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

Meeting Three
Draft Meeting Agenda
Monday, December 9, 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 Area Manager*

8:45 Introductions, Agenda Overview, Updates and Action Items– *Facilitator and Working Group*

9:00 Presentation of Initial Scenarios for each watershed – *Cape Cod Commission Technical Lead*

- Whole Watershed Conventional Scenarios
- Targeted Conventional Scenarios to meet the TMDLs (or expected TMDLs):
- Whole Watershed 7-Step Scenarios
- Working Group Reactions, Questions and Discussion

10:30 Break

10:45 Adaptive Management – *Cape Cod Commission and Working Group*

- Adaptive Management Sample Scenarios
- Key Adaptive Management Questions
- Defining Adaptive Management

11:30 Preparing for 2014 Jan-June – *Cape Cod Commission and Working Group*

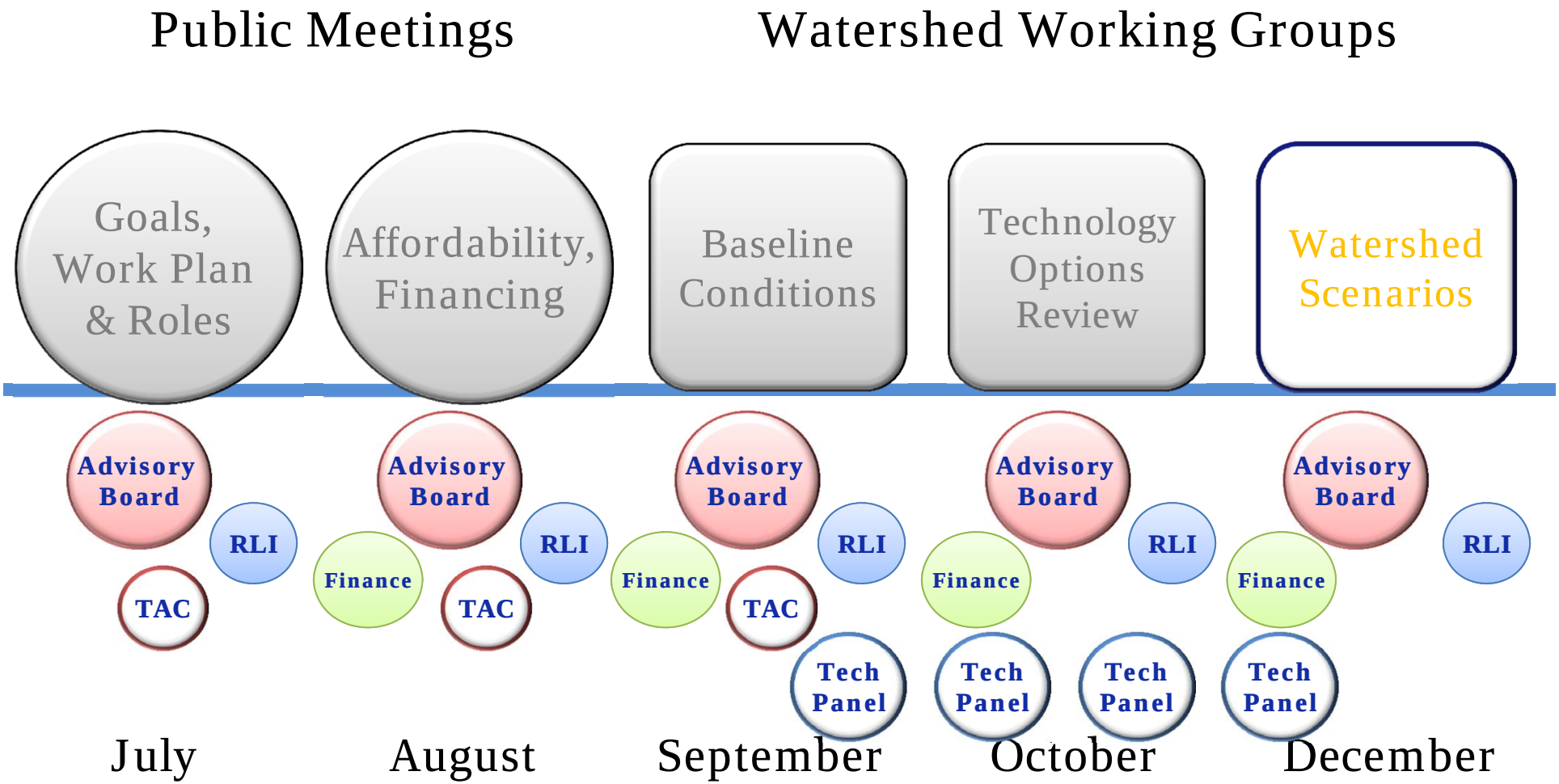
- Triple Bottom Line approach
- Identify Shared Principles and Lessons Learned
- Describe Next Steps

12:15 Public Comments

12:30 Adjourn

Pleasant Bay Group

Watershed Scenarios

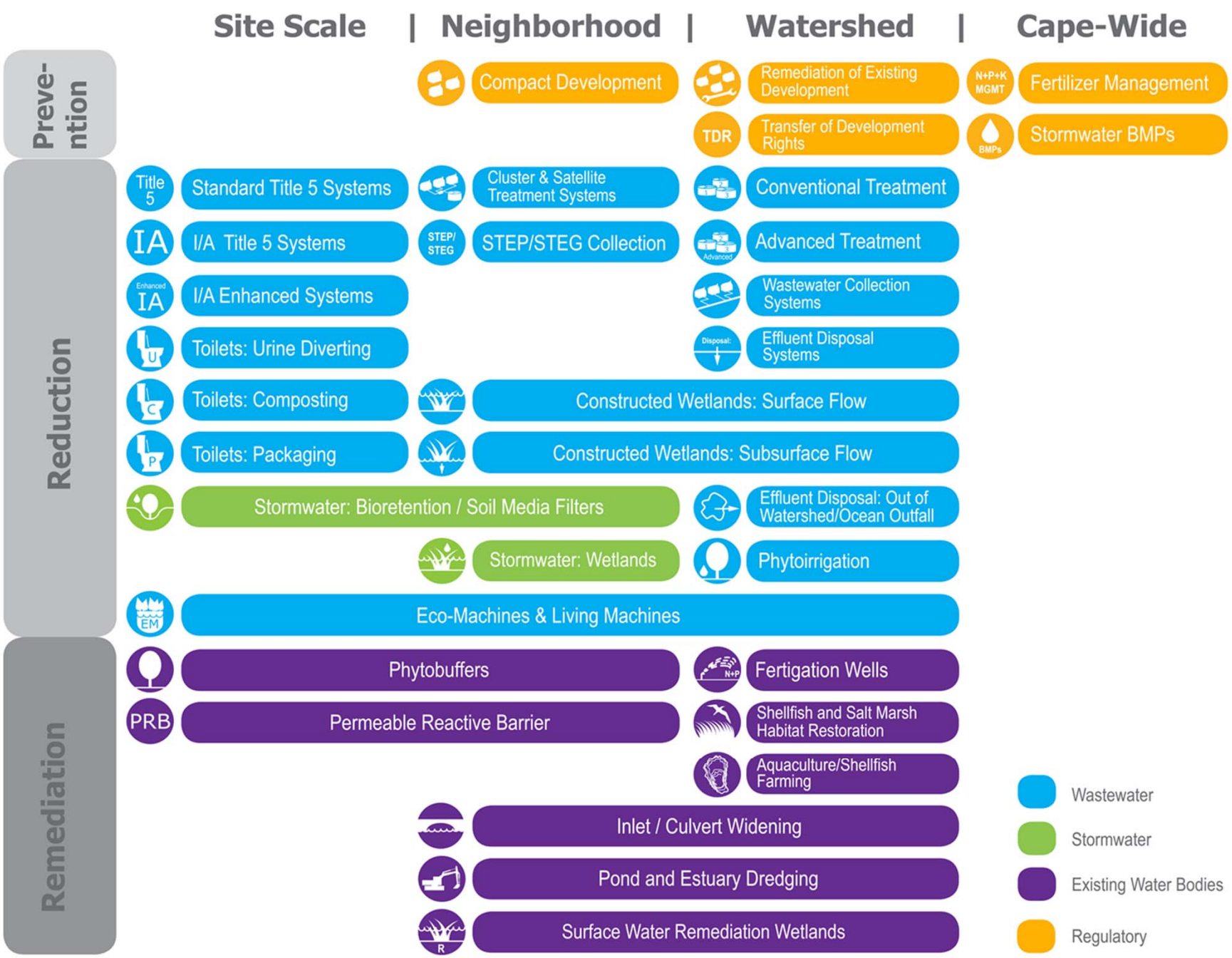


RLI — Regulatory, Legal & Institutional Work Group

TAC — Technical Advisory Committee of Cape Cod Water Protection Collaborative

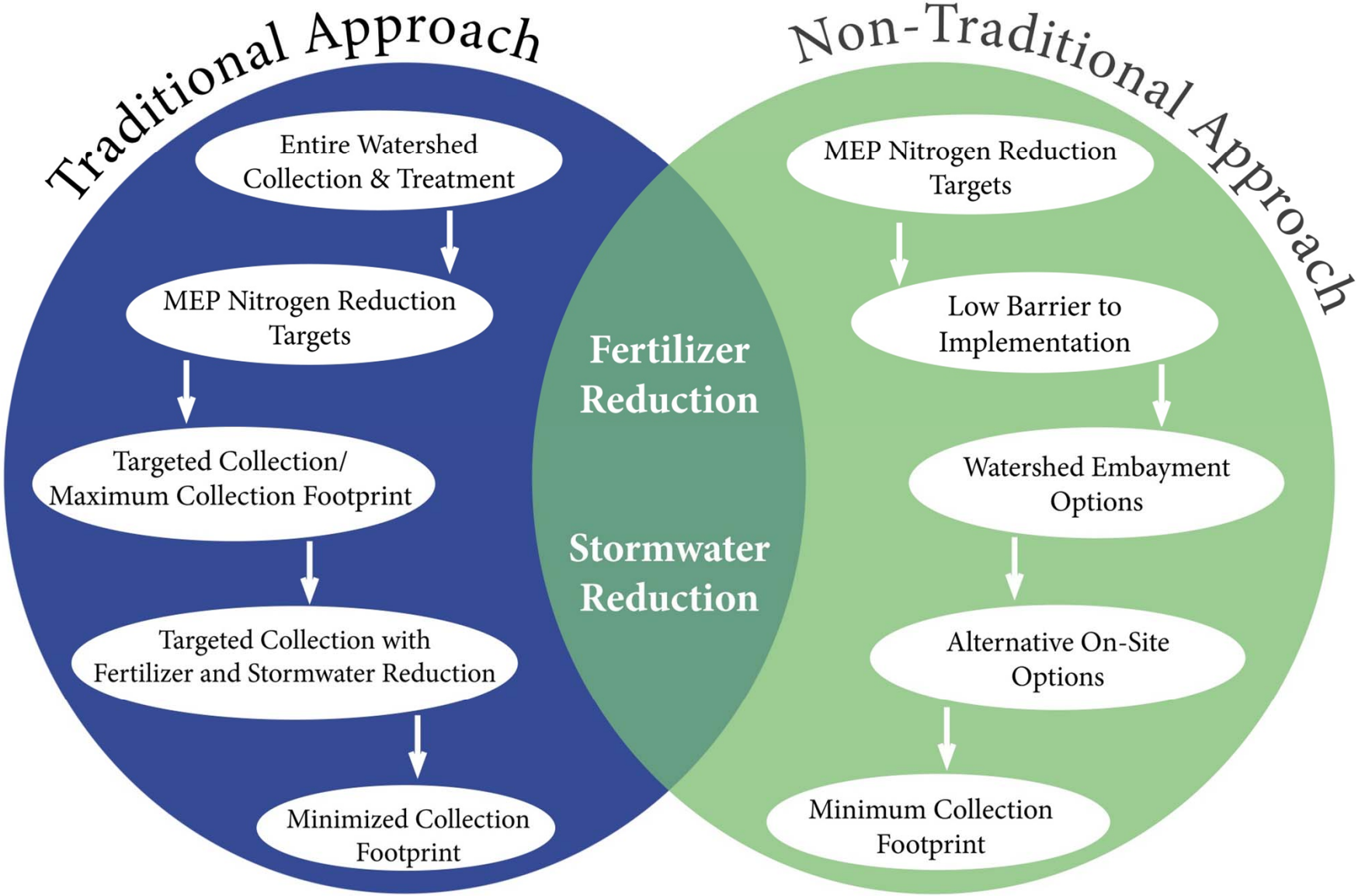
208 Planning Process

"Watershed Working Group - Pleasant Bay - Workshop 3"

