

Preview of 10/28 Agenda

Select Watershed Analyses and
Adaptive Management Discussion

208 Watershed Solution Conventional Approaches Bookends to Targeted Solutions

Oct 10, 2013

WATERSHED MVP
MULTI-VARIANT PLANNER

Planning Scenarios

- Scenario
- Scenario Settings
- Treatment Type Settings

Factor: Septic 26.25ppm

Value:

- Septic 26.25ppm
- Individual I/A Septic 19ppm
- Single-Stage Cluster 15ppm
- Enhanced I/A Septic 13ppm
- Two-Stage Cluster 8ppm
- Satellite Facility (Sm) 8ppm
- Satellite Facility (Lg) 5ppm**
- Centralized Facility (within watershed) 5ppm
- Centralized Facility (outside watershed) 0ppm

Data Summary

Summarize by

- Existing

Chart

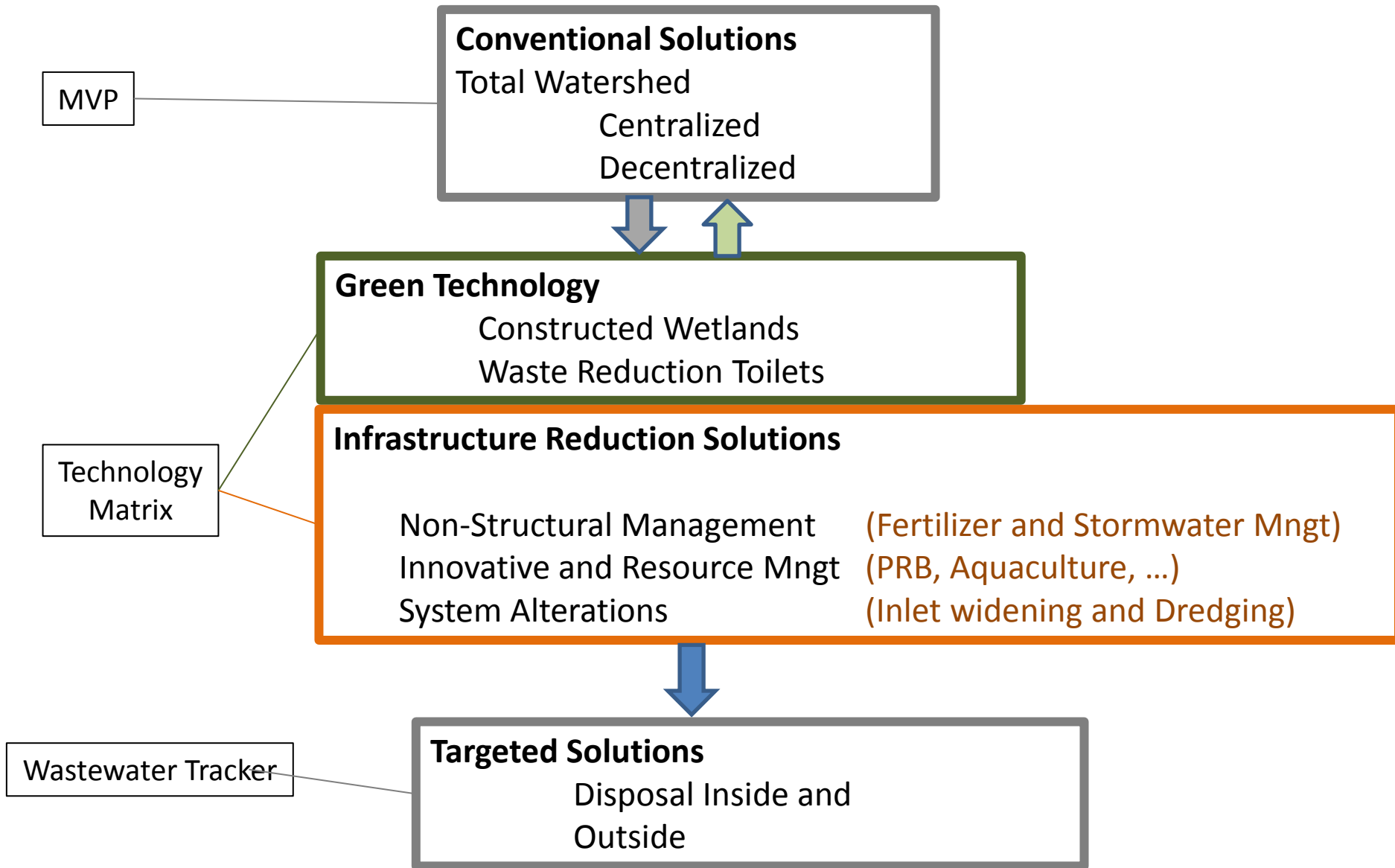
Technology Matrix

Group	Technology/Strategy
Green Infrastructure	Constructed Wetlands - Surface Flow
	Constructed Wetlands - Subsurface Flow
	Constructed Wetlands - Cluster Subsurface Flow (SSF)
	Eco-Machines & Living Machines
	Phytoirrigation and Phytobuffers
	Stormwater: Bioretention / Soil Media Filters
	Stormwater: Constructed Wetlands
Innovative and Resource-Management Technologies	Aquaculture/Shellfish
	Phytoremediation
	Permeable Reactive Barriers (PRBs)
	Fertigation Wells
Waste Reduction Toilets	Toilets: Composting
	Toilets: Packaging
	Toilets: Urine Diverting
Non-Structural Technologies	Fertilizer Management
	Stormwater BMPs
	Remediation of Existing Development
	Compact Development/OSRD
	Transfer of Development Rights
System Alterations	Inlet/Culvert Widening
	Surface Water Remediation Wetlands
	Pond and Estuary Dredging
Gray Infrastructure	Wastewater Treatment
	Title 5 Replacement (Base Line Condition)
	Innovative/Alternative (I/A) Systems
	Innovative/Alternative (I/A) Enhanced Systems
	Cluster Treatment System - Single-stage
	Cluster Treatment System - Two-stage
	Conventional Treatment
	Advanced Treatment
	Satellite Treatment
	Satellite Treatment - Enhanced

Group	Technology/Strategy
Gray Infrastructure	Collection Systems
	STEG - Collection
	STEP - Collection
	Effluent Disposal - Infiltration Basins
	Effluent Disposal - Soil Absorption System (SAS)
	Effluent Disposal - Injection Well
	Effluent Disposal - Wick Well
Onsite-Decentralized and Cluster Systems	Effluent Disposal - Ocean Outfall
	Effluent Transport out of Watershed to Recharge, Reuse Facility or Ocean Outfall
	Next Generation On-site System Technologies (currently under development)
Other	BUSSE Green Technologies, Inc. - Small Scale MBR (currently under development)
	On-Site Grey Water Treatment
Other	Digester and Combined Heat Power Unit
	Switch from Fuels that Deliver Nitrogen to Watersheds

