

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630



CAPE COD
COMMISSION

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

**Cape Cod 208 -Wide Water Quality Planning
Panel on Technologies**

**Thursday, September 26, 2013
Innovation Room, Cape Cod Commission
1pm**

Meeting Agenda

- 1:00 Welcome and Introductions – *Cape Cod Commission & Panel*
- 1:15 Review of the 208 planning process, goals, and role of Panel on Technologies – *Cape Cod Commission*
- 1:35 Presentation of technologies matrix – *Cape Cod Commission*
- 1:55 Discussion: Matrix Content and Structure – *Cape Cod Commission & Panel*
- 2:40 Break
- 2:55 Continued Discussion: Matrix Content and Structure – *Cape Cod Commission & Panel*
- 3:50 Public Comments
- 4:00 Adjourn



Cape Cod 208 Plan Update



What is the 208 Plan?

Clean Water Act Section 208



The Commission was directed to update the 1978 Plan

The Commonwealth provided \$3 million to fund the project

Focus on 21st Century Problems

Nitrogen:
Saline Waters

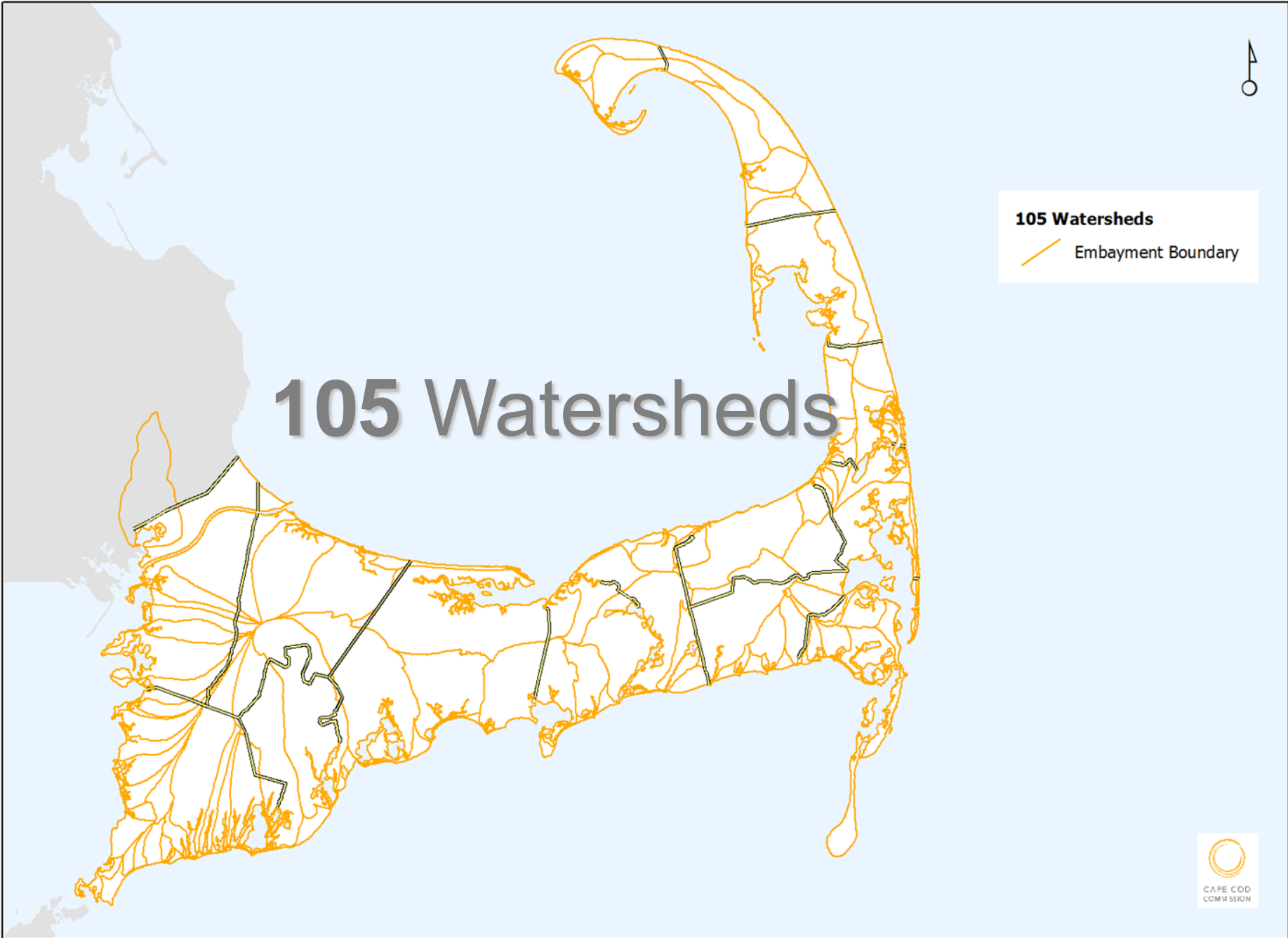
Phosphorus:
Fresh Waters

Growth &
Title 5
Limitations



105 Watersheds
— Embayment Boundary

105 Watersheds

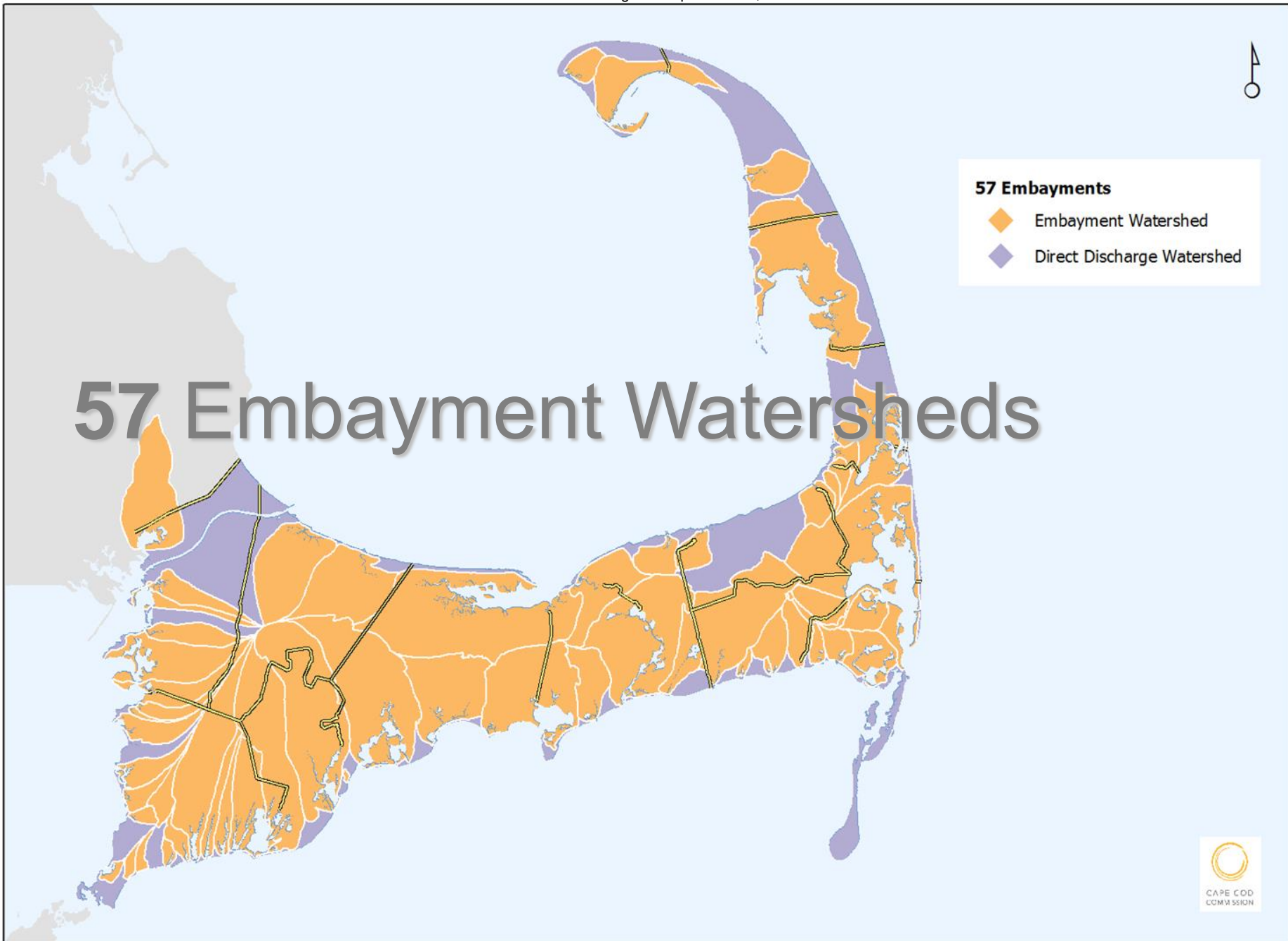




57 Embayments

- ◆ Embayment Watershed
- ◆ Direct Discharge Watershed

57 Embayment Watersheds

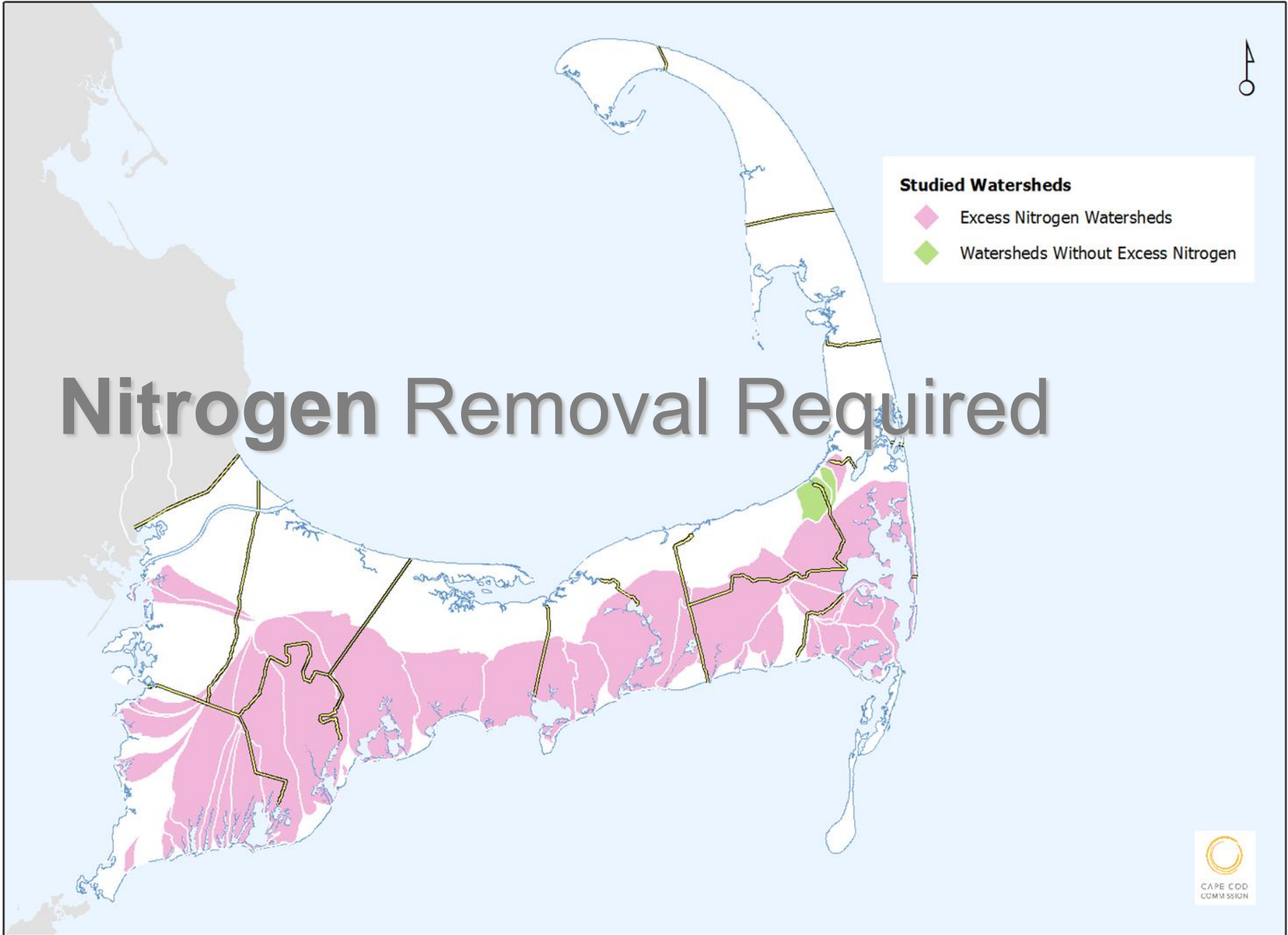




Studied Watersheds

- ◆ Excess Nitrogen Watersheds
- ◆ Watersheds Without Excess Nitrogen

Nitrogen Removal Required

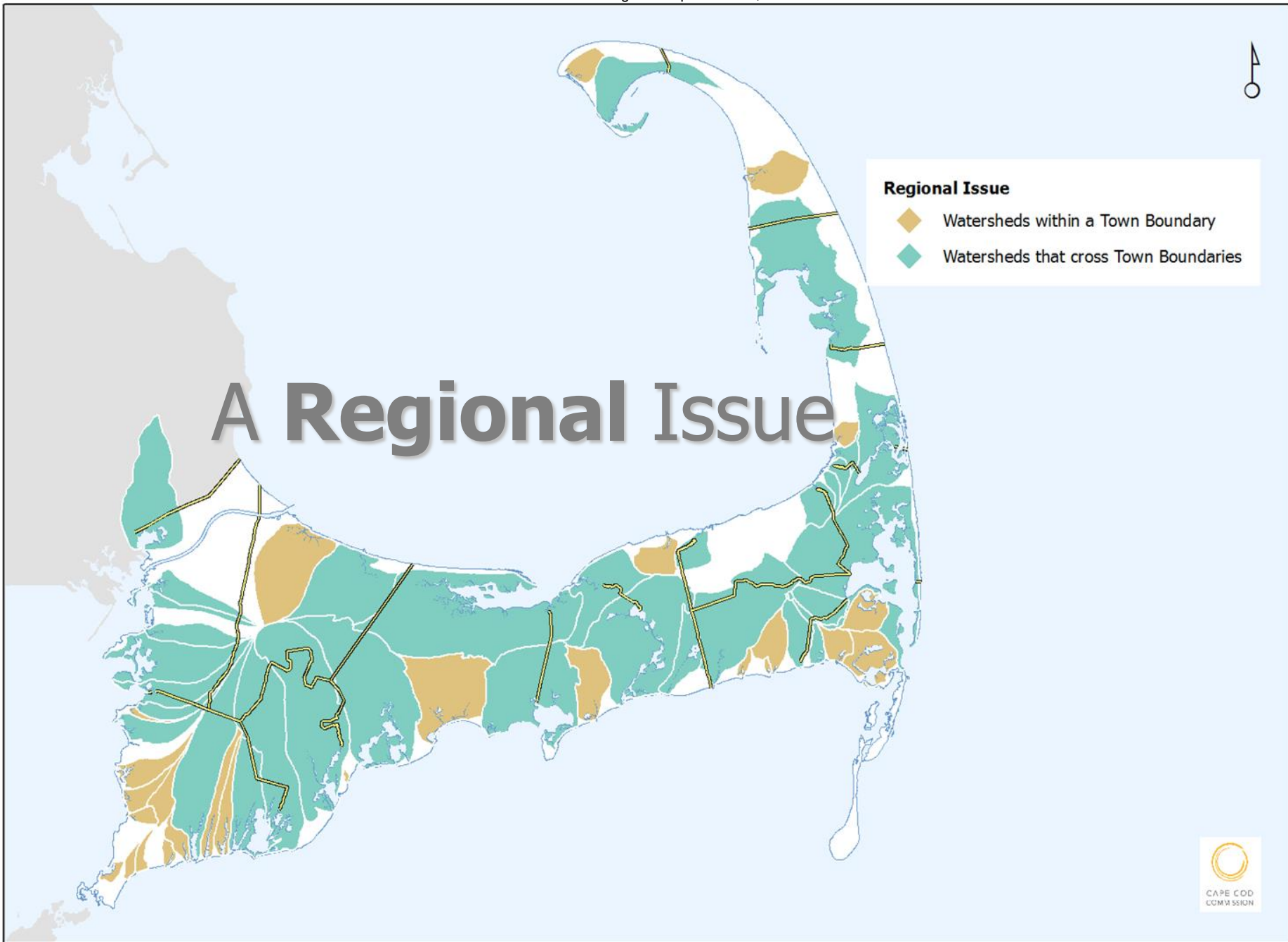




Regional Issue

- ◆ Watersheds within a Town Boundary
- ◆ Watersheds that cross Town Boundaries

A Regional Issue



Approach to the 208 Plan Update

Watershed
Based

Stakeholder
Engagement

Maximize Benefits
of Local Planning

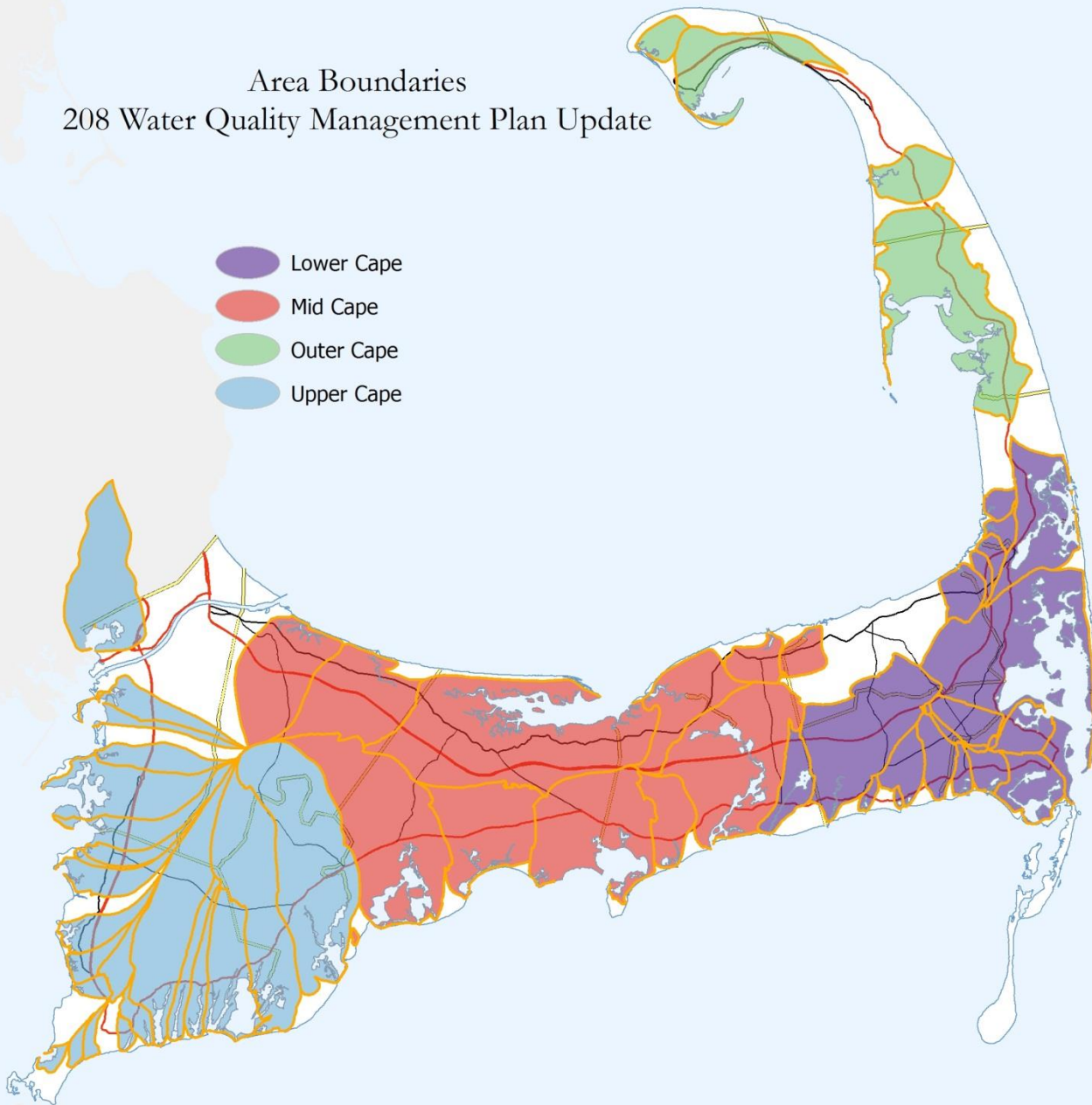
No Optimal
Solutions

Goal:

To generate a series of approaches in each watershed that will meet water quality standards

Area Boundaries 208 Water Quality Management Plan Update

- Lower Cape
- Mid Cape
- Outer Cape
- Upper Cape





Subgroup Boundaries 208 Water Quality Management Plan Update



Lower Cape

-  Herring River
-  Pleasant Bay
-  Stage Harbor Group
-  Nauset and Cape Cod Bay Marsh Group

Mid Cape

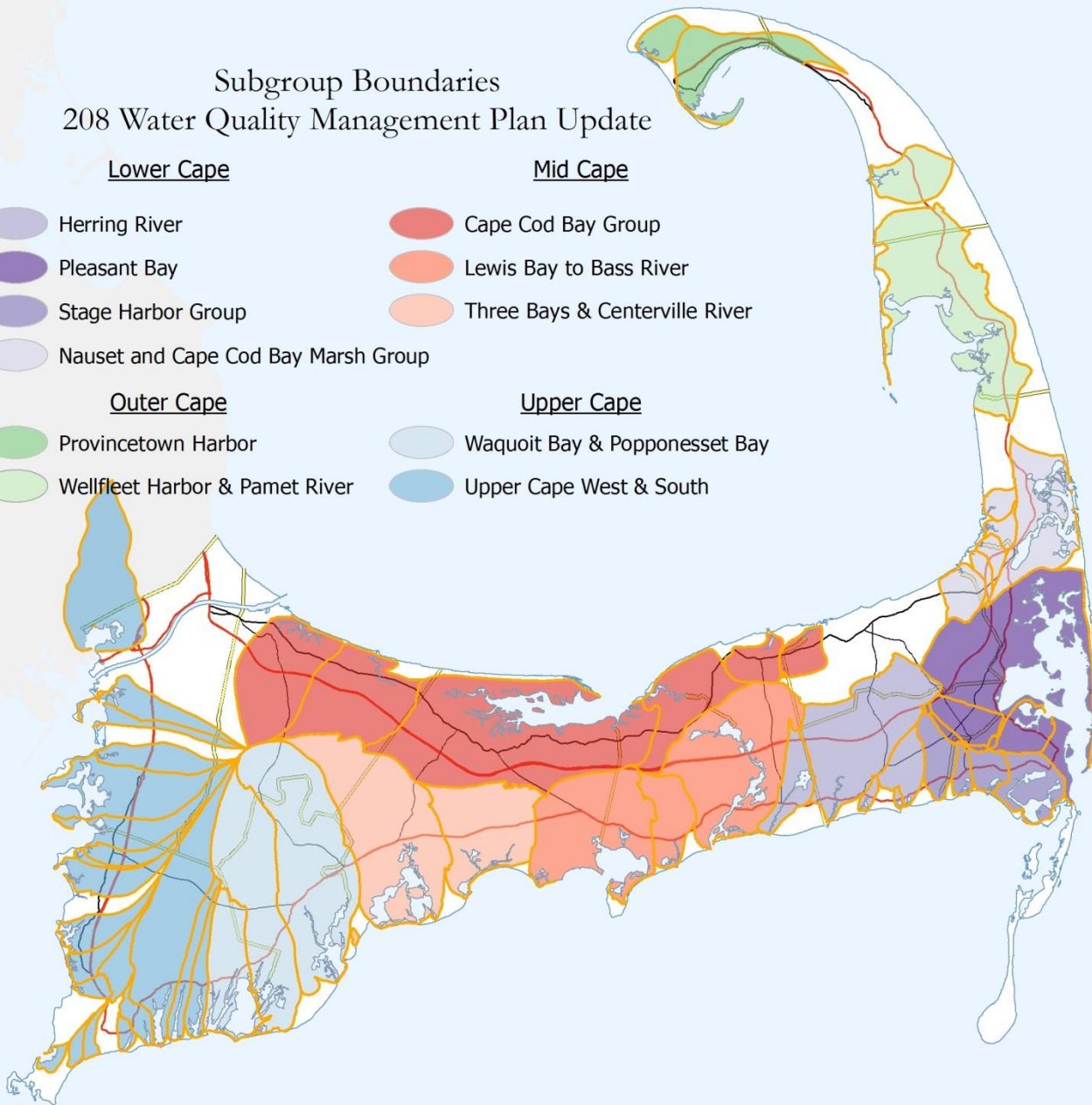
-  Cape Cod Bay Group
-  Lewis Bay to Bass River
-  Three Bays & Centerville River

Outer Cape

-  Provincetown Harbor
-  Wellfleet Harbor & Pamet River

Upper Cape

-  Waquoit Bay & Popponesset Bay
-  Upper Cape West & South



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

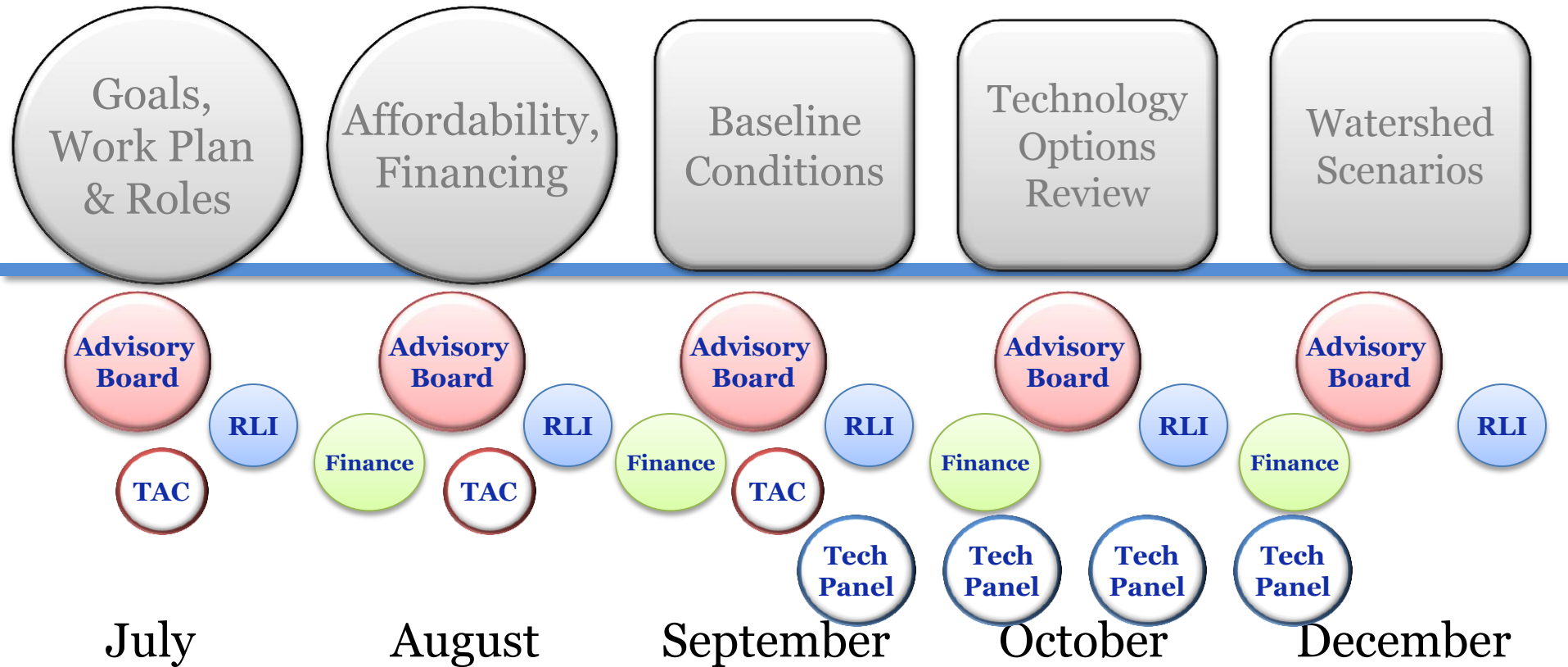
October

December

208 Planning Process

Public Meetings

Watershed Working Groups



RLI Regulatory, Legal & Institutional Work Group

TAC Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process

The 208 Advisory Board

Mission: To support the 208 planning process by providing advice on the overall approach, reviewing draft work product and offering insight on strategic and tactical decision-making.

Members

Robert Churchill, Broker-Owner of Buyer Brokers of Cape Cod, Churchill Associates

Robert Lawton, former Yarmouth Town Administrator

Wendy Northcross, CEO of the Cape Cod Chamber of Commerce

Sheila Vanderhoef, Eastham Town Administrator

Virginia Valiela, Member of the Falmouth Water Quality Management Committee

Robin Wilkins, former Town of Harwich Selectman

208 Planning Process

The 208 Finance Subcommittee

Mission: Establish a factual basis for discussing issues of affordability, financing, and resources

Members

Bob Ciolek, Chair, consultant to Barnstable County

Bill Hinchey, Yarmouth Town Administrator

Mark Milne, Finance Director, Town of Barnstable

The 208 Panel on Technologies