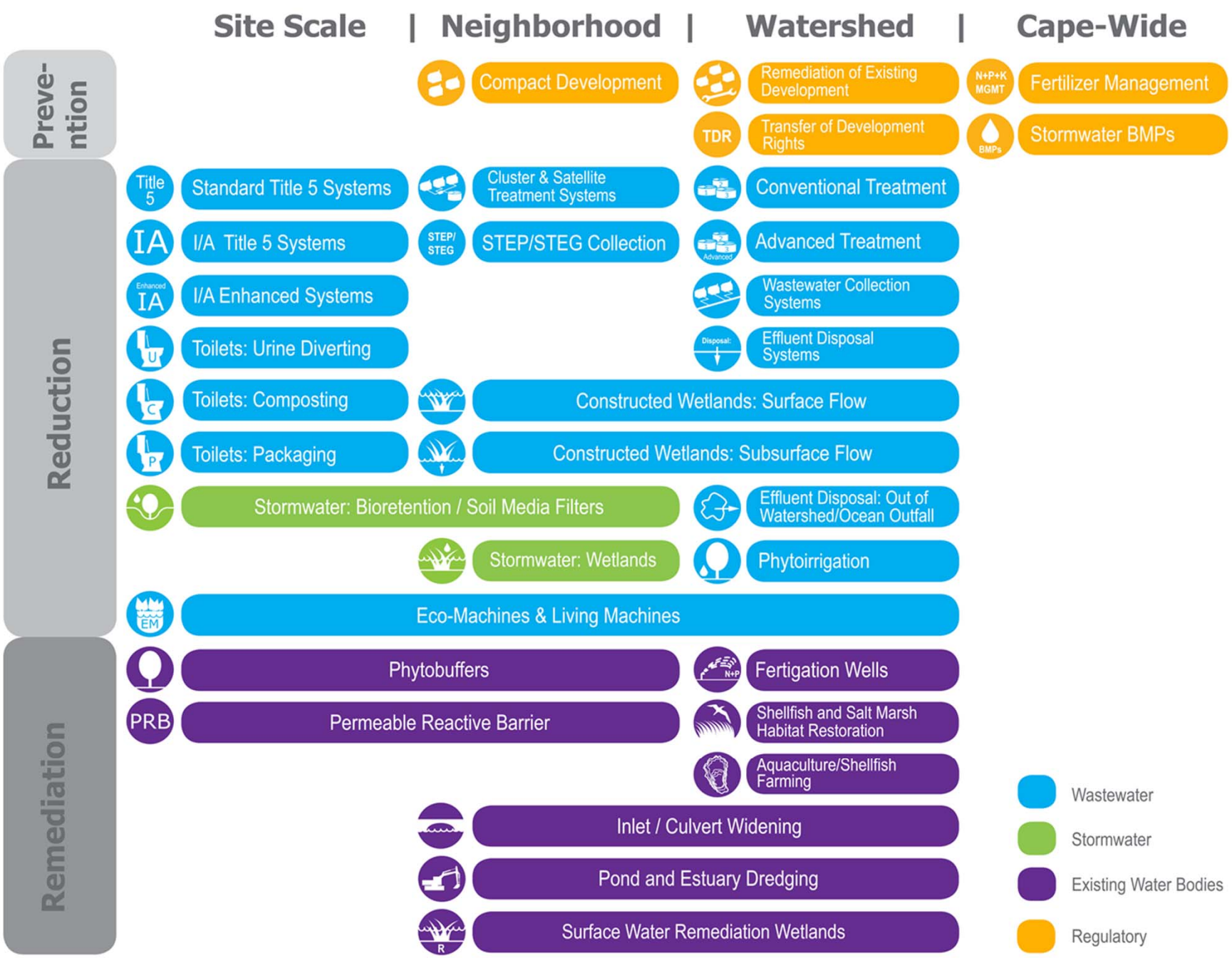


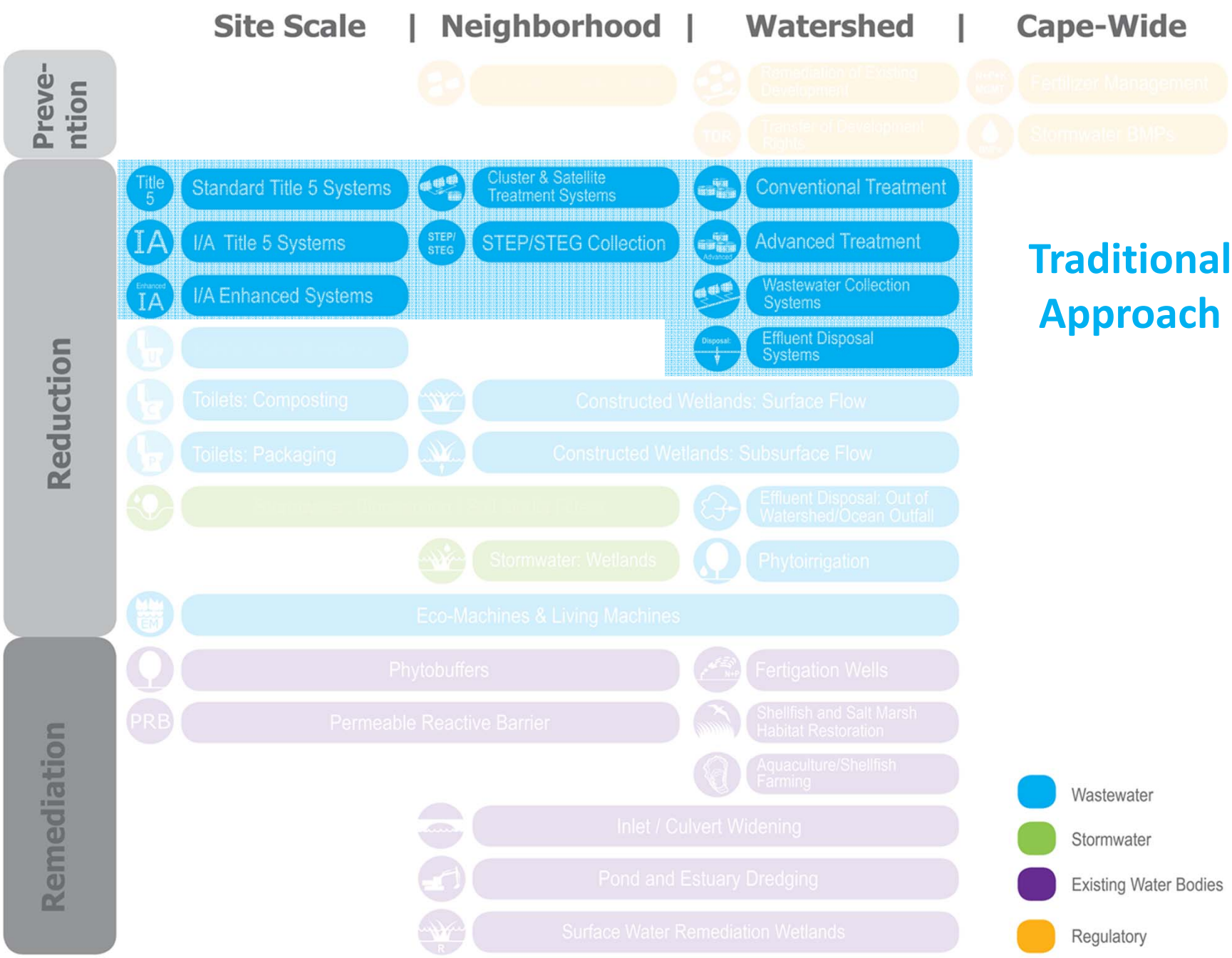
Goal of Today's Meeting:

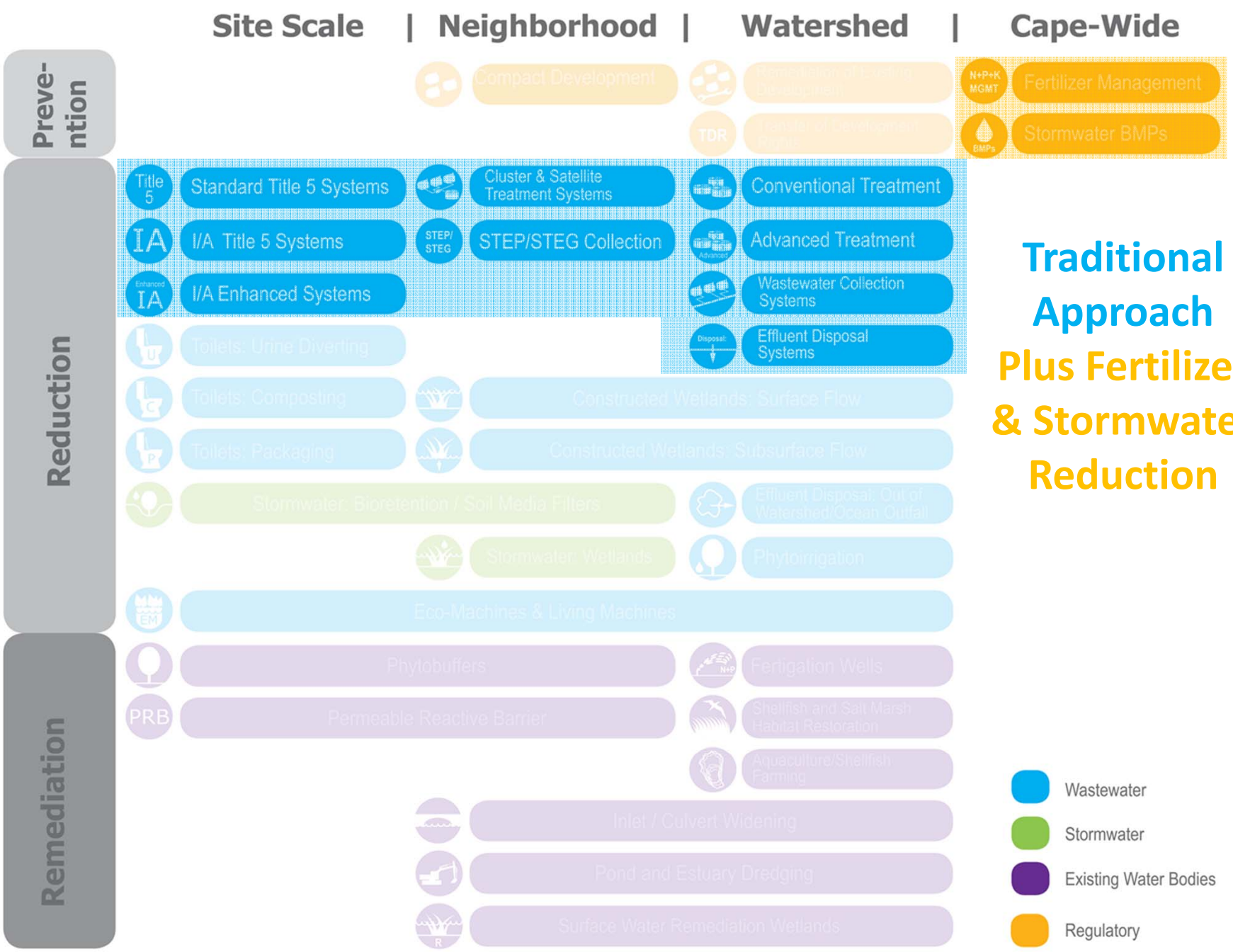
- To discuss the approach for developing watershed scenarios that will remediate water quality impairments in your watersheds.
- To identify preferences, advantages and disadvantages of a set of scenarios of different technologies and approaches, and
- To develop a set of adaptive management principles to guide sub-regional groups in refining scenarios for the 208 Plan.


Traditional Approach
Entire Watershed Collection & Treatment
MEP Nitrogen Reduction Targets
Targeted Collection/ Maximum Collection Footprint
Targeted Collection with Fertilizer and Stormwater Reduction
Minimized Collection Footprint
Fertilizer Reduction
Stormwater Reduction
Non-Traditional Approach
MEP Nitrogen Reduction Targets
Low Barrier to Implementation
Watershed Embayment Options
Alternative On-Site Options
Minimum Collection Footprint

"Watershed Working Group - Pleasant Bay - Workshop 3"




