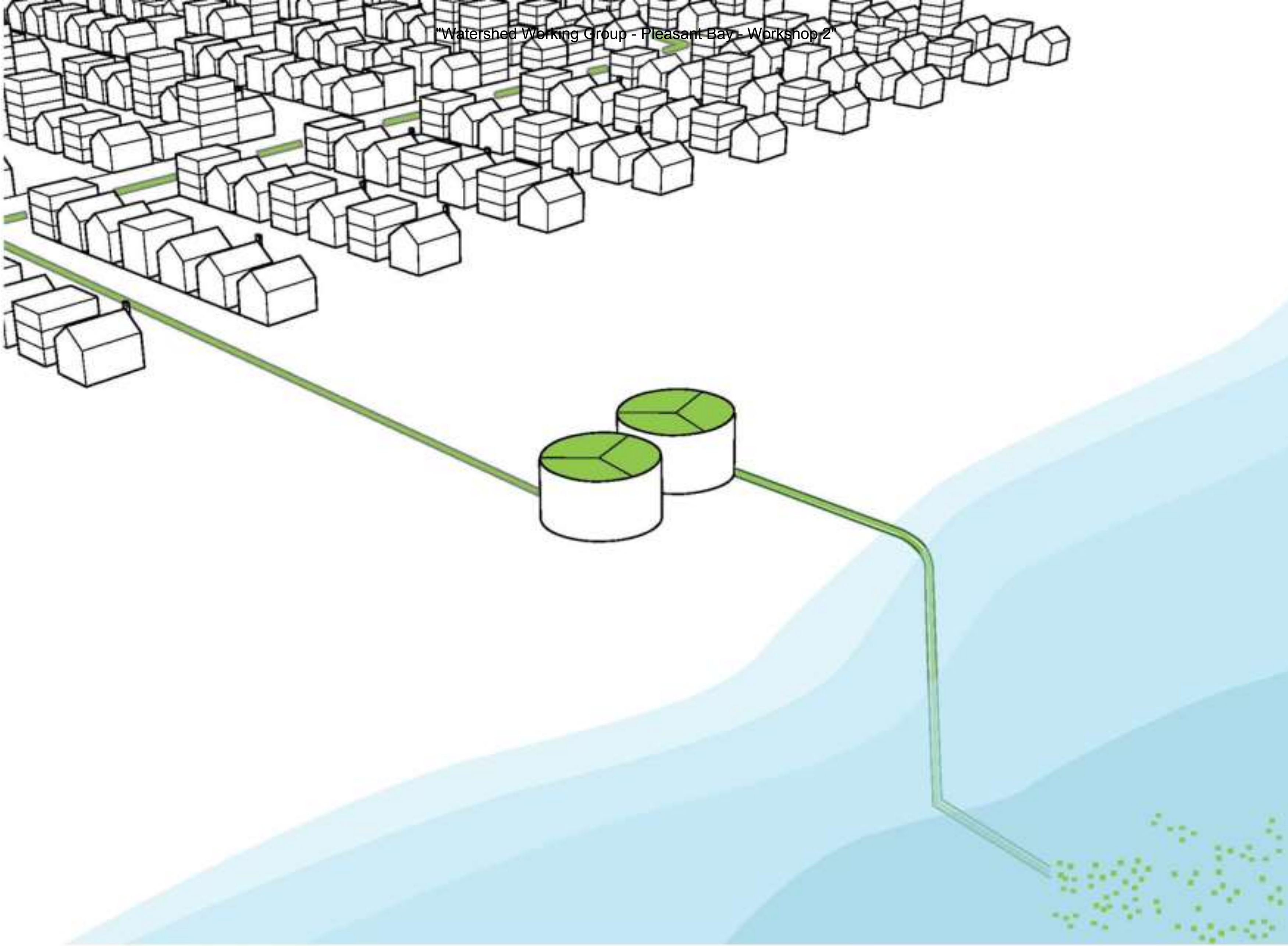
Effluent Disposal Systems

Disposal:



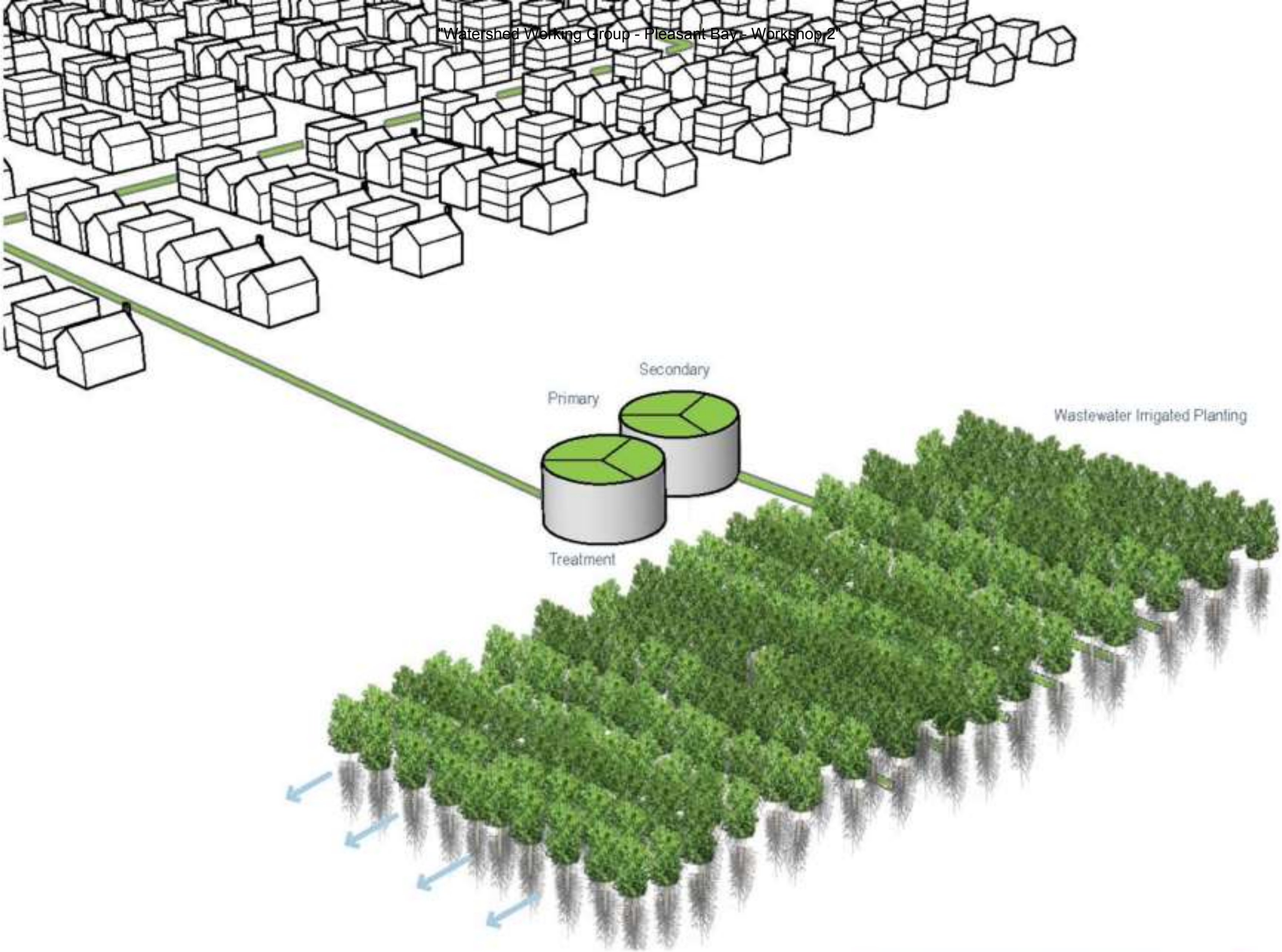
Scale: WATERSHED
Target: WASTEWATER

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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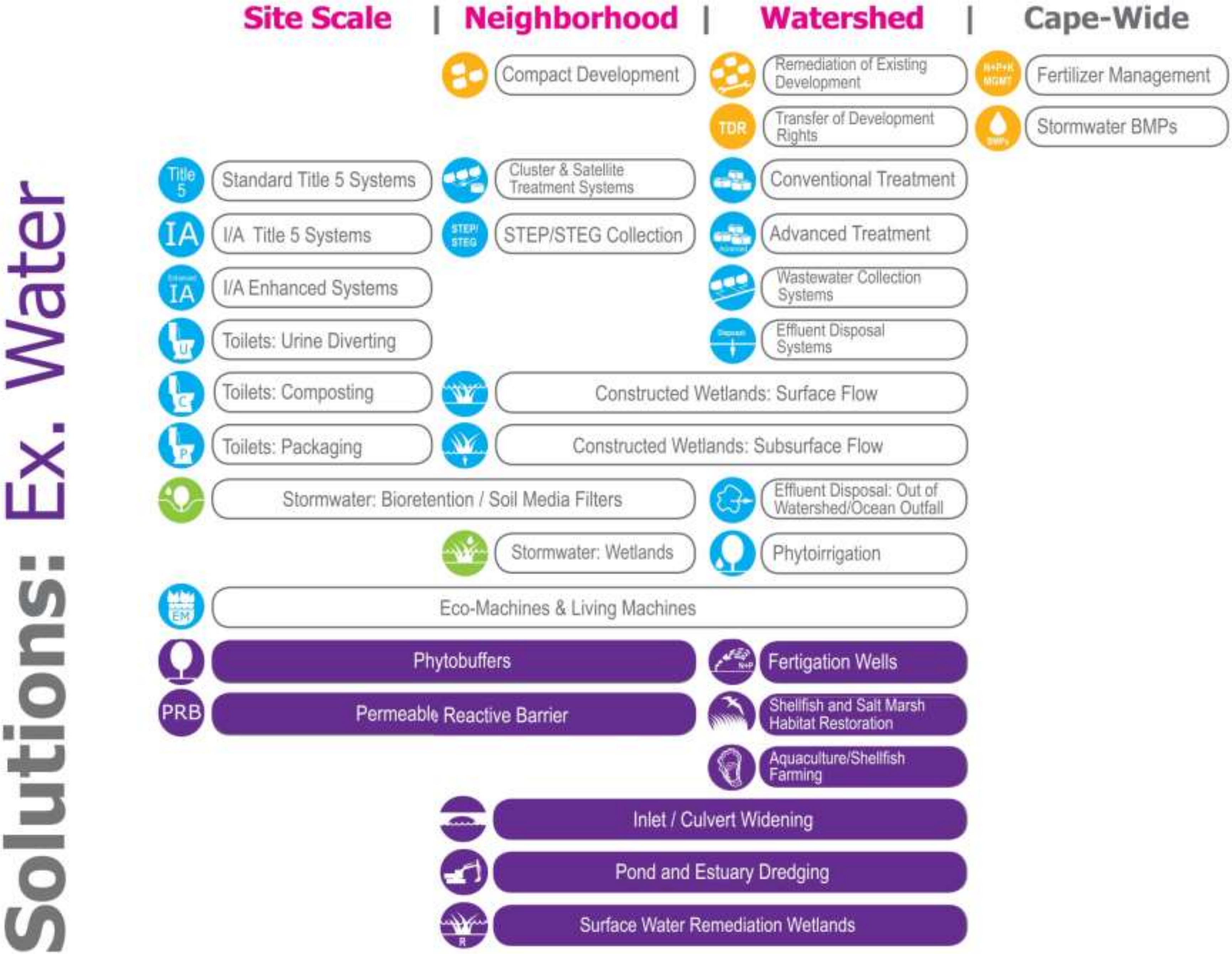
Source: CH2MHill

Phytoirrigation


Solutions: Ex. Water
Site Scale | Neighborhood | Watershed | Cape-Wide
Compact Development
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N+P+K MGMT
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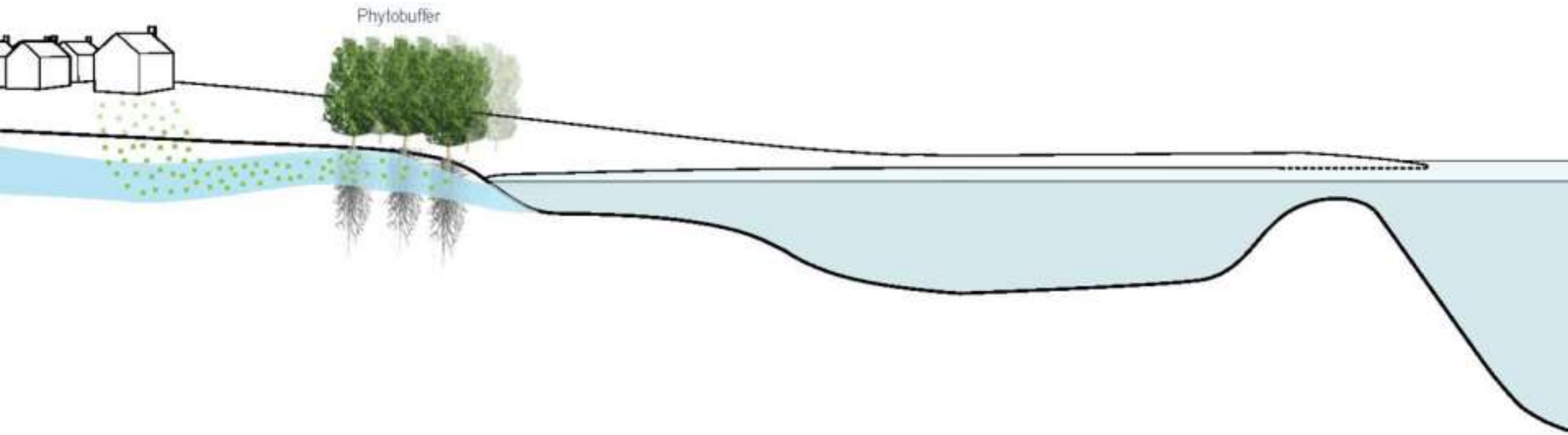