Watershed Management Solution Approach

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"An Entire Watershed"

WATERSHED MVP

MULTI-VARIANT PLANNER

Scenario

Created By JS
 Description Three Bay Book Ends
 Scenario ID 511 - 9/24/2013 1:53:47 PM

Link: <http://www.watershedmvp.org/Default.aspx?s>

Scenario Settings

Baseline Value Existing Future

Use Override Factors

Flow Thru %
 Water Use: Res % Com %
 I/I Increase %

Treatment Type Settings

Factor Individual I/A Septic 19ppm
 Value 19.00 ppm

Data Summary

Summarize by Nitrogen Load

Existing
 Future
 Scenario

Chart

Nitrogen Load: kg/year

Category	Nitrogen Load (kg/year)
Existing	~35,000
Future	~38,000
Scenario	~25,000

Map Tools

- Map Navigation
- Identify
- Draw a Polygon
- Add/Remove Selection

Results

Total Number of Properties Selected	7,620
Existing Sewered	3
Total Scenario Cost	\$301,324,050.00
Cost/lb of Nitrogen Removed	\$1,139.00

Costs

Show Annual Cost

Annual Costs

Category	Annual Cost
O&M Cost	\$9,518,000.00
Capital Cost	\$9,594,000.00
Total Cost	\$19,111,000.00

[See Detailed Comparison](#)

Centralized Treatment Inside Watershed

WATERSHED MVP
MULTI-VARIANT PLANNER

Scenario

Created By JS
Description Three Bay Book Ends
Scenario ID 511 - 9/27/2013 9:17:26 AM

New Find Delete Clear Run

Link: <http://www.watershedmvp.org/Default.aspx?s>
Go to Dashboard

Scenario Settings

Baseline Value Existing Future

Use Override Factors

Flow Thru %
Water Use: Res % Com %
I/I Increase %

Treatment Type Settings

Factor Centralized Facility (within watr
Value 5.00 ppm

Data Summary

Summarize by Nitrogen Load

Existing Future Scenario

Chart

Nitrogen Load: kg/year

Total Nitrogen Load
[See Detailed Comparison](#)

Results

Map Tools

Summary Legend

Results

Total Number of Properties Selected	7,620
Existing Sewered	3
Total Scenario Cost	\$460,116,415.00
Cost/lb of Nitrogen Removed	\$600.00