Mission: The mission of this panel is to review, confirm, and expand upon the matrix of technology options, review the overall planning approach to be used in each watershed, and provide input on a site screening methodology for green infrastructure technologies.

Members

Ivan Valiela, Marine Biological Laboratory

Chris Neill, Marine Biological Laboratory

Eric Davidson, Woods Hole Research Center

Sarah Slaughter, Built Environment Coalition

Anamarija Frankic, UMASS Boston

Patrick Lucey, Aquatex, British Columbia

Jay Prager, Maryland Dept of the Environment

Site Scale

Neighborhood

Watershed

Cape-Wide

Prevention

- Compact Development
- Remediation of Ex. Dev.
- Fertilizer Management
- TDR
- Transfer of Dev. Rights
- Stormwater BMPs

Reduction

- Title 5 Replacement
- Cluster Treatment
- Adv. Central. Treatment
- I/A On-site Denitrifying
- Satellite Treatment
- Wastewater Transport
- Enhanced I/A Systems
- STEP/STEG
- Treated Effluent Disposal
- Toilets: Urine Diversion
- Conventional Treatment
- Toilets: Composting
- Wetlands: Surface Flow
- Toilets: Packaging
- Wetlands: Subsurface Flow
- Stormwater: Bioretention
- Disposal: Out of Watershed
- Stormwater: Wetlands
- Disposal: Ocean
- Eco-Machines & Living Machines
- Phyto-Irrigation

Remediation

- Phyto-buffers
- Fertigation
- PRB Permeable React. Bar.
- Aquaculture/Shellfish
- Inlet / Culvert Widening
- Pond / Estuary Dredging
- Surface Water Remediation Wetlands

- Wastewater
- Stormwater
- Existing Water Bodies
- Regulatory



Wastewater



Existing Water Bodies



Regulatory

Alternatives: Screening Method

1
2
3
4
5
6
7



Targets/ Goals

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

Composite Target Areas

A. High Nitrogen Reduction Areas C. Title 5 Problem Areas
B. Pond Recharge Areas

Low Barrier to Implementation

A. Fertilizer Management B. Stormwater Mitigation

Watershed/Embayment Options

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

Alternative On-Site Options

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

Priority Collection/High-Density Areas

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

Supplemental Sewering





CAPE COD
COMMISSION

Alternative Strategies for Improving Water Quality

Section 208 Plan Update, September 26, 2013

Precedent Studies & Alternatives



STRATEGIES:

Site Scale

"Panel on Technologies Agenda, September 26, 2013"

Neighborhood

Watershed

Cape-Wide

WASTE WATER
80%

WATER BODYS
8%

IMPERVIOUS
6%

FERTILIZER
5%

NATURAL
1%

Septic System Title 5

Innovative Septic Title 5

Toilets: Urine Diversion

Toilets: Composting

Toilets: Packaging

Low Flow Fixtures

Grey Water Reuse

Eco-Machines

DISCHARGE

Wetlands: Vertical S

Phyto-buffer: S

Permeable React Bar.

Biofiltration Strips

Green Roofs

SECONDARY, TERTIARY & DISCHARGE

Sewers

Satelite Treatment

Cluster Treatment

Eco-Machines

Wetlands: Surface Flow

Wetlands: Vertical LG

Phyto-irrigation

Wetlands: Surface Flow

Wetlands: Vertical LG

Sewers

Centralized Treatment

Culvert Widening

Dredging

Phyto-buffer: LG

Permeable React Bar

Shellfish Aquaculture

Seaweed Farming

Eco-Restorer/
Floating Wetland

Nutrient Harvesting Gabion

Septic: Regulation

Toilets: Regulation

H2O Reuse: Regulation

Low-Flow Fixtures: Regs

Growth Management

Alt. Discharge Options

Landscape Guidelines

Fertilizer Policies

Mun. Maintenance Regs

Traditional Approaches

STRATEGIES:

Site Scale

"Panel on Technologies Agenda, September 26, 2013"

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DISCHARGE

- Septic System Title 5
- Innovative Septic Title 5
- Toilets: Urine Diversion
- Toilets: Composting
- Toilets: Packaging
- Low Flow Fixtures
- Grey Water Reuse
- Eco-Machines
- Wetlands: Vertical S
- Phyto-buffer: S
- Permeable React Bar.