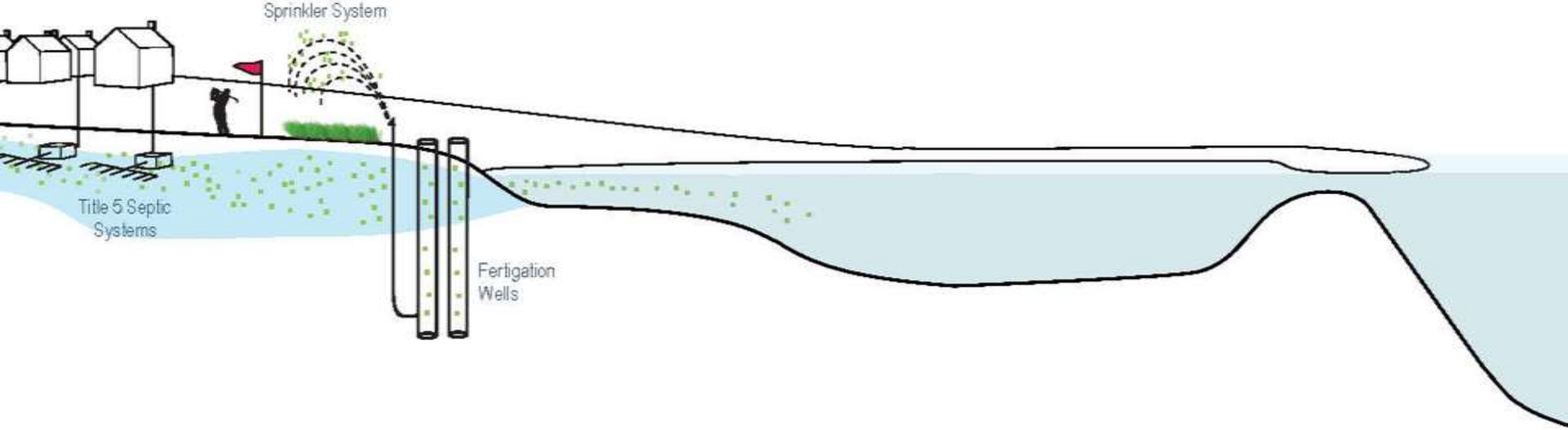
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Phytobuffers