Site Scale | Neighborhood | Watershed | Cape-Wide
Preve-ntion
Reduction
Remediation
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
Enhanced IA
I/A Enhanced Systems
Wastewater Collection Systems
Disposal:
Effluent Disposal Systems
Toilets: Composting
Constructed Wetlands: Surface Flow
Toilets: Packaging
Constructed Wetlands: Subsurface Flow
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
Fertilizer Management
Stormwater BMPs
Traditional Approach
Wastewater
Stormwater
Existing Water Bodies
Regulatory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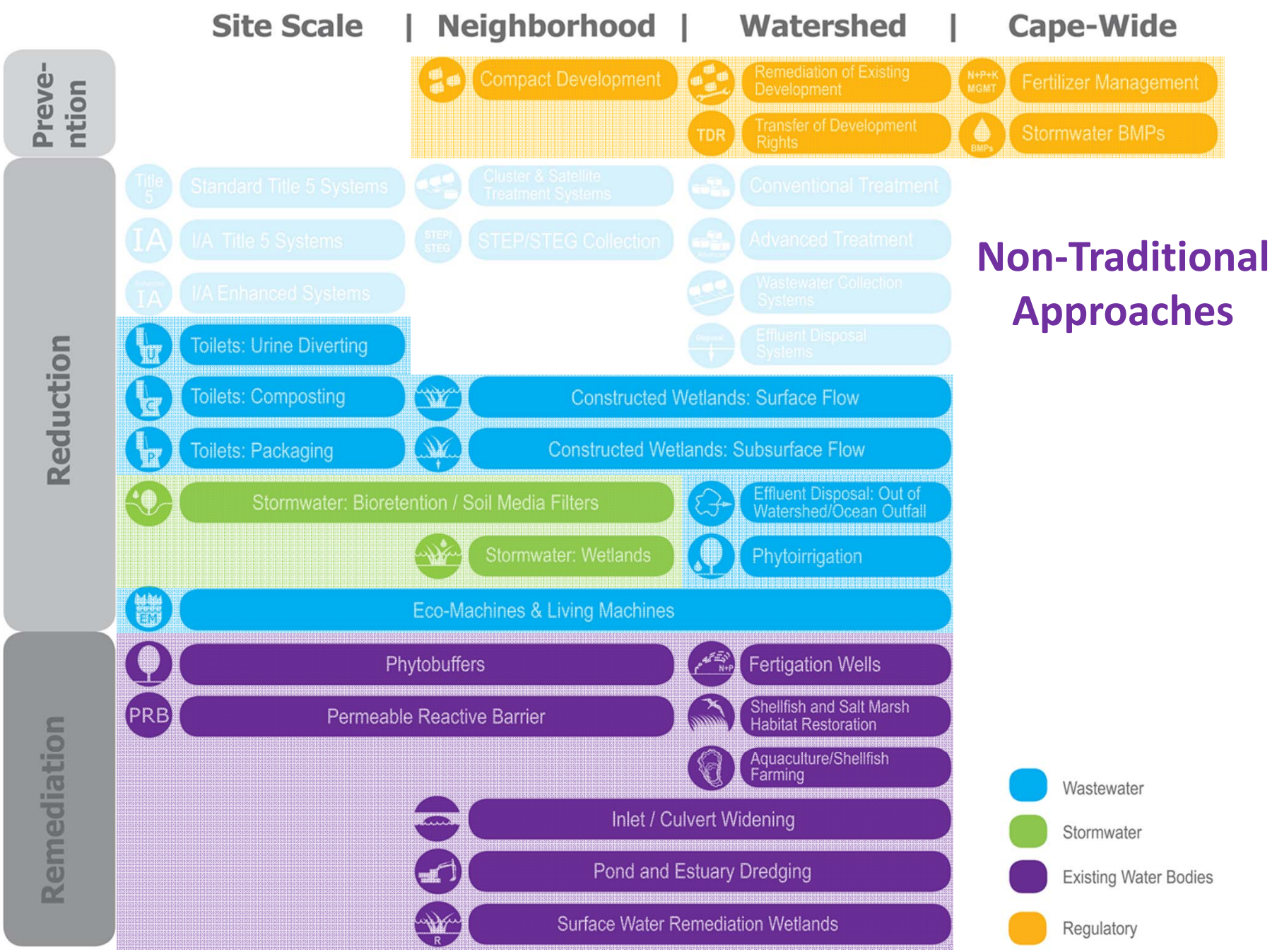
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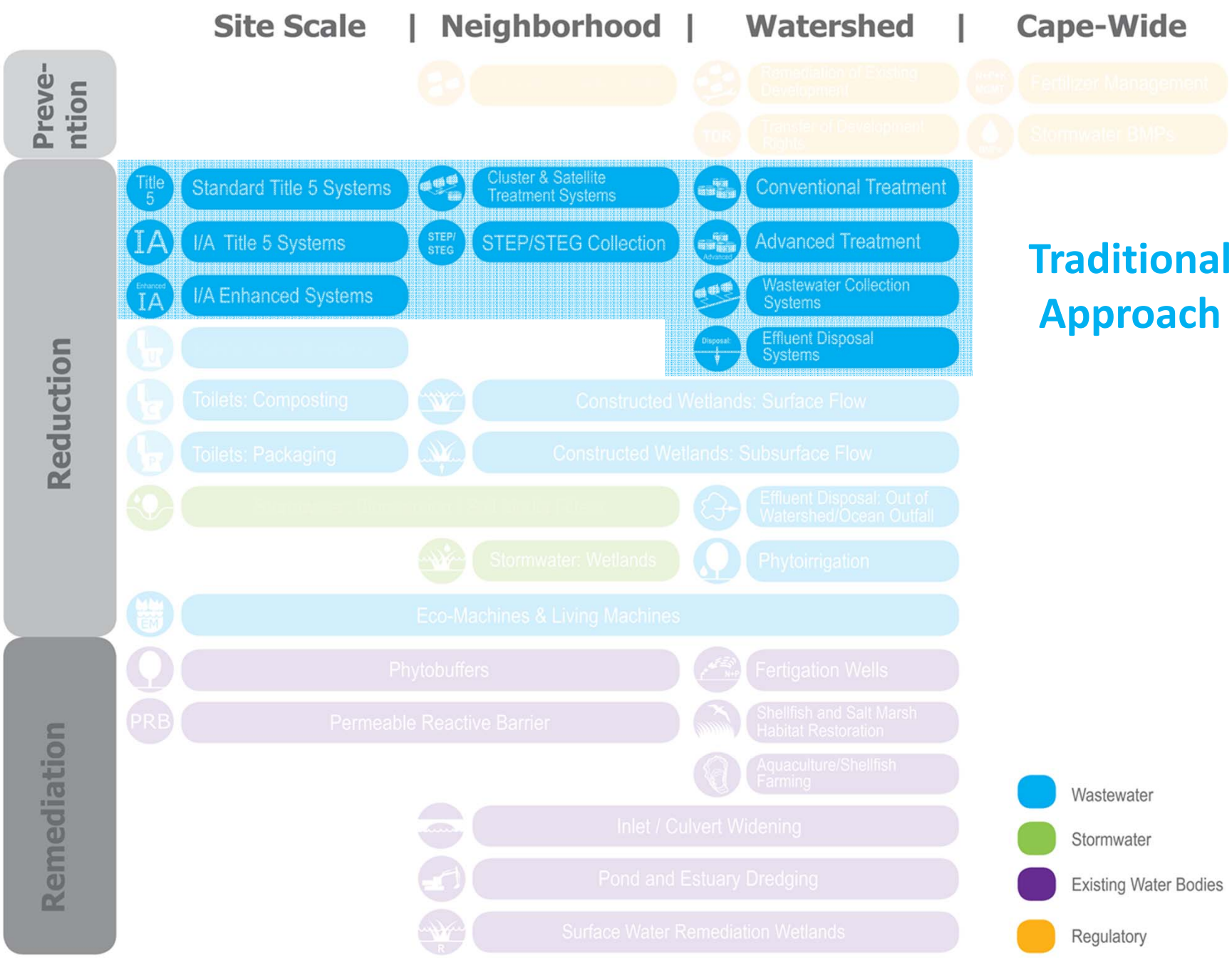
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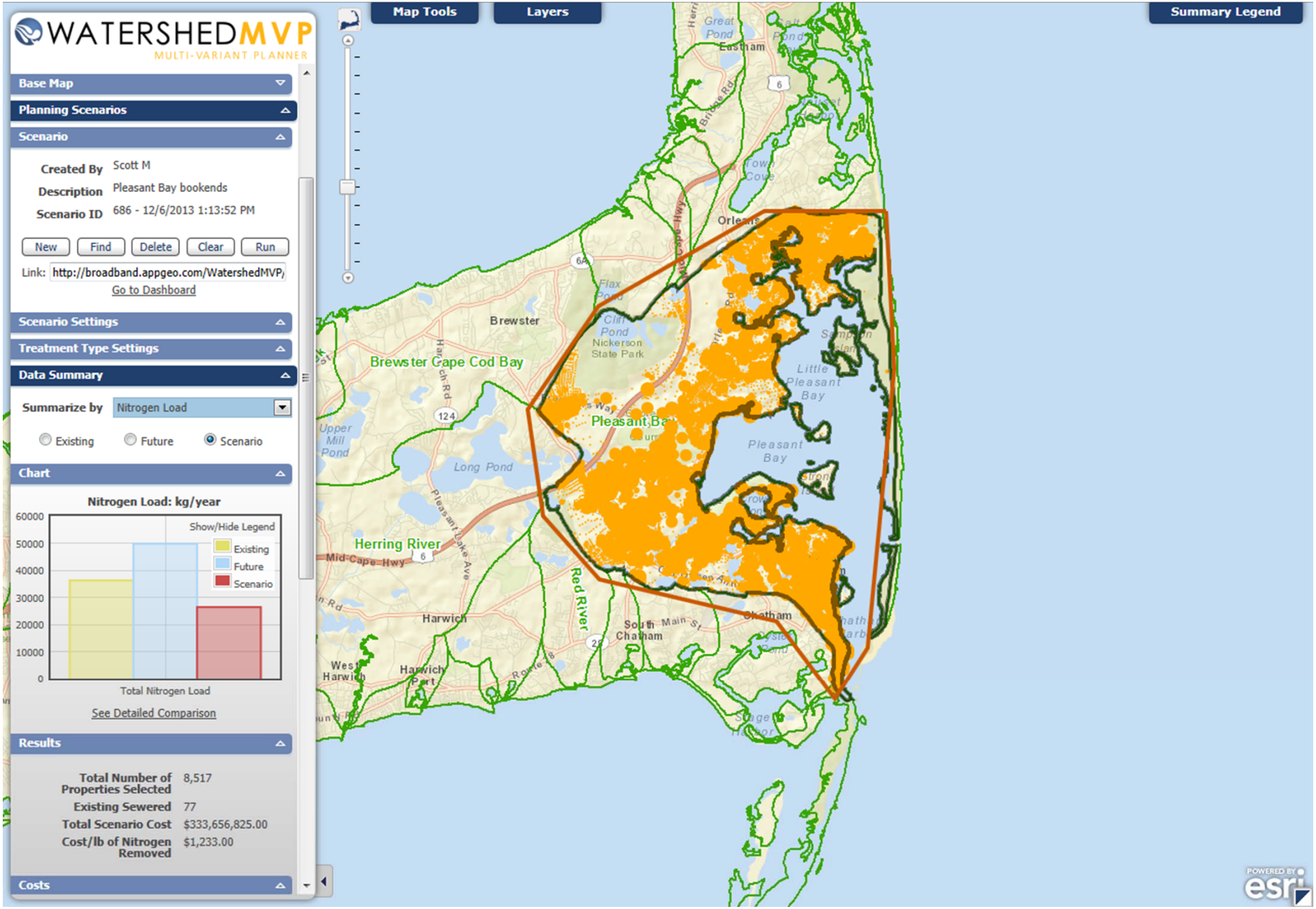
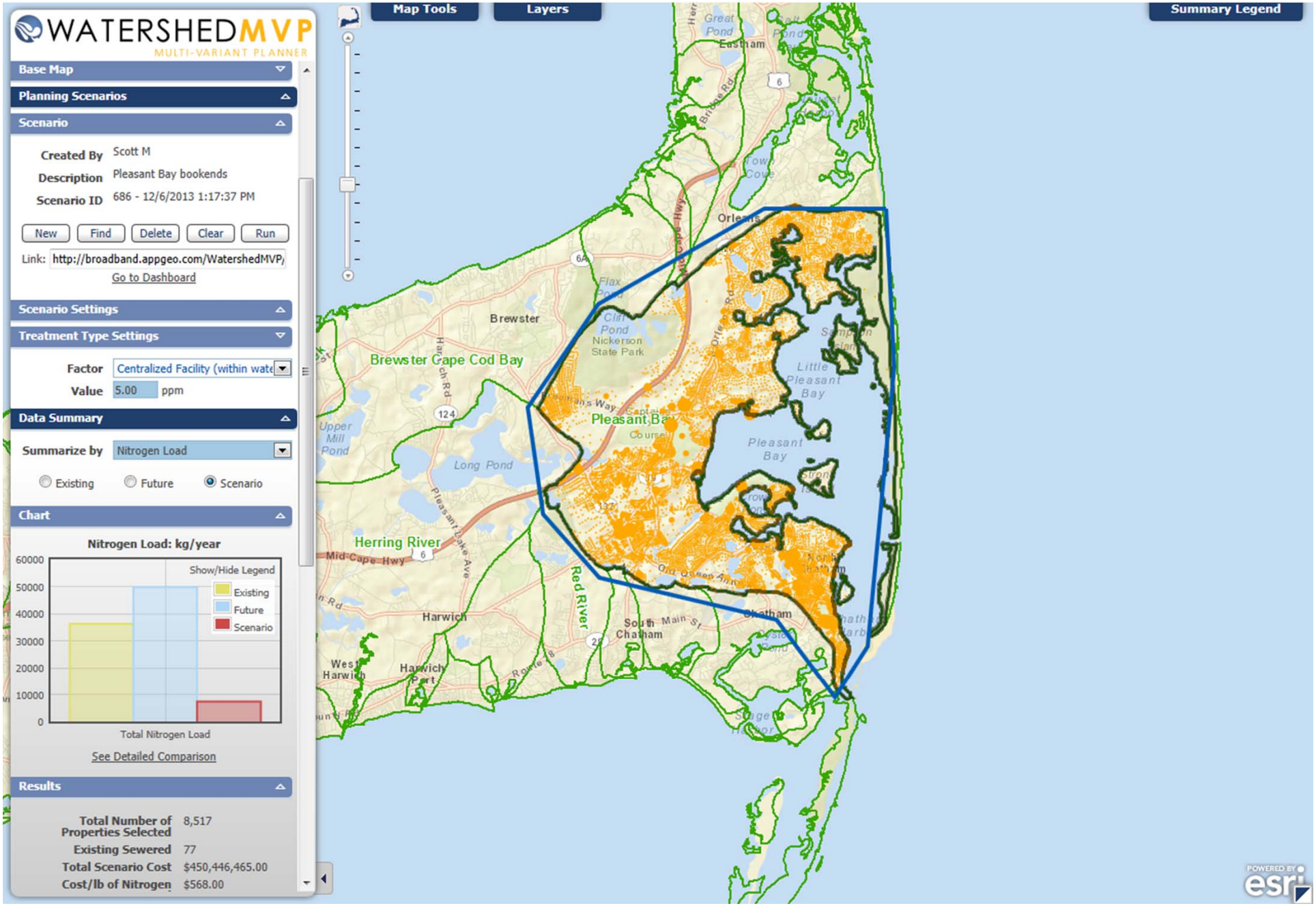
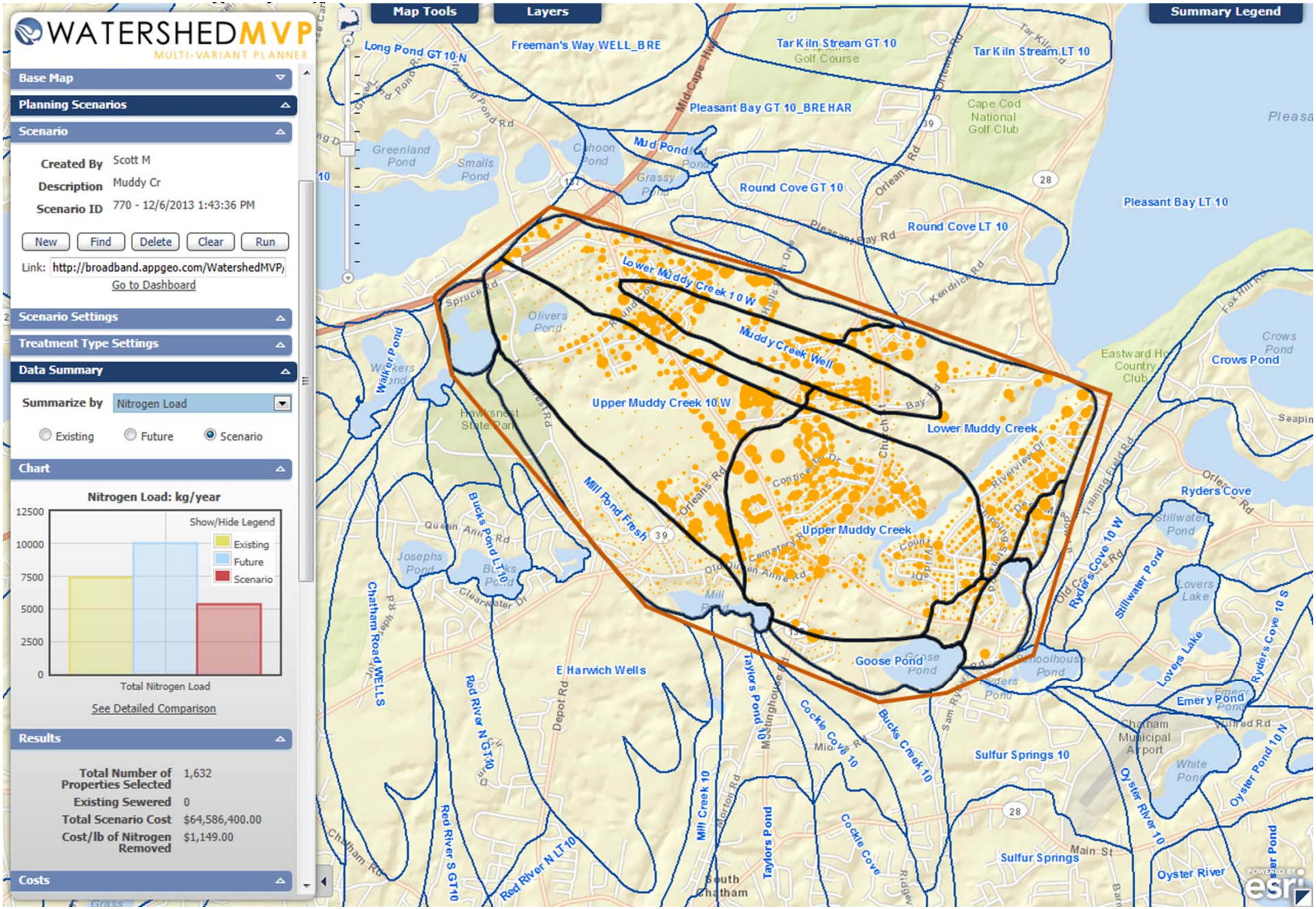
Watershed-Wide Innovative/Alternative (I/A) Onsite Systems



Watershed-Wide Centralized Treatment with Disposal Inside the Watershed



Watershed-Wide (Muddy Creek) Innovative/Alternative (I/A)



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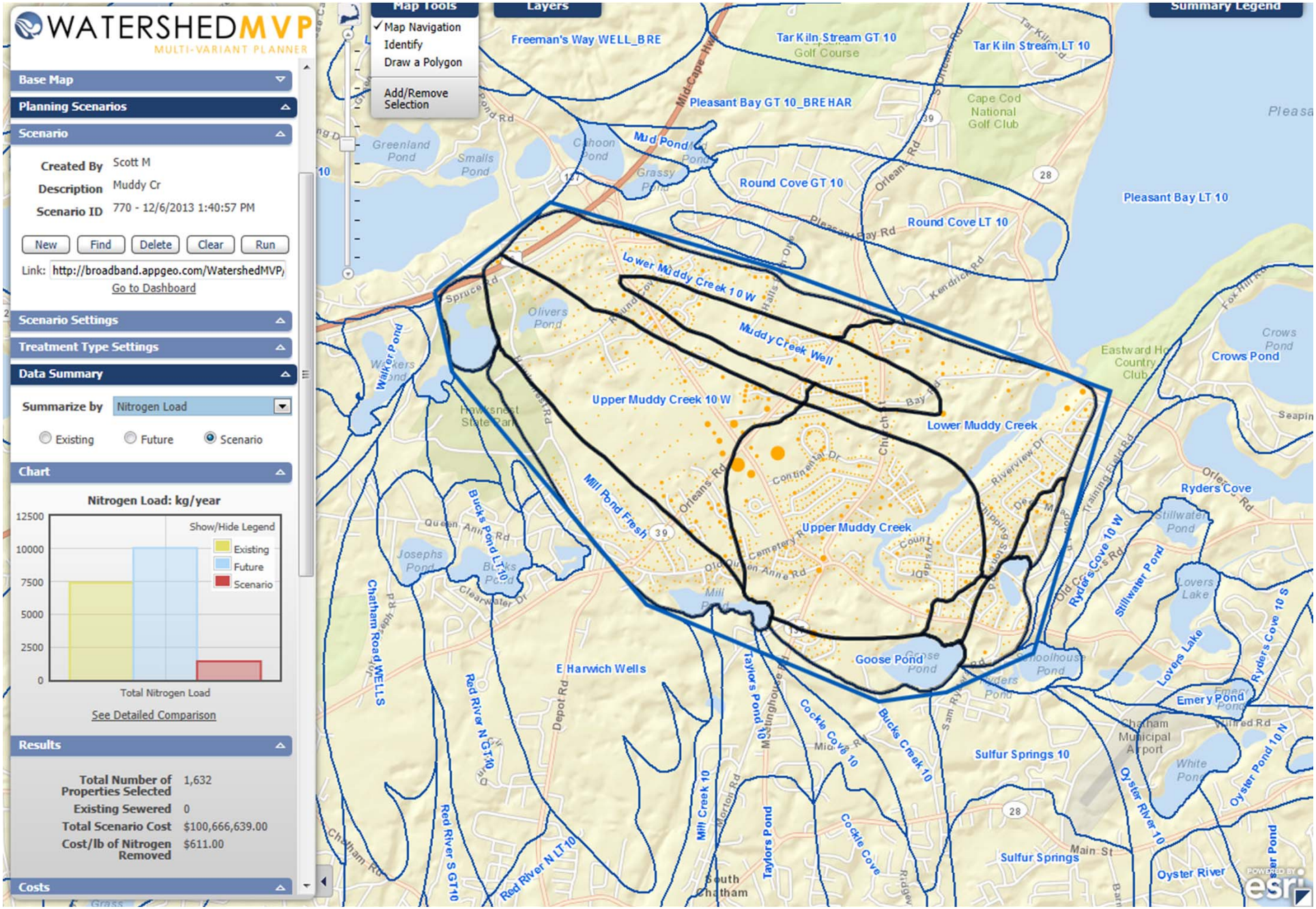