Costs

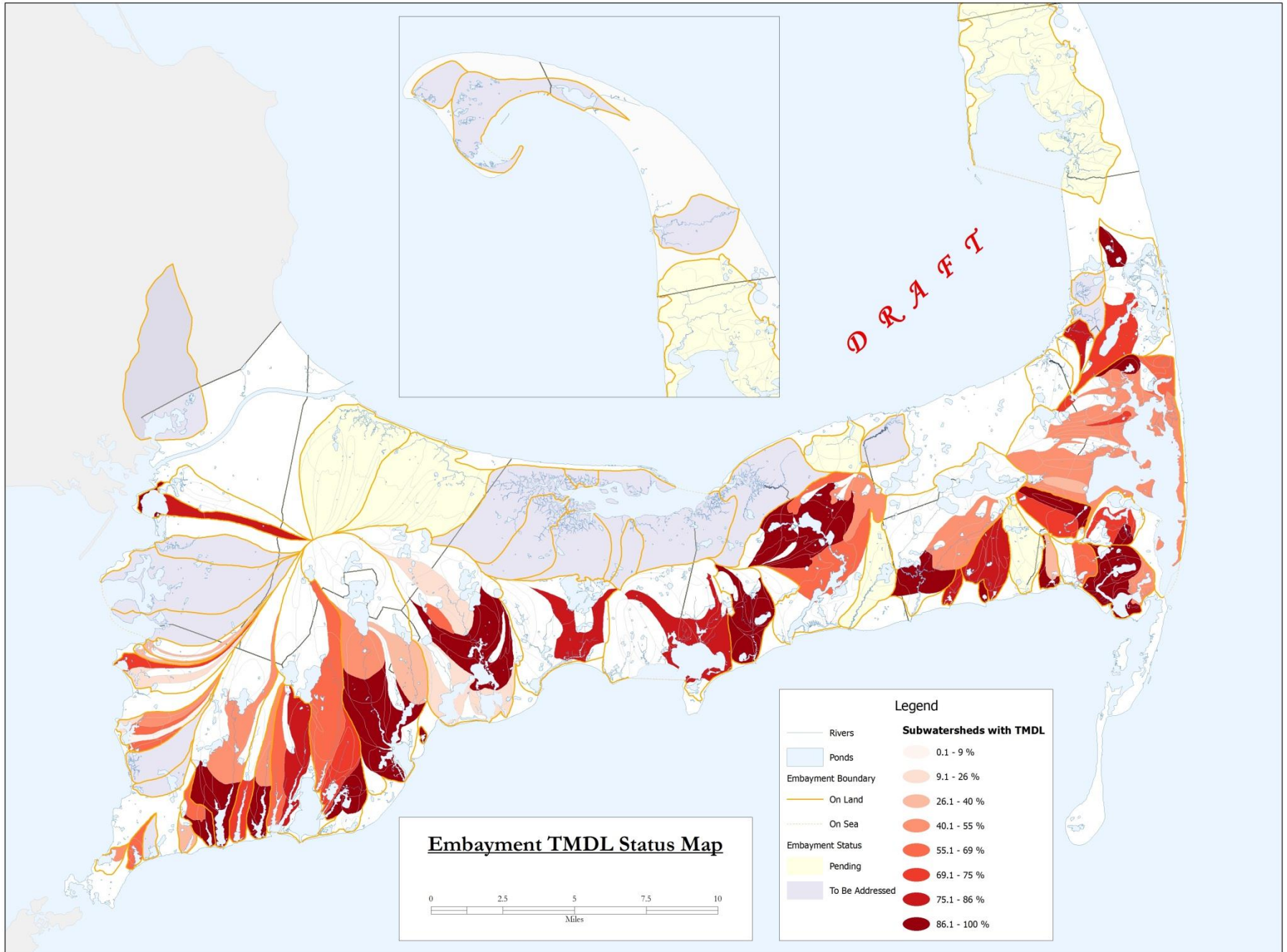
Show Annual Cost

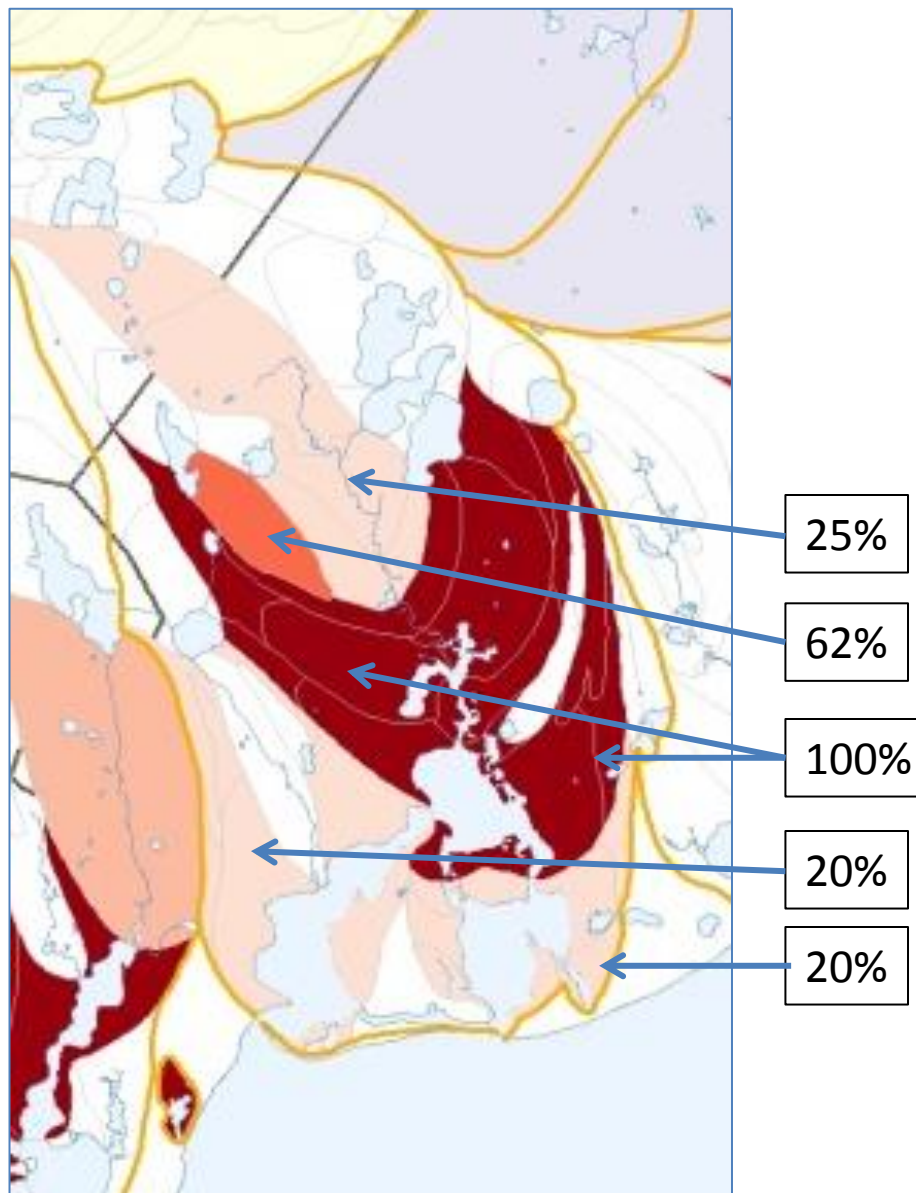
Annual Costs

Annual Cost (Total: \$24,960,000.00)

[See Detailed Comparison](#)

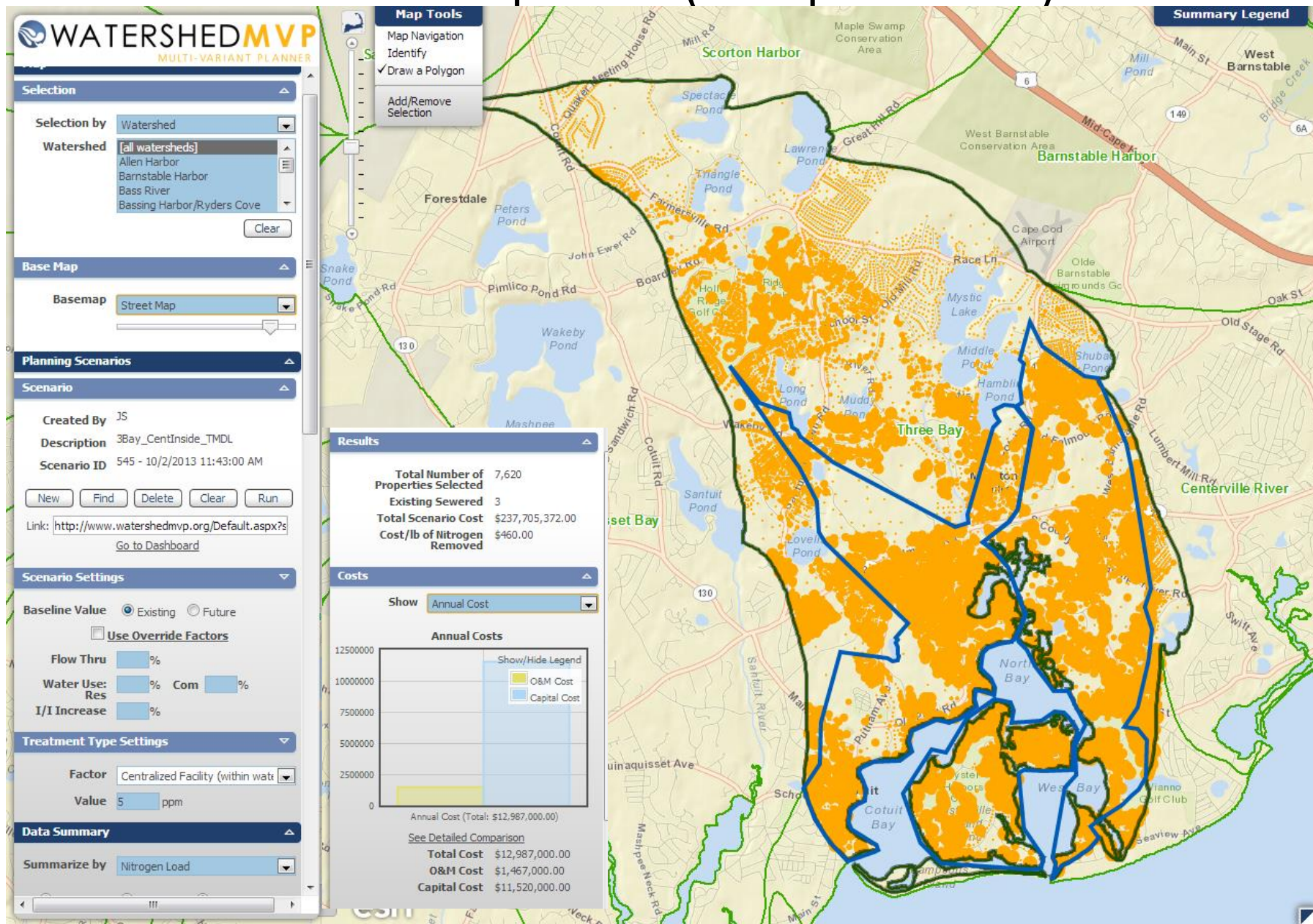
Total Cost	\$24,960,000.00
O&M Cost	\$2,324,000.00
Capital Cost	\$22,636,000.00