- Biofiltration Strips
- Green Roofs

SECONDARY, TERTIARY & DISCHARGE

- Sewers
- Satelite Treatment
- Cluster Treatment

- Eco-Machines
- Wetlands: Surface Flow
- Wetlands: Vertical LG
- Phyto-irrigation

- Wetlands: Surface Flow
- Wetlands: Vertical LG

- Sewers
- Centralized Treatment
- Culvert Widening
- Dredging

- Phyto-buffer: LG
- Permeable React Bar
- Shellfish Aquaculture
- Seaweed Farming
- Eco-Restorer/
Floating Wetland
- Nutrient Harvesting Gabion

- Septic: Regulation
- Toilets: Regulation
- H2O Reuse: Regulation
- Low-Flow Fixtures: Regs
- Growth Management
- Alt. Discharge Options

- Landscape Guidelines
- Fertilizer Policies
- Mun. Maintenance Regs

NITROGEN POLLUTION

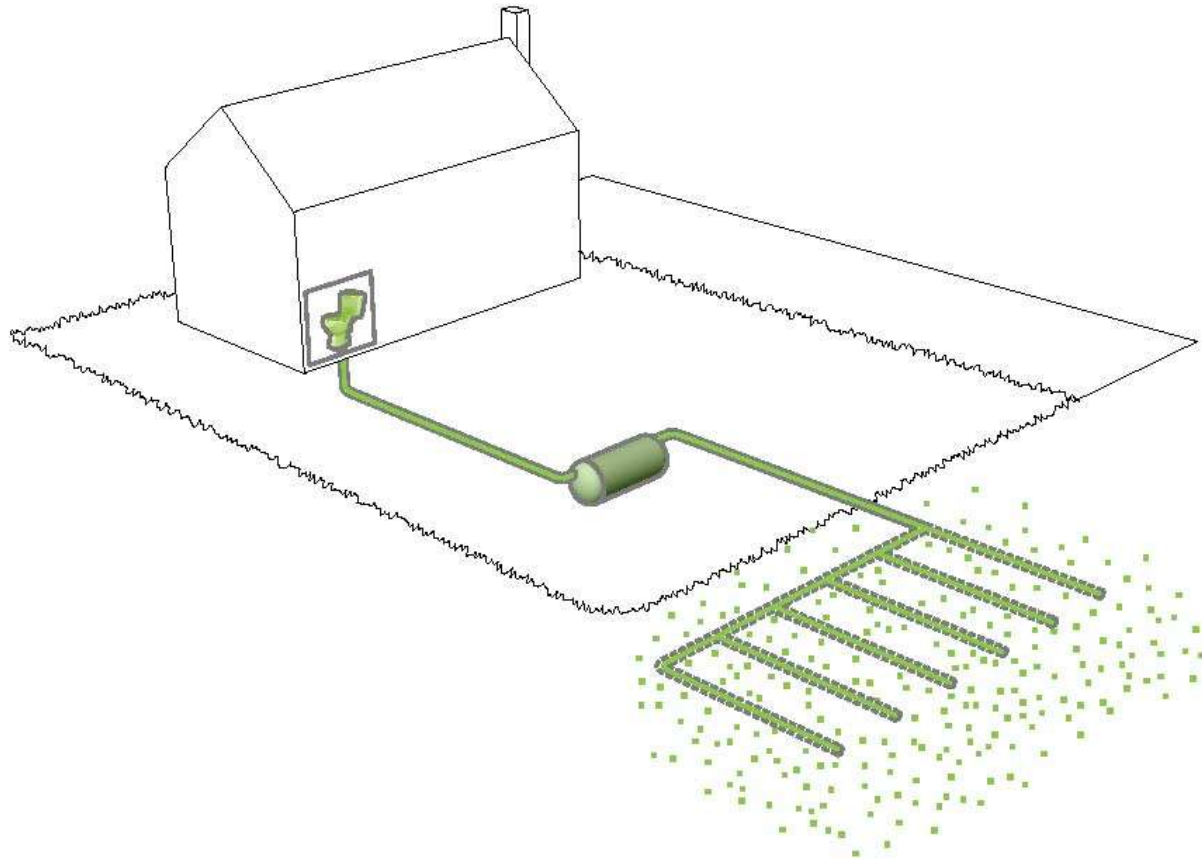
WASTE
WATER

WATER
BODYS

IMPERVIOUS

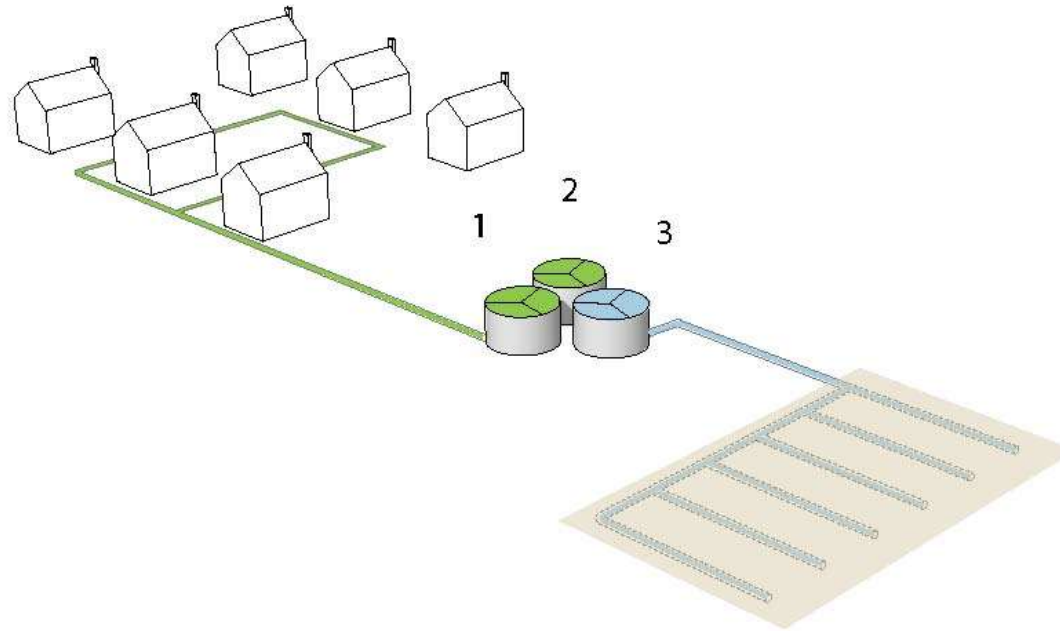
FERTILIZER

NATURAL



Septic Systems

NITROGEN POLLUTION



Cluster (3-30 Homes) & Satellite (30-1000) with offsite disposal

NITROGEN POLLUTION

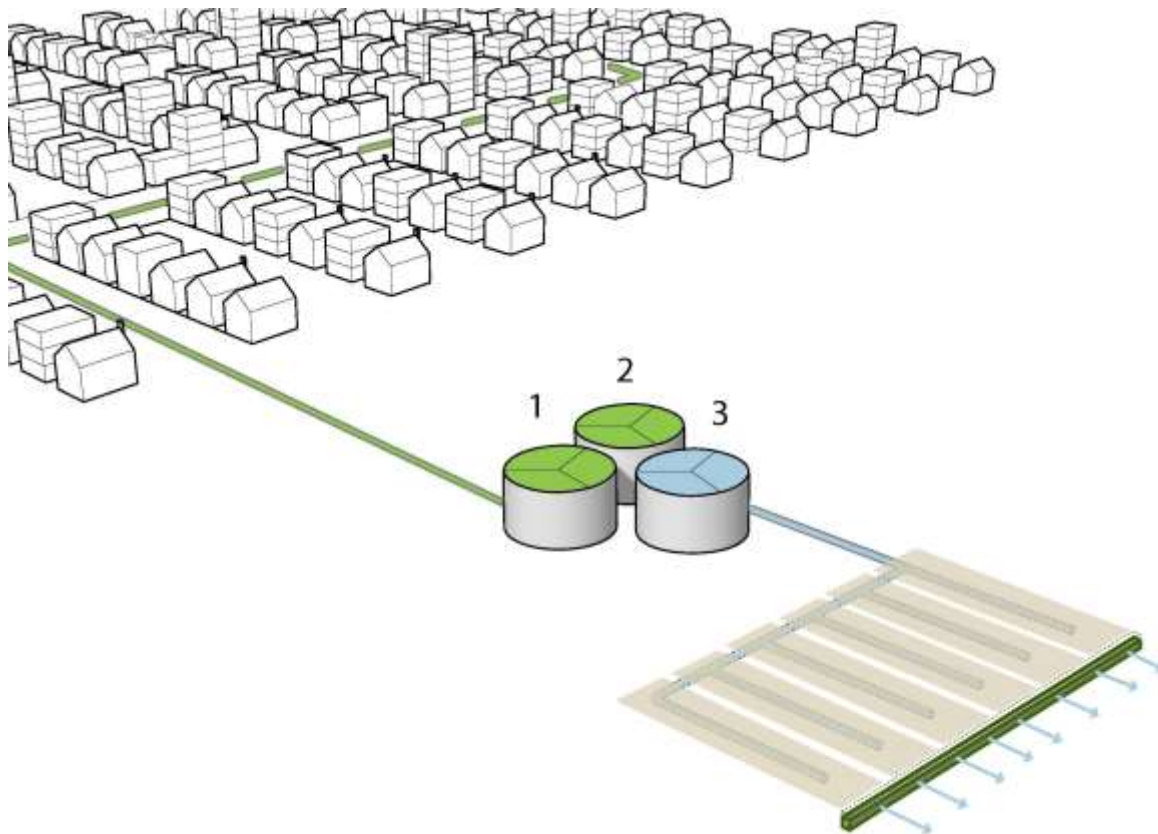
WASTE WATER

WATER BODYS

IMPERVIOUS

FERTILIZER

NATURAL



Centralized Treatment

Alternative Approaches

STRATEGIES:

Site Scale

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- Eco-Machines
- Wetlands: Vertical S
- Phyto-buffer: S
- Permeable React Bar.

DISCHARGE

SECONDARY, TERTIARY & DISCHARGE

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- Satelite Treatment
- Cluster Treatment

- Eco-Machines
- Wetlands: Surface Flow
- Wetlands: Vertical LG
- Phyto-irrigation

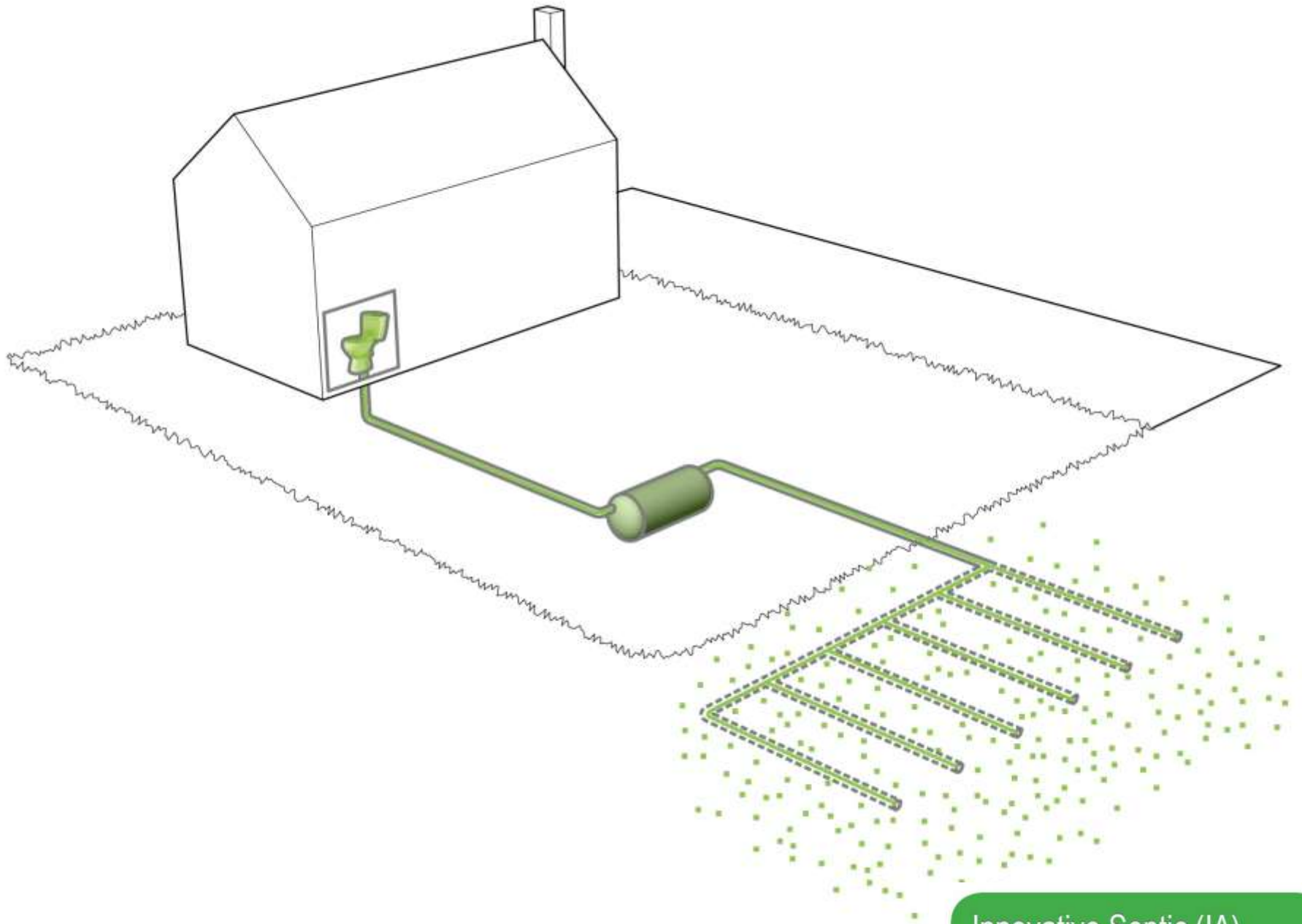
- Sewers
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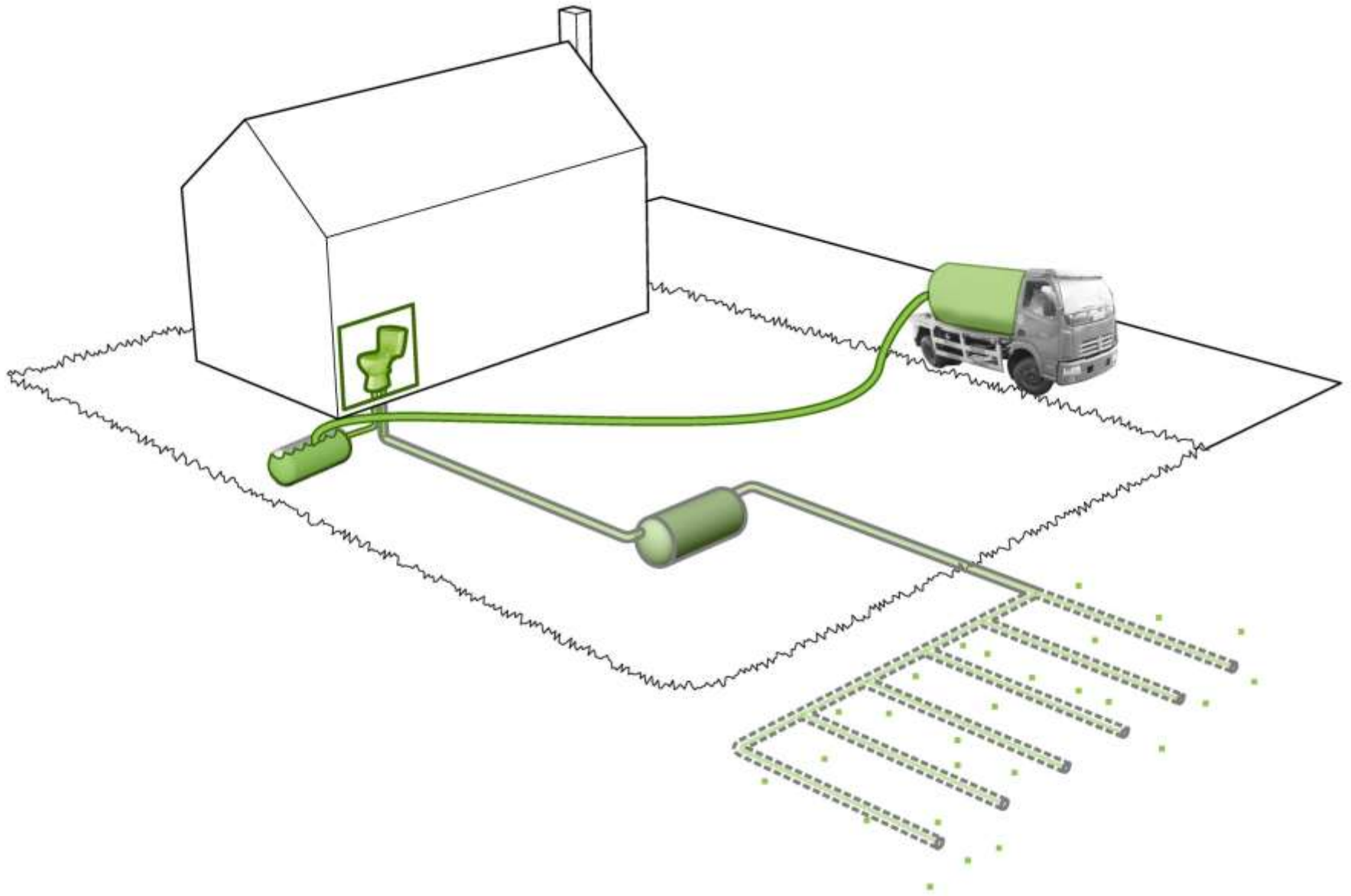
- Wetlands: Surface Flow
- Wetlands: Vertical LG