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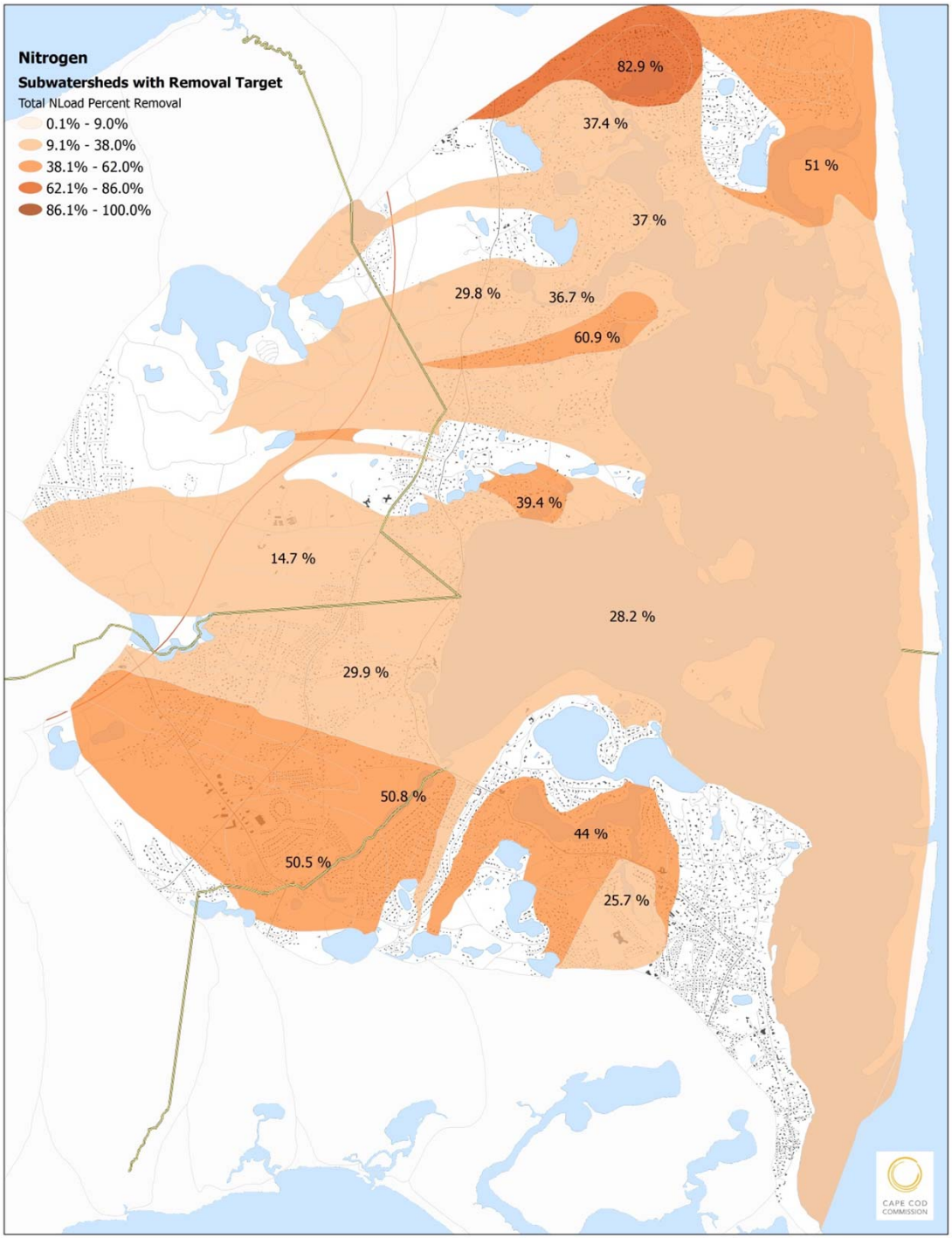
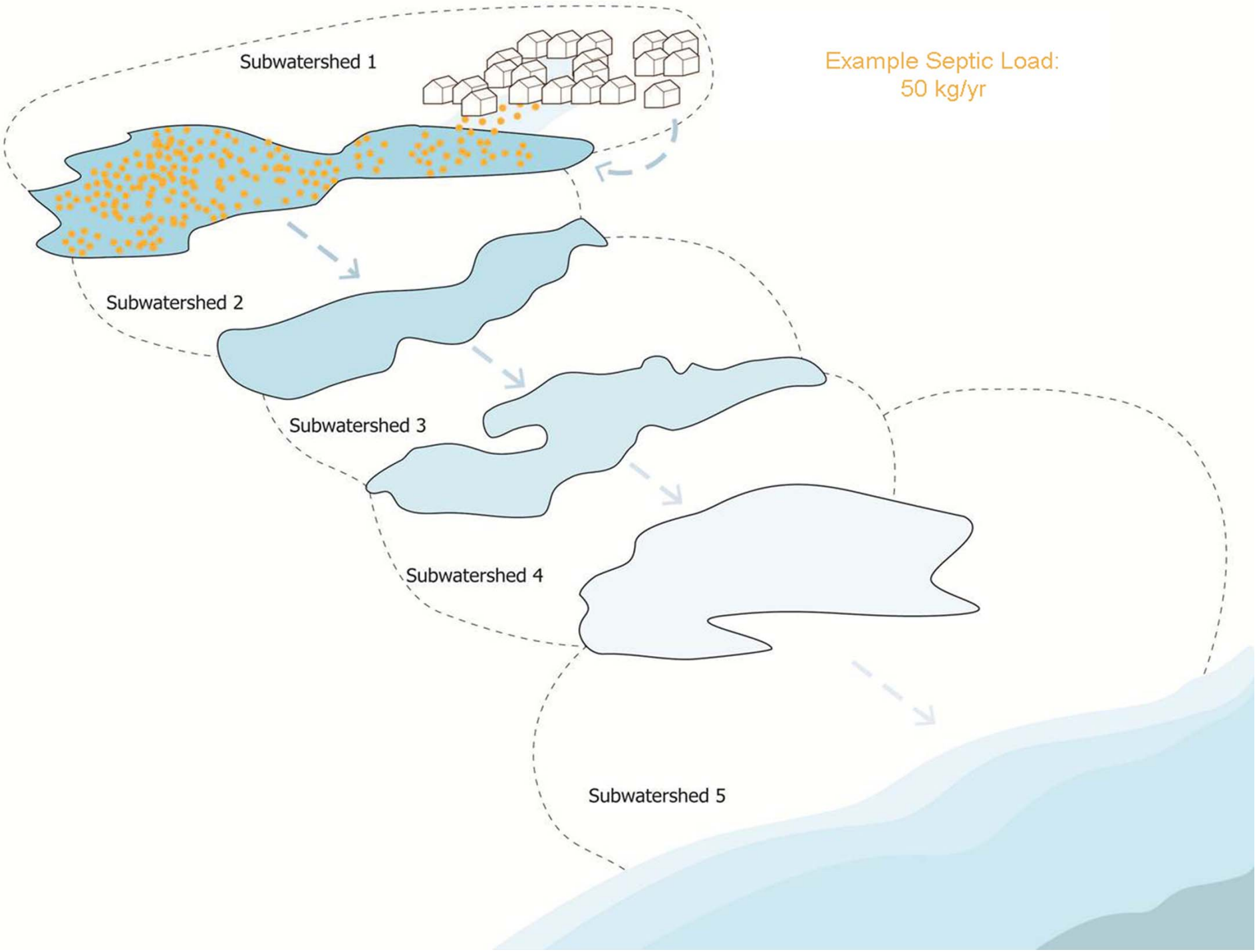
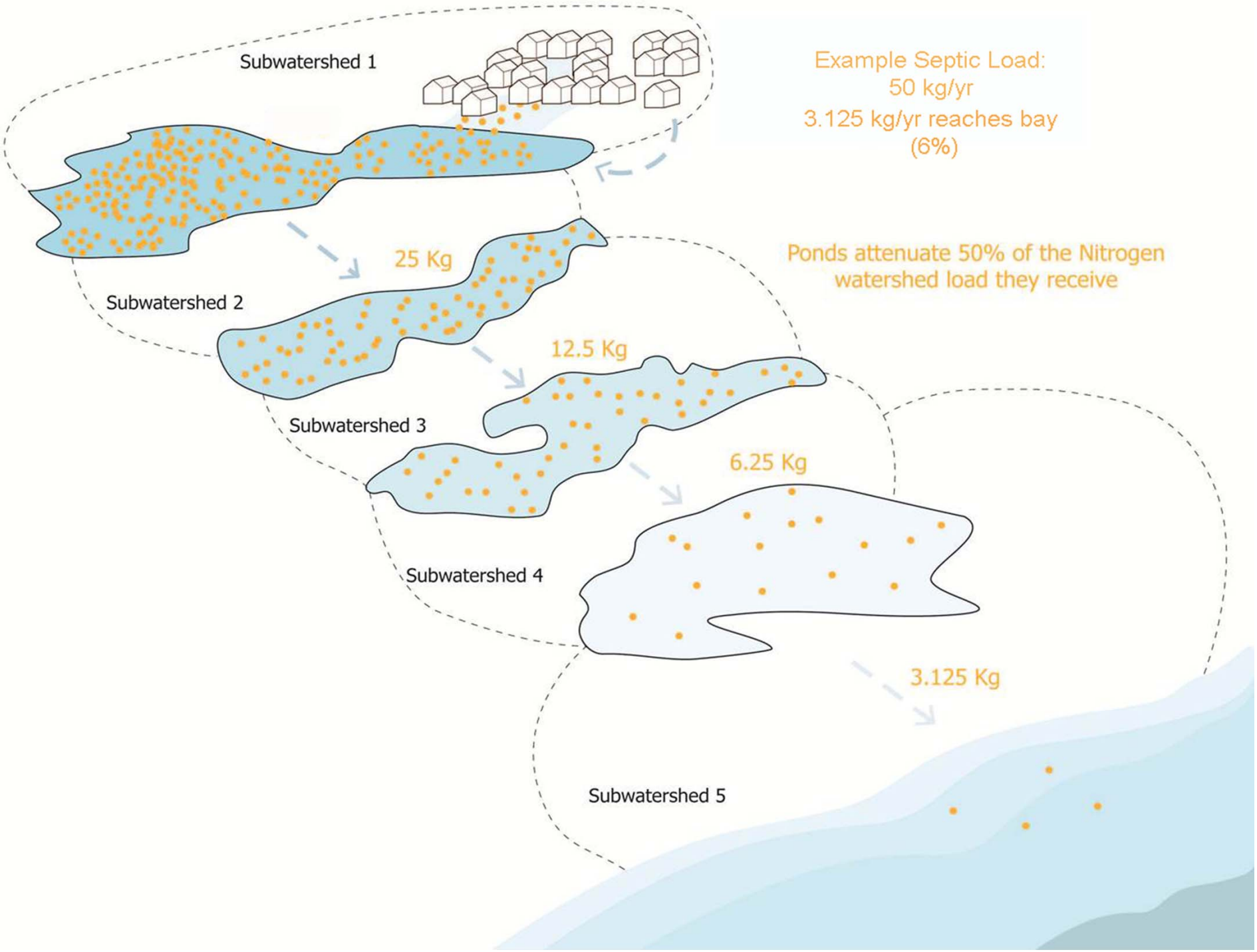
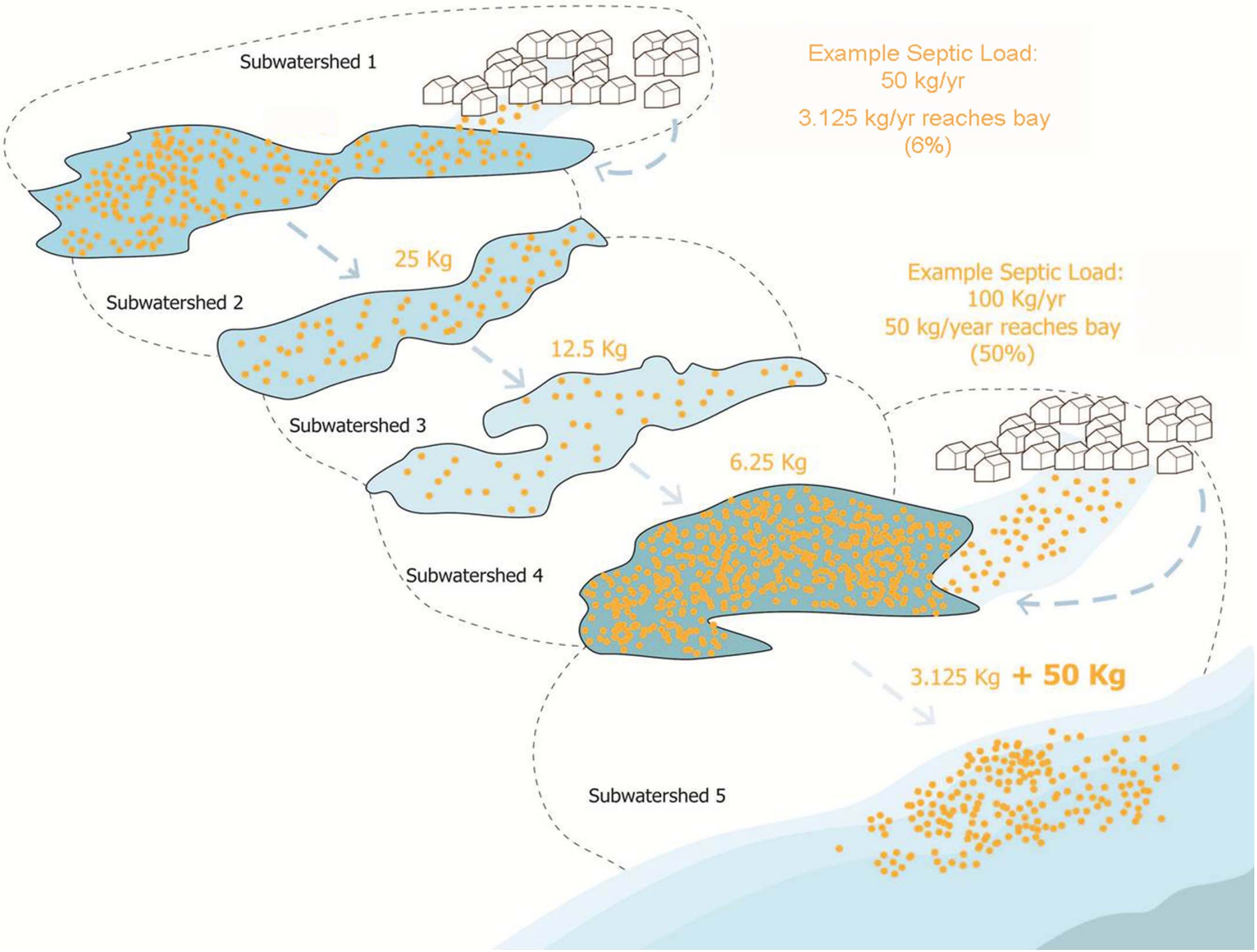