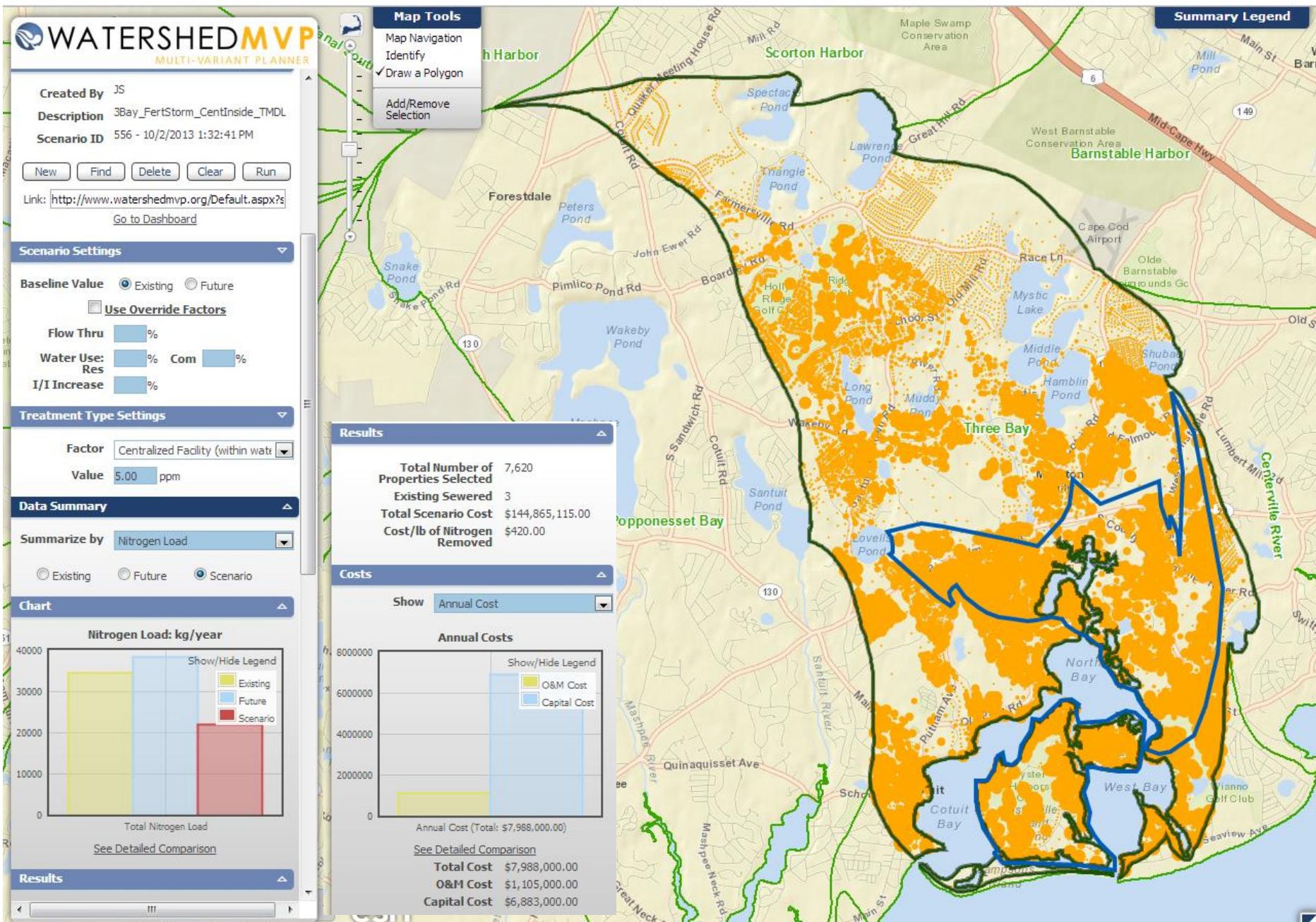


Three Bay Scenario #1 – Centralized Inside Watershed for TMDL Compliance (3 Disposal Sites)

Water on Technology | October 10, 2013



Three Bay Scenario #1 – Fertilizer & Stormwater Reduction with Centralized Inside Watershed for TMDL Compliance (3 Disposal Sites)



Three Bay Scenario Comparison

"Panel on Technologies - October 10, 2013"

Three Bay Scenarios Achieving TMDL Compliance

	Annual Cost Total (Capital and O&M)	Sewered Wastewater Flow (g/day)	Percent above TMDL Compliance	Remaining Excess (kg-N/yr)
Centralized Inside Treatment (5 ppm)	\$12,987,000	667,380	2%	473
50% Reduction in Fertilizer and Stormwater Contribution with Centralized Inside Treatment (5 ppm)	\$7,988,000	440,019	3%	601