- Septic: Regulation
- Toilets: Regulation
- H2O Reuse: Regulation
- Low-Flow Fixtures: Regs
- Growth Management
- Alt. Discharge Options

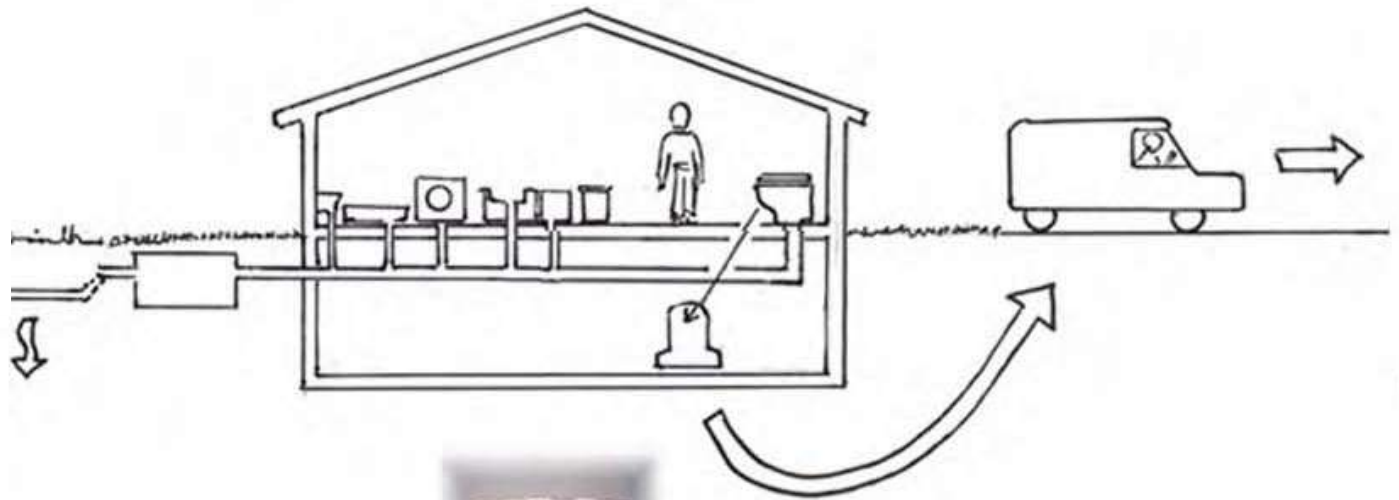
- Landscape Guidelines
- Fertilizer Policies
- Mun. Maintenance Regs



Innovative Septic (IA)



Toilets: Urine Diversion



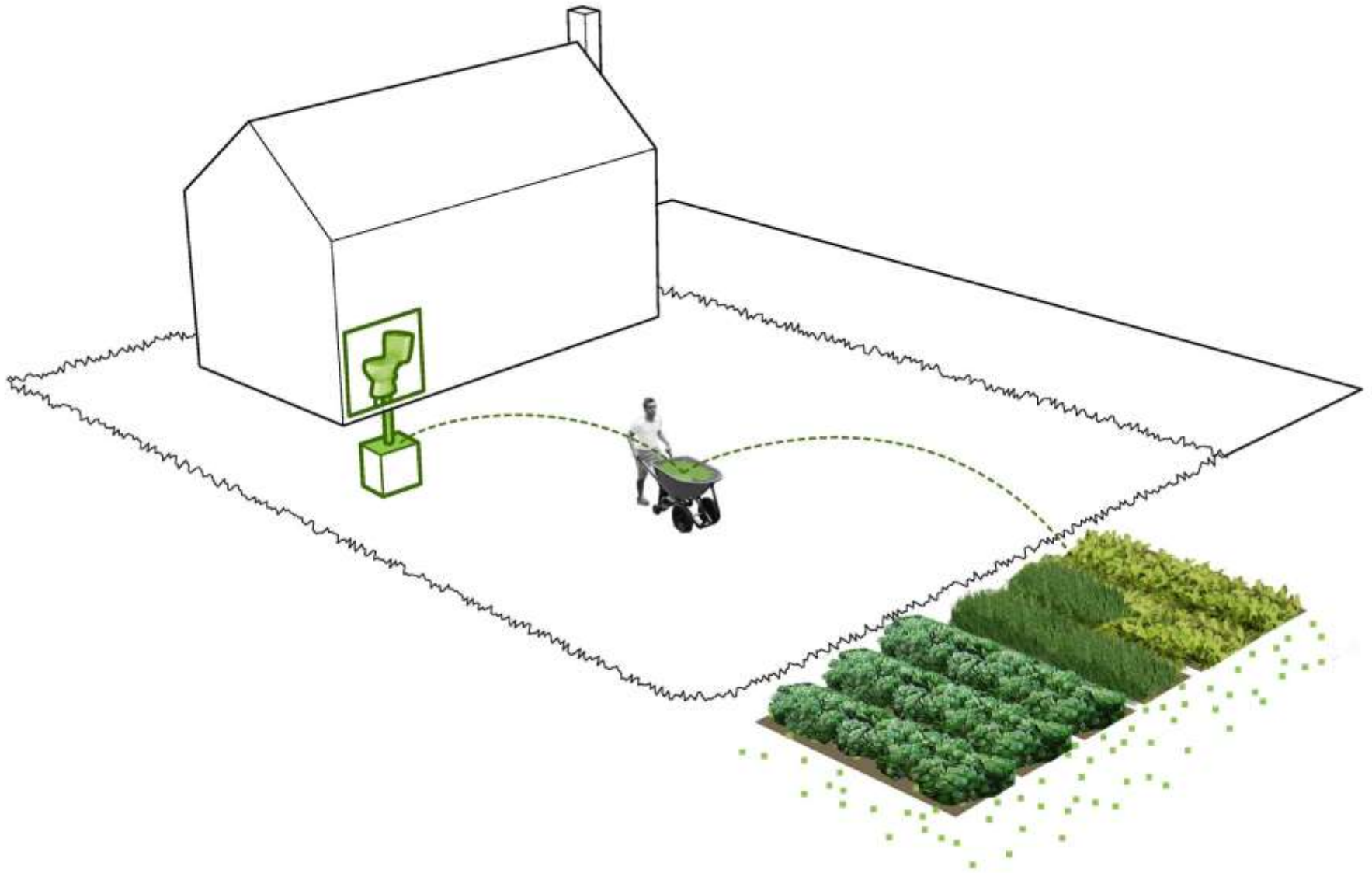
**Waterless
Urinal**

**IBC container
(220 gallons)**

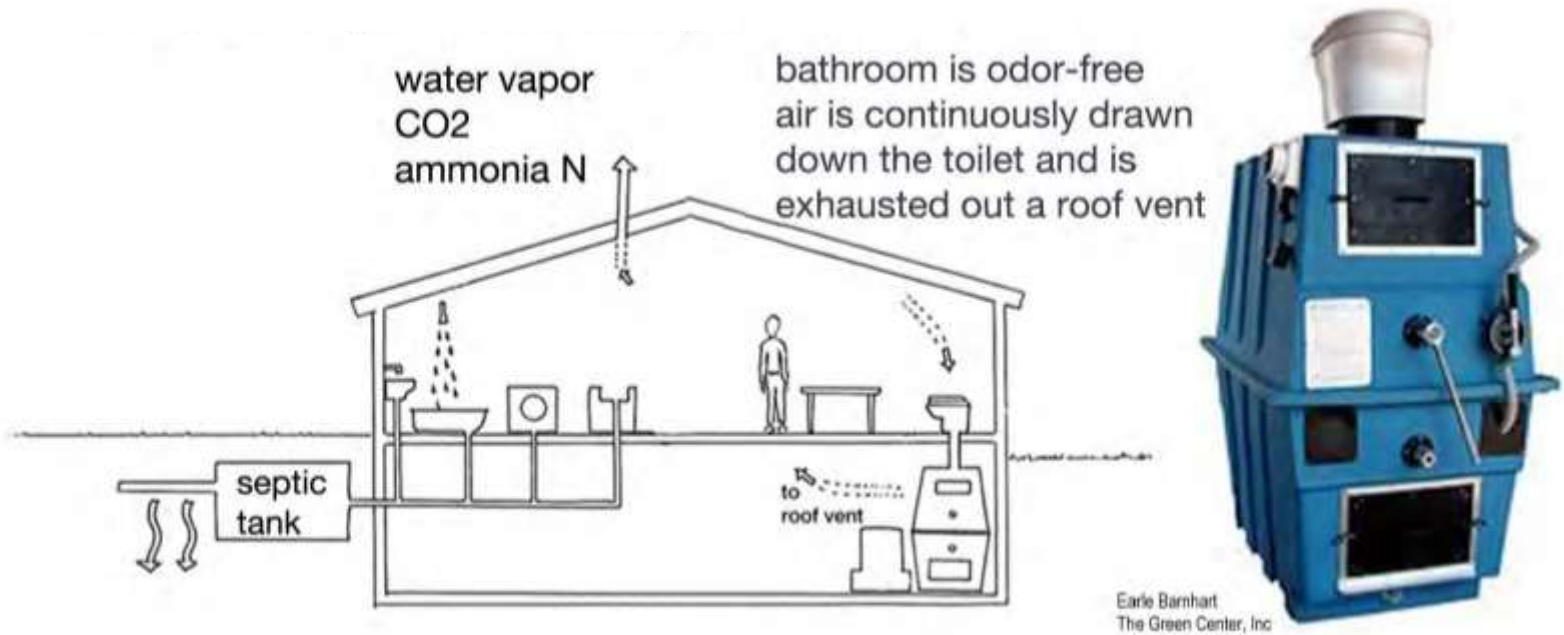


40" x 40" x 48"

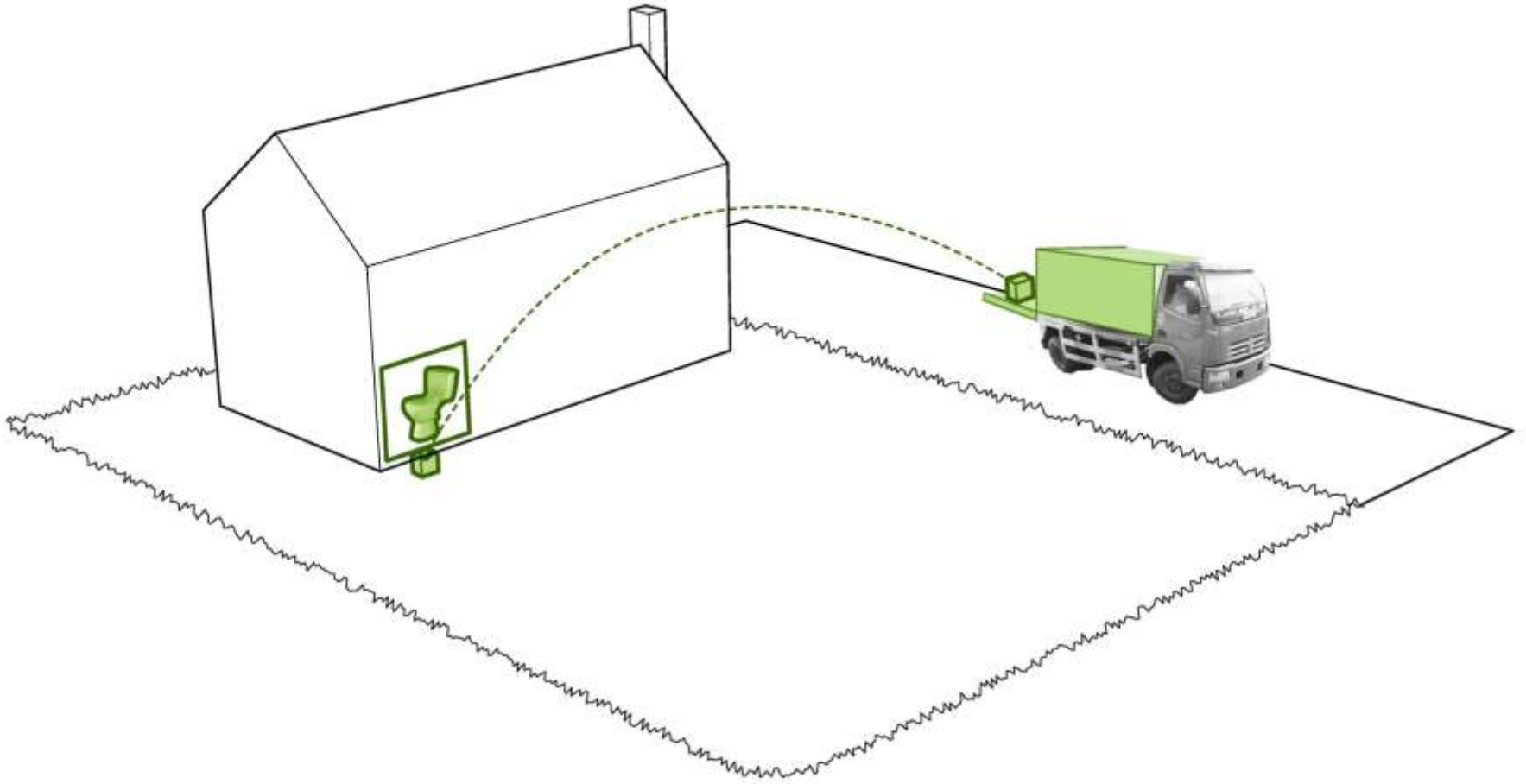
Toilets: Urine Diversion



Toilets: Composting



Toilets: Composting



PACTO[®]



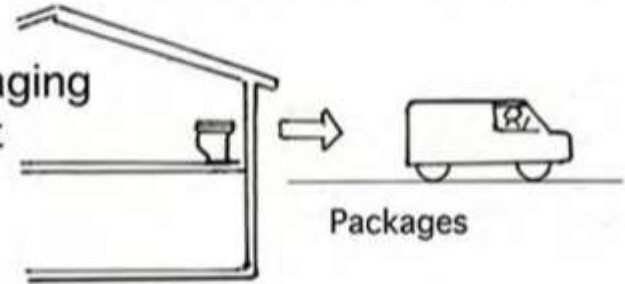
A packaging toilet directs human wastes into a biodegradable package, that is sealed after each use and stored at the base of the toilet.

- No water
- No plumbing
- No electricity
- Movable
- Installs immediately, anywhere
- Water use in house is reduced 30-40%



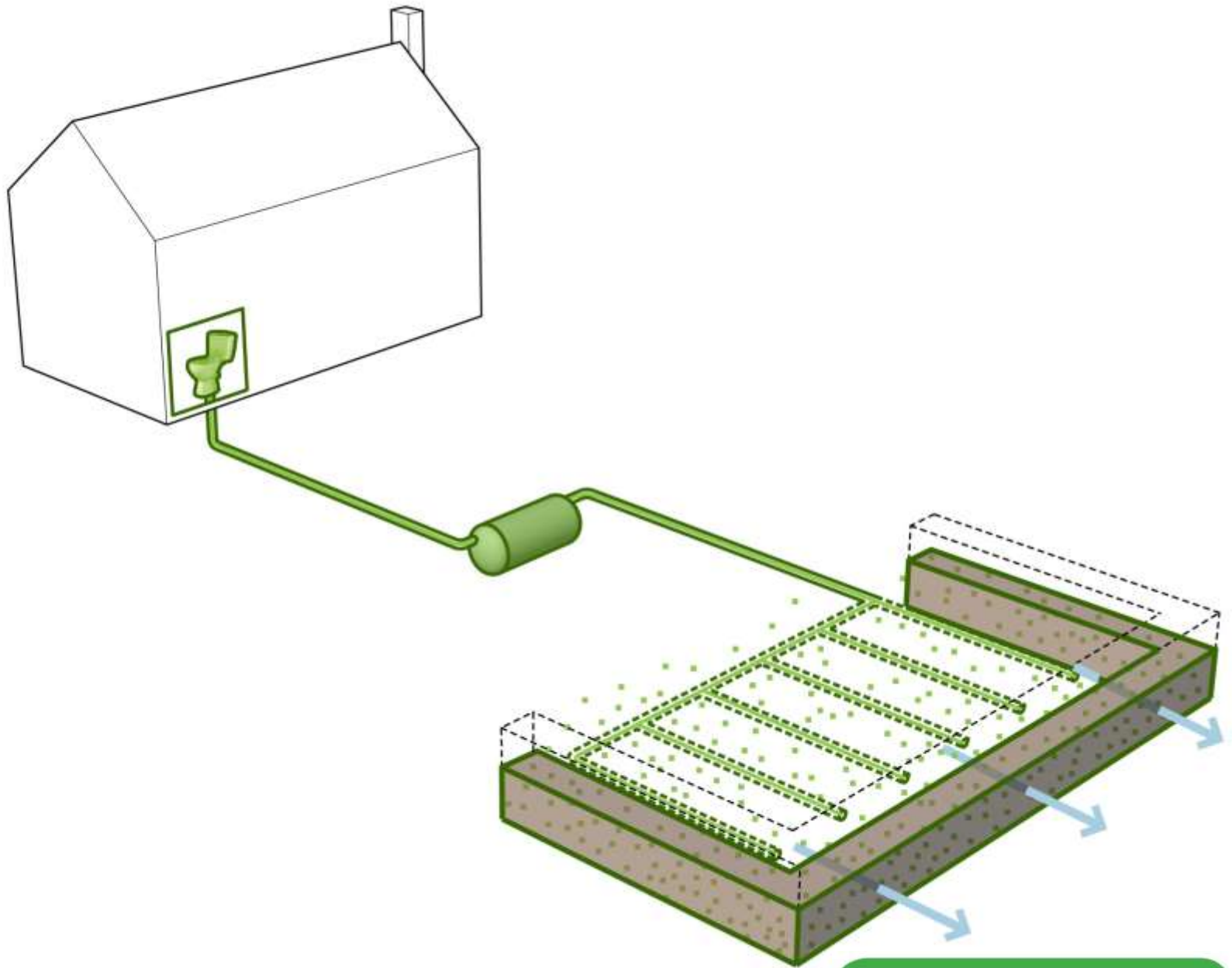
LOOWATT

Packaging Toilet



Earle Barnhart
The Green Center, Inc

Toilets: Packaging



Permeable React Bar.