Subwatershed 1
Example Septic Load:
50 kg/yr
Subwatershed 2
Subwatershed 3
Subwatershed 4
Subwatershed 5


Subwatershed 1
Example Septic Load:
50 kg/yr
3.125 kg/yr reaches bay
(6%)
25 Kg
Subwatershed 2
Ponds attenuate 50% of the Nitrogen
watershed load they receive
12.5 Kg
Subwatershed 3
6.25 Kg
Subwatershed 4
3.125 Kg
Subwatershed 5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50 kg/year reaches bay
(50%)
12.5 Kg
Subwatershed 3
6.25 Kg
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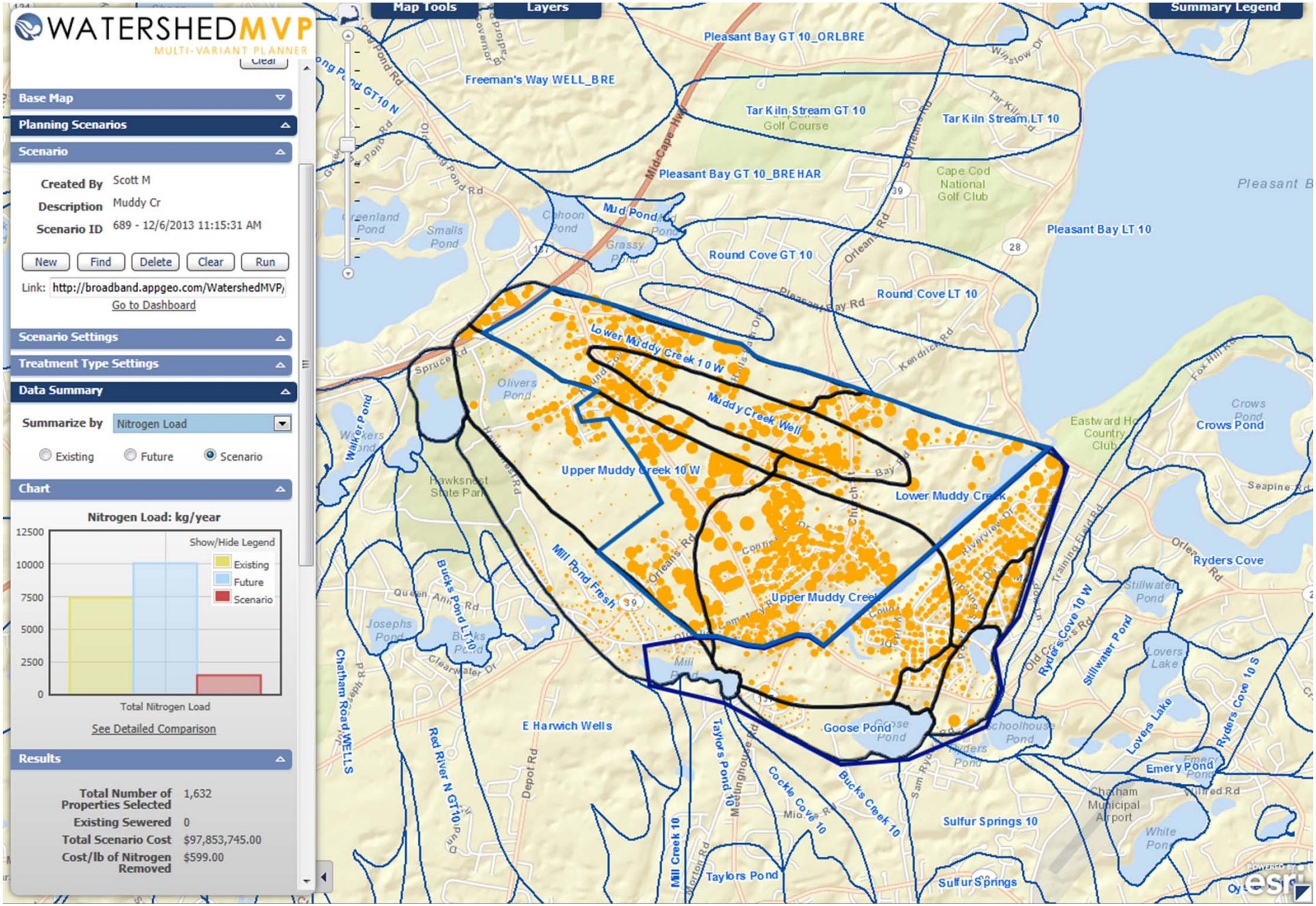
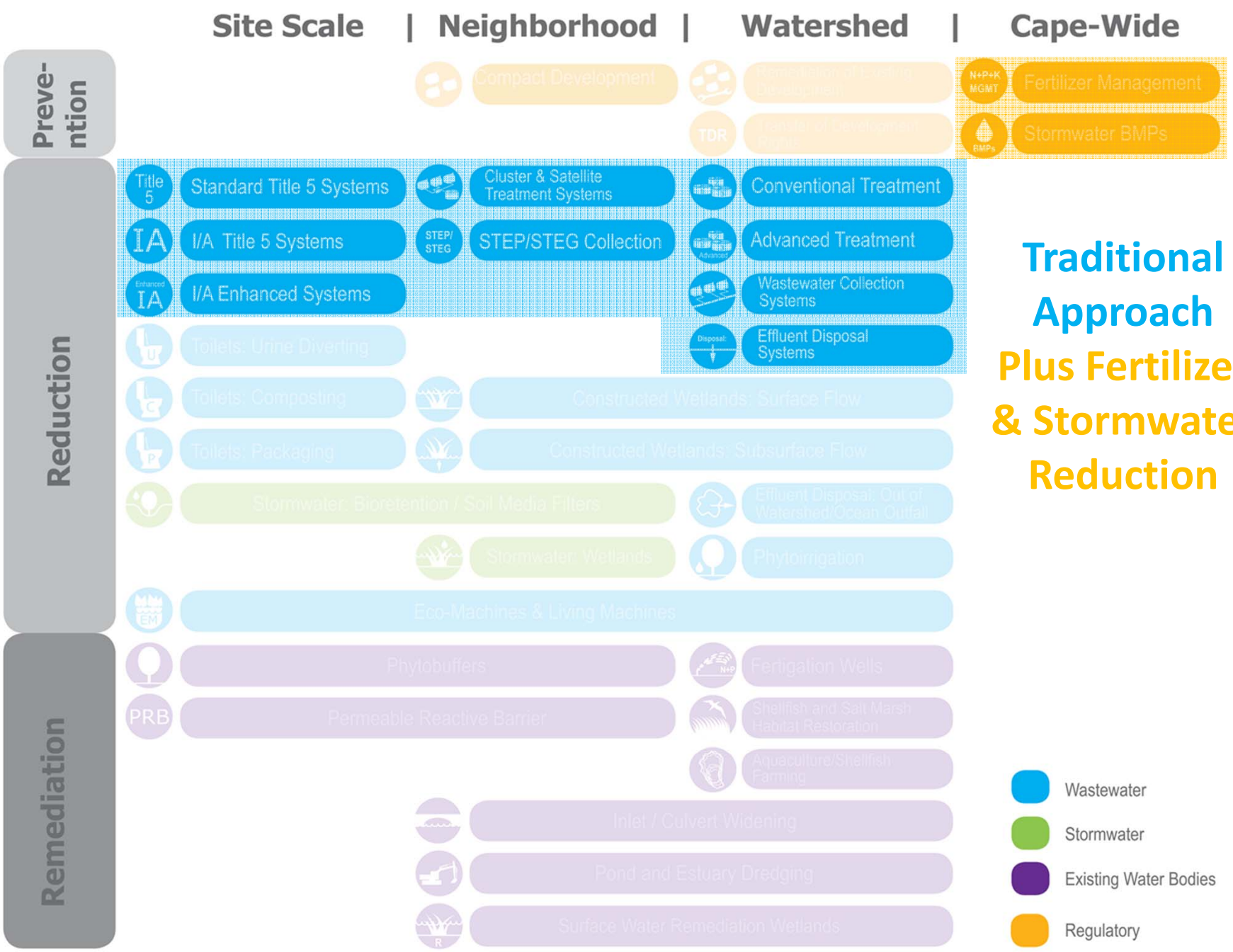
3.125 Kg + 50 Kg
Subwatershed 5

Targeted Centralized Treatment with Disposal in Harwich

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Traditional Approach Plus Fertilizer & Stormwater Reduction
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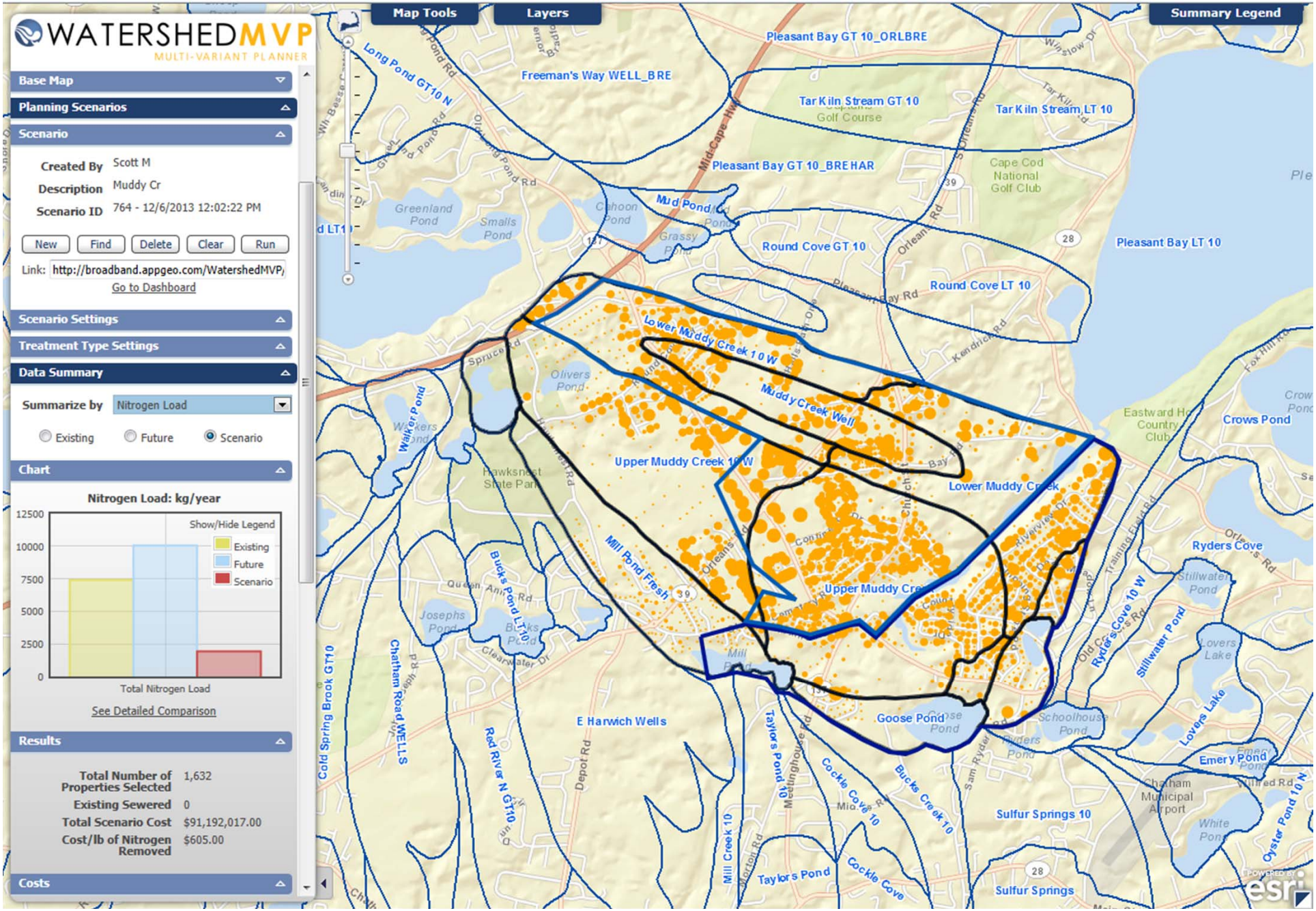
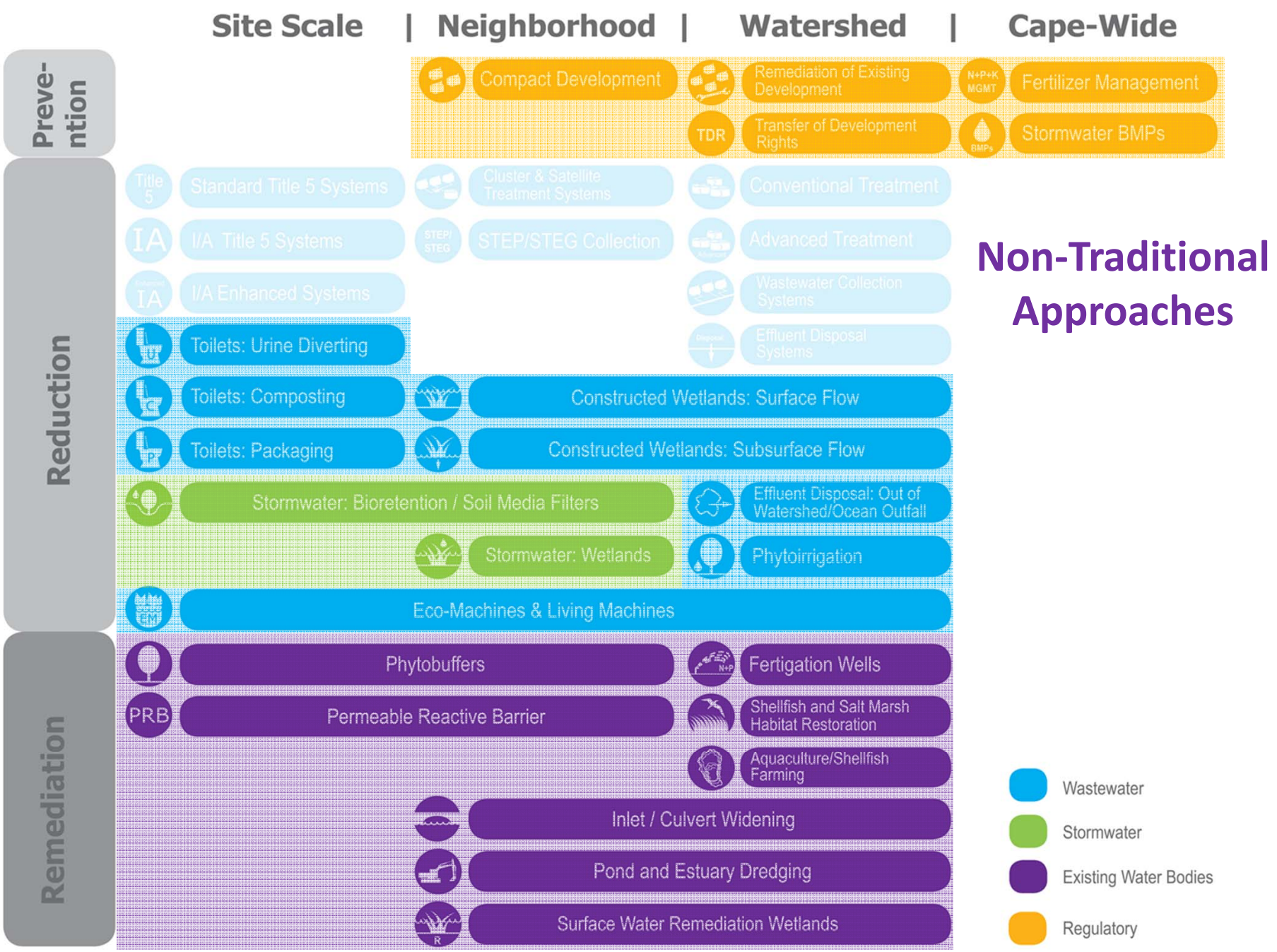
Targeted Centralized Treatment with a 50% Reduction in Fertilizer and Stormwater