Precedent: Phytobuffer - Kavcee, WY

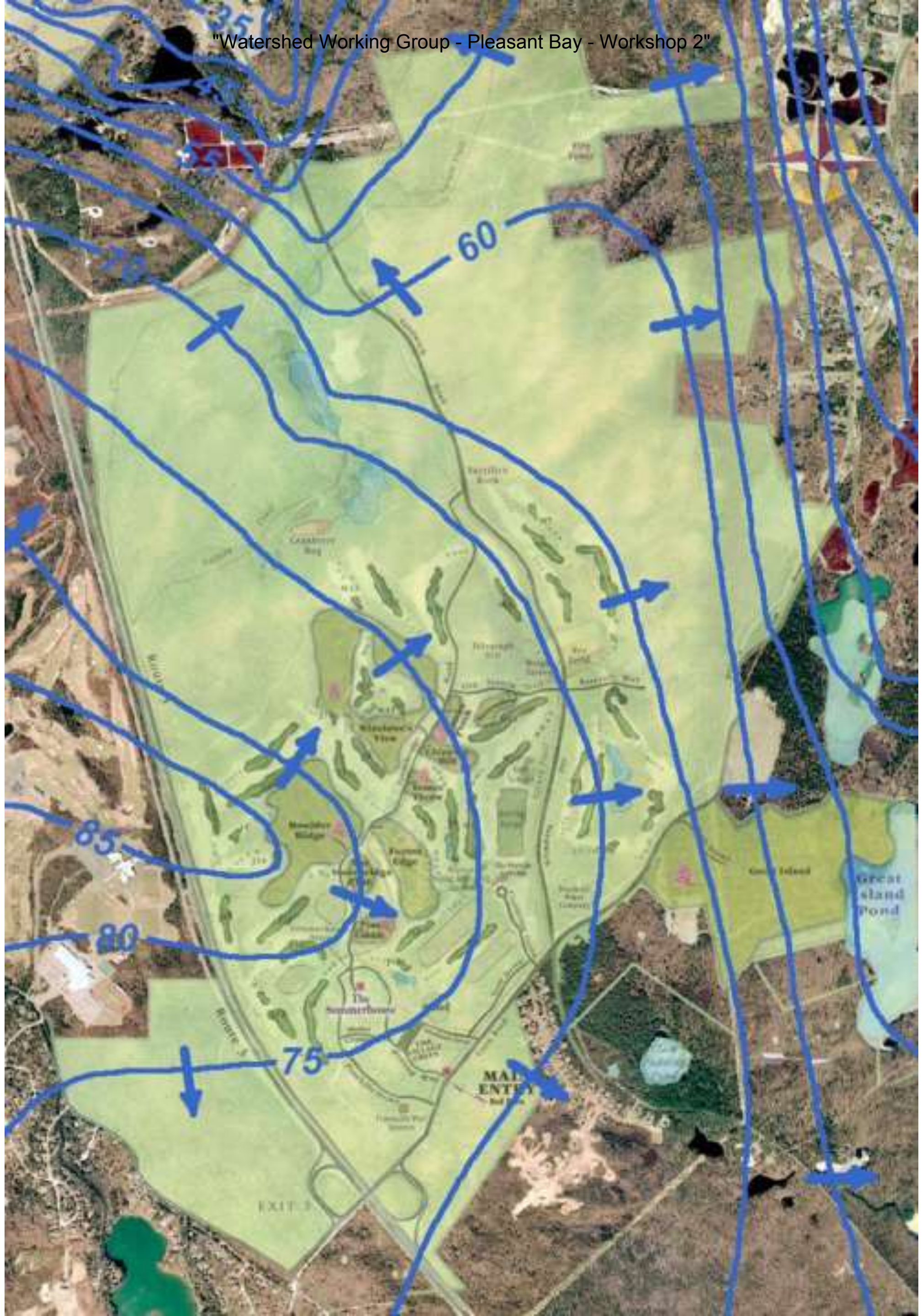
Source: Sand Creek Consultants

Phytobuffers

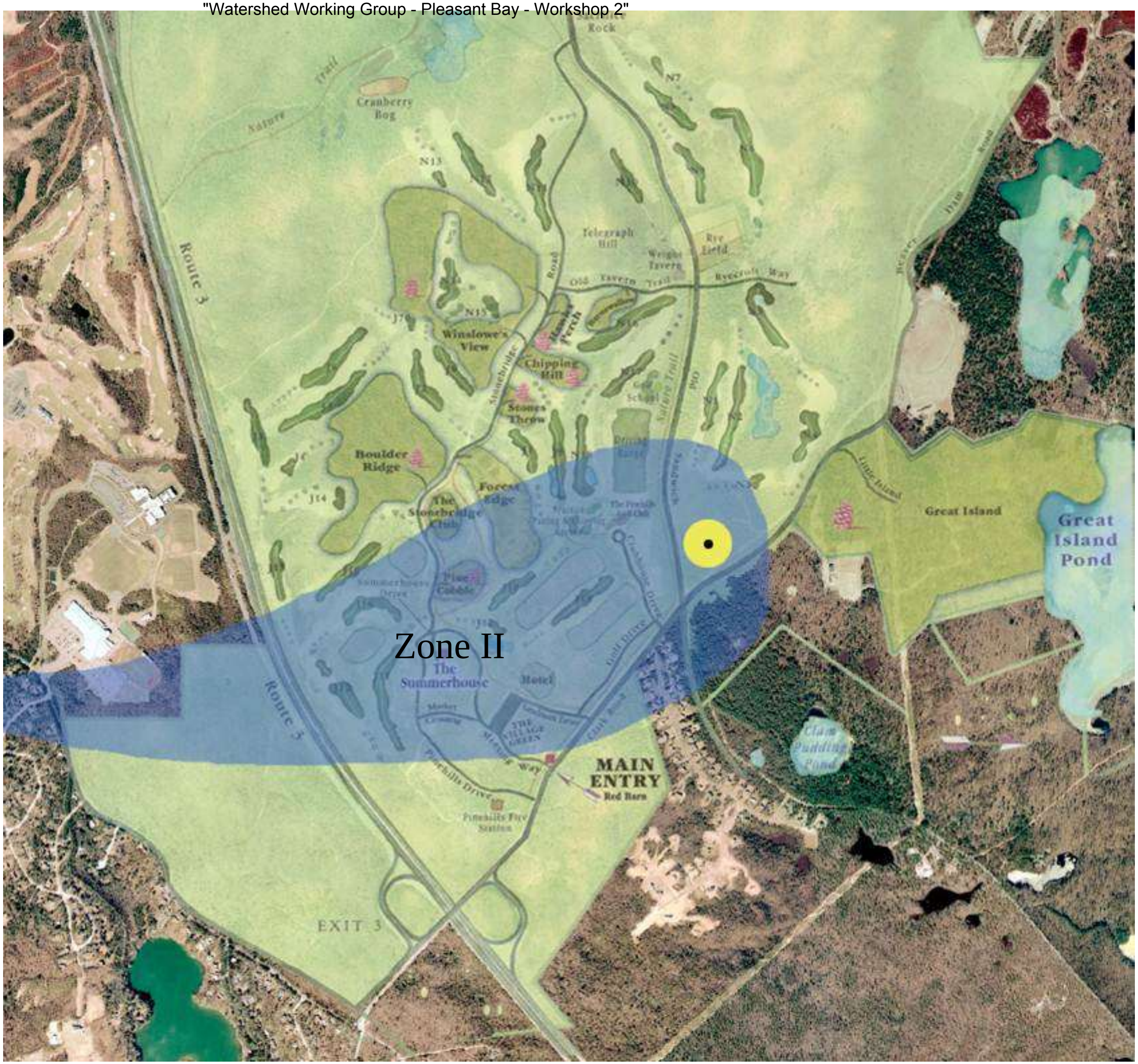


Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Fertigation Wells



Precedent:
Pine Hills
Plymouth, MA



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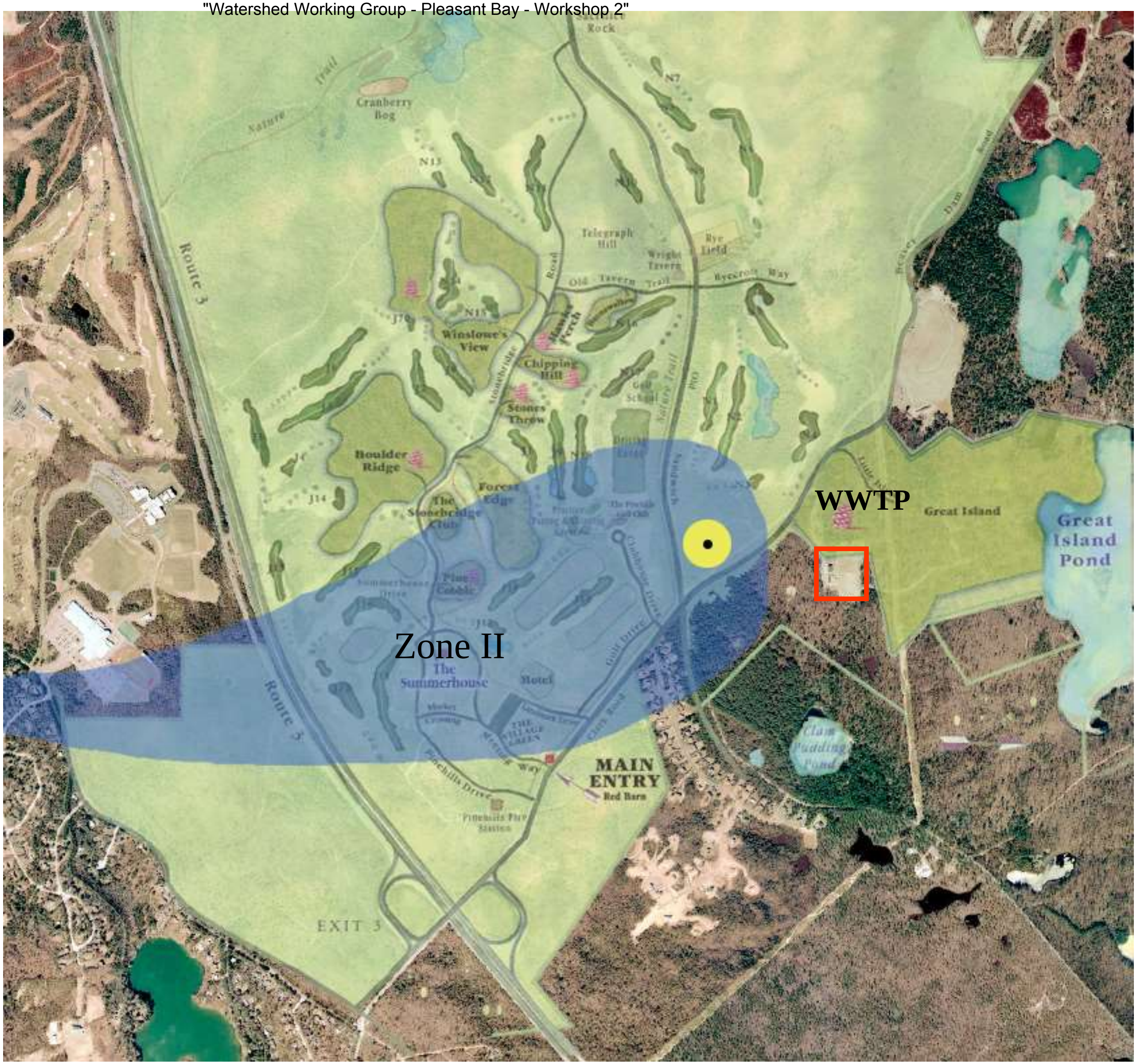

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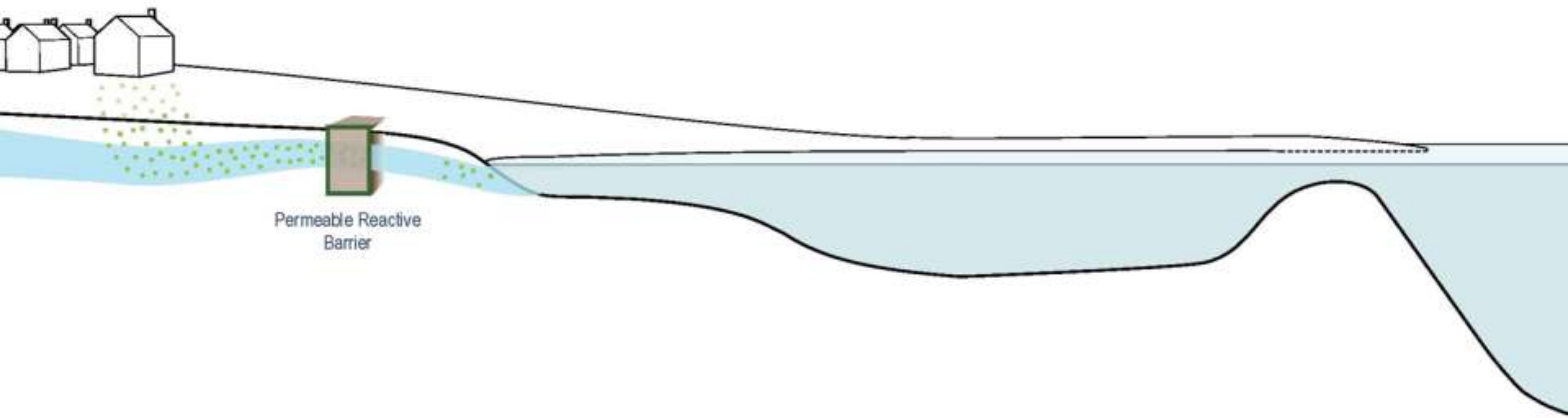
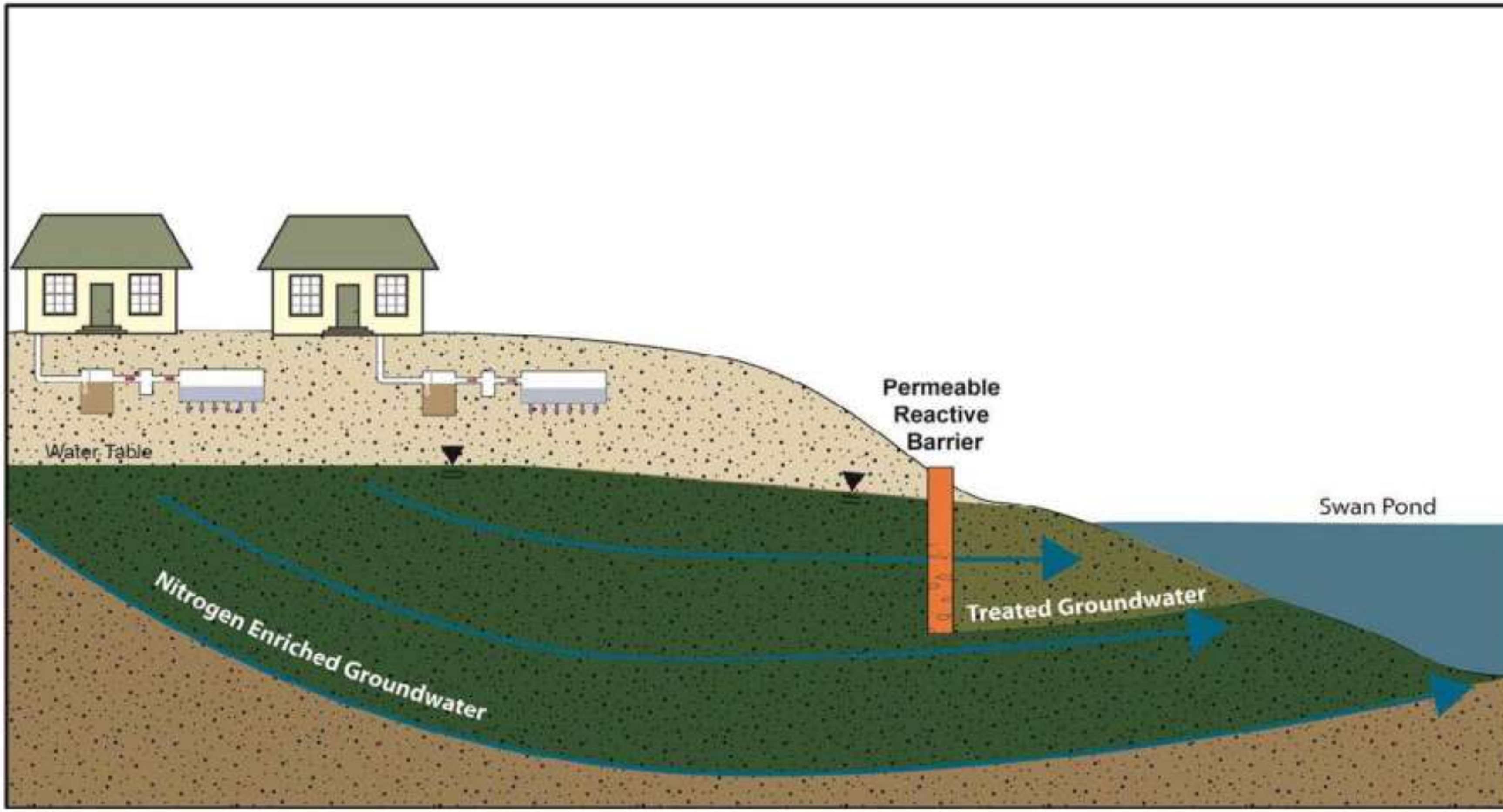


Scale: SITE / NEIGHBORHOOD / WATERSHED
Target: EXISTING WATER BODIES

Permeable Reactive Barrier

PRB



Precedent: PRB

Source: Horsley Witten Group Inc.

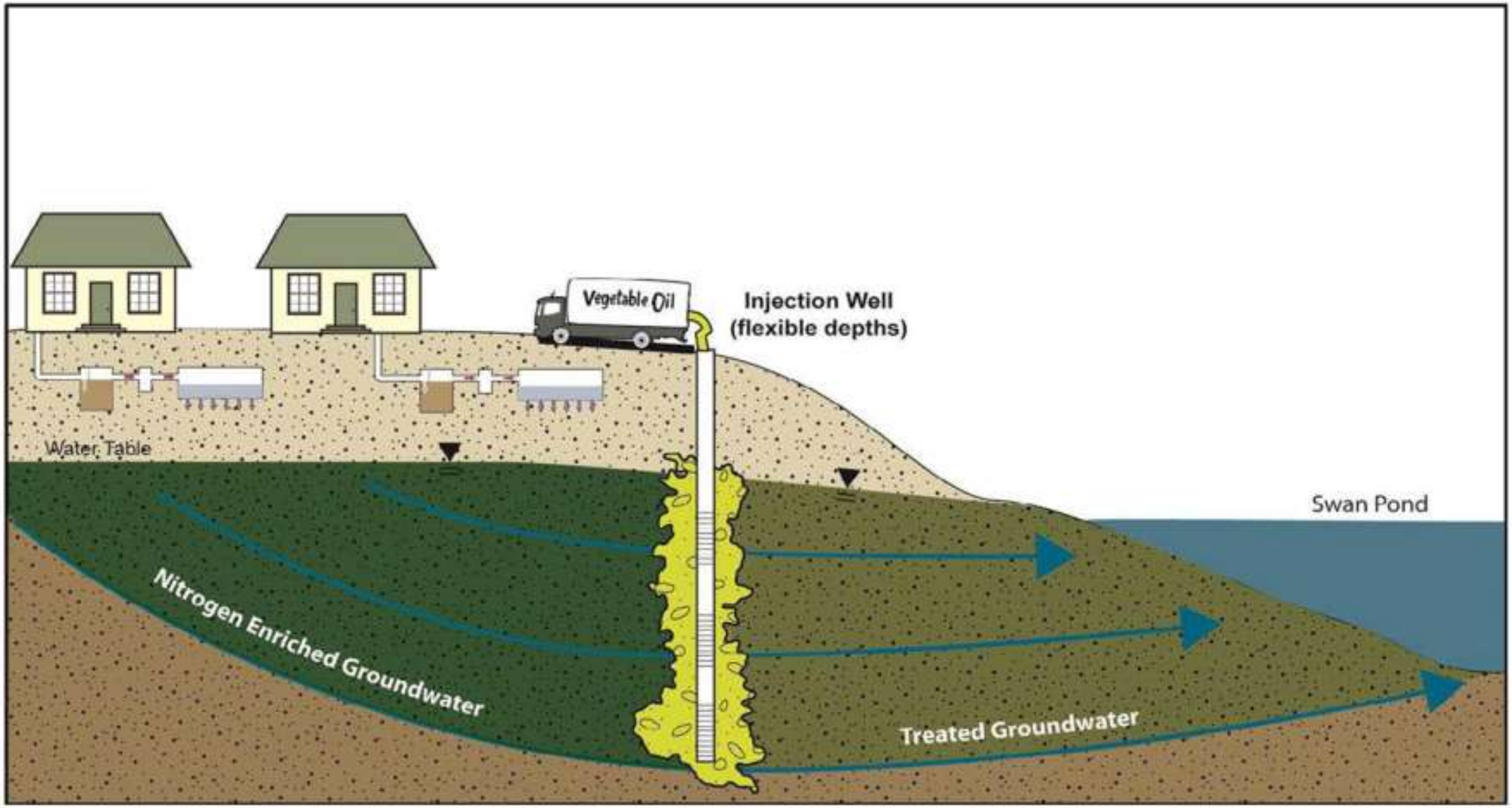
Permeable Reactive Barrier

PRB

Precedent: Falmouth PRB
Source: Mike Domenica

Permeable Reactive Barrier

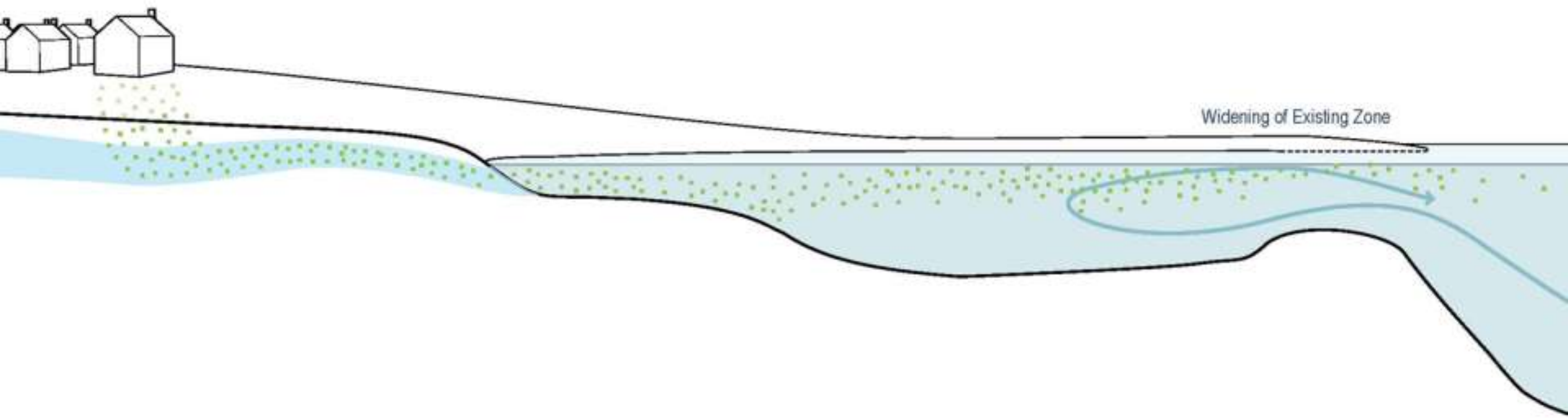
PRB



Precedent: PRB
Source: Horsley Witten Group Inc.