Alternative Approaches

STRATEGIES:

Site Scale

"Panel on Technologies Agenda, September 26, 2013"

Neighborhood

Watershed

Cape-Wide

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DISCHARGE

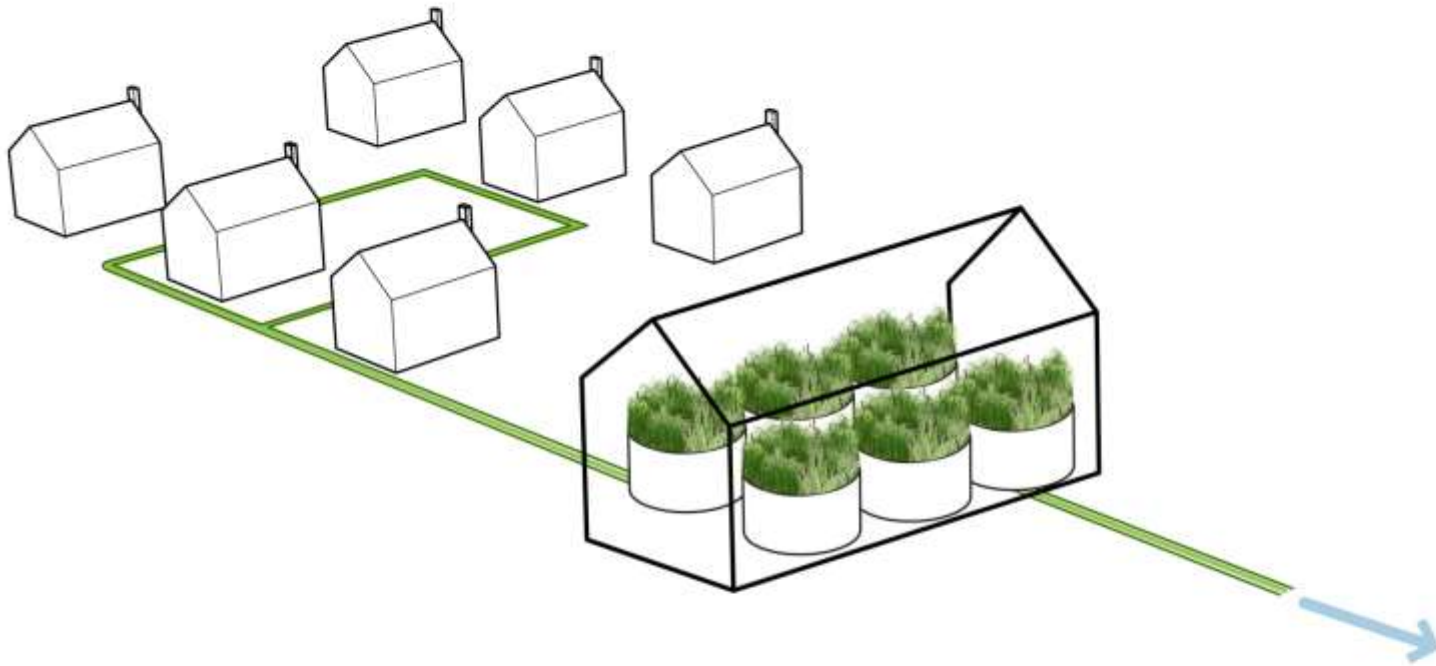
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- Eco-Machines
- Wetlands: Vertical S
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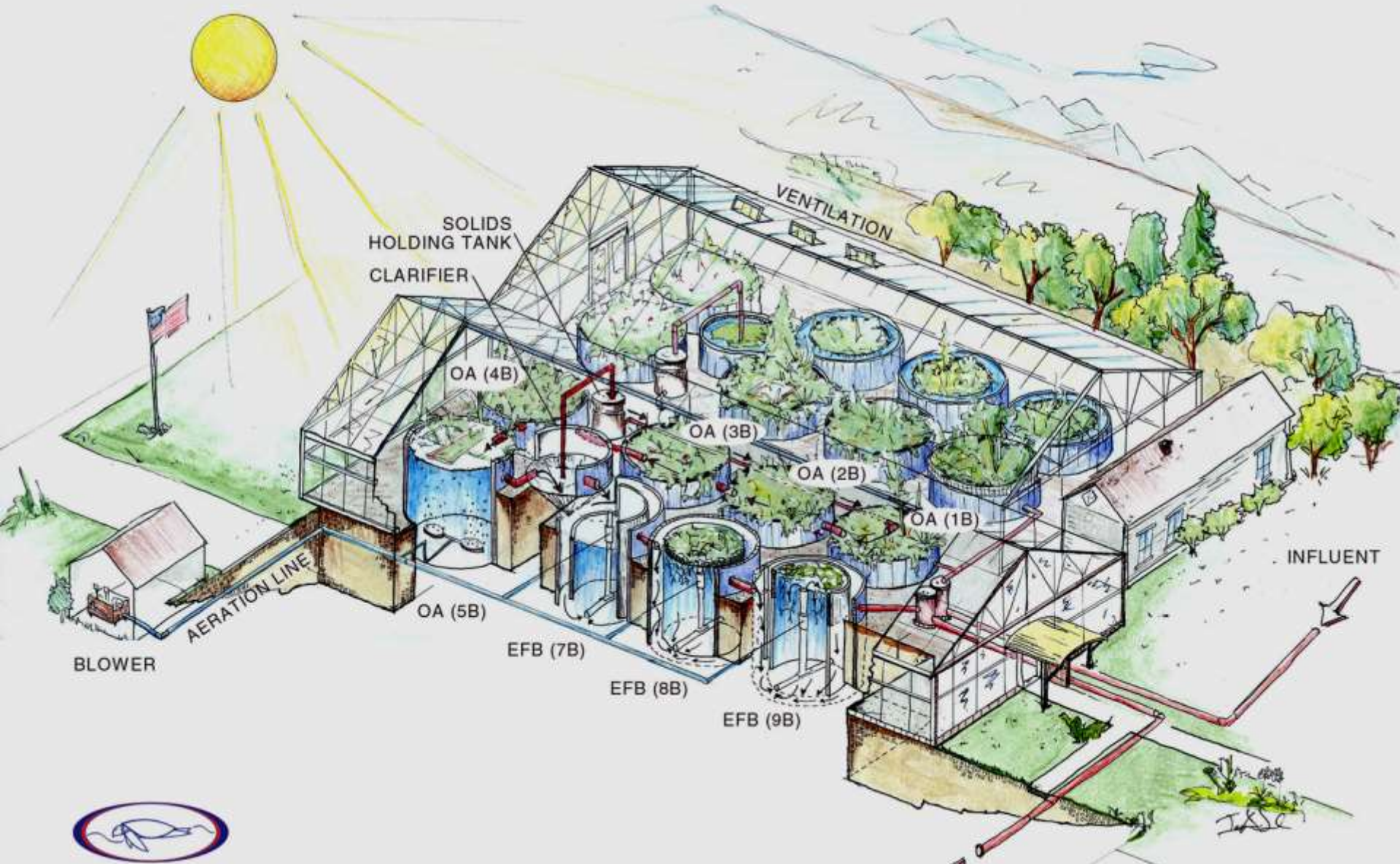
SECONDARY, TERTIARY & DISCHARGE

- Sewers
- Satelite Treatment
- Cluster Treatment
- Eco-Machines & Living Machines
- Wetlands: Surface Flow
- Wetlands: Vertical LG
- Phyto-irrigation
- Phyto-buffer: LG
- Permeable React Bar
- Shellfish Aquaculture
- Seaweed Farming
- Eco-Restorer/
Floating Wetland
- Nutrient Harvesting Gabion

- Wetlands: Surface Flow
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John Todd Ecological Design, 2000

80,000 gpd wastewater treatment

PRECEDENT: South Burlington, VT WWTF



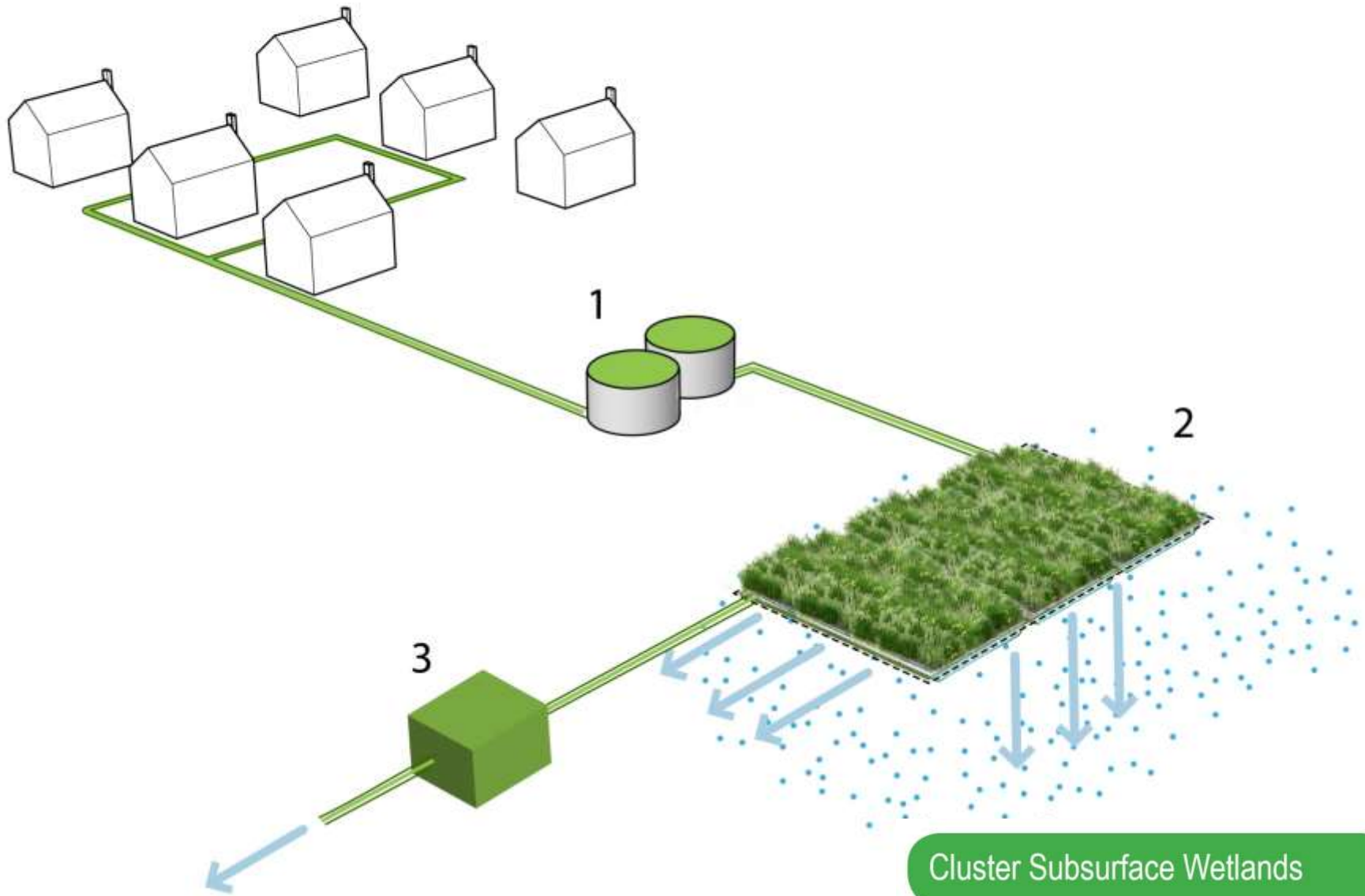
South Burlington:

-System was designed to deal with organic nitrogen loading from municipal sewage.

-Denitrification was later targeted through the uses of pulsed aerobic/non aerobic reactors and the addition of carbon.

-Consistent achievement of an 86.4 % denitrification rate over a continuous 960 day data collection period.





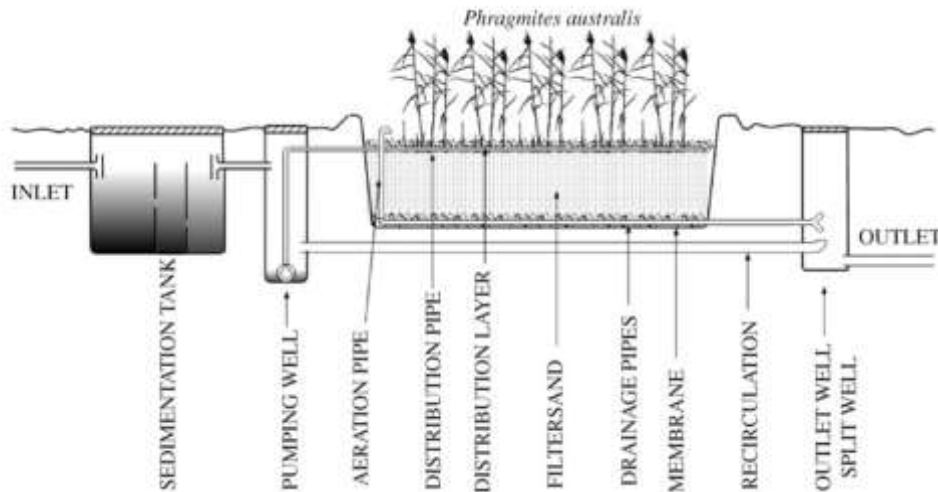
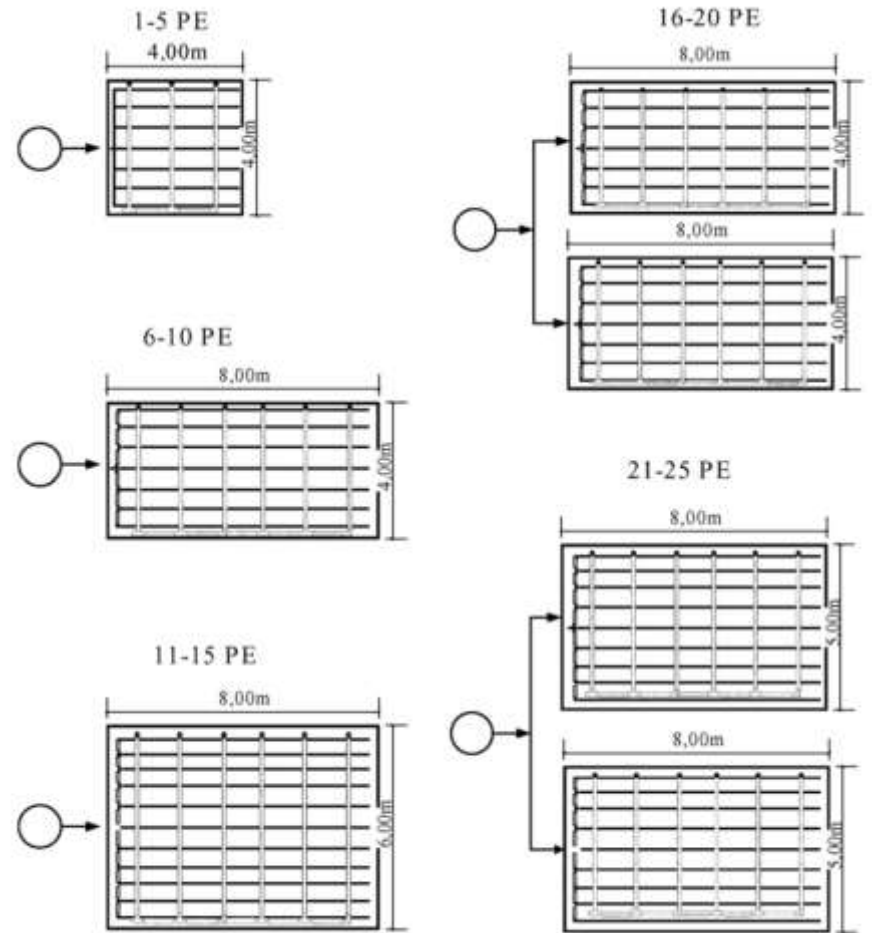
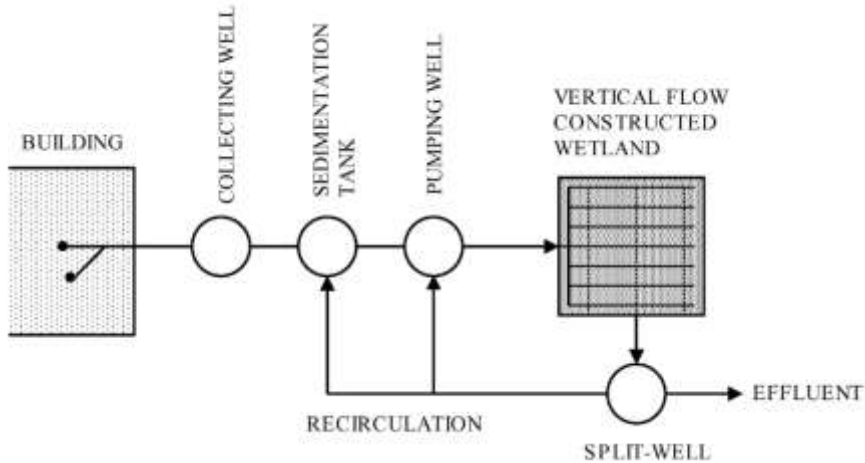