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

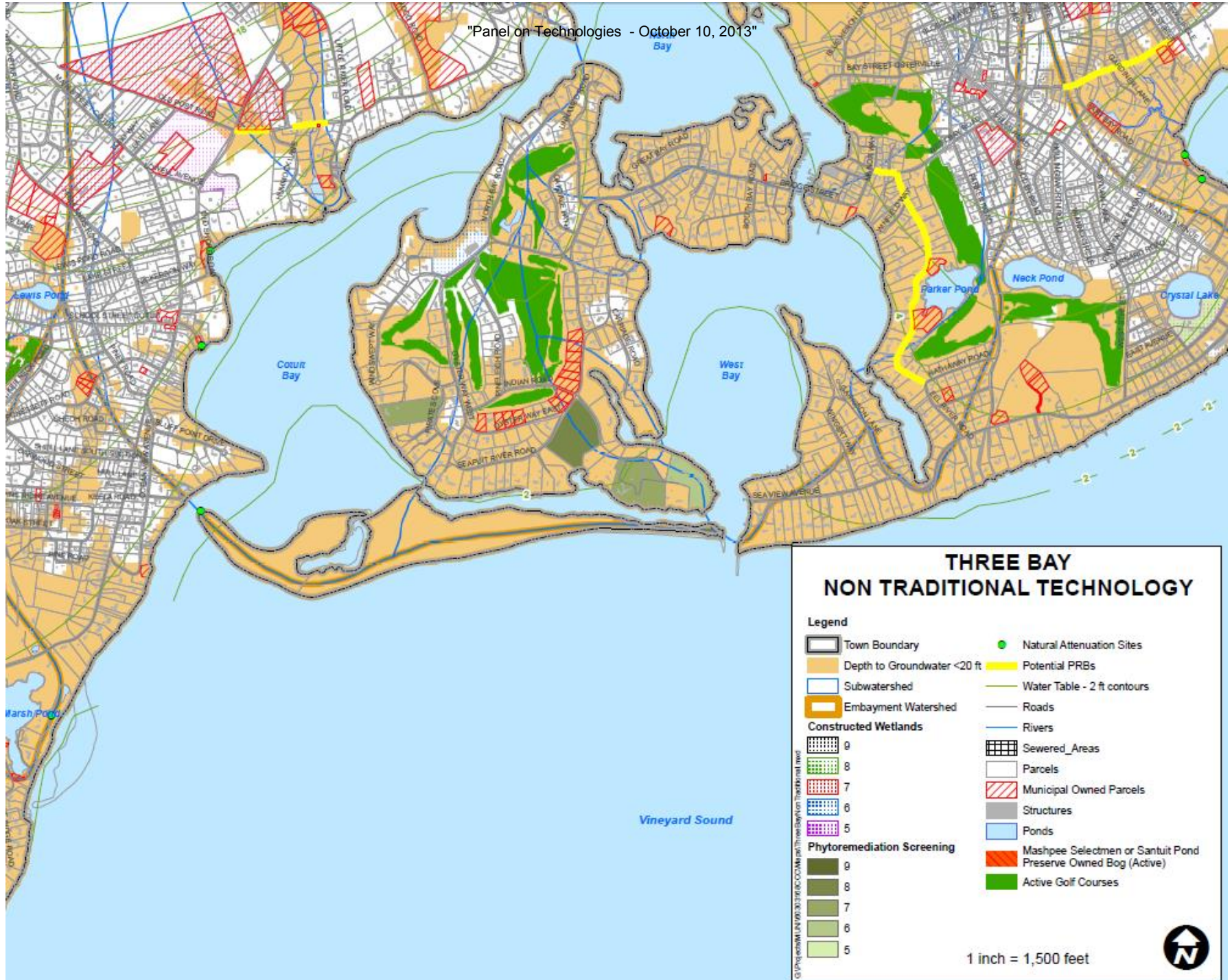
A. Eco-toilets (UD & Compost) C. Enhanced I/A Technologies
B. I/A Technologies D. Shared Systems

Priority Collection/High-Density Areas

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

Supplemental Sewering





THREE BAY NON TRADITIONAL TECHNOLOGY

Legend

- Town Boundary
- Depth to Groundwater <20 ft
- Subwatershed
- Embayment Watershed
- Constructed Wetlands
- Sewered_Areas
- Parcels
- Municipal Owned Parcels
- Structures
- Ponds
- Natural Attenuation Sites
- Potential PRBs
- Water Table - 2 ft contours
- Roads
- Rivers
- Phytoremediation Screening
- Mashpee Selectmen or Santuit Pond Preserve Owned Bog (Active)
- Active Golf Courses