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Problem Solving Approach
1
2
3
4
5
6
7
Wastewater
Existing Water Bodies
Regulatory
Targets/Reduction Goals
Present Load: X kg/day
Target: Y kg/day
Reduction Required: N kg/day
Other Wastewater Management Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management
Low Barrier to Implementation
A. Fertilizer Management
B. Stormwater Mitigation
N+P+K MGMT
BMPs
Watershed/Embayment Options
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture
PRB
R
Alternative On-Site Options
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems
Title 5
Enhanced IA
IA
Priority Collection/High-Density Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
Advanced
Disposal:
STEP/ STEG
Supplemental Sewering
Advanced

Watershed Calculator **Muddy Creek**

MEP Targets and Goals:		**kg/day**	**Nitrogen (kg/yr)**
Present Total Nitrogen Load:		18.458	6,737
wastewater		13.496	4,926
fertilizer			612
stormwater			776
Target Nitrogen Load:		6.751	2,464
Chatham Portion to WWTF		1,785	
Nitrogen Removal Required:		**6.817**	**2,488**
Total Number of Properties:	1408		

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Low Barrier to Implementation:	**Reduction by Technology (Kg/yr)**	**Remaining to Meet Target (Kg/yr)**	**Unit Cost ($/lb N)**
Fertilizer Management	306	2,182	
Stormwater Mitigation	388	1,794	

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Oyster Beds/Aquaculture	2 acres	500	445	$0

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Floating Constructed Wetlands	1000 cu feet	450	-5	$61

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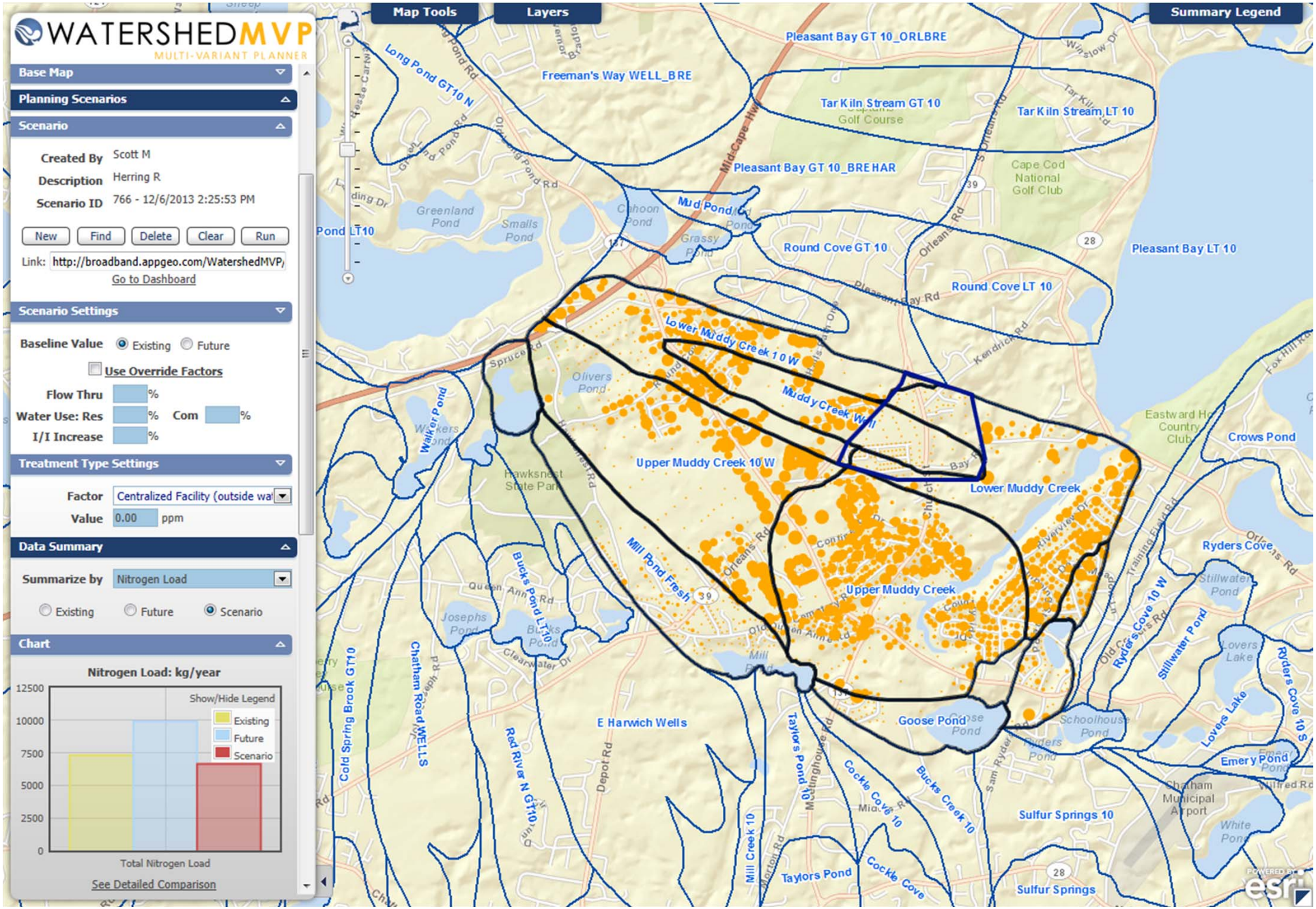
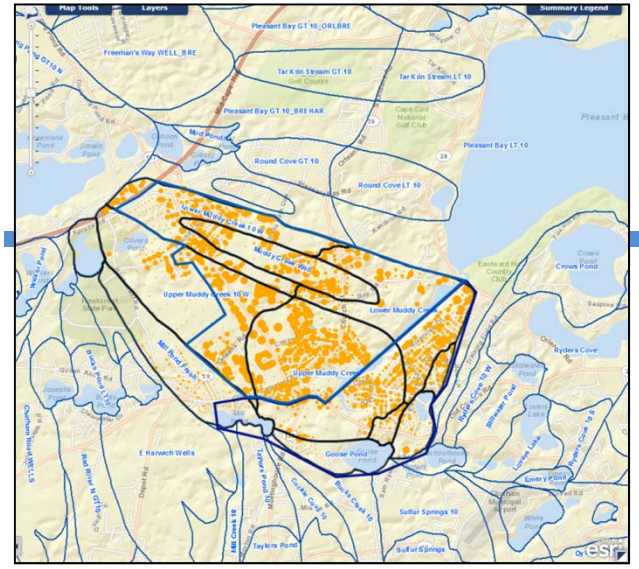
Floating Constructed Wetlands	1000	cu feet	450	-5	$61
Sewering	-1	homes	-5	0	$1,000

Targeted Centralized Treatment after Applying Alternative Strategies



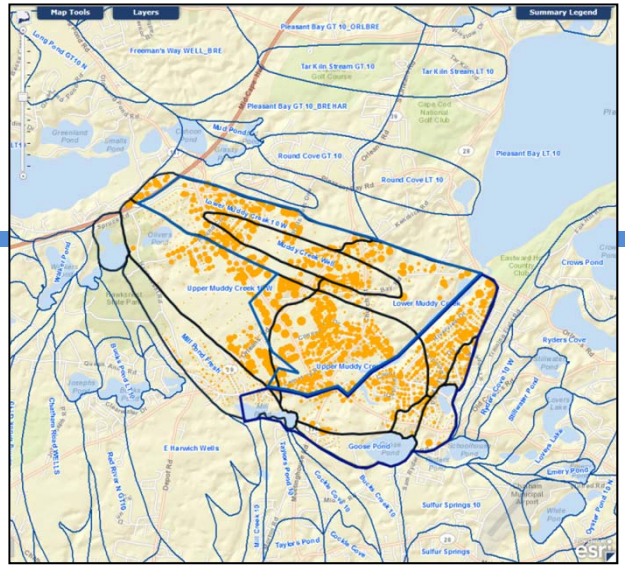
Scenario Comparison

Targeted Collection



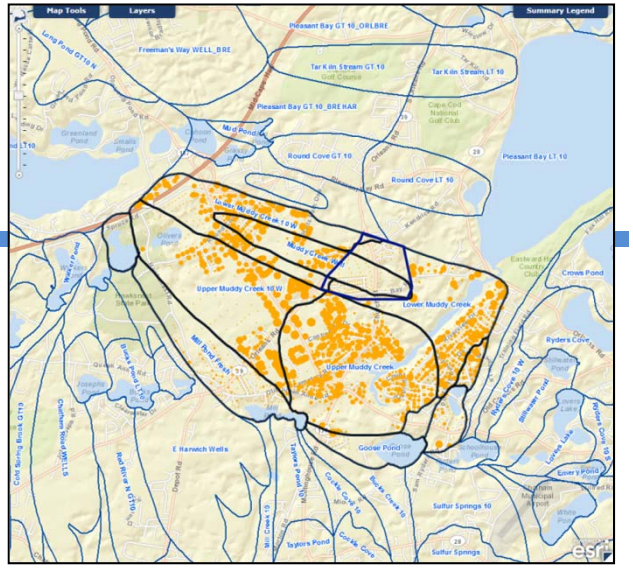
- Achieves TMDL[1]
- Cost/lb N = $600
- Treated Flow = 145,000 gpd

Targeted Collection after a 50% reduction in fertilizer and stormwater



- Achieves TMDL[1]
- Cost/lb N = $600
- Treated Flow = 125,000 gpd

Targeted Collection after a 50% reduction in fertilizer and stormwater & after applying alternative approaches



- Achieves TMDL[1]
- Cost/lb N = $750
- Treated Flow = 20,000 gpd

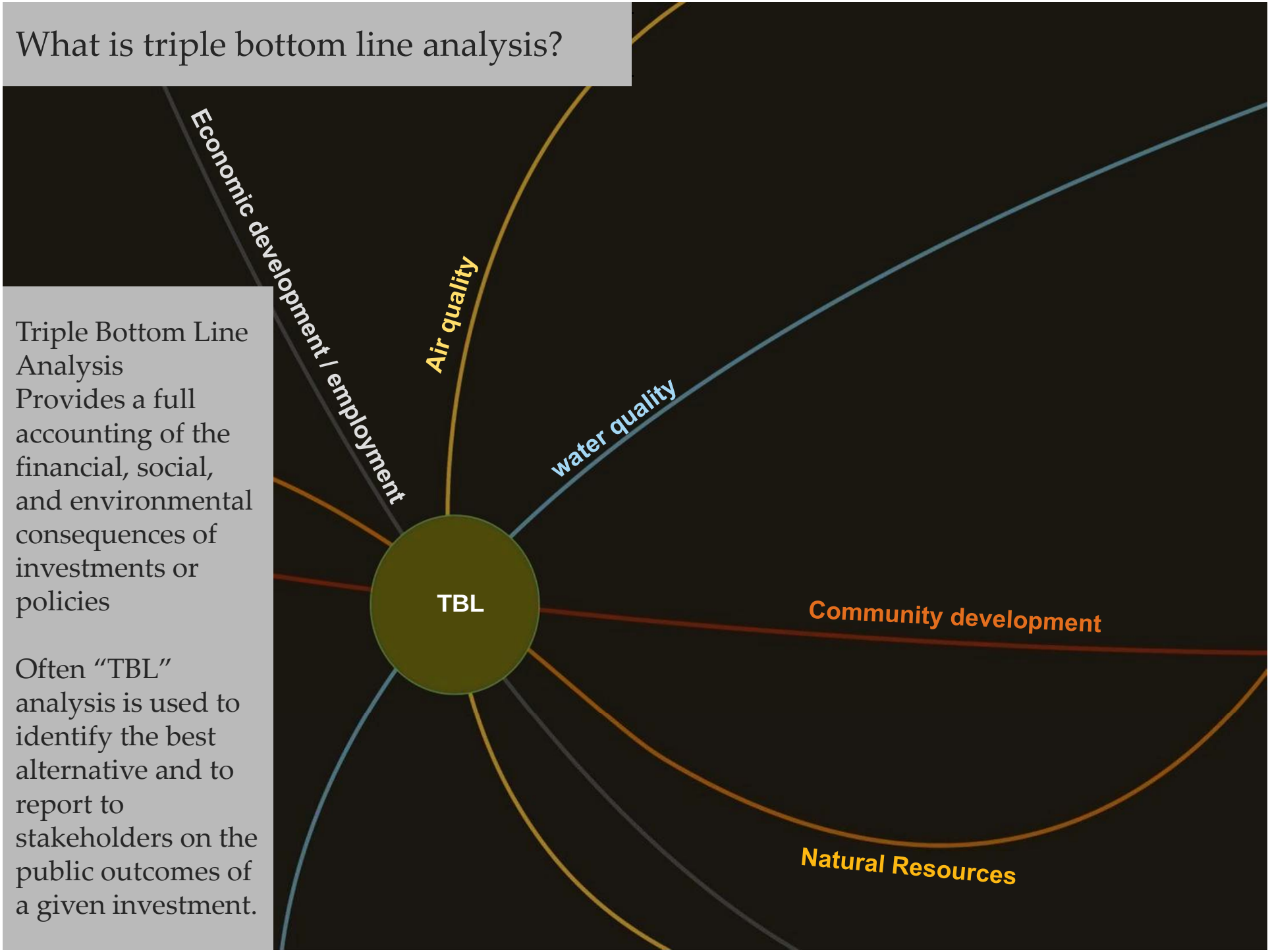
[1] within 5% of goal

Adaptive Management:

A structured approach for addressing uncertainties by linking science and monitoring to decision-making and adjusting implementation, as necessary, to increase the probability of meeting water quality goals in a cost effective and efficient way.

Triple Bottom Line (TBL) Introduction

What is triple bottom line analysis?