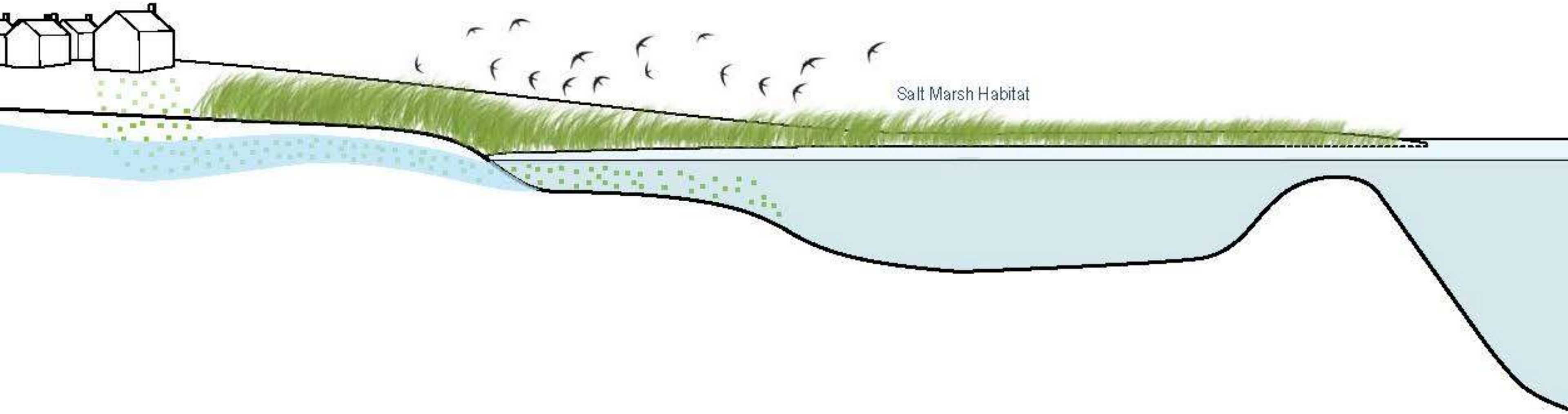
Permeable Reactive Barrier

PRB



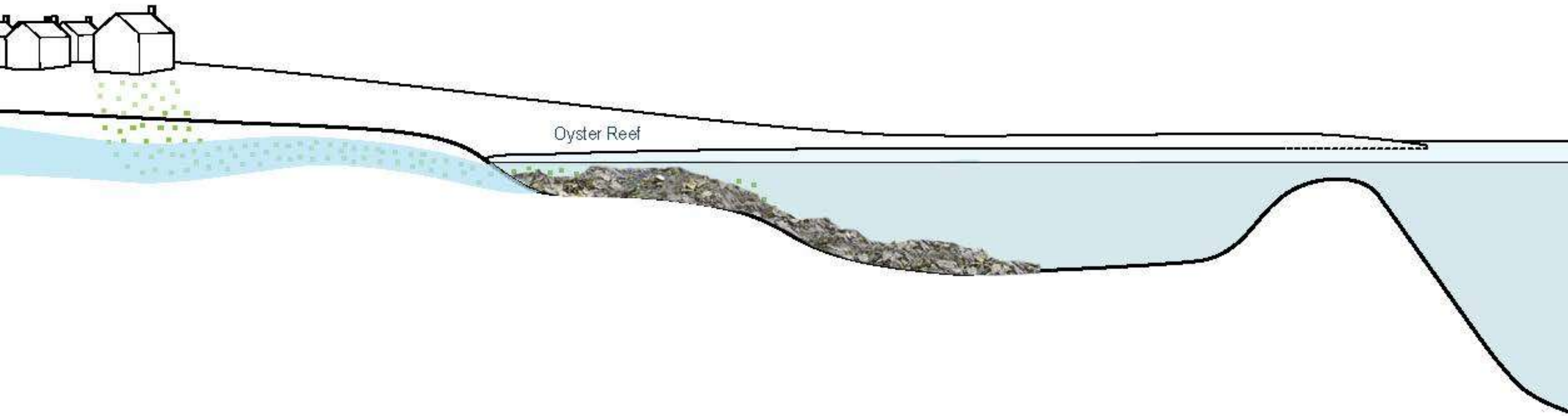
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

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

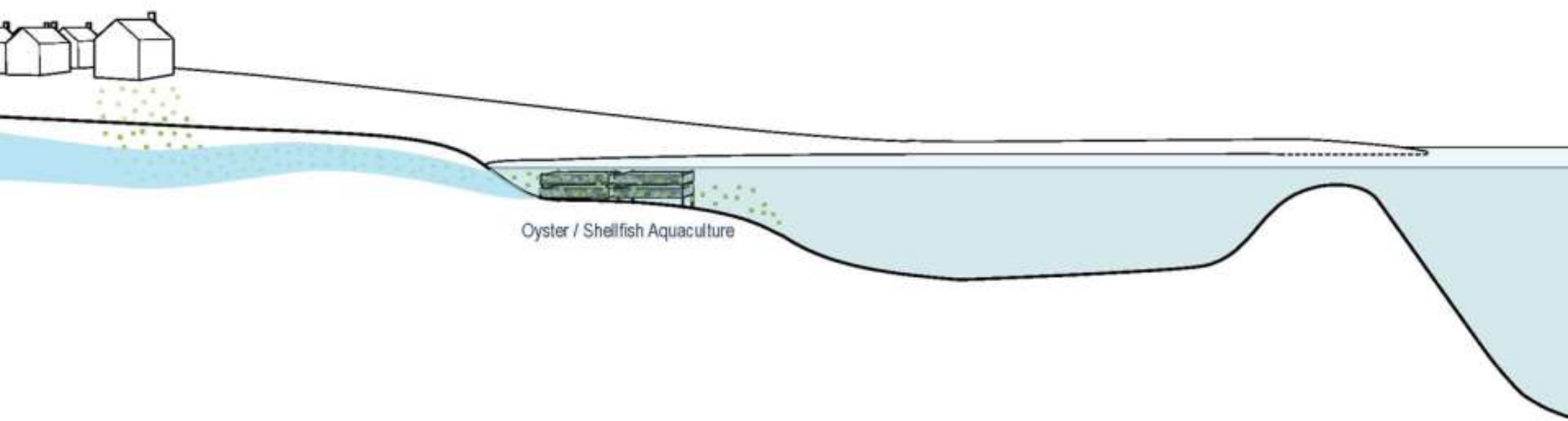
Precedent: Wellfleet Oyster Restoration Project

Source: Anamarija Francik

Shellfish Habitat Restoration

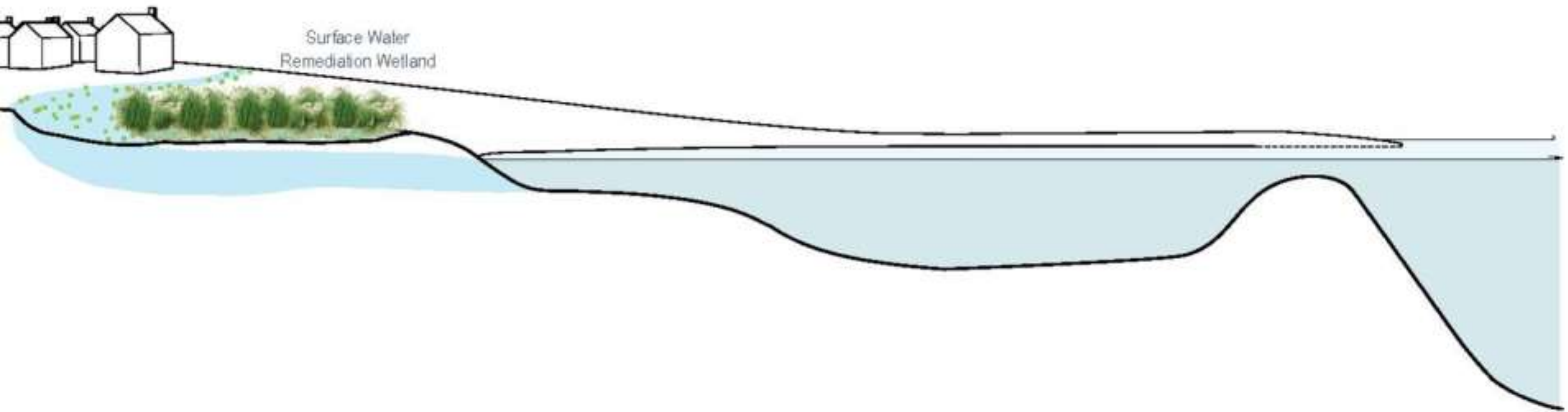
Precedent: Wellfleet Oyster Restoration Project
Source: Anamarija Francik

Shellfish Habitat Restoration



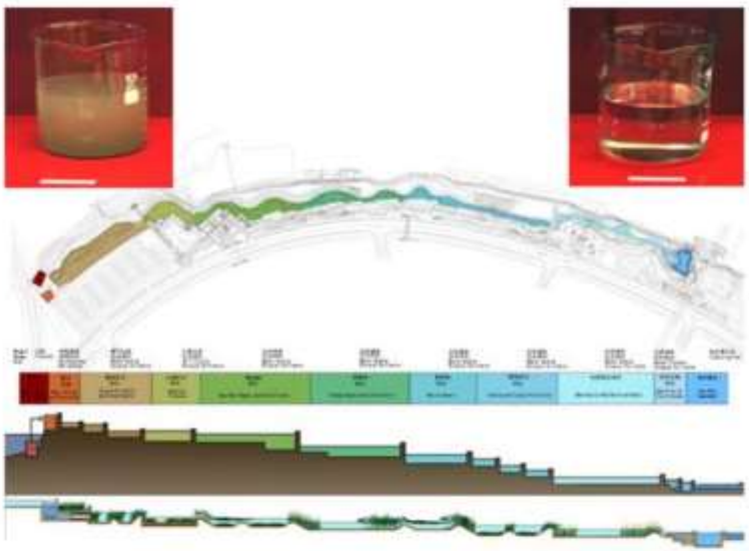
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Aquaculture / Shellfish Farming



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

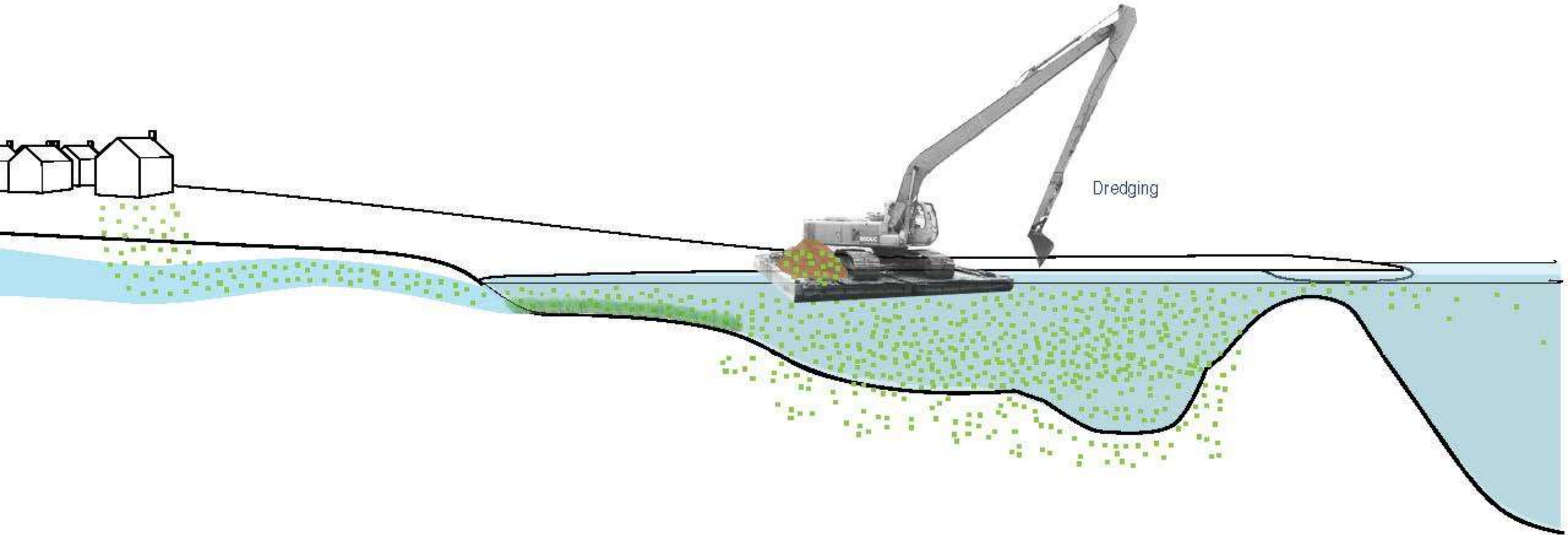
Surface Water
Remediation Wetlands



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
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
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