Site Area Needed: 22 Square Feet per person
Provides both secondary and tertiary treatment:
BOD, TSS, Pathogenic Bacteria and Nitrogen, even in winter

Cluster Subsurface Wetlands

Jan Vyzamal

PRECEDENT: Kamen, Czech Republic



Hans Brix, Ecological Engineering 2005

PRECEDENT: Denmark Standard Vertical Wetland Details: SF House

Alternative Approaches

STRATEGIES:

Site Scale

"Panel on Technologies Agenda, September 26, 2013"

Neighborhood

Watershed

Cape-Wide

WASTE WATER
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WATER BODYS
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FERTILIZER
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NATURAL 1%

DISCHARGE

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SECONDARY, TERTIARY & DISCHARGE

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- Eco-Machines & Living Machines
- Wetlands: Surface Flow
- Wetlands: Subsurface Flow
- Phyto-irrigation

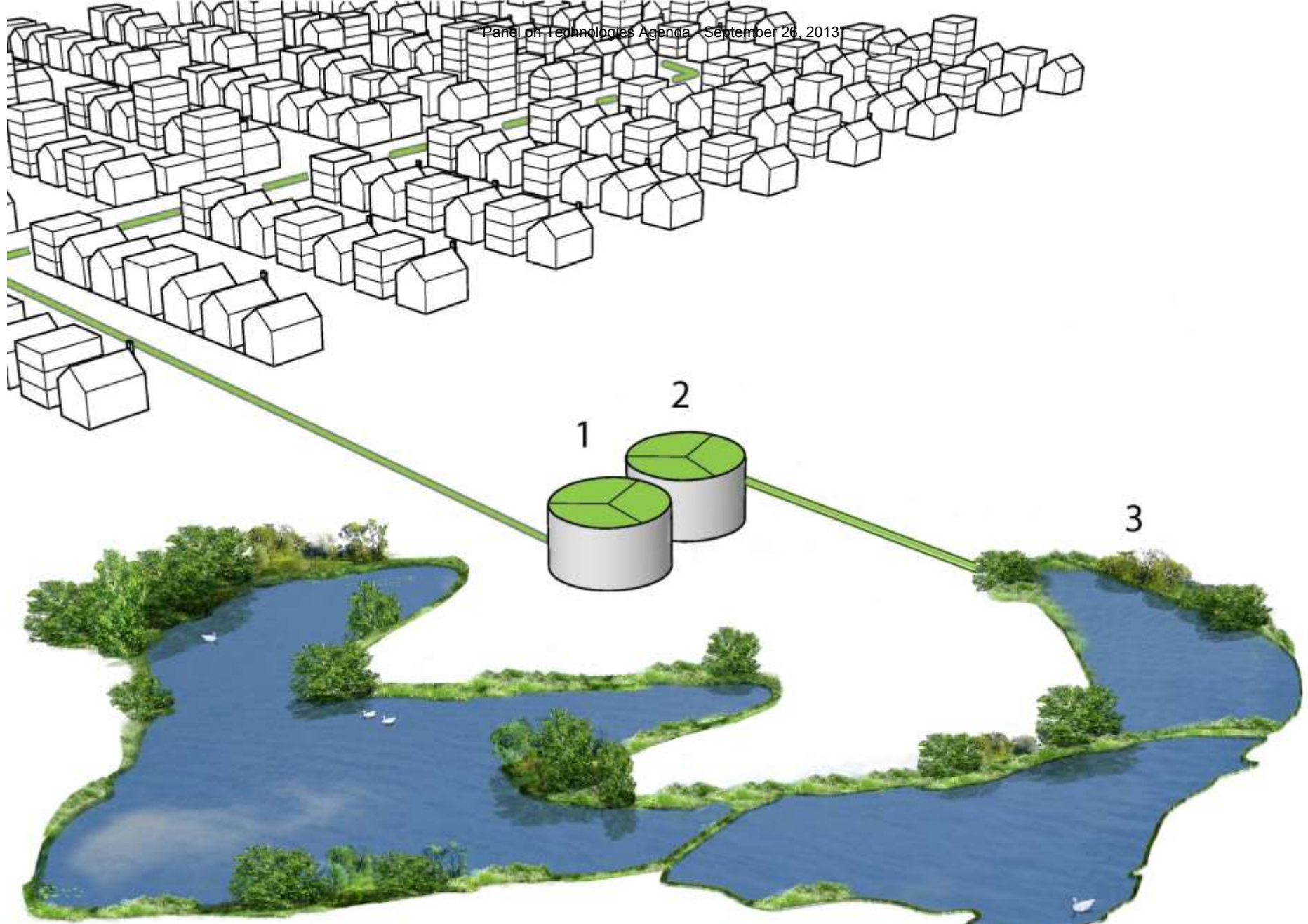
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- Centralized Treatment
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- Phyto-buffer: LG
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Floating Wetland
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- Restoration Wetlands: Surface Flow
- Wetlands: Vertical LG

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Wetlands: Surface Flow

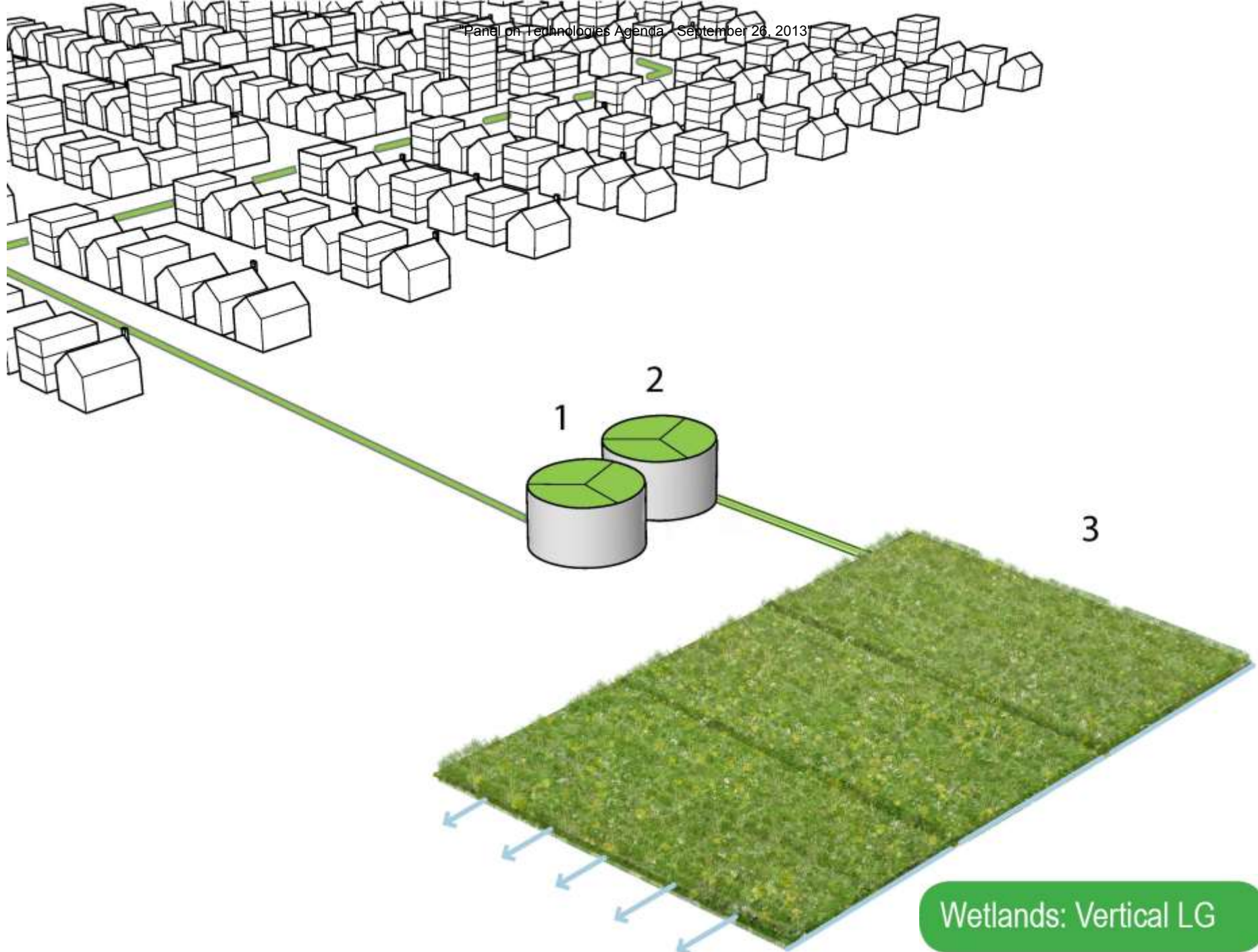


Photograph by Kate Kennen, 2011

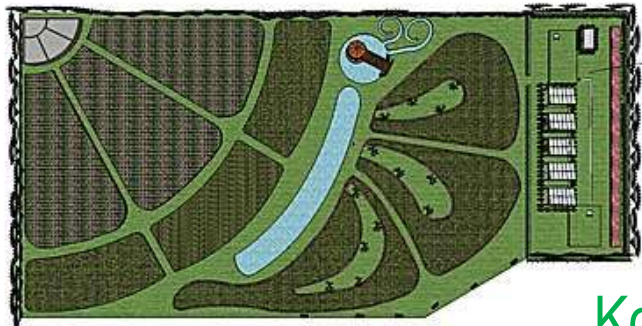
Mark Madison, CH2MHill, Portland, OR

PRECEDENT: Talking Water Gardens, Albany, -Millersburg OR





Wetlands: Vertical LG



Hans Brix, 2006 and CWI Website

Koh Phi Phi, Thailand Vertical Wetland Treatment Plant



Site Area: 1000 sq m

Treats: 500 PE

Pre-treatment: sedimentation tank

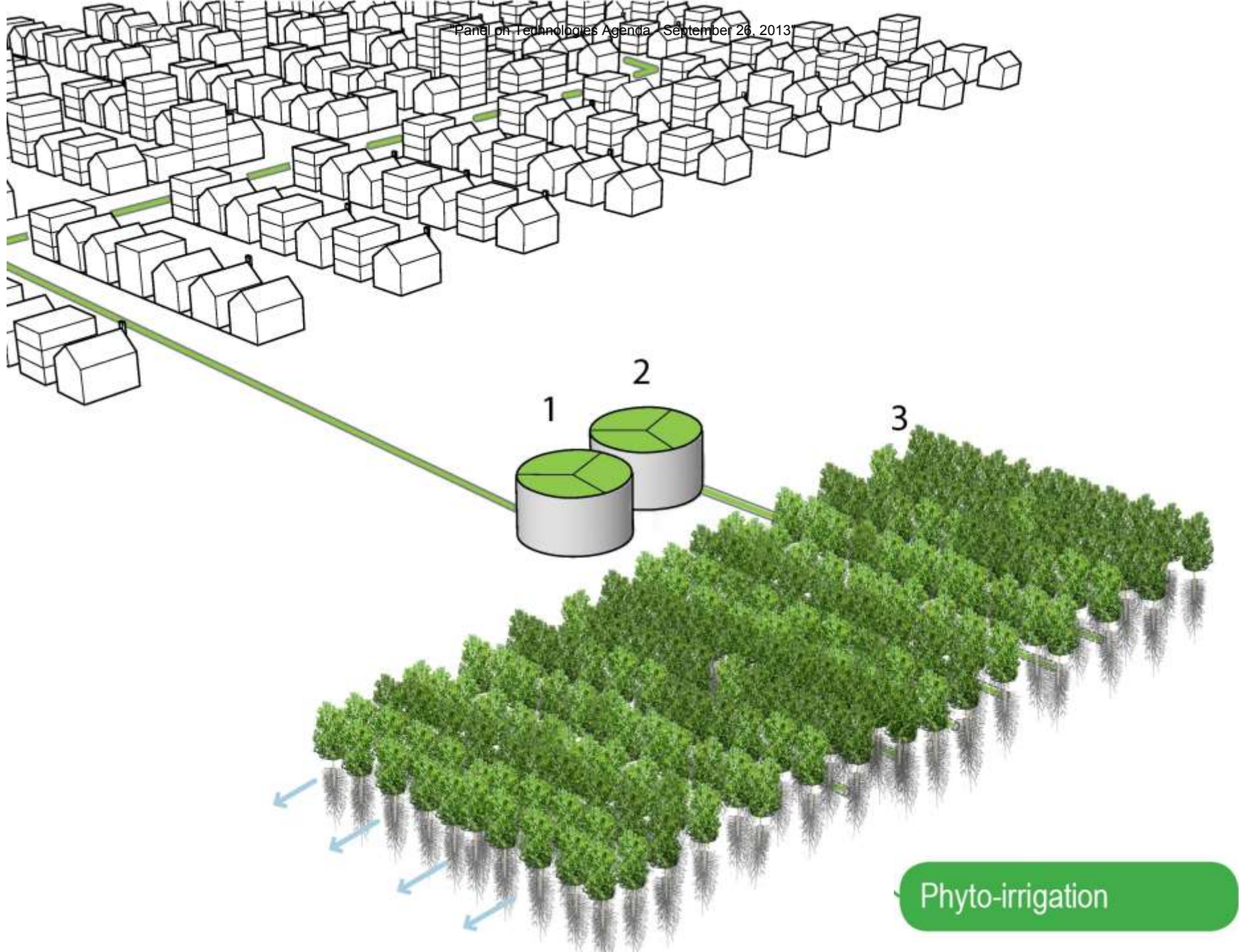
2 vertical subsurface flow wetlands

1 horizontal subsurface flow wetland

1 Free water surface wetland

Blumberg Engineers

Shuangshan Island (Zhangjiagang, Jiangsu Province, China)



Phyto-irrigation



Jason Smeasrod & Mark Madison, CH2MHill, Portland, OR

PRECEDENT: Woodburn, OR Treatment Facility

Excess Nutrient Capacity within the Poplar Tree Plantation Utilized for Biosolids Reuse



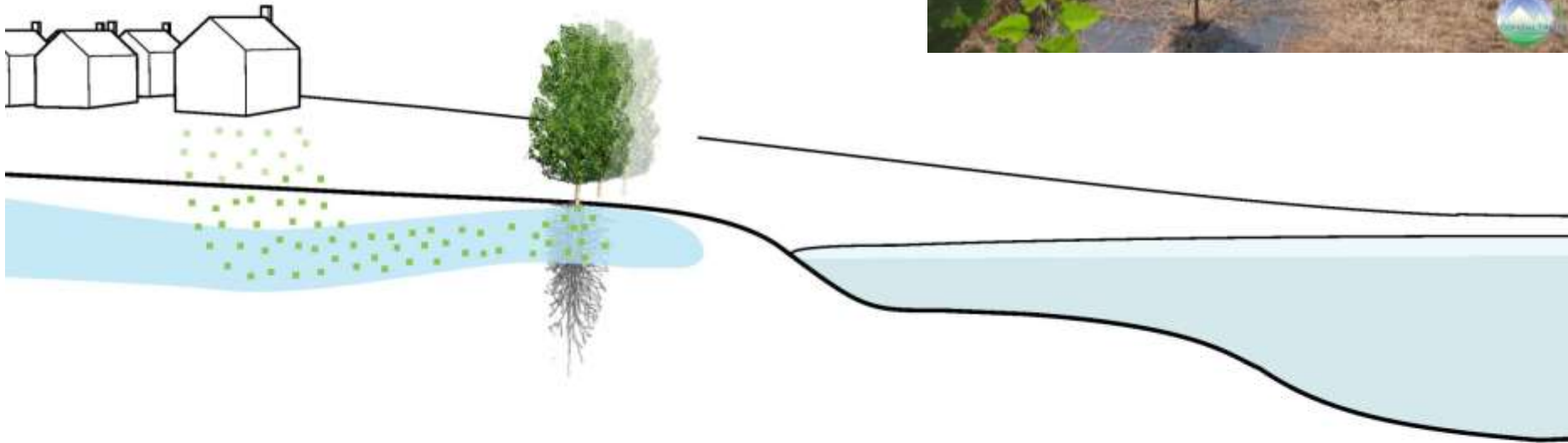
215 lb/ac/yr N Limit
(average across tree age classes)