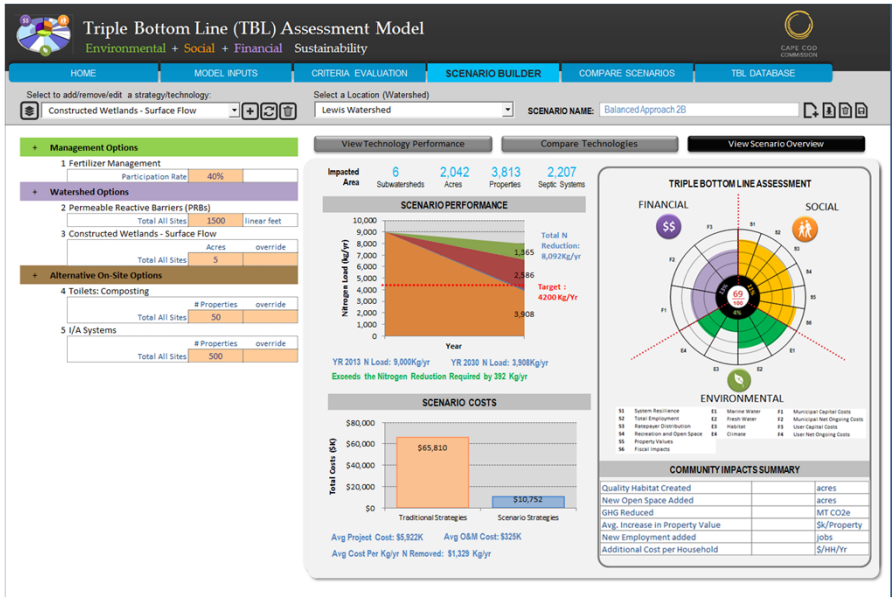
Triple Bottom Line Analysis
Provides a full accounting of the financial, social, and environmental consequences of investments or policies

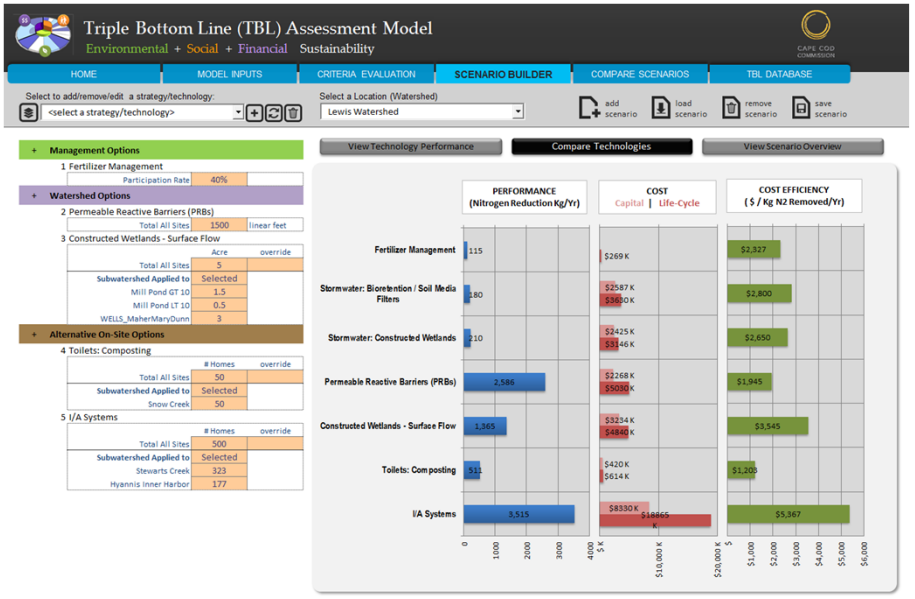
Often "TBL" analysis is used to identify the best alternative and to report to stakeholders on the public outcomes of a given investment.

Why develop a TBL model?

- To consider the financial, environmental, and social consequences of water quality investments and policies in Cape Cod.

- TBL Model evaluates the “ancillary” or downstream consequences of water quality investments not the direct Phosphorous or Nitrogen levels.





Triple Bottom Line (TBL) Assessment Model

Environmental + Social + Financial Sustainability

CAPE COD COMMISSION

HOME | MODEL INPUTS | CRITERIA EVALUATION | SCENARIO BUILDER | COMPARE SCENARIOS | TBL DATABASE

Alternative Definition | Alternative Results | Alternative Scoring Rules

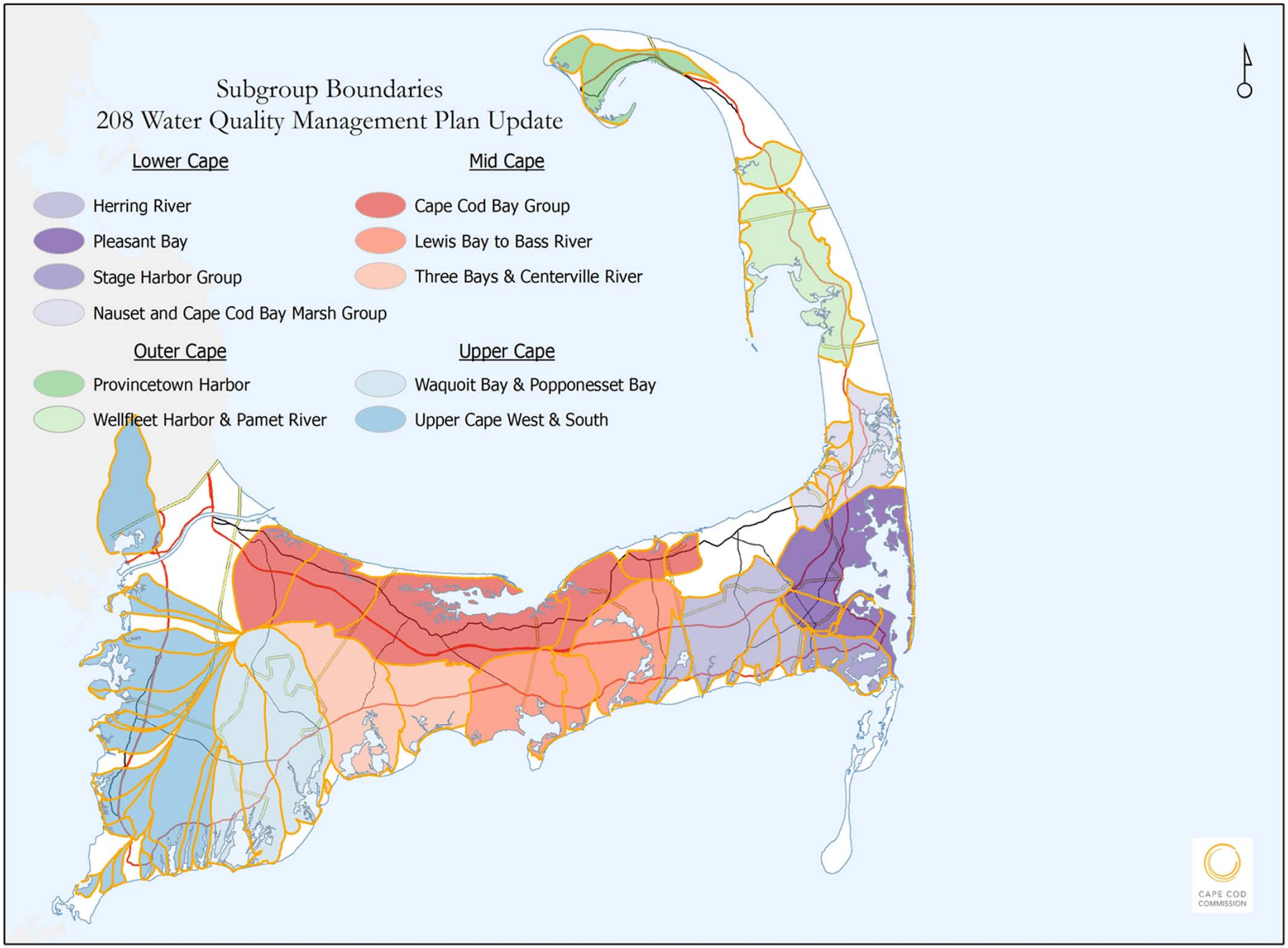
Criterion Scores

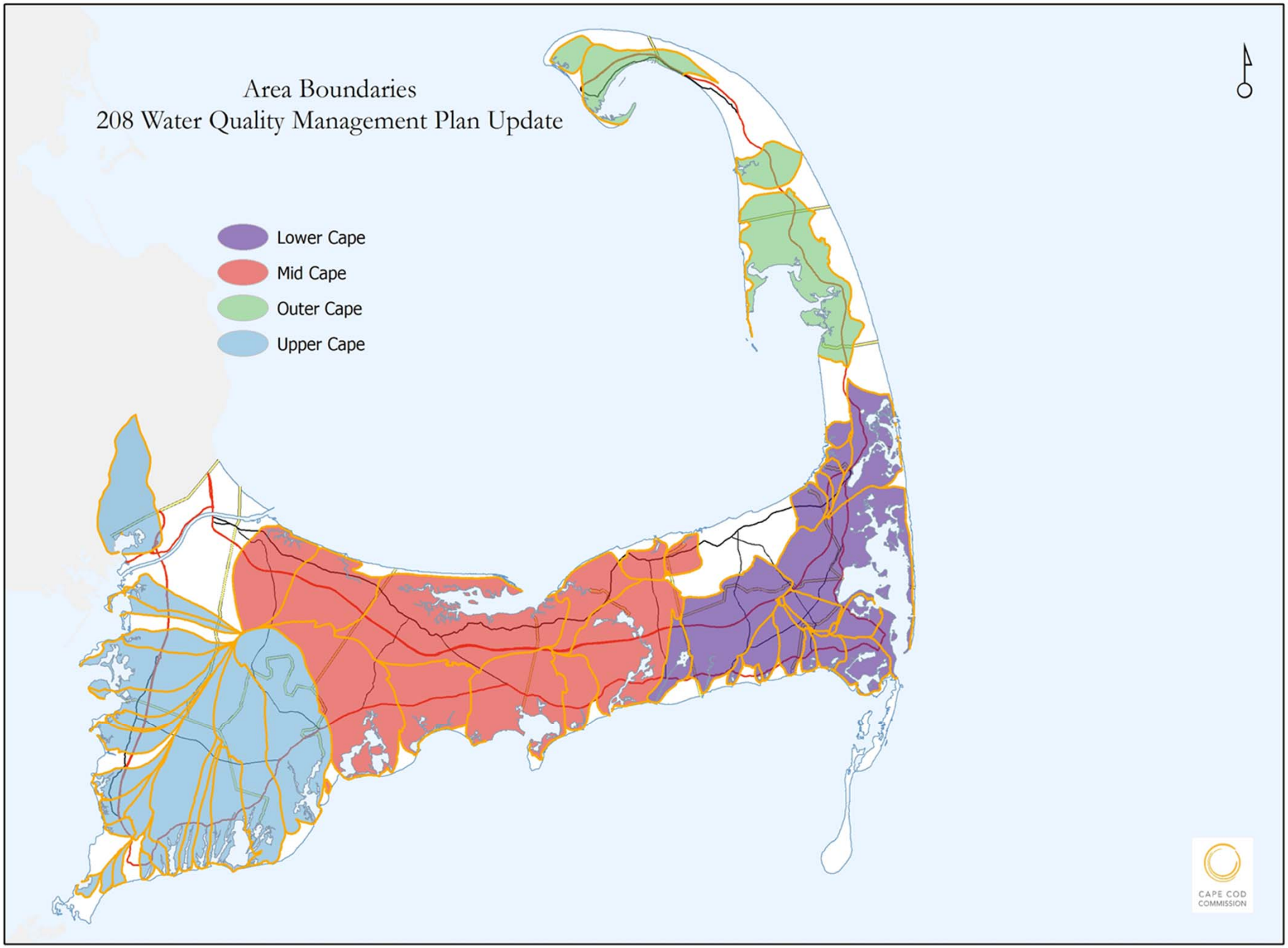
SOCIAL	
System Resilience	S1
Employment	S2
Ratepayer Distribution	S3
Recreation and Open Space	S4
Property Values	S5
Fiscal Impacts	S6
ENVIRONMENTAL	
Marine Water	E1
Fresh Water	E2
Habitat	E3
Climate	E4
FINANCIAL	
Municipal Capital Costs	F1
Municipal Other Costs	F2
Property Owner Capital Costs	F3
Property Owner Other Costs	F4

Strategy/Technology Distribution

	Scenario 1	Scenario 2	Scenario 3
	Minimum Cost	Cost Effective	Maximum Performance
			
			

COST & PERFORMANCE	Scenario 1	Scenario 2	Scenario 3
Nitrogen Reduction %	30%	52%	61%
Remaining Nitrogen Load (Kg N)	8,400	5,760	4,680
Life Cycle Costs ($K)	$5,922	$7,350	$9,800
Municipal O&M Cost ($K)	$325	$425	$610
Municipal Project Cost ($K)	$1,329	$1,600	$1,800
Property Owner O&M Cost ($K)	$98	$128	$183
Property Owner Project Cost ($K)	$397	$480	$540
COMMUNITY BENEFITS			
Quality Habitat (acres)	0.5	1.8	2.4
New Open Space Added (acres)	1.5	4.6	5.0
GHG Reduced (MT CO2e/yr)	2.1	3.1	3.3
Avg. Increase in Property Value ($/pty)	$200	$1,200	$2,000
New Employment Added (jobs)	152	188	252
Additional Cost per Household ($/HH/yr)	$20	$26	$37


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
CAPE COD COMMISSION


Area Boundaries
208 Water Quality Management Plan Update
Lower Cape
Mid Cape
Outer Cape
Upper Cape
CAPE COD COMMISSION

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

Meeting Three
December 9, 2013
Orleans Town Hall
8:30 am - 12:30 pm

Meeting Summary Prepared by the Consensus Building Institute

I. ACTION ITEMS

Working Group

- Provide feedback on the draft meeting for Meeting #3 after it is circulated.
- 208 Plan Stakeholders Summit meeting date and location to be announced soon.

Consensus Building Institute

- Draft, solicit feedback from Working Group, and finalize Meeting Three summary
- Conduct further outreach to working group members regarding the process moving forward and possible ongoing involvement, for example in the area working groups.

Cape Cod Commission

- Provide PowerPoint presentation to Working Group members
- Share information about date and time of the Stakeholder Summit meeting with the Working Group when determined.

II. WELCOME AND OVERVIEW

Patty Daley, Deputy Director and Area Manager, Cape Cod Commission, welcomed participants and offered an overview of the 208 Update stakeholder process.[1] In July, public meetings were held across the Cape to present the 208 Plan Update goals, work plan, and participant roles. Public meetings were also held in August to present information on the affordability and financing of the updated comprehensive 208 Plan. The first meetings of the eleven Watershed Working Groups were held in September and focused on baseline conditions in each of the watersheds. The second meetings of the Watershed Working Groups were held in October and early November and are focused on exploring technology options and approaches. These third meetings of the Watershed Working Groups will focus on evaluating watershed scenarios. These scenarios are informed by Working Groups' discussions at previous meetings about baseline conditions, priority areas, and technology options/approaches.

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

Ms. Daley reviewed the goal of the meeting:

- To discuss the approach for developing watershed scenarios that will remediate water quality impairments in your watersheds.
- To identify preferences, advantages and disadvantages of a set of scenarios of different technologies and approaches, and
- To develop a set of adaptive management principles to guide subregional groups in refining scenarios for the 208 Plan.