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

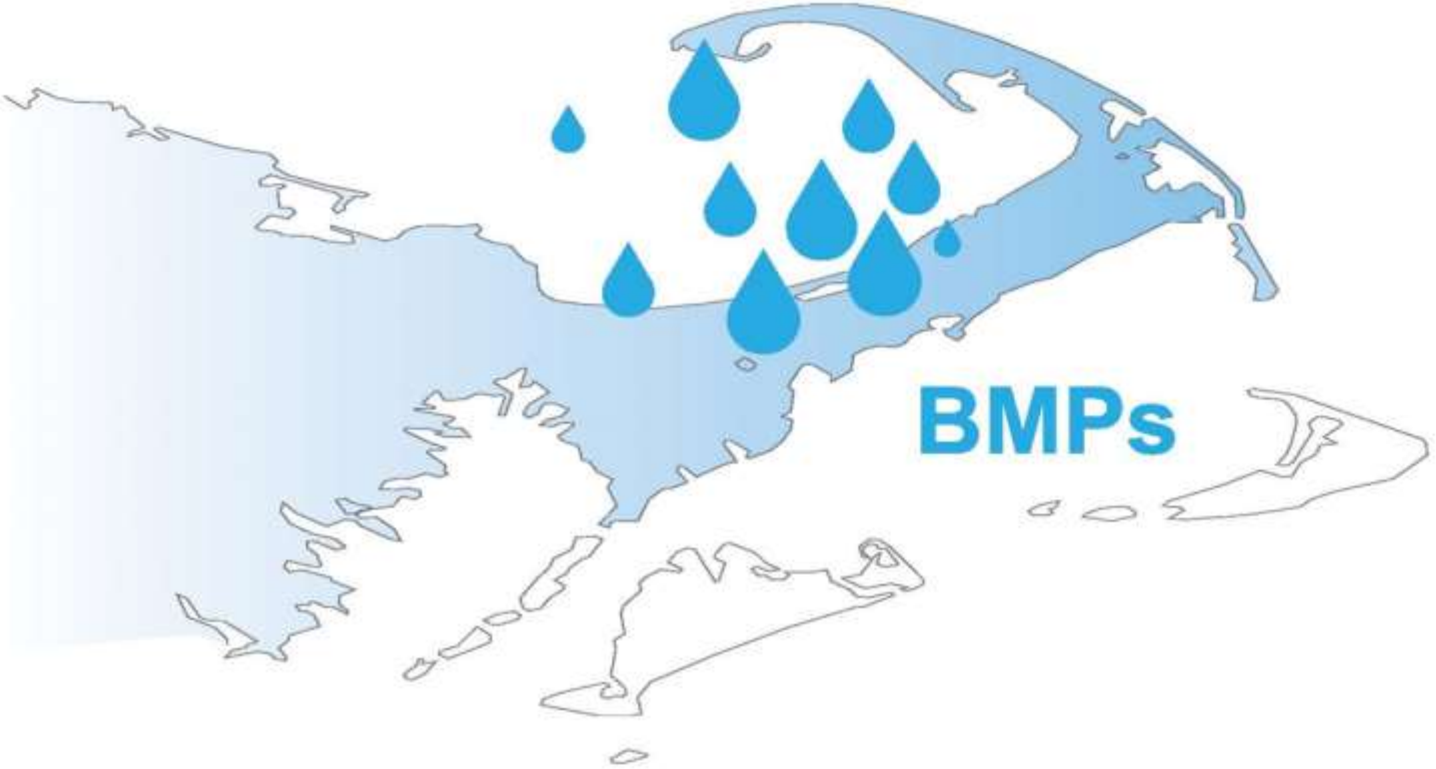
TDR

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

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-	*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

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

Wastewater · Existing Water Bodies · Regulatory

Problem Solving Approach

1 Nitrogen Targets/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

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

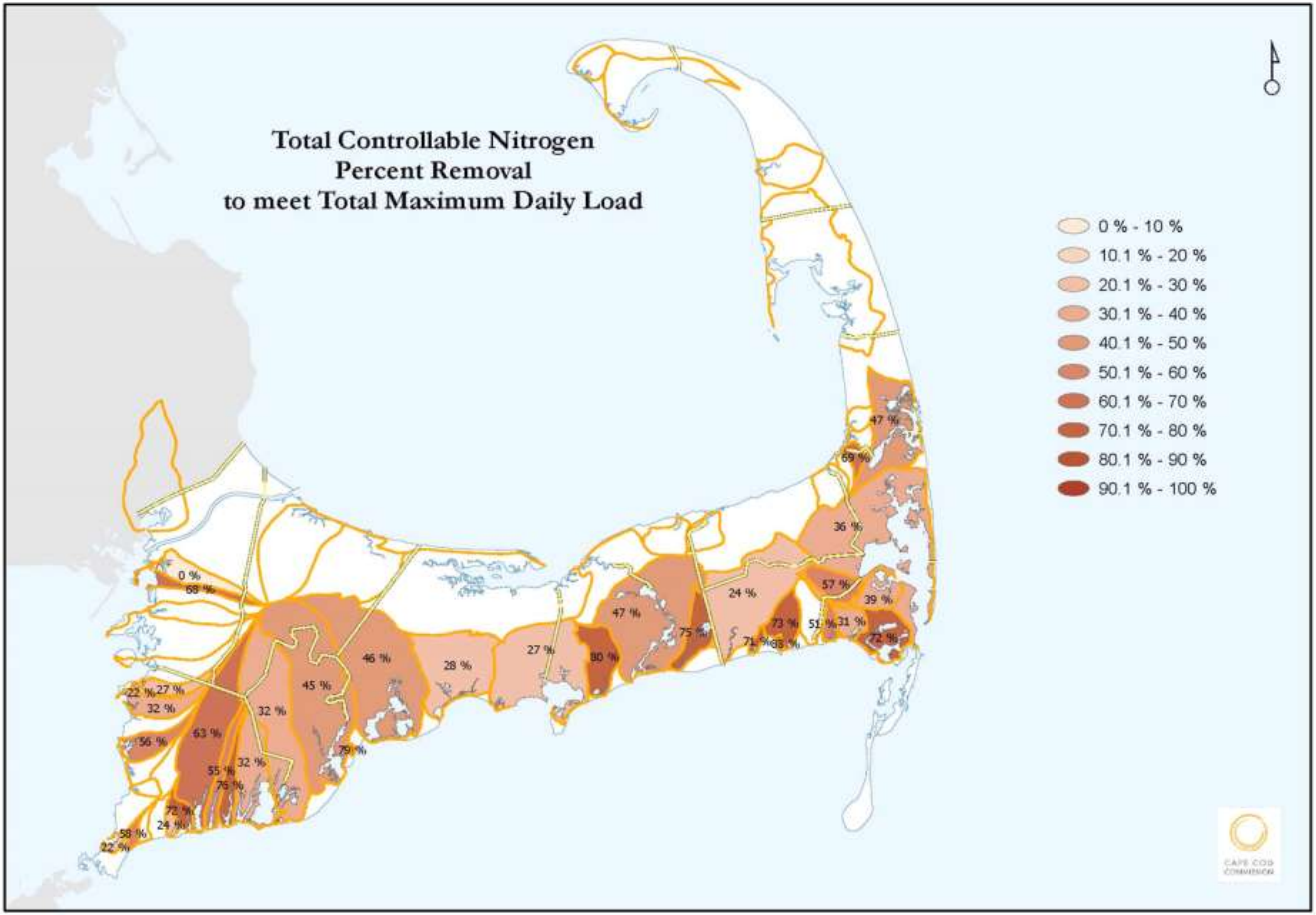
5 Alternative On-Site Options

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 %
47 %
69 %
36 %
57 %
39 %
24 %
73 %
51 %
31 %
72 %
71 %
83 %
75 %
47 %
80 %
27 %
28 %
46 %
45 %
32 %
79 %
0 %
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27 %
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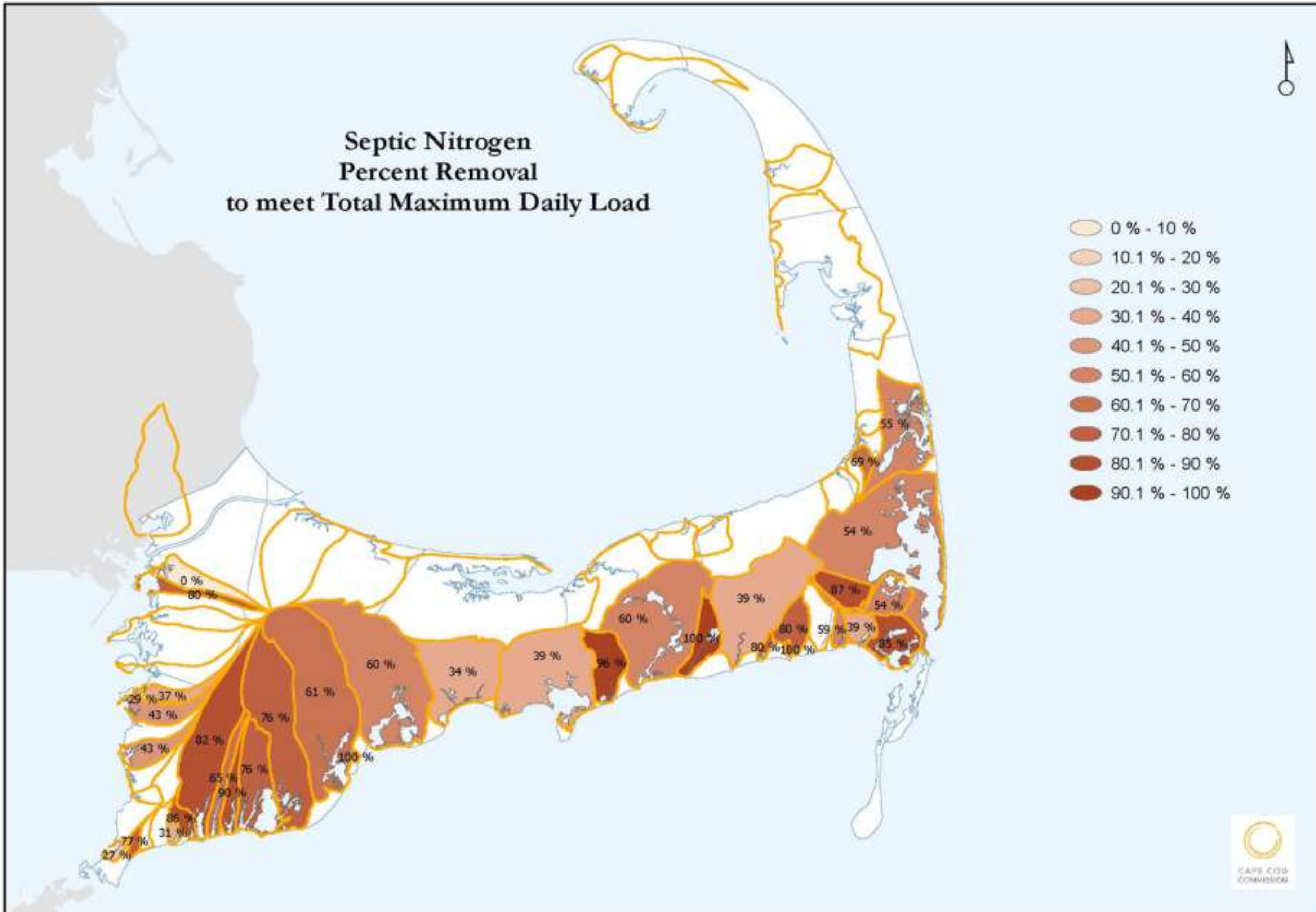
76 %
72 %
24 %
58 %
22 %