Annual lbs of Nitrogen per acre



Effluent
28 in/yr
@10 mg/L N

Biosolids
2.9 dT/ac/yr
@52 lbs
PAN/dT



Phyto-buffer: LG

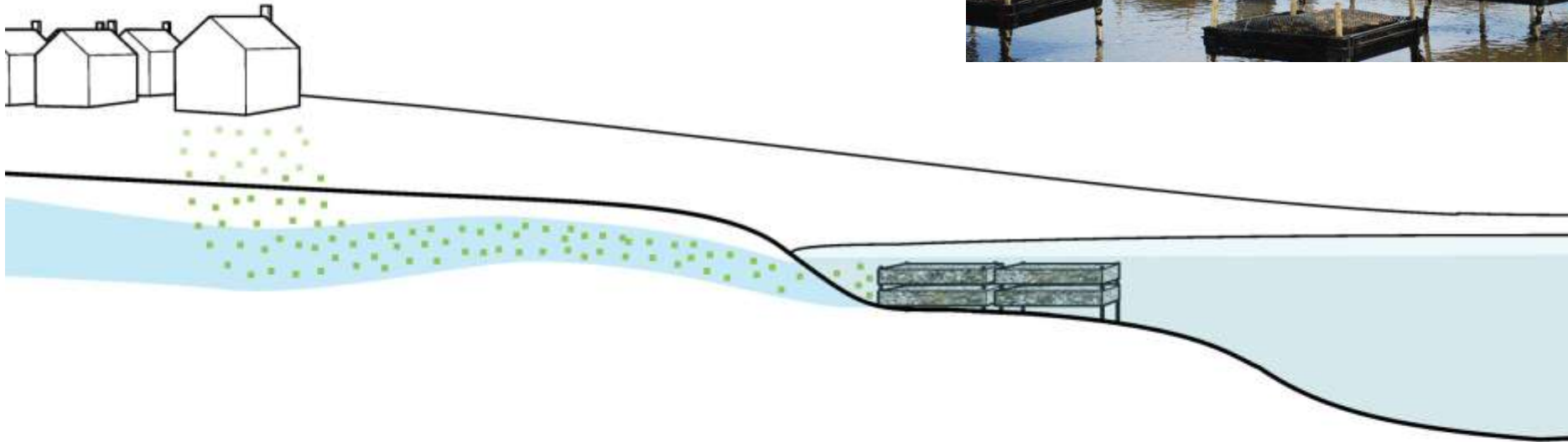


Poplars reach up to 20' Ground Water Depths



Ecolotree and Sand Creek Engineers

PRECEDENT: Fertilizer Factory, North Carolina- Deep Rooting Poplars

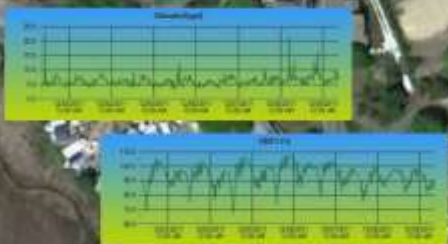


Shellfish Aquaculture

Measuring Oysters' Improvements on Water Quality



Real Time Water Quality



www.capecodextension.org/Marine-Programs/YSI-Water-Quality-Monitoring.html



Overall project area with new catch

- > already 2-3 million additional oysters
- > goal: 8,800 pounds of nitrogen removed per year
- > likely increase in commercial shellfish value of \$1 million/year
- > increased water filtration approximately 100 million gallons/day
- > erosion control
- > sediment reduction
- > increased turtle, eel, juvenile fish habitat



New spat on seaclam catch (small black patches)



YSI Meter

Recycled OysterFest Shells

Oyster Spawning Study Area (2.04 acres)

Blueberry Wells



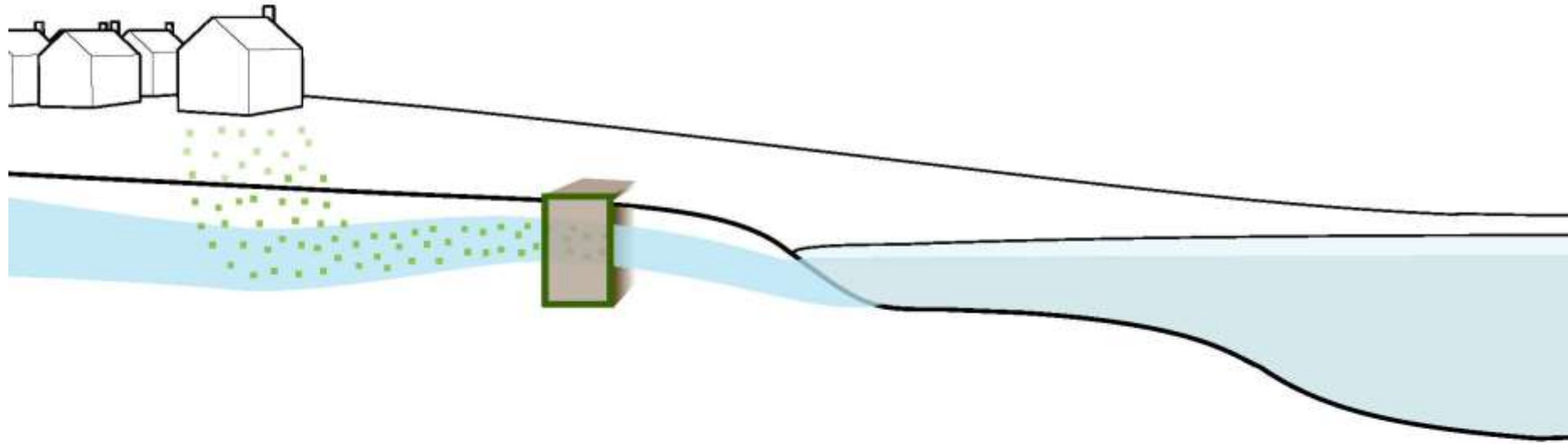
Cape Cod Cooperative Extension
Environmental Partners
 a partnership for engineering solutions

Anamarija Frankic (Umass)

PRECEDENT: Wellfleet Harbor, Cape Cod

"Panel on Technologies Agenda - September 26, 2013"





Permeable React Bar.



Location of N removal trench – Hard to even see where it is!

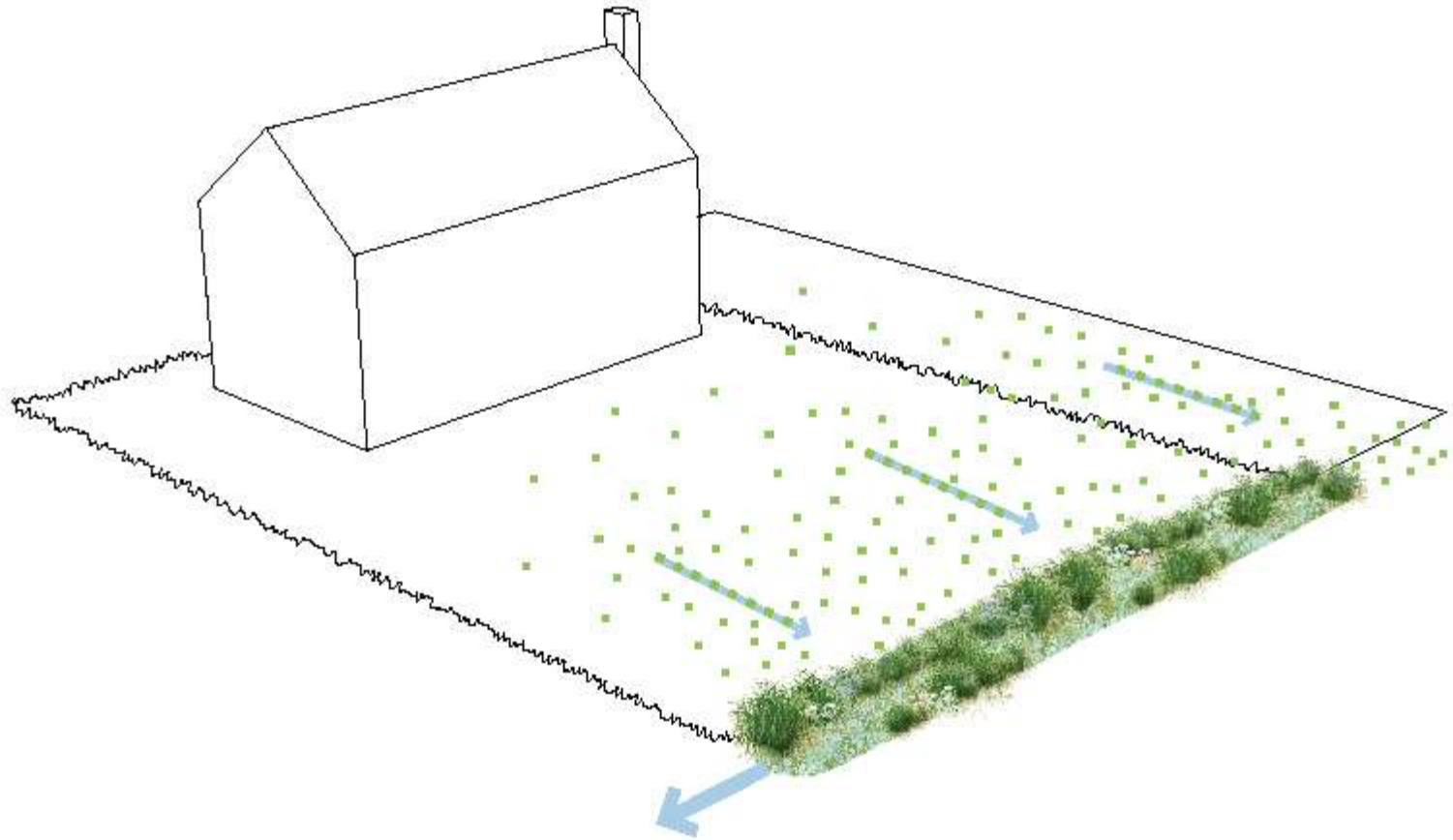


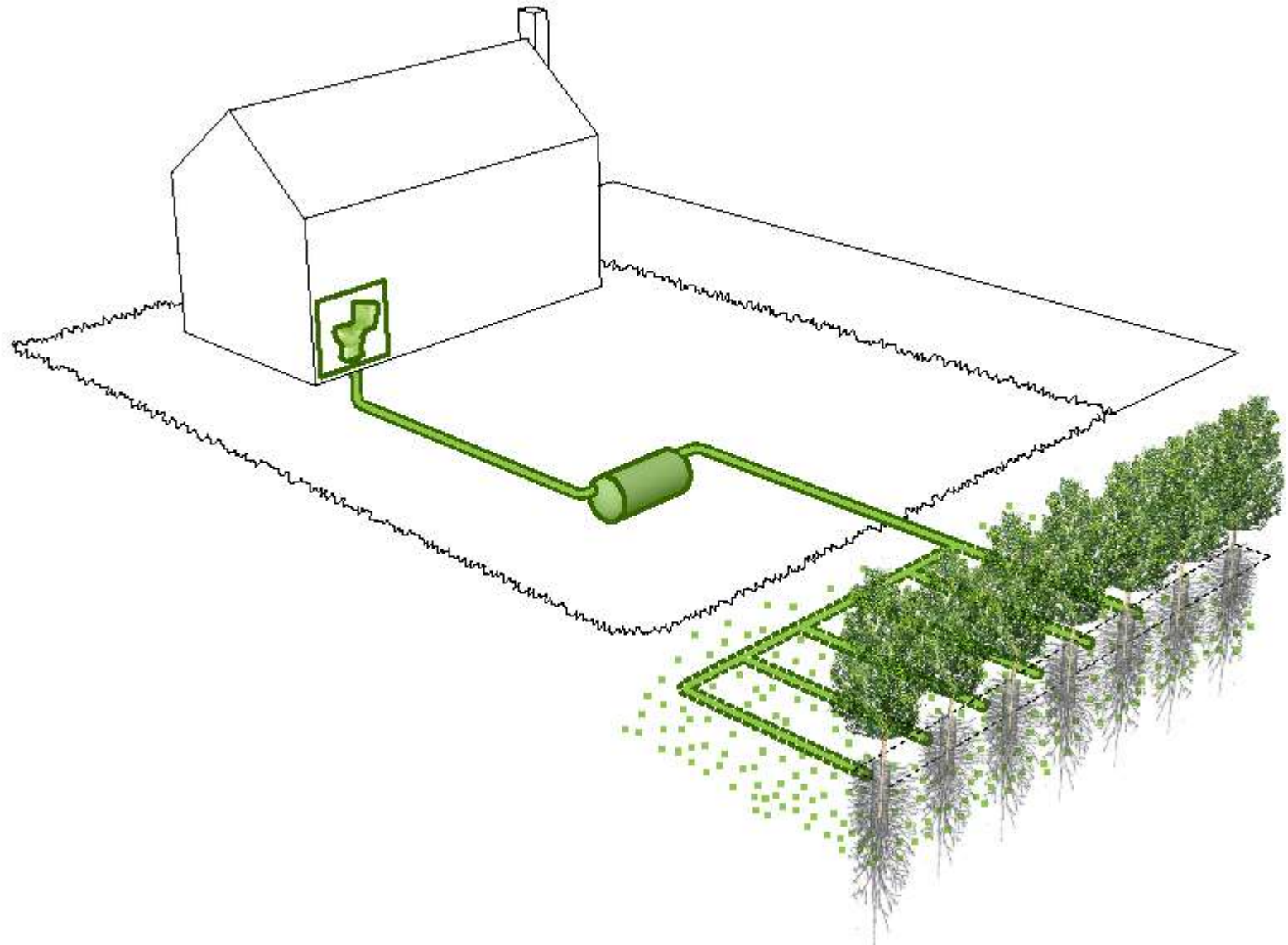
Chips



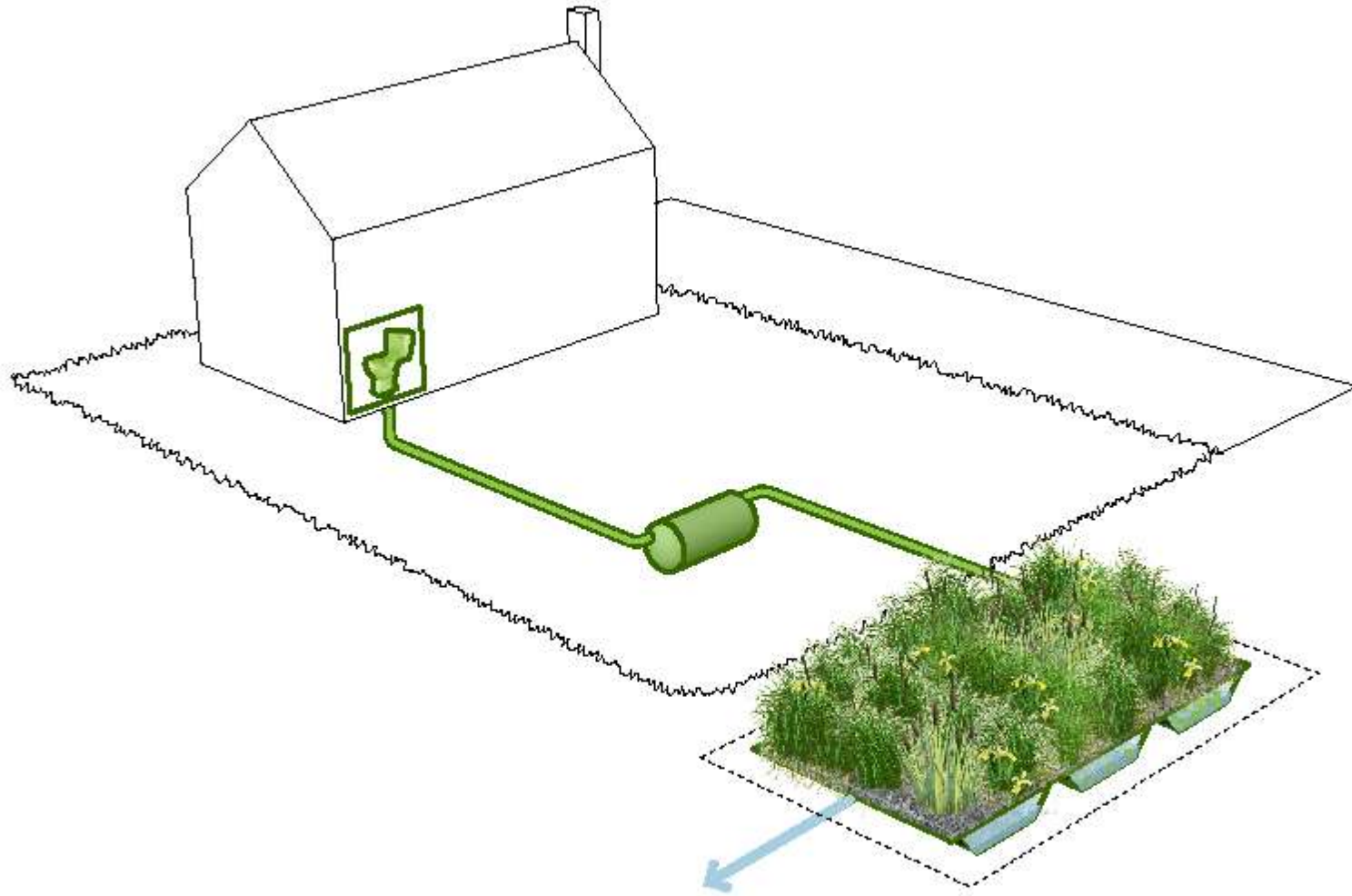
- Nitrate → to nitrogen gas by micro-organisms
- 90-99% removal of nitrate
- Also effective for Phosphorus - fresh water ponds
- 20-30 year media life estimated