G:\Projects\ML\10-31-13\AC\CC\Map\3\ThreeBay\NonTraditional_Tech

1 inch = 1,500 feet



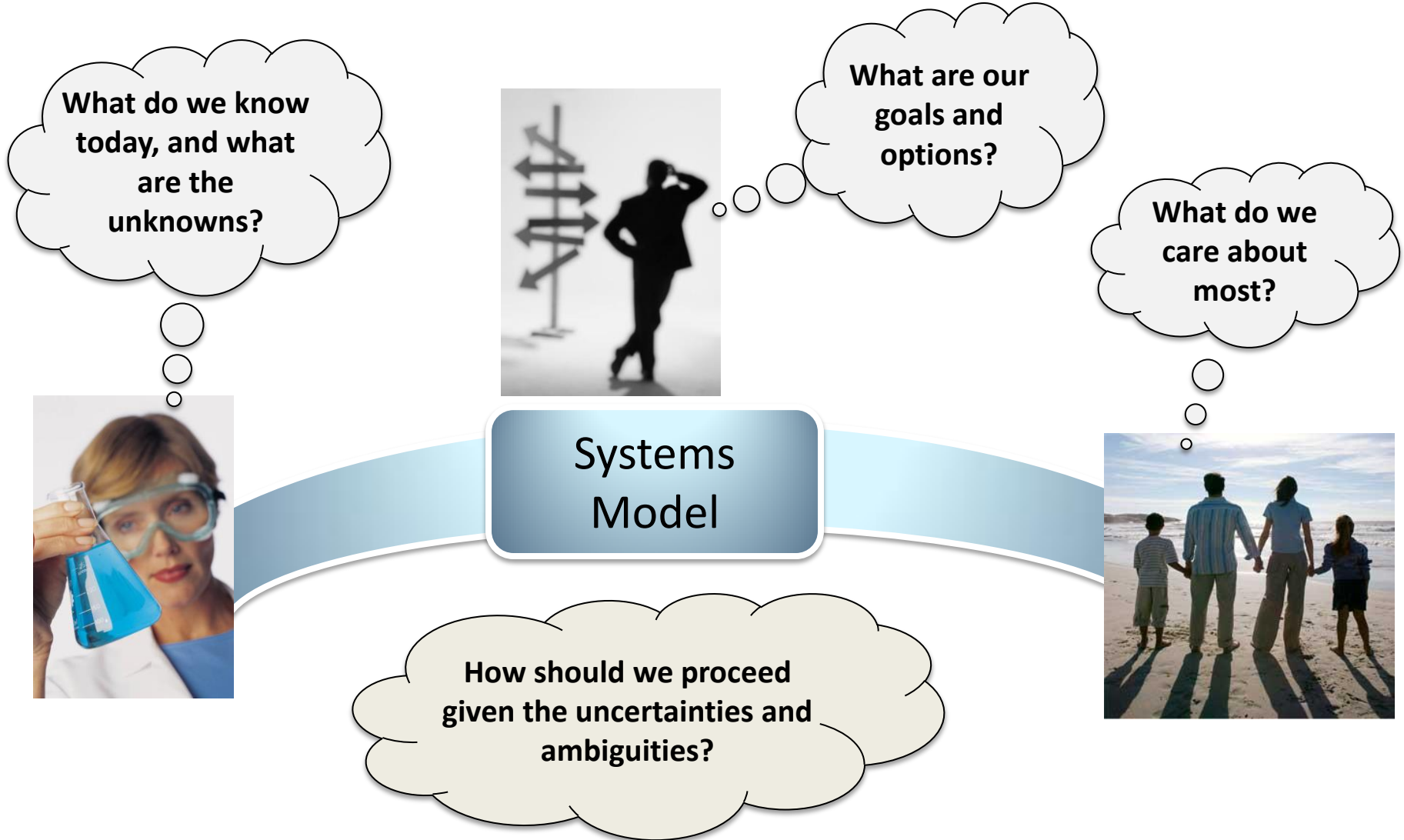
Preview of 11/6 Agenda

3VS Model Preview and
GI Screening Criteria

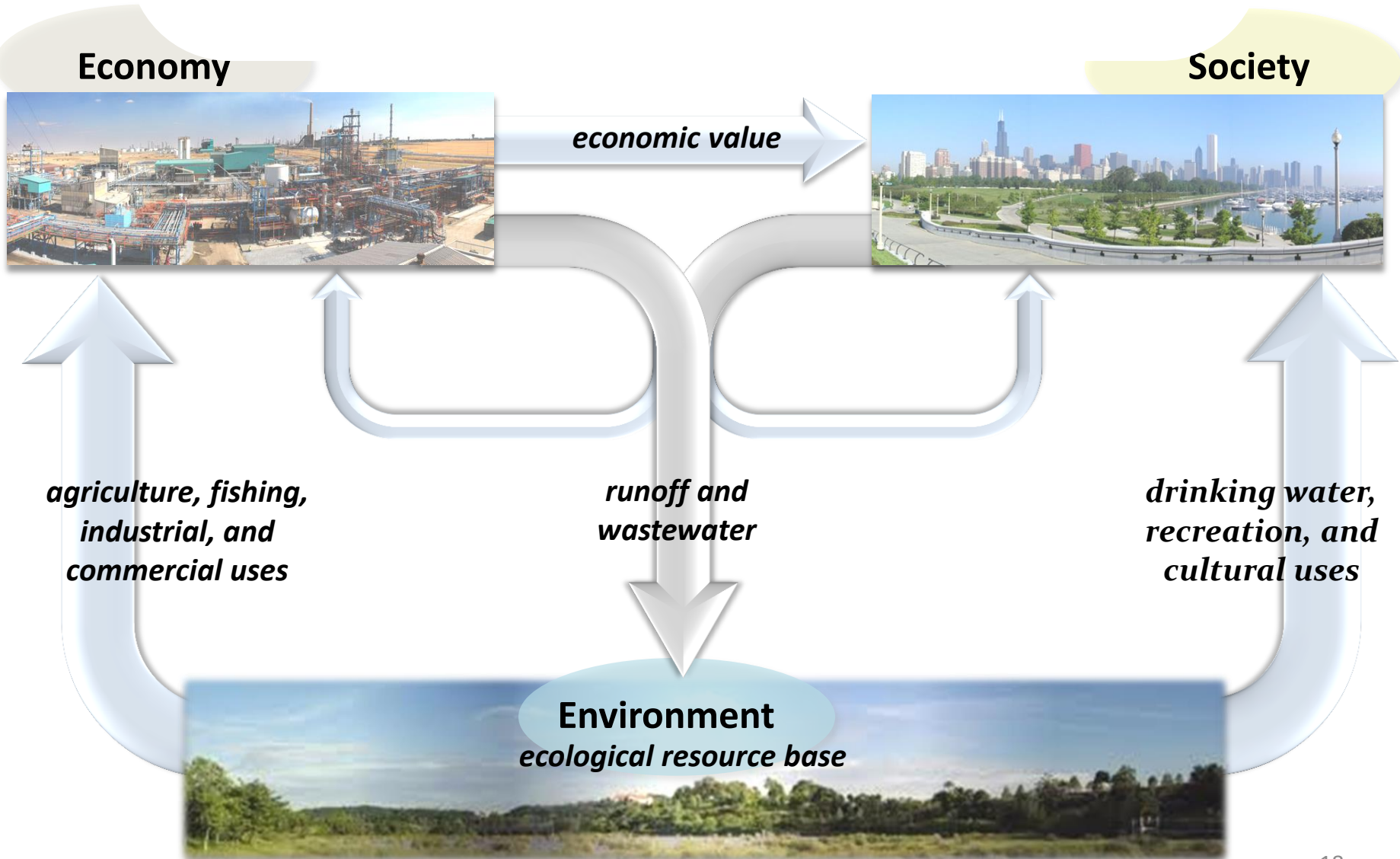
Systems Thinking is a Sustainability Assessment Tool