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 %
54 %
87 %
54 %
39 %
60 %
100 %
80 %
59 %
39 %
85 %
80 %
100 %
96 %
39 %
34 %
60 %
61 %
76 %
82 %
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90 %
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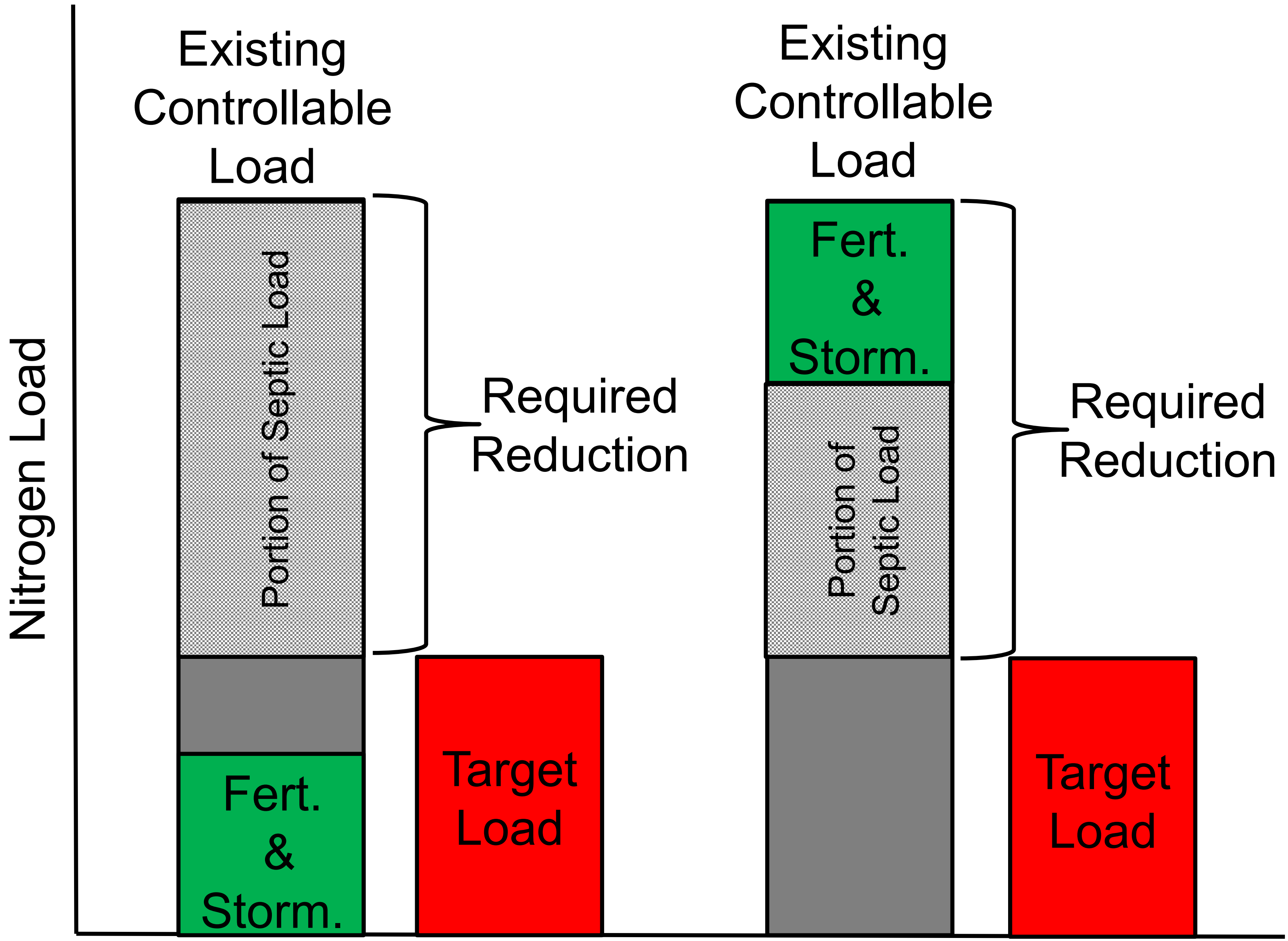
29 %
37 %
43 %
43 %


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 Nitrogen Targets/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

3 Low Barrier to Implementation

A. Fertilizer Management
B. Stormwater Mitigation

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

7 Supplemental Sewering

Triple Bottom Line

Impacts of Technologies and Approaches

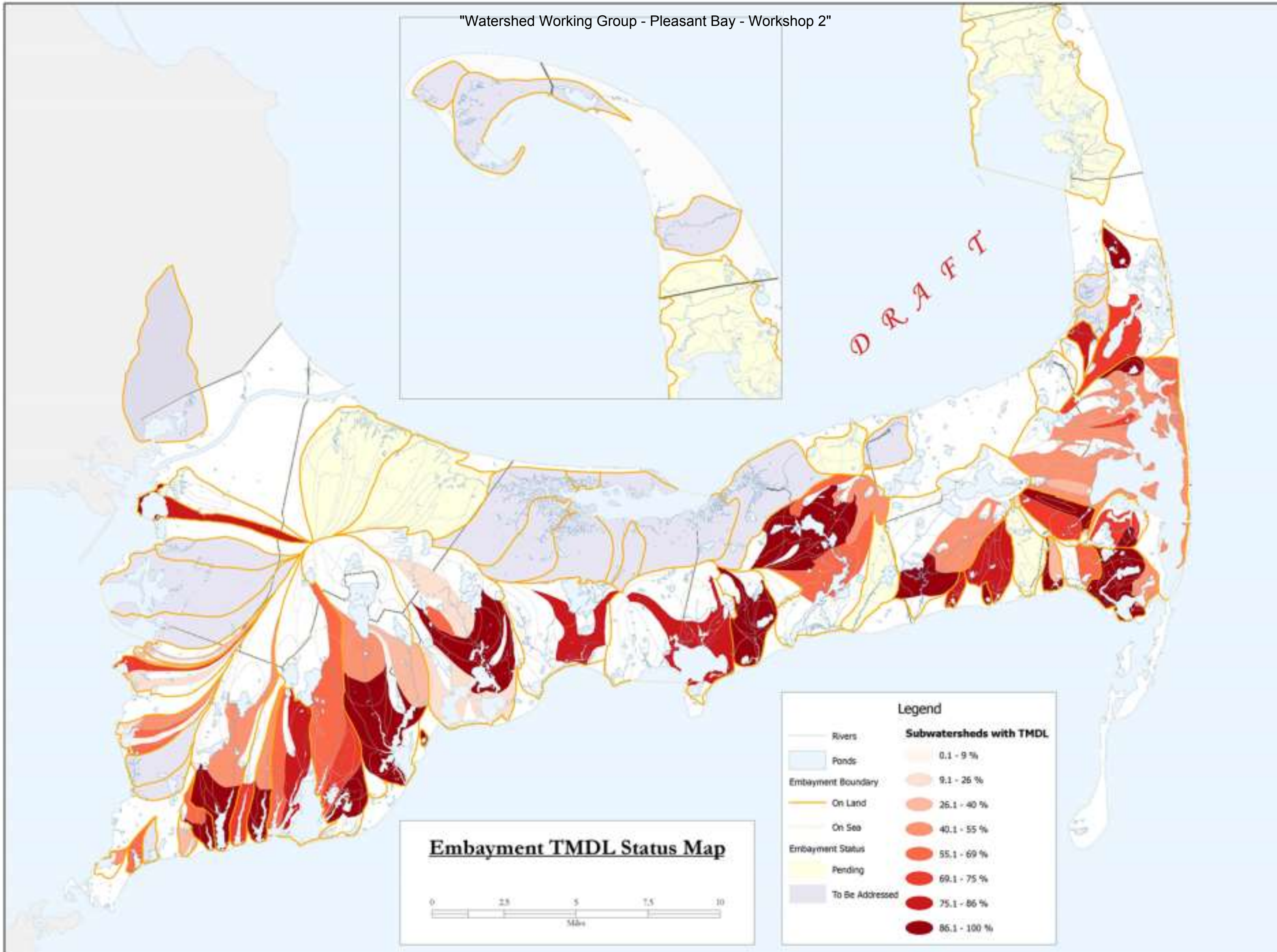
Environmental

Economic

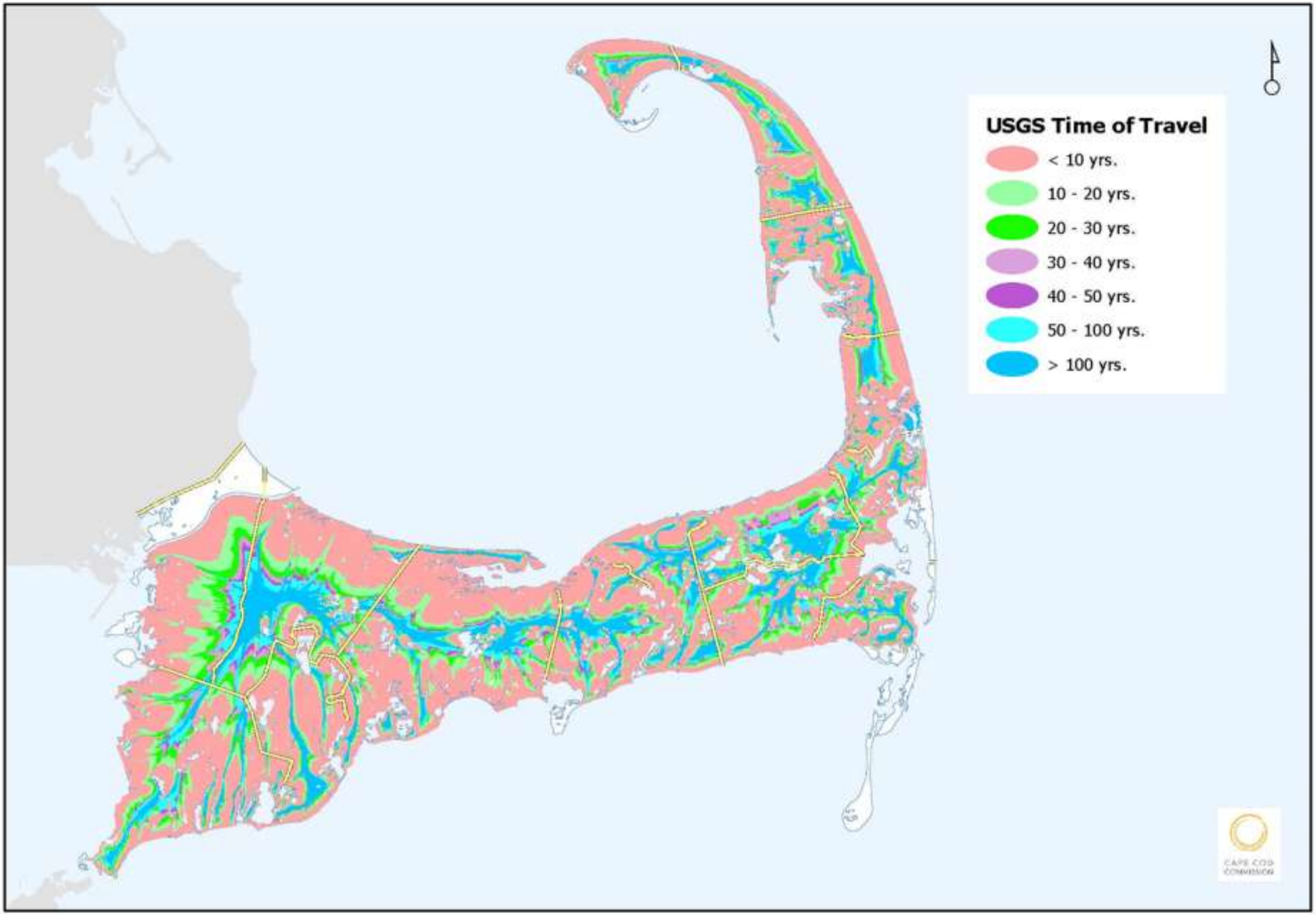
Social

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


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 %

"Watershed Working Group - Pleasant Bay - Workshop 2"



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
Pleasant Bay Watershed Working Group

Meeting Two
Wednesday, October 23, 2013
8:30 am- 12:30 pm
Orleans Town Hall, 19 School Road, Orleans, MA 02653

Meeting Summary prepared by the Consensus Building Institute

I. ACTION ITEMS

Working Group

- Next meeting: Meeting Three
  Monday, December 9, 2013
  8:30AM -12:30PM
  Orleans Town Hall, 19 School Road, Orleans, MA 02653
- Send Stacie any additional comments on Meeting One Summary
- Continue to prepare thoughts about which technologies/approaches it would like to learn more about for application in the Pleasant Bay Watershed. Different scenarios and options will be discussed during Meeting Three.
- Go to 208 website and access GIS layers[1]

Consensus Building Institute

- Finalize Meeting One summary
- Draft, solicit feedback from Working Group, and finalize Meeting Two summary.