Other Diagrams Drawn

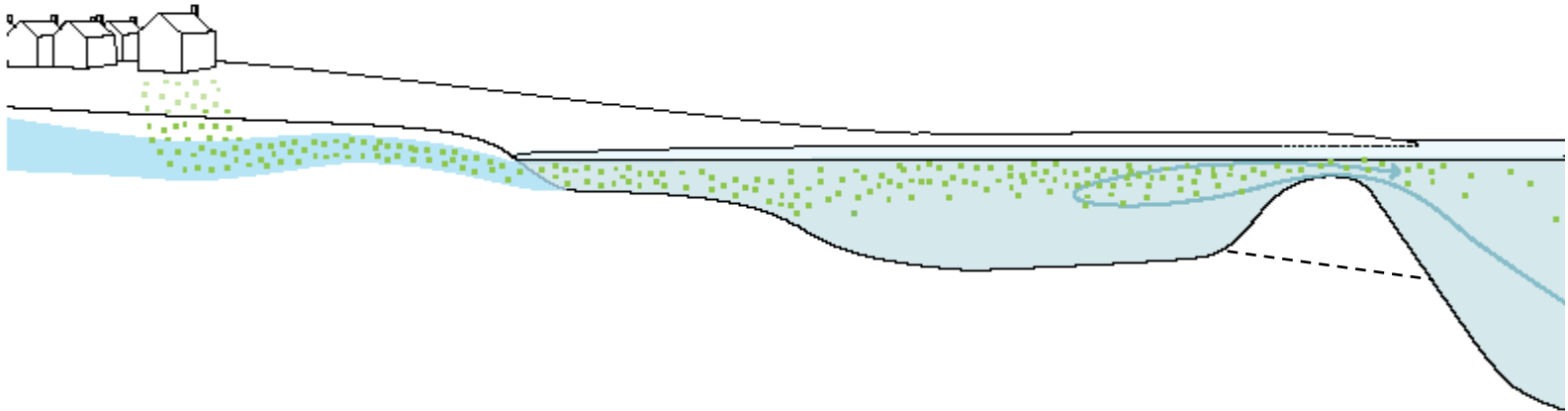




SITE: Phyto Buffer



SITE: Subsurface Wetland



WATERSHED: Dredging

The meeting of the Cape Cod 208 Water Quality Planning Panel on Technologies convened on Thursday, September 26, 2013 at 1:00 p.m. in the Strategic Information Office/Innovation Room, Barnstable, MA.

Panelists Present: Ivan Valiela, Marine Biological Laboratory (MBL)
Chris Neill, Marine Biological Laboratory (MBL)
Eric Davidson, Woods Hole Research Center
Sarah Slaughter, Built Environment Coalition

Remote participation via Conference Call: Patrick Lucey, Aquatex, British Columbia
Anamarija Frankic, UMASS Boston

CCC Staff : Paul Niedzwiecki, Executive Director
Heather McElroy, Natural Resources Specialist
Scott Michaud, Hydrologist
Erin Perry, Special Projects Coordinator

CCC Consultants: Scott Horsley, Horsley Witten Group
Tom Parece, AECOM
Mark Owen, AECOM

Welcome and Introductions

Heather McElroy introduced the panelists present and announced that Patrick Lucey and Anamarija Frankic would be participating remotely by phone.

Review of the 208 Planning Process, Goals, and Role of the Panel on Technologies

Paul Niedzwiecki, Executive Director of the Cape Cod Commission, with the use of PowerPoint slides described the 208 Plan and provided an update on the planning process to date. He said the Commission was directed to update the 1978 Clean Water Act Section 208 Plan and the Commonwealth provided \$3 million to fund the project. He said the focus on the 21st Century problems is nitrogen in saline waters, phosphorus in fresh waters, and growth and Title 5 limitations with septic systems being the primary source of nitrogen loading on Cape Cod. He said the approach to the 208 Plan Update is watershed based with stakeholder engagement to maximize benefits of local planning and said there are no optimal solutions. He said the goal is to generate a series of approaches in each watershed that will meet water quality standards. He described the stakeholder process, public meetings that have been held, the watershed working groups and the scheduled timeline for the 208 planning process. He said the mission of the 208 Advisory Board is to support the 208 planning process by providing advice on the overall approach, reviewing a draft work product and offering insight on strategic and tactical decision-making; the mission of the 208 Finance Subcommittee is to establish a factual basis for discussing issues of affordability, financing, and resources; and the mission of the 208 Panel on Technologies is to review, confirm, and expand upon the matrix of technology options, review the overall planning approach to be used in each watershed, and provide input on a site screening methodology for green infrastructure technologies. He provided a brief overview of the alternatives screening method.

Sarah Slaughter, Built Environment Coalition, inquired about affordability and financing meetings and asked if that is being done before solutions. She said options have revenue streams. She asked about climate change impacts.

Paul Niedzwiecki said they are starting with what the communities' feelings are on cost as the plan is being presented to them today. He said they would be constructing a financial model based on technologies. He said climate change is foremost in their thoughts and the EPA has been pushing them in that direction. He said the Commission would be updating its Regional Policy Plan.

Sarah Slaughter said she would suggest considering the resilience aspect as well.

Heather McElroy said the Commission is looking for that type of feedback.

Ivan Valiela, MBL, said a major source of nitrogen has been accumulating in trees as part of natural succession from pastures. He said green land covers are important and should be worked into the plan.

Patrick Lucey, Aquatex-British Columbia, said he would agree with the concept of avoiding discussions on cost and said this is not the forum to elaborate on costs but he would welcome working with the Commission on revenue streams. He said in other locations it has been demonstrated to be self-paying. He said he agrees with habitat conservation banking.

Chris Neill, MBL, said they are not talking about expanding farming.

Paul Niedzwiecki explained the function of the Commission and said the Commission is facilitating the conversation. He said the Commission has a good GIS department and the Commission will build on the financial model. He said they are relying on outside sources to fill in the blanks.

Presentation of Technologies Matrix

Tom Parece, AECOM, with the use of PowerPoint slides presented the technologies matrix and highlighted the different systems for watershed based nitrogen solutions. He explained the different groups and the technology/strategy within each of the groups and said the slides would be updated and passed out to the working groups. He said they are still working with the Commission on missing information and costs. He said some communities may just need a Plan A and others may need a Plan A and Plan B. He said there is no one solution for the entire Cape and they are looking for the most cost effective ways that would remove nitrogen and said construction costs, project costs, and operation costs all need to be factored in. He said during the second round of workshops they would be using the matrix tools watershed by watershed.

Discussion on Matrix Content and Structure

Sarah Slaughter inquired about costs and whether there have been discussions with local contractors about what the local costs might be.

Tom Parece said they have worked with Wright-Pierce to get IA information and said a lot of vetting has been done but it's not thorough. He said he realizes that there is a scale factor involved.

Sarah Slaughter said construction costs initially might look to be expensive but cost may go down after. She said there would be local opportunities such as employment, etc. She questioned whether screening had been done at the local level and asked about the screening criteria.

Tom Parece said cost has been taken out of the equation from day one. He said they are looking at technologies and then if applicable they would look at the cost.

Scott Horsley, Horsley Witten Group, said with the stakeholder groups they are trying to articulate targets/goals up front and then tackle implementation of tools in golf courses, fertilizer reduction with the Cape-wide DCPC, with storm water, etc. He said they would be looking at those opportunities in each of the watersheds and then try to apply greener alternatives. He said they would be looking at on-site options first and then build an accounting system to see what the bottom line solutions are.

Ivan Valiela said long range change should be considered. He said in the interim water levels change and shift and temperatures increase. He said nitrogen removal rates are highly temperature sensitive and they need to think about the range of uncertainty in our climate and expect change to take place.

Chris Neill suggested doing some exercises and see how each of these scale and how change would influence those options. He said there needs to be an organizing principle.

Tom Parece said some of that is being initially screened and then perhaps options would come off the table.

Scott Horsley said screening has been done such as depth to water.

Chris Neill said a barrier could go along the coast.

Scott Horsley said they are looking along road layouts as opposed to the coastline because of permitting.

Chris Neill said perhaps the public could be engaged as to whether they want to have something like this in their back yards.

Sarah Slaughter said when talking about where or what land should be used think about the overall beneficial use when talking about land. She said in Seattle people turned in inefficient appliances and replaced them with new ones. She said you need to think about what the overall benefits are. She asked about other watersheds.

Scott Horsley said they are not there yet. He said they are putting the same matrix on the table and at the end of October they would be discussing technologies.

Ivan Valiela said Falmouth has done this and suggested working with Falmouth on this.

Scott Horsley said Tom Cambareri, hydrogeologist at the Cape Cod Commission, has been working with Falmouth.

Eric Davidson, Woods Hole Research Center, said he is confused about the mission here and asked what kind of feasibility and review is expected from the panel.

Heather McElroy said time has been invested in nitrogen removal rates. She said they have identified a range of rates for the technologies and the Commission is looking for input on whether more information is needed say for siting requirements, removal rates, reference materials, or using GIS. She said the Commission is looking for that level of detail and whether the Commission is looking at the right reference materials.

Scott Michaud, hydrogeologist at the Commission, said in addition to cost they should be focusing on revenue-generating savings. He said feedback from the Panel would be valuable.

Chris Neill said it's a massive job to go through and critique all the numbers and he is not sure the Panel could take it on with the timeframe involved. He said they could do brainstorming on whether siting requirements are right but they probably cannot review and analyze all of the detailed literature.

Tom Parece said they want to know if they are in the right ball park with the technologies.

Sarah Slaughter suggested working with the USDA Extension. She said they could help with the calculations. She said getting into climate change issues for the different areas of the Cape is a complex issue. She suggested staying away from "sunk" cost. She talked about public bonds and suggested doing a "back of the envelope" calculation in a few areas.

Chris Neill said if they do a "back of the envelope" calculation the Panel could look at that.

Ivan Valiela said they need to keep forests there.

Eric Davidson agreed with having to maintain forests but questioned if that is the case on the Cape and questioned whether the Cape was close to build out.

Ivan Valiela said there is still a lot of green cover on the Cape.

Eric Davidson said the rate of build out has dropped from the 1980s but look at the areas closer to build out. He said there is no silver bullet on the Cape and the Cape will have to move on both extremes.

Ivan Valiela said that would be a reasonable approach.

Eric Davidson said he's looking forward to looking at the revenue streams. He said perhaps there should be a column on the spreadsheet for co-benefits such as recreation, open space, fish habitat, fresh and salt water. He

said perhaps get to an approach on how to quantify that. He said it may not yield revenue but it may yield other benefits. He said at the end of the day he is not sure if they would be removing the amount of nitrogen to where they need to be with the requirements. He said they may be removing some but questioned if they would be removing enough.

Mark Owen, AECOM, said he is working with the Commission looking at watersheds and trying to make the information understandable for non-technical people. He referred to PowerPoint slides showing a map illustrating properties where they have done screening. He said they have just started looking at a few areas and using them as examples. He referred to Prince's Cove and said perhaps this area could be used for a permeable reactive barrier. He said they are trying to educate stakeholders.

Ivan Valiela asked how they determine the amount of nitrogen to be captured.

Mark Owen explained the 10-year travel time and how nitrogen from septic systems sink.

Ivan Valiela said deeper flows would catch more.

Mark Owen said it captures the low side.

Chris Neill said it's not doing anything about cutting out the source—homes.

Mark Owen said that's correct. He explained the spreadsheet from a MEP report. He said they are looking at each of the technologies to see how much can be removed with each of the technologies.

Scott Horsley said stakeholders don't have the ability to evaluate that so they have to inform them.

Chris Neill said that is deeper than test sites in Falmouth. He said removal ranges go from okay to excellent. He said its variable but it's not 90%.

Ivan Valiela questioned whether it would be more practical in interrupting the flow with eco-toilets. He said that would be a reasonable way to do it.

Scott Horsley said that's the discussion they want to have with stakeholders. He said the idea is to do a Plan A and Plan B because they don't have all the answers.

Mark Owen said this is where adaptive management comes in.

Ivan Valiela said he would emphasize prevention to start with.

Sarah Slaughter said also think about each lot having an advanced field with plantings, etc. and water efficient toilets that homeowners could be asked to do that would change water flow rates. She said that would be a way to intercept.

Chris Neill said regarding the water use question, PRB is not a sewer flow it's a water flow. Concentrations are already low.

Sarah Slaughter said there are different ways of thinking about scales of intervention in the home. She said you need to think about the pathway from home to neighborhood. She said that would help in accumulating the credits.

Patrick Lucey said another element they need to capture is public education. He said they need to celebrate the role of water in the ecosystem. He said engage the community and educate them about when people do things they make impacts to the water.

Anamarija Frankic, UMASS Boston, said when looking at nitrogen maybe it needs to be seen in a more positive way instead of a negative. Nature loves nutrients and nitrogen comes from nature. She said this opportunity can change how to use technology and nature to solve these problems. She said nature knows how to reduce nitrogen

load in ponds. She said sometimes we can get overwhelmed with technology and technology can change in five years.

Hilda Maingay said all the nutrients they have been talking about come from food. She said these nutrients are needed to produce food and the nutrients should be put back where they came from. She said nutrients should be captured at the household level with eco-toilets and put back where they came from. She said people have to start thinking more eco-system based.

Heather McElroy asked the Panel what they see their task being.

Eric Davidson inquired about the second meeting with towns.

Heather McElroy said this Panel would be meeting again in two weeks and perhaps the discussion today should be included in the matrix.

Sarah Slaughter asked about the Commission's expectations and questioned whether the Commission is looking for the Panel to give their 100% confidence in three months.

Heather McElroy said that was not their expectation.

Sarah Slaughter said to go through all the data would not be possible to do in three months. She suggested doing sample exercises as they are doing today.

Chris Neill said the Panel could give them feedback on 75% reduction; he said they could go through that as well as siting requirements. He said they couldn't provide more detail in three months and agreed with Ms. Slaughter that they could go through sample exercises like today.

Eric Davidson said the Panel may provide a bigger service by walking through adaptive management plans to advise towns where to invest. He inquired about a plan for monitoring before and after. He said thinking through that type of planning and monitoring with the use of examples would be a better use of the Panel's time.

Patrick Lucey agreed and said there is more than enough talent to determine what is adequate to get what you want in the ground and see how it works.

Ivan Valiela suggested that the Commission make a list of what they are most uncertain about and the Panel could work on that.

Sarah Slaughter inquired about references for different climates in soil.

Heather McElroy said the Commission will prepare different watersheds to look at.

Chris Neill said that could address what Mr. Davidson is talking about. He said it would be good to get some of those vetted.

Heather McElroy said that the panel may also look at the adaptive management process and monitoring approach in a future meeting.

Mark Owen said it would be helpful if the Panel could point the Commission to projects that they are familiar with for the Commission to look at.

Sarah Slaughter said training contractors on O&M helps with the functionality of the project.

Heather McElroy said the next meeting of the 208 Panel on Technologies will be October 10 from 1:00-4:00 p.m. in this room. She said the matrix would be available to the public after the second round of stakeholder group meetings have concluded.

Public Comments

David Dow, Sierra Club, said the Sierra Club recently released a fact sheet on personal care products and septic systems and said they would like to see that addressed as part of the 208 process. He said it could also help towns with their CWMPs as well.

Heinz Proft referred to Mr. Dow's comment and said that was actually his question; how much attention and effort is being put into addressing other toxins that need to be looked at in wastewater and asked about the adaptability of the different types of technologies.

Ed Daley, Orleans, said the approach Mr. Owen presented was very well and easily understood and said the public would accept it more than looking at a very complex matrix. He said he is with the Nauset Cape Cod Bay Group and asked if someone would be available to speak to his group and explain the process to them. He said part of their job is to look at this since wastewater is a local issue. He said every place is different and they need to know enough about the process to make an intelligent claim on the issue.

Heather McElroy said she would take that information back to the Commission.

Mark Owen said at the next round of stakeholder meetings they would be presenting some of the results for each of the embayments and sub-watersheds at least.

Hilda Maingay said she would like to see CO₂ be part of the comparison in systems as well as energy use that is needed. She said if anyone wants to learn more about eco-toilets they have a website for the Cape Cod Eco Toilets Center that they try to update as they learn more. She said education is most important.

Brian Dudley, Department of Environmental Protection, said it would be helpful for the Panel to work with demonstration projects that are going on particularly in Falmouth in regard to helping to evaluate the monitoring and sampling processes that are going on. He said it would be useful to know if they are hitting the right targets.

Laura Kelley, Eastham, said as a landscaper working with plants and trees all day she has information that she would like to share and asked where she could send the information.

Heather McElroy said she could send the information to the Commission. She said the County's Cooperative Extension Service maintains a list of plants and trees as well.

The meeting adjourned at 3:45 p.m.