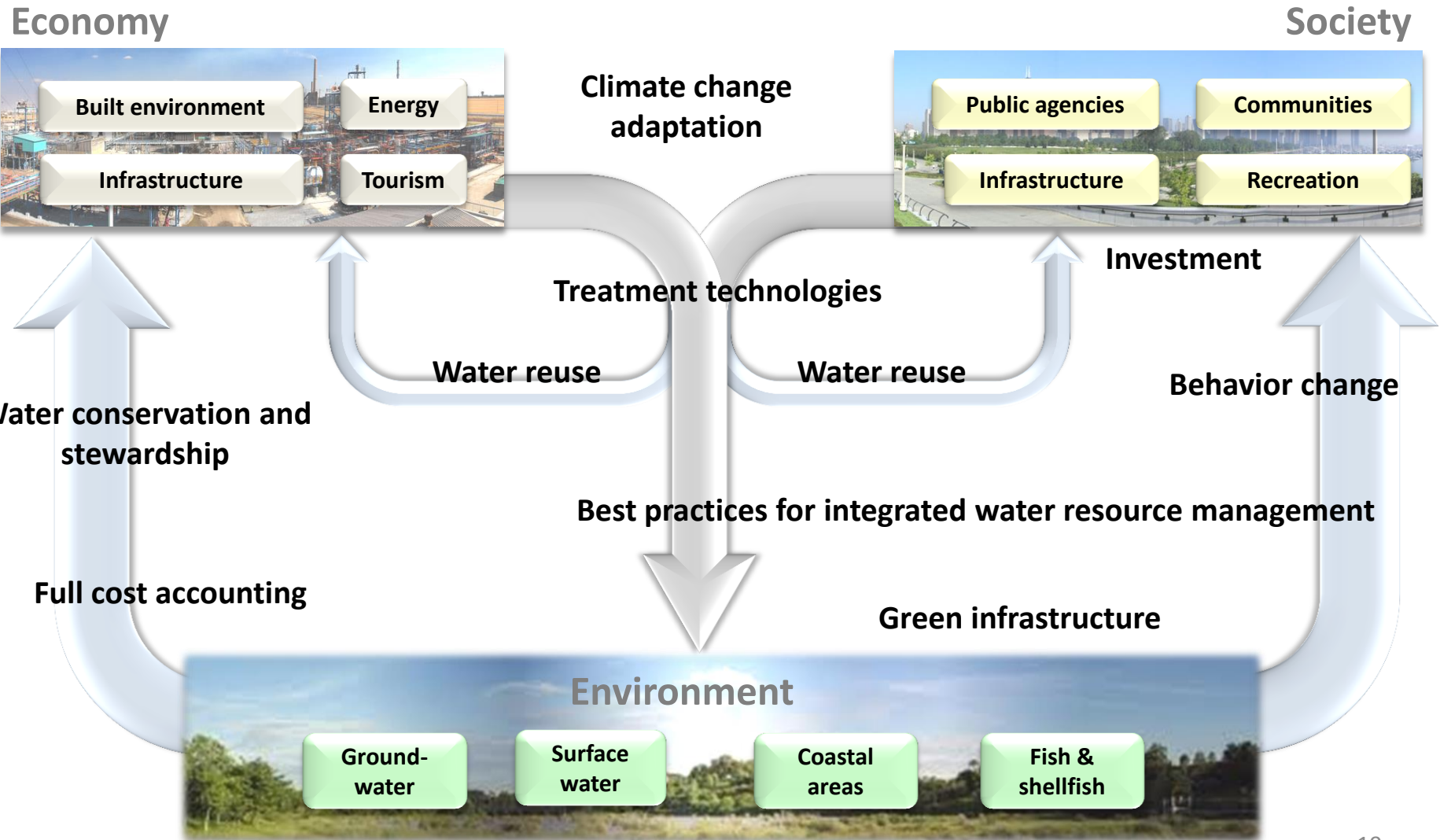
Systems Models Support Decision Making by Bridging Science, Policy, and Human Values



"Triple Value" Framework



Potential Interventions to Improve Sustainability of Water Resources



Modeling the Cape Cod System with a Triple Value Simulation (3VS) Model

Economic Activities

- Tourism
- Commercial Fisheries
- Energy & Transportation
- Land Development
- Wastewater Facilities

Community Stakeholders

- Consumers & residents
- State & municipal agencies
- Water & energy utilities
- Regional businesses
- Septic and cesspool users
- Part-time residents

*runoff and
wastewater*

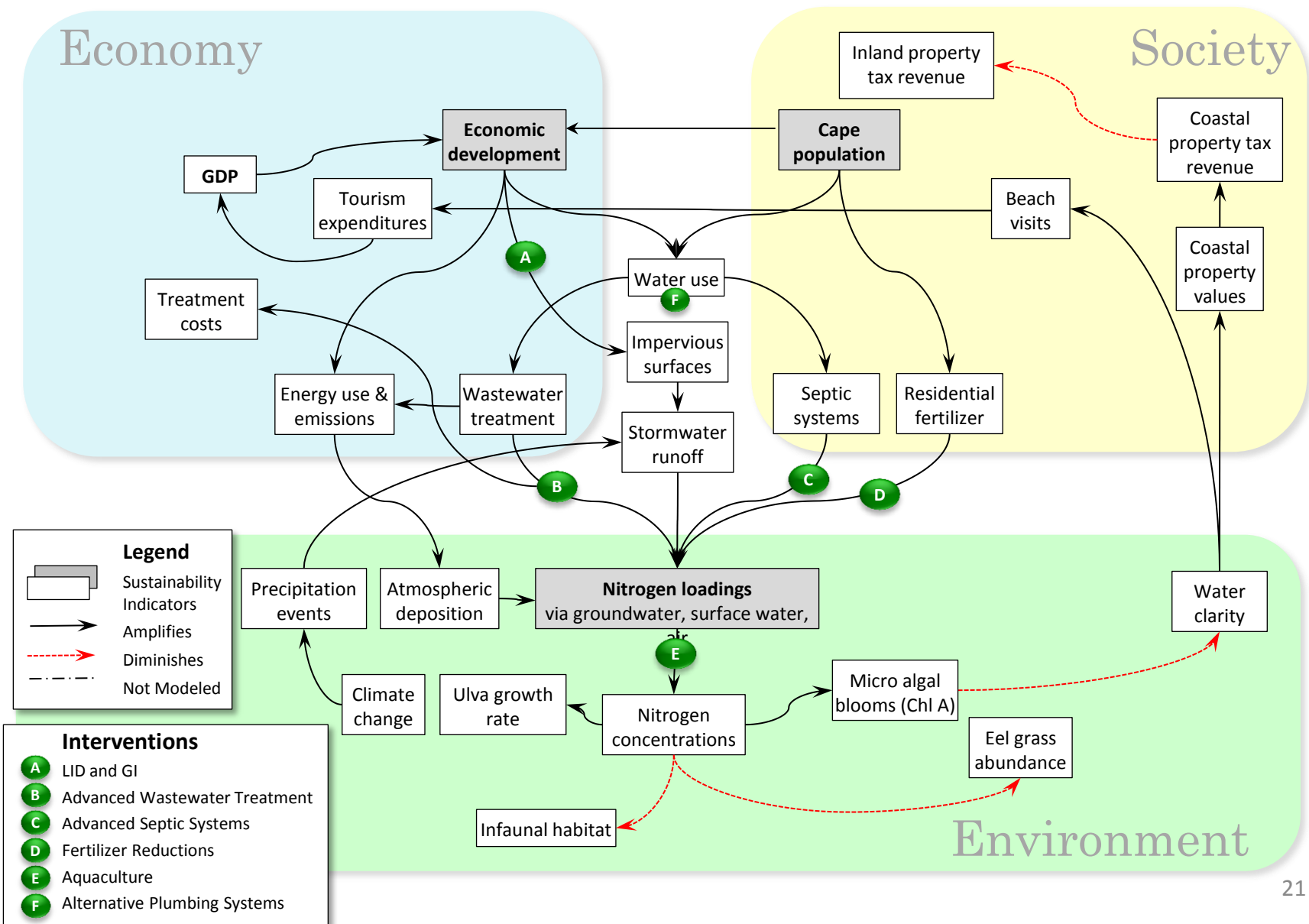
Environmental Resources

- Coastal areas
- Fish & shellfish habitat
- Inland ponds
- Ground water
- Regional ecosystems
- Atmosphere & climate