Cape Cod Commission

- Provide PowerPoint presentation to Working Groups
- Share Technology Matrix with Working Groups
- Add information on incinerating toilets to technology matrix
- Share information on George Heufelder's I/A data with Working Group
- Include growth management as an option under the 'low barriers for implementation' section in the 7-steps for Problem-Solving Process
- Resolve website issue with the interactive GIS layers feature

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

Erin Perry, Special Projects Coordinator from the Cape Cod Commission, offered an overview of the 208 Update stakeholder process.[2] In July, public meetings were held across the Cape to

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[1] Available at: http://watersheds.capecodcommission.org/docs/frames/
[2] The PowerPoint Presentation made at this meeting is available at: http://watersheds.capecodcommission.org/index.php/watersheds/lower-cape/pleasant-bay

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 watersheds. The second meetings of the Watershed Working Groups are being 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 Technical Advisory Committee of the Cape Cod Water Protection Collaborative and 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[3]. Once the Cape Cod Commission finalizes it, the Technology Matrix will be shared with Working Group Members. The 208 process also builds on the work of the Cape Cod Commission's Advisory Board; Regulatory, Legal, and Institutional Working Group; Technology Advisory Committee of Cape Cod Water Protection Collaborative; and Finance Committee. The meetings held by these groups are videotaped and available on the Comission's website.

Ms. Perry shared the 208 Plan team's progress since Meeting One that 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 the 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.

In addition, 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!"; and a discussion of the stakeholder role in the second 6 months of the 208 planning process.

Patty Daley, Deputy Director at the Cape Cod Commission and Area Manager for the Pleasant Bay Watershed Working Group, informed the Working Group that there will also be an upcoming meeting focusing on build out on Cape Cod. The meeting date is yet to be set.

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[3] Technology Fact Sheets are available at: http://watersheds.capecodcommission.org/index.php/watersheds/lower-cape/pleasant-bay

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.

Stacie Smith, the facilitator from the Consensus Building Institute, led the Working Group through introductions, reviewed the goal of the meeting and the meeting agenda, and went over the progress of the action items established in meeting one.

III. RANGE OF POSSIBLE SOLUTIONS

Ms. Daley 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, she 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 summary information on the technologies being considered; the Technology Matrix, which includes additional information on site requirements, construction, project, 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.
- Particularly promising technologies should be identified for demonstration and pilot projects.
- Workshop 3 will embark on hands on problem solving in each watershed to meet target load reductions.
- Certain technologies and 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.

Ms. Daley offered a brief overview of the technologies and approaches categorized into site, neighborhood, watershed, and Cape-wide (technical and regulatory) solutions. The following section briefly describes each technology. Participants' questions and comments about the technologies are also discussed below (questions in *italics;* Cape Cod Commission or facilitator responses to questions or comments in plain text*)*:

Site level technologies/approaches

Standard Title V System*:* 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).

- *Do you have a sense of how many septic systems are failed or failing?* This information is not currently available, but the Cape Cod Commission is working with a consultant to obtain this information from town health departments.
- *Would one of these failed systems leak nitrogen?* Title V systems all release nitrogen as they are intended to control pathogen escape intro the environment, not control nitrogen.
- *Is it true there are cesspools on the Cape that also have not been improved?* This is true, and the Commission is trying to obtain this data; cesspools do not need to be replaced until a new owner buys the property, or the system fails.
- *What year was this law put in place? Title 5 was originally adopted in 1978, with a major amendment in* 1995.

I/A title V System: 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 V. All I/A systems require collection of waste.

- *Incinerating (Insolet) toilets work well for preventing nitrogen escape.* Ms. Daley said incinerating toilets could be investigated and added to the matrix.
- *How do these different systems compare with one another?* There is a broad range of nitrogen reduction depending on a range of factors, including what technology is being used, the maintenance and upkeep, and impacts of seasonality potentially requiring restarting the biological process.
- *There is a range of nitrogen removal in Title V I/A systems, which is not clearly shown on the factsheets, and systems can be upgraded (enhanced I/A systems) to reduce more nitrogen by using soil and other measures. There are also I/A systems out there that can reduce phosphorous. It would be helpful to share information about effectiveness and costs across these technologies.*
- *The county tracks I/A systems by technology, so are there opportunities to use the data to see which systems are operated on a more seasonal basis and which technologies are successful regionally on an intermittent use?* George Heufelder's data provided through the Barnstable County Health and Environment Department (BCHED) provides an overview of this. Ms. Daley said the Cape Cod Commission can post George Heufelder's data to the website.
- *I would prefer real world data.* George Heufelder's latest report reflects real world data, and the purpose of these fact sheets is to provide a basic overview; there is advanced I/A data in the Technology Matrix.
- *The challenge is deciding what is the most effective way to meet TMDL regulations. Assuming pilots for these technologies are successful, how do you anticipate that voluntary adoption by homeowners will be integrated into a community plan*? Pumping

by individuals does not happen as much as it should. The county could oversee this; this is a good question.

- *EPA guidelines and other sources emphasize the importance of a management entity for these nonconventional systems. When talking about seasonal variation, there is some benefit that people are not around all year, and systems can respond to this.*
- *The BCHED Carmody database has a good overview of these technologies. These technologies were not being operated or maintained appropriately, and due to this lack of maintenance, the efficiency of some systems were decreased. The Carmody database is now reporting on this, and advanced systems can correct themselves. Some also have telemetry devices, which allows them to be operated remotely. All of this technology is currently available.*
- *With respect to I/A systems, it seems that owners often get these to have a bigger home in nitrogen sensitive areas. What fractions of I/A system installations are motivated by this?* This is not known, though there are some people who put them in due to concern for the environment. However, most systems are installed to make formerly unbuildable lots buildable, or allow for the construction of additional bedrooms.
- *Towns and the Commission should better understand seasonal habitation by monitoring water usage. Real-estate brokers would have a lot of information on this. Seasonal homeowners could then be required to have I/A technology and provide funding.*

<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 that 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 (sink and shower uses) continues to flow to the septic system. (Case example, Falmouth, MA).

- *There is an ecotoilet demonstration project in Falmouth; do you have number and cost data for this project?* There are probably five so far, fewer than expected as the cost of the retrofit is expensive.
- *We got a quote to retrofit our house for eco-toilets, and it was $40,000.*
- *These don't remove less nitrogen than urine diverting toilets.*

<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.

Stormwater bioretention: 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).

- *Does the twenty-five percent removal rate mean the overall reduction in nitrogen or just the rate of reduction in stormwater, and why is there such a large range in possible reduction values?* It is only for nitrogen reduction in stormwater. The range represents levels of uncertainty for the technologies; the range of nitrogen reduction would likely be different across sites.

Neighborhood level technologies/approaches

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

STEP/STEG collection: 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.

- *For STEP systems, you need to have easements, so pipes could go through adjacent properties and go downhill to maximize efficiency. Are there regulatory efforts to simplify this?* Falmouth is starting to look at small pipes, local control, and pump systems. Their efforts could be used as a model. Provincetown is using STEP as part of their reduction efforts. These systems are easier to install than traditional sewers, but you need user agreements and easements. That said, they can be very effective.
- *I do not see average nitrogen reduction rates for STEP systems.* These are purely collection systems; there is no nitrogen reduction.
- *In urban situations, these systems can save the town a lot of work. The excavations are pretty easy, and they require less water.*
- *For STEP systems it should be noted that there could be odor, upkeep, and cost issues as seen in Orleans.*

Eco machines and living machines: 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 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).

- *What is the size requirement for these systems?* They normally have a fairly small footprint; a system for six houses would likely be the size of a two-car garage.
- *Can these systems be split up and managed individually?* It is more cost effective to construct these systems on a larger scale. The drawback is that these require water and heating.

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).

- *Are stormwater wetlands and vegetated swales the same thing?* Yes, swales are just smaller in size.
- *What is the nitrogen removal rate for a typical subsurface disposal system, and what scale of improvement do these represent over current systems?* These bio systems are a significant improvement because traditional ones (catch basins leaching directly to groundwater) only remove nitrogen attached to particulates.

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 wetlands by utilizing hydrophilic plants to filter wastewater through their root zone, a planted medium, and open water zones. In surface flow wetlands systems, 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 recreational activities on land above the subsurface system. (Case example, Thailand).

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 that the receiving watershed be able to accommodate the additional nitrogen load.

- *What do you mean by the term 'highly treated?'* In most cases, this would mean water coming from a treatment facility after tertiary treatment.
- *Are there other problems with out of watershed systems?* Yes, many studies are required, though Cape Code is considered a single basin so transfers among watersheds would not be out of basin transfers. Any solution like this would need a groundwater discharge permit. Furthermore, most of the transfers would be from one sub-watershed to another, which can easily be done and can represent an insignificant transfer of water. Transfers would also be dependent on local watershed conditions.
- *Orleans has a large watershed, which is a benefit.*
- *For perspective, we already do a lot of this inter-watershed transport for water supply delivery.*
- *We should be careful about wasting fresh water, as it is a scarce resource. I do not believe in robbing from Peter and discharging to Paul. This should not be considered without a lot of study and evaluation, and freshwater aquifers should be maintained.*
- *While I sympathize with that, if one has a salt marsh that is an excellent sink for wastewater effluent, it is an option that should be considered. Orleans has considered this.*
- *It is important to have a sense of context. There is a variable amount of rain each year. What percentage of total rainwater might be transported?* This might be around five percent of total rainwater. Before transport permits are approved, the impact of moving the water around is studied. It is normally very localized. There is also a public comment session during the permit review process.

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

- *The outfall plan would entail a huge amount of bureaucracy.* That is true, and Nantucket Sound is also shallow, which could further complicate permitting. .

<u>Phytoirrigation:</u> 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).

Cape-wide level technological approaches

<u>Phytobuffers</u>: Using trees with a deep root system to capture nutrients in the soil, particularly willows and poplars. Green plants with deep taproots 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).

- *Phytobuffer seem like they would require substantially less infrastructure for having a high rate of nitrogen removal, but aren't poplars and willows invasive?* There are native species with similar nitrogen removal capacities.

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).

- *We would need empirical evidence to look at specific lawn fertigation systems.*

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, reducing the nitrogen load to an estuary and removing it from the watershed. The CCC is considering pilot projects, initial screenings, and a full hydro-geologic evaluation to study the efficacy of this approach. (Case example, Falmouth, MA).

- *There is a successful example of a PRB filled with zero valence iron next to Ashumet Pond. However, there were specific local conditions that made it successful. In PRB injection projects, there might be problems if specific conditions are not present. It is important to make sure these projects will work before funds are spent to figure out if it is a cost effective option. Does the Cape Cod Commission have experience with this?* If you have to construct a PRB below 40 feet in the ground, only wells can be considered as groundwater nitrogen could go underneath it. There is a system in Canada that has worked well for over fifteen years. These systems have a tendency to last a long time. Lifecycle costs are included in the matrix, which includes the cost per pound of nitrogen. Trenching and wells can also be used in conjunction with each other to make a more effective system.
- *Brewster is looking at installing these systems, but the depth to groundwater makes a large cost difference.*
- *The depth of a PRB clearly matters; what about the width of a PRB?* PRBs can pretty much extend as far as you want.
- *There has been work done looking at roadways that are on long estuaries and installing PRBs on the shoulders of these roads.*

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 sixty-five percent of historic salt marsh has been lost in Massachusetts. 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 ninety-five percent. In conjunction with the natural transition from land to sea in estuaries, bays, 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).

- *While nitrogen uptake only occurs during the growing season, this corresponds to the visitor season, when the Cape most needs it.*

Aquaculture / shellfish farming: Oyster beds have been proposed as a potential method for reducing nitrogen levels and eutrophication in estuaries. Nitrogen removal rates from oyster beds have been well documented, and the harvest of oysters physically removes the nitrogen sequestered by the oysters. In addition, oysters remove nitrogen through their biological cycling, which puts nitrogen back into the atmosphere. Aquaculture can use both man-made structures (e.g. cages, floating bags) or natural reefs.

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 released 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 from the watershed. (Case example, Dennis, MA).

- *Aren't spoils from dredging highly regulated at the moment? This will have to be addressed. The county has a dredge and should pursue this. The disposal of dredge spoils* is highly regulated. Maintenance dredging can help reduce nitrogen loads.
- *Harwich just dealt with a dredging project, and it was a major hassle.*
- *The state does not have a great way to regulate dredging solely related to nutrient removal.* Yes, Barnstable's recent dredging project at Mill Pond to increase freshwater involved dealing with complex regulations.

Cape-wide level regulatory 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 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.

- *For home fertilizer use, there are garden services that do not introduce nitrogen, and we should consider promoting this kind of service.*

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. Mark Owen, Consultant from AECOM, noted there is a school in the area that has a treatment plant that would benefit from getting more wastewater, and there may be more of these opportunities.