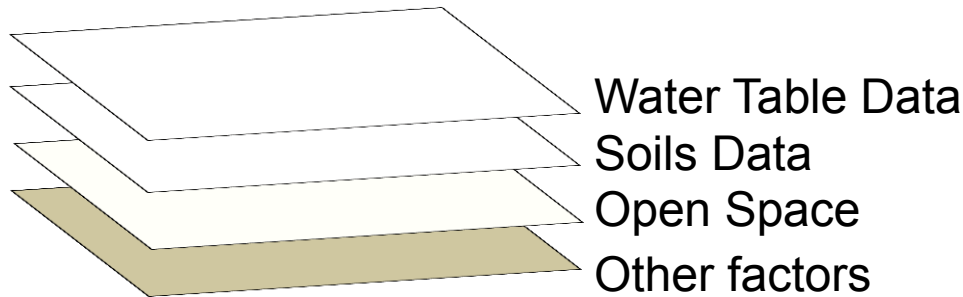
*industrial &
commercial uses*

*recreational
and cultural uses*

Cape Cod 3VS Schematic: Initial Model



Developing a Green Infrastructure Site Selection Methodology



Goal: Develop a siting criteria matrix to use in GIS analysis

Task: Identify siting criteria for individual green technologies and apply these to GIS analysis

Treatment Options Evaluated

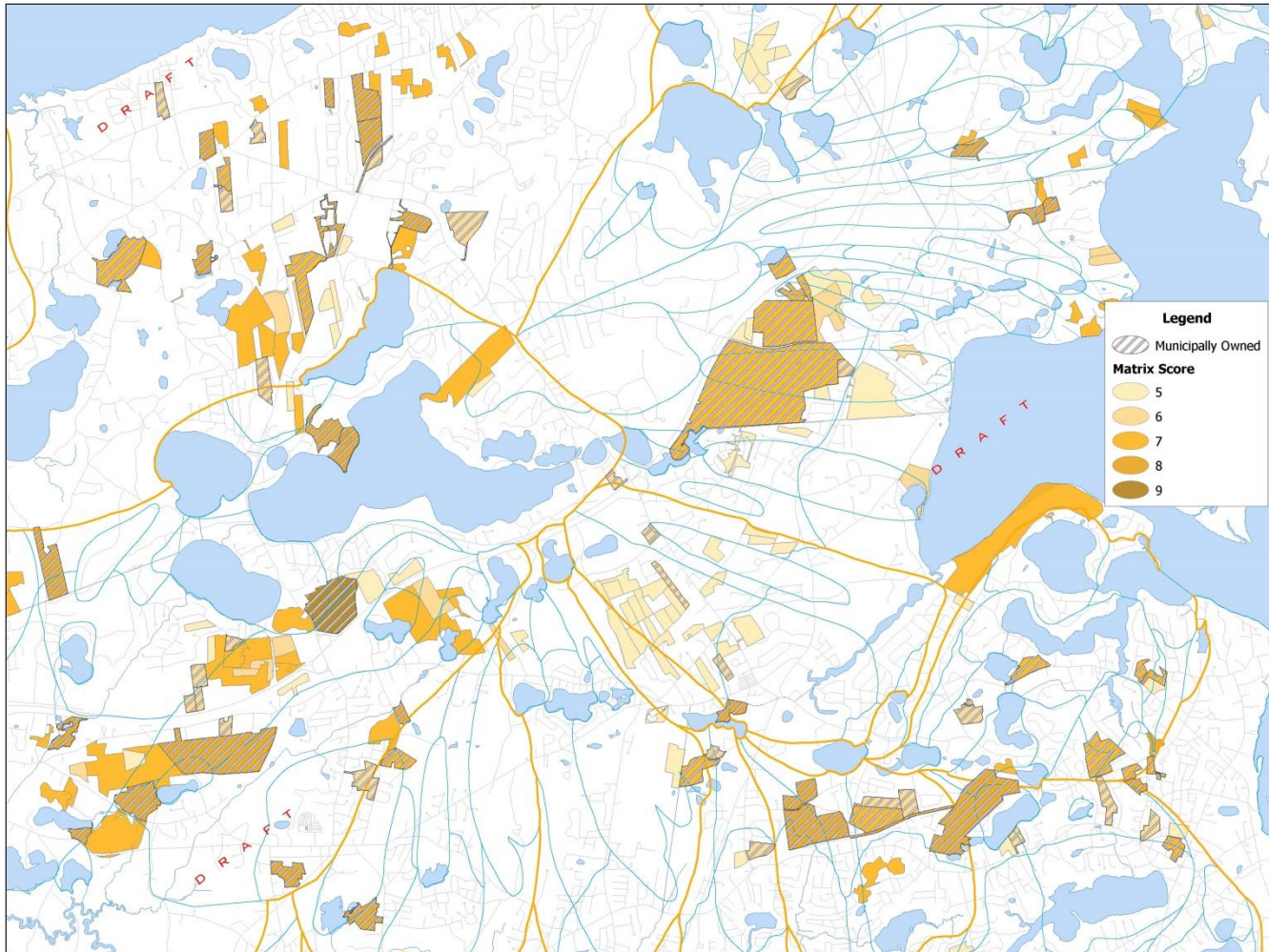
- Constructed wetlands
- Phyto-technology
- Permeable Reactive Barriers (PRBs)



GI Siting Criteria

GI Technologies Siting Criteria			
Notes			
x = all parcels which contain these positive siting criteria (desirable for project siting)			
Mandatory siting criteria			
Bonus siting criteria			
			GI - Wastewater
		Constructed Wetlands	
		Permeable Reactive Barriers	
		Phyto technology	
Siting Criteria			
outside 100 year floodplain	x		
100 - 50 ft buffer to wetland	x	x	x
Zone II's - wellhead protection areas		x	
Soils: disturbed	x	x	x
Soils: well drained			x
Soils: poorly drained, clay (per soil survey)	x		
not protected open space	x	x	x
outside priority habitat	x	x	x
depth to groundwater > 4'	x		
depth to groundwater <10'		x	x
parcels >5 acres	x		x
municipally owned, not protected open space	x	x	x

Potential Constructed Wetlands



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