- *What about the use of military base's treatment system; how does that play into this?* Yes, there is excess treatment and disposal capacity at the base. The Commission is working with base command to develop a master plan to decide what might happen at the base going forward. A host of potential solutions are under discussion, including bringing in the surrounding community's waste or having the towns around the base form a sewer district to take advantage of the base's extra capacity.

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.

- *Do we have successful examples of developmental transfer in the area?* Not on Cape Cod specifically.
- *Shaws Market gave a transfer development right.* Yes, a good example of a single project offset.
- *In regard to the transfer of rights, Title V already has a provision that allows you to buy more land to make up for additional nitrogen loads on your on property. This is done in Harwich.*

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.

Ms. Daley concluded by reviewing the technologies in use and under consideration in towns on the Cape. The Working Group suggested several revisions to this overview, including noting that the Muddy Creek Project is a two-town venture and the existence of a demo subsurface project in Falmouth. Ms. Perry responded that the Cape Cod Commission would check their information.

General questions and comments about technologies:

- *For clarity, the factsheets should state the source of nitrogen that the technology addresses, and the percentage that source is of the total nitrogen problem (*i.e. technology A removes 46% percent of nitrogen from a source that contains 60% of the total nitrogen load).
- *Not all of the recommendations from the Technology Panel are included in the fact sheets. The Technology Panel recommended starting with solutions that begin in the watershed*.
- *Huefelder, Kreissel and EPA have stated that high levels of nitrogen removal (down to less than 3 mg/l) are achievable at any scale from enhanced on-site (single home), cluster or satellite treatment or centralized treatment facilities.*

- *We need to clarify growth rate scenarios to estimate future waste loads. Towns have the ability to alter this future rate – Brewster has worked with zoning laws and acquired land to affect this.* This a good point and should be included.
- *Is the information that talks about finance on the CCC website?* Yes, it is[4].

IV. PROBLEM SOLVING PROCESS AND PRINCIPLES

Overview of 7-steps for Problem-Solving Process

Ms. Daley 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). She 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, and 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). In response to a question, Ms. Daley agreed that growth management solutions would also fit under this category.
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

She 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. In addition, the percentages of controllable nitrogen that needs to be removed to meet TMDLs change depending on the characteristics of the watershed. She 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.

Ms. Daley responded to questions from the Working Group about how to document and deal with regulations for different technologies. She explained this involves adaptive management and discussion with the Department of Environmental Protection (DEP). Another participant asked about the needed measurements for obtaining baseline data. Other Working Group

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[4] Cape Cod Commission topic page: http://www.capecodcommission.org/index.php?id=62&a=topic

members responded by listing existing monitoring programs, and Ms. Daley acknowledged the participant's concern about measuring success and its importance in demonstrating compliance, but emphasized that the goal of the meeting was discussing potentially successful technologies and outcomes.

Categories of Solutions and their Impacts on the Environment, Economy, and Community and Overview of Guiding Principles and Processes

Ms. Daley 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. Daley highlighted some of the principles the Cape Cod Commission hopes will guide the technology/approaches selection and expressed her optimism that a wide-ranging discussion with the Working Group would be able to clarify role of these principles. These process and principles include:

- *100% septic removal sub-watershed*: Combinations of technologies can be used to reduce the septic and other controllable 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 that 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.

Discussion – Identify Considerations and Priorities for Application

Before starting the discussion, Ms. Smith reiterated the themes she had captured during the discussion from the first part of the meeting. These themes included:

- Scale:
  - At the homeowner level, how can the Working Group clarify the best technologies for variable conditions; how can these technologies be enforced and homeowners be made accountable; and how do you incentivize people to use these better systems?
  - What are the costs and benefits as these technologies scale up, and what is the right place to implement technologies on this scale?
  - Systems with small pipes have potential benefits, but there are also concerns about their effectiveness and social impacts.
- Seasonality: What is the understanding and effect of different kinds of seasonality; how does this impact the success of different technologies; and considering this, how should technologies be tailored to specific properties?
- Compliance and documentation: how can this best be done, and how should success be measured going forward?

The Working Group members brought up a number of questions and comments about the discussed technologies.

Discussion of Potential Efficiencies in the Process:
Several members of the Working Group mentioned ideas and existing programs that could take advantage of efficiencies to simplify the adoption of future technologies. A participant noted that, as this process is both town and watershed based, the 208 Process could be aligned with the Towns' process. Ms. Smith agreed that this coordination is important for the next phase of the planning process.

Another participant brought up the idea of taking one town's effluent and sending it to another town within the watershed, and emphasized the importance of considering the economics of regional solutions, noting there are multiple opportunities for inter-municipal solutions. Others agreed that the Working Group should think in terms of watersheds instead of towns to find efficiencies. A discussant also suggested comparing the alternative technologies at both the local and watershed scales. A Working Group member noted that Brewster is considering a PRB as an alternative, and it might make sense to include adjacent towns in the project. Another group member pointed out that there can be timing issues in planning among municipalities if they are in different stages of the assessment process as it makes it more difficult to know the needs of the entire watershed and a common understanding has yet to be developed. Others acknowledged this, and felt that collaboration was still possible in meeting each town where they are. While Brewster is behind the other towns, it has made a point to keep an open dialogue and discuss solutions, even though it is not ready to commit to specific approaches yet. Other members brought up the Pleasant Bay Alliance, which includes all four towns, and holds monthly watershed workgroup meetings in which wastewater, stormwater, and fertilizer management plans have all been discussed. The Alliance could serve as a model for other towns that share a watershed. Ms. Daley noted that it would be the Commission's job to look at these collaborations after the third meeting and integrate them into Cape-wide options where shared infrastructure might make sense and present these findings to stakeholders.

Cost and Affordability:
The issues of cost and affordability were also recurrent themes in the discussion. In response to a Working Group question about the absence of cost from the fact sheets and matrix, Ms. Smith told the group that there is a huge range in the cost projections for the different projects depending on local conditions, and while funding is clearly a fundamental piece of this, there are other economic and environmental considerations on the fact sheets. Ms. Daley added that the Commission also did not include costs, as people might focus solely on the financial issue, which is a conversation for a later time. A Working Group member thanked the group for addressing the funding issue and acknowledged that, while this is not the forum to discuss cost, it is an important consideration as there is not an excess of money at the moment. In response to further comments about municipal funding of nitrogen reduction projects, Ms. Daley informed the Working Group that the Commission seeks to obtain fifty percent of the funding from state and federal sources.

Another participant noted that due to the lack of immediate deadlines, people do not have their feet to the fire and will want to wait for better and cheaper approaches to arise, but this does not usually happen. For example, every fire station project in the Cape that has been pushed back to save costs has cost more and been smaller than the original proposal. Other members expressed a shared concern that this problem has only gotten worse in the last fifteen years, creating a host of water quality issues; the towns on the Cape cannot wait anymore and let conditions further deteriorate.

The Working Group discussed the issue of incentives for homeowners making improvements. A participant noted that tax breaks could be problematic as those who can afford to make an immediate investment in new technologies are more likely to be the more financially stable residents of the Cape, so granting this group a tax break on their expensive properties would hurt town revenues. Others noted that costs are a huge area to be explored, and whole-town funding options could be one potential set of solutions. Ms. Daley added that new systems could also bolster the local pumping industry and emphasized the benefit of looking at nutrients as a value instead of a cost. Another participant brought up the difference in costs between new construction projects and retrofitting, stating that it may be more financially feasible to install systems such as eco-toilets in houses under future construction. Others noted that the Working Group needs to recognize the importance of resale in cost calculations. The cost of installing new system should be offset by the increase in a house's value in the long term. A Working Group member also asked about the effect of these additional costs on affordable housing projects on the Cape. Ms. Daley responded that there are many land use approaches for dealing with this type of issue, and wastewater infrastructure planning could be changed for future developments.

Regulatory:
The Working Group brought up several issues that involved the regulation of potential projects and technologies. A discussant stated that, while pilot programs can document the benefit of new technologies and demonstrate their feasibility, there are remaining regulatory and legal

challenges and asked if the Cape Cod Commission envisions itself as a champion to the DEP in overcoming these obstacles where stakeholder have identified particular technologies as valuable. Ms. Daley responded that hearing stakeholders opinions about the proposed technologies will help the Commission in its discussions with state regulators.

The Working Group posed several questions about the technical and regulatory timeline of the process. Ms. Daley explained that the CWMPs look at the issue from a twenty to forty year build out perspective, and the time for fixing the nitrogen problem relates to its travel time in different areas, noting that a newly sewered area may still require a PRB to capture nitrogen already in the ground. From a regulatory standpoint, the towns need to meet the requirements set forth in their TMDLs, lest the DEP or a judge enforce these regulations, potentially in a less efficient and more expensive manner. Ms. Daley clarified that, while the state has not acted on a number of regulatory actions that it could take , it could if it wants to do so, but noted that it is in the Cape's best interest to come up with its own solutions as its economy is dependent on the quality of its environment.

A Working Group member proposed that the best regulatory course of action was promoting self-accountability and installing I/A systems, on an individual level. Ms. Smith noted previous comments about proper enforcement, and Ms. Daley added that, according to George Heufelder, I/A systems could not be used alone if more than fifty percent of nitrogen needs to be removed from a watershed system. Others group members encouraged thinking about a package of solutions with I/A systems as one of many potential options. Ms. Daley added that the Commission is using GIS layers to screen different areas to determine which technologies are most appropriate for specific sets of conditions.

In response to a participant request to individually review each technology, another discussant responded that in most cases the more local the response the higher the tolerance for risk because local responses require less capital, but these local proposals are more dependent on local conditions, and as there is high local variability, these will be finite discussions, noting that the Working Group had selected a good group of technologies and might not need to discuss the specifics yet. Another group member suggested that a reasonable principle would be not committing to any initial plans that would preclude other options later on in the process. Ms. Smith affirmed that looking at the extent to which any option allowed other options to stay on the table could be a possible evaluative criterion. A participant added that the nutrient issue should not be the sole focus of the Working Group, stating that there are other issues, including water supply considerations, that are important to residents of the Cape.

General Questions and Concerns:
A Working Group member asked for clarification about the 7-step process. Ms. Daley explained that it is not a temporal approach, but rather an evaluation method for considering alternatives. A Working Group member noted the recommendations of the Tech Panel to restore the natural functioning of systems and maximize in-situ solutions. Participants noted the value of considering other environmental and economic benefits of technology choices. Another discussant asked if it was possible to include a representative from the Tri-Town Septic

Treatment Facility. Ms. Smith explained that the group can talk about the plant and treatment facilities in general, but the Tri-Town plant is expected to be decommissioned.

V. PLANNING FOR THE NEXT MEETING

Meeting Three will be held:
Monday, December 9th, 2013
8:30AM -12:30PM
Orleans Town Hall, 19 School Road, Orleans, MA 02653

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 would like to explore further given their understanding of the baseline conditions, issues, and priorities in this watershed.

VI. PUBLIC COMMENTS

- *This process should be broadened beyond nutrients alone to other issues, such as public health and not foreclose on other options and problems. I work with young scientists on social and technology issues, and remind the group that in addition to technological complexity, we need to consider the complexity of human behavior and the likelihood of citizens all fulfilling their parts. For example, use of seat belts, and replacing batteries on smoke alarms. I urge caution in underestimating the human regulatory component.*
- *I want to second the agenda for broadening the scope of this process and looking at other contaminants, such as hormones. Also, the more water you have to treat the less easy it is to clean that water. Given today's regulations, we should be able to implement I/A systems and save costs without having to raise taxes.*
- *Has anyone interacted with the online GIS data? IF so what was your experience?*
    - *I wasn't able to use it on my computer.* Ms. Daley responded that the site was having some issues that the GIS technicians would soon fix. Ms. Smith asked the Working Group to retry the GIS site as homework before the next meeting.

APPENDIX ONE: MEETING PARTICIPANTS

Primary Members:

Category	Name	Title
Local Elected Official	Linda Cebula	Harwich Board of Selectmen
	Florence Seldin	Chatham Board of Selectmen
	Sims McGrath	Orleans Selectman
Appointed/Committee	Russell Schell	Brewster Wastewater Committee
	Heinz Proft	Harwich, Natural Resources Director
Town Staff	George Meservey	Orleans Planning Director
	Sue Leven	Brewster Town Planner
	Robert Duncanson	Chatham, Program manger of CWMP
Environmental and Civic Group	Jeff Eagles	Orleans Citizens Peer Review Group
	Fran McClennen	Orleans Pond Coalition
	Joy Cuming	Orleans Community Partnership Advisory Council member
	Carole Ridley	Coordinator, Pleasant Bay Alliance
Business	David Bennett	Brewster Chamber of Commerce
	Jim McCauley	Orleans
	John Payson	Chatham Concerned Taxpayers
	Ben Buck	Orleans

Alternates and Members of the Public:

Jim Bast
Paul Davis
Steve Kleinberg
Dan Milz
Ed Nash
Peter Sivco
Gordon Smith