Stacie Smith, the facilitator from the Consensus Building Institute, reviewed the agenda and led introductions. A participant list can be found in Appendix A. She explained that the Working Group would be asked to provide input on possible approaches/scenarios for wastewater management in the watershed study area, including adaptive management applications. She also reviewed action items, noting that they were all completed except for revision of the technology fact sheets, which are still underway.

III. INITIAL SCENARIOS FOR THE PLEASANT BAY WATERSHED

Patty Daley explained the Commission's process for developing watershed scenarios. Two teams were formed: one team is exploring "traditional " technologies and approaches (permitted technologies such as sewering and I/A systems) and another team is exploring "alternative" or "non-traditional" technologies and approaches. The teams are both working under the assumption that fertilizer and stormwater reductions will reduced the footprint of required wastewater infrastructure. The goal in employing both traditional and nontraditional approaches is to reduce the project's footprint and reduce the ultimate cost to the Cape's taxpayers.

The Cape Cod Commission used comparative analysis to provide an "apples to apples" comparison for the cost of removing a pound of nitrogen. The costs are derived from the Barnstable County 2010 Cost Report, and the costs in the technologies matrix, and include a lifecycle analysis. This cost data is for comparative purposes. In response to a question, Ms. Daley also clarified that the thorough comments on the online technology matrix came from stakeholders, to which the Commission responded in a single document.

Scott Michaud, Hydrologist with the Cape Cod Commission, led the discussion of "traditional " technologies and approaches. . He explained that the scenarios were developed using the Commission's Watershed MVP Tool. This web-based tool models different technology scenarios by incorporating parcel and water data, build out analysis, technology costs, and other factors. He offered several scenarios based on currently permitted technologies:

<u>Whole Watershed Conventional Scenarios – Pleasant Bay</u>

The Pleasant Bay watershed has an aggregated MEP target for wastewater nitrogen removal of 87%.

- Watershed-Wide Innovative/Alternative (I/A) Onsite Systems. Installation of I/A systems for all properties in the Pleasant Bay Watershed. The cost of this approach would be $1200 per lb. of nitrogen removed. This would remove 27% of the system's wastewater nitrogen, well below the aggregated MEP target for wastewater nitrogen removal from the Pleasant Bay watershed of 87%.
- Watershed-Wide Centralized Treatment with Disposal Inside the Watershed. Modeled scenario in which all properties are sewered and treated water is put back into the watershed with nitrogen levels of 5 parts per million, at a cost of $600 per lb. of nitrogen. This would remove 81% of the system's nitrogen, also below the aggregated MEP target for wastewater nitrogen removal from the Pleasant Bay watershed of 87%.

Whole Watershed Conventional Scenarios – Muddy Creek

A similar evaluation was conducted for Muddy Creek, a tributary sub-system to Pleasant Bay:

- Muddy Creek Sub-Watershed-Wide Innovative/Alternative (I/A) approach, at $1150 per lb. of nitrogen removed. This would remove 27% of the system's nitrogen, well below the aggregated MEP target for wastewater nitrogen removal from the Muddy Creek watershed at 100% for the lower portion, and 75% for the upper portion.
- Muddy Creek Sub-Watershed-Wide Centralized Treatment with Disposal Inside the Watershed, at a cost of $600 per lb. of nitrogen. This would remove 81% of the system's nitrogen, also below the aggregated MEP target for wastewater nitrogen removal from the Muddy Creek watershed of 100% for the lower portion, and 75% for the upper portion.

Natural Attenuation

Mr. Michaud explained that the MEP generally assumes 50% of nitrogen is attenuated when passing through a pond or lake and 30% when passing through a stream or river, which can be modeled to find more effective remediation scenarios by focusing on downstream watersheds.

Targeted Watershed Conventional Scenarios – Muddy Creek

Targeted Approaches.

- Targeted Centralized Treatment, w/o reductions in fertilizer/stormwater loads. This scenario achieves the MEP wastewater nitrogen removal targets, acknowledges the Chatham CWMP which proposes to collect and remove wastewater nitrogen loads from the Chatham portion of the Muddy Creek watershed, assumes that reduced nitrogen loads collected from the Harwich portion of the watershed will be returned to the Muddy Creek watershed following treatment for nitrogen, and involves total collection (from Harwich and Chatham) of about 200,000 gallons per day, with a cost of about $600 per lb. of nitrogen removed.

He also noted that reducing fertilizer and stormwater runoff would reduce the amount of wastewater needing collection. When fertilizer and stormwater runoff are reduced by 50% and

attenuation is used advantageously, the footprint of the proposed centralized system could be reduced.

- Targeted Centralized Treatment with a 50% Reduction in Fertilizer and Stormwater nitrogen. This scenario also achieves the MEP nitrogen removal target and involves collection of about 180,000 gallons per day at a similar cost of about $600 per lb. of nitrogen.

In order to achieve TMDLS in each of these two scenarios, the scenario transports the nitrogen loads within Harwich from the lower reach of the Muddy Creek watershed to the upper reach. Much of the Muddy Creek watershed is located in a Zone II wellhead protection area such that the option to dispose of treated wastewater effluent in this area would have to address stringent drinking water quality standards that can significantly add to treatment cost.

Working Group members had the following questions and comments about the conventional scenarios (in italics):

- *What costs do these estimates include?* They include operation and management and all the costs generally included in infrastructure projects. They do not include hookup costs.
- *Because most of this watershed is a Zone 2 wellhead protection area, there are additional regulatory and permitting issues that may increase the costs of disposal here up to 20%. Do the scenarios reflect this cost?* The scenarios do not currently include potential costs of disposing in Zone 2 areas.
- *This scenario doesn't reflect what Chatham is planning in terms of sewering.* We will look at that in the next section.
- *When we think about the percentage reductions and removals and costs, they are only for existing loads, and will all change based on future development. 100% of any future load has to be taken out to meet the TMDLs and this will increase costs.*
- *Are you expecting us to endorse any of these scenarios?* No, they're just meant to be illustrative.
- *This year Orleans substantially increased the amount of money they're putting towards stormwater reduction. It is not reflected in these scenarios, but stormwater management represents an increased cost for the town.* We haven't included the cost per pound of nitrogen for stormwater because we're following the assumption that, since EPA is requiring stormwater management, it is something that the towns are doing anyway. The costs within these scenarios are strictly related to wastewater. *It is still important for stakeholders to be aware of how much towns are spending on stormwater.*

Whole Watershed 7-Step Scenarios (Alternative Technology and Approaches)

Mark Owen, Project Director at AECOM and consultant to the Cape Cod Commission, led the discussion of "alternative" technologies and approaches. He explained that the scenarios were developed for discussion purposes and encouraged Working Group members to offer their own

modifications and suggestions. The scenarios follow the whole watershed 7-step process, which targets fertilizer and stormwater reductions first, then explores watershed/embayment options, and then alternative on-site options.

The scenarios presented here focus on the Muddy Creek area. Nitrogen contributions from Chatham properties, which will be sewered and effluent discharged out of the sub-watershed, have been removed from these calculations. The scenarios also include assumptions of a 50% reduction of nitrogen coming from fertilizer and stormwater.

Using a calculator slide, he showed the group the subsequent reductions in nitrogen levels for each additional technology used to eventually achieve the required reduction targets. Mr. Owen compared the effectiveness and cost of several different watershed scenarios, which demonstrated decreased nitrogen reduction costs when reducing stormwater and fertilizer runoff and using alternative technologies in conjunction with traditional approaches. The use of alternative approaches would also reduce the footprint of any necessary sewering.

He offered the following scenario for Muddy Creek[2]:

- Nitrogen reduction goals: 2,548 kg of nitrogen per year
- Low barrier options: assumes 50% reduction of fertilizer and stormwater runoff
    - Fertilizer reduction: 401 kg/year
    - Stormwater reduction: 505 kg/year
- Watershed/Embayment Options
    - Constructed wetlands
        - 1.5 acres, 849 kg/year reduction, estimated cost: $521 per pound of nitrogen.
    - Oyster beds/aquaculture
        - 2 acres, 500 kg/year reduction, estimated cost: $0 per pound of nitrogen. The cost is zero with the assumption that these would be implemented by private industry, and would provide revenues based on harvesting.
    - Floating constructed wetlands
        - 1000 cubic feet, 450 kg/year reduction, estimated cost: $61 per pound of nitrogen.
- Using these approaches, no additional sewering would be required to meet the TMDLs.
- Total unit cost of removing a pound of nitrogen: $123
- Total treated flow would be 0 gallons per day.

Working group members had the following comments and questions on the alternative technologies (in italics):

- In response to questions about target removal percentages, Mr. Michaud explained that the percentages are different depending on whether you're referring to the overall required removal, or if you're referring to the amount of nitrogen that needs to be

[2] Working Group members noted that these numbers were initially miscalculated on the slide. These were adjusted over the break to reflect the accurate numbers.

removed from the septic load. If you prioritize removal from fertilizer and stormwater, you can remove less septic nitrogen and still meet the overall target load.

- *Are the reduction numbers listed here reliable?* Mr. Owen responded that they are a conservative average based on research of actual implementations. However, there is more variability from these technologies than there is from a wastewater treatment plant where you have a very controlled environment.
- *Participants raised concerns that the scenarios assume it will be possible to remove 50% from fertilizer and stormwater, when, in reality, it may not be possible to remove this much.* Mr. Owen responded that this is why there will be continual monitoring, so that if certain technologies do not meet the expected removal, you can implement other technologies.
- *A participant remarked that the Commission and the Working Group need to be clear that these scenarios are only at a conceptual level, lest people see these and misunderstand them.*
- *Why has the future culvert widening not been included in this scenario, as it could significantly reduce nitrogen levels?* To stay on the conservative side, we have not included it here. *Working group members stated that they would like to see the planned culvert widening added to the watershed calculator. Another participant commented that the initial calculation is that the culvert widening will treat a third of the nitrogen (concentration not load).*
- *On the calculator, what does "other watershed management needs" mean?* Ms. Smith responded that it is being used as a placeholder now for target areas that may be identified later. It could be filled in as the process continues.
- *Growth management is one of the most powerful tools for reduction so it should not be sidelined, it should be highlighted and included in the calculator more so that it is clear to communities that it's one of their best tools.* Ms. Daley responded that the Commission chose to illustrate the scenarios using existing development. In the 2014 part of the process, we'll delve further into growth management issues. We are saving this topic for regional-level discussions because it is more relevant at that level.

<u>Questions and comments on oyster beds/aquaculture:</u>

- *Are the examples listed on the calculator, 1.5 acres of constructed wetlands and 2 acres of oyster beds, practical recommendations for our watershed?* Mr. Owen responded that they may be considered, but there are a lot of factors that have not been taken into account. Jay Detjens, GIS Analyst, Cape Cod Commission, added that there is technically space for 2 acres of oysters in this pond, although realistically you probably wouldn't put them in a single 2-acre rectangle.
- *A participant raised concerns about the uncertainty around "soft solutions" like culvert widening and oysters; the analysis needs to account for this uncertainty.* Mr. Owen responded that this highlights the importance of a site-specific approach for examining if certain solutions are viable. When you get into the design phase, costs will change somewhat.

- *There are 24 acres granted for aquaculture in this area, but there are now only two people undertaking any aquaculture. There used to be more. This implies that the conditions might not be good for oysters, or that it is not economically viable. It is misleading to assume that there will be no cost to the town for aquaculture, when private industry has already shown that they are not very interested in growing shellfish here. For aquaculture to work, the town may need to implement and run the program , or provide incentives for private industry.* Ms. Daley responded that it looks like the Commission should come up with cost estimates for municipal implementation of aquaculture projects.
- *If we did decide to implement a pilot oyster project, do we have the existing organizational structure across Towns to figure out how to do it? Who would apply for the grants? The Pleasant Bay Alliance might address some of this, but we would need to figure out how to organize MOUs with other towns, and address other organizational challenges.* Ms. Daley replied that, in the second round of stakeholder engagement, we look more at shared watersheds and sharing solutions between municipalities.
- *Numerous working group members reiterated their support in trying oysters or other shellfish, despite the decrease in shellfish aquaculture in this area over the years. It is low-hanging fruit, it is a natural process, and can be very effective if it works. At the same time, other working group members noted the uncertainty of shellfish aquaculture: shellfish populations in Pleasant Bay fluctuate a lot. We need to be aware that, if we count on aquaculture as a solution, it may not be equally effective from year to year.*
- *A participant pointed out that oysters have an almost immediate effect, whereas sewering takes a long time to affect the embayment.*
- *Other aquaculture factors discussed included: salinity, seasonality, bacterial levels, successes with oysters in Wellfleet and Falmouth, boat mooring and navigation, and the fact that Pleasant Bay is a very dynamic system and understanding these dynamics will help us understand if it can support oysters or other shellfish.*

<u>Questions and comments on floating constructed wetlands:</u>

- *Are there examples of where floating constructed wetlands have been used in salt water?* Mr. Owen responded that there are some, but it is limited. In order to enhance the attenuation, you would probably want to focus on areas with more freshwater or areas where the freshwater is on top of the salt. If it's more saline, you can use different plants, seaweed, and oysters.
- *How did you get the $61/unit cost?* Mr. Owen responded that the materials cost about $20-25 per sq/ft, and operation/management (OM) costs are low. This estimate includes construction costs, fees for design and implementation, and OM over 20 years.
- *Presumably they only work during 6 months of growing time?* Mr. Owen responded that the vegetation and oysters only work during the 6 months, but the microorganisms work longer than that.

Mr. Owen shared a summary slide comparing the three scenarios:

- Targeted collection – cost/lb of nitrogen: $600, treated flow: 145,000 gallons per day
- Targeted collection after 50% reduction in fertilizer and stormwater – cost /lb of nitrogen: $600, treated flow: 125,000 gallons per day
- Targeted collection after 50% reduction in fertilizer and stormwater and after applying alternative approaches – cost/lb of nitrogen: $123, treated flow: 0 gallons per day.

Working group members had the following overall comments, questions, and reactions to the scenarios presented *(in italics)*:

- *Participants felt that the summary slide was misleading because it did not give a clear comparison of the costs of each scenario and because it did not incorporate all the associated costs, e.g. costs for stormwater management. They suggested adding notation to the slide specifying that these are not the total costs. They stated that, although it is difficult to estimate the total cost of each scenario, it is important for stakeholders to have the total costs in order to consider and compare the different scenarios.* Ms. Smith clarified that these are not yet completed cost estimates and plans ready to take back to town meeting. Today we are having a high level discussion of approaches within this watershed, how to go about tackling the issue, what alternatives might be viable here to help us reduce the sewering footprint and cost, and whether the group is comfortable with the approach being put forward thus far.
- *A participant raised the concept of early adopters and late adopters, and stated New Englanders are generally not early adopters; it would feel more comfortable if we could point to another area that had successfully tackled a large-scale nitrogen problem with these alternative technologies.* Mr. Owen responded that many of these technologies have been implemented elsewhere. Some of them have not yet been applied in New England, but many have been used in neighboring states. *Another participant added that any of these technologies can work in the right place, but we need to figure out what level of risk we're willing to tolerate.*
- *A participant from Brewster noted that most of Brewster is not on Pleasant Bay. We have heard that the biggest impact for lowest cost will be closer to the water. Will Brewster be able to contribute, for instance, by making monetary contributions to larger-scale solutions implemented in other towns, where Brewster's investment will go further?* Ms. Daley responded that, yes, the Commission is hoping to find solutions like this and it will be discussed in the upcoming part of the process. The Commission is looking into whether DEP can permit by watershed, not municipality. *Participants discussed tensions around the fact that, if Chatham sewers, the watershed will meet the TMDLs and the other towns may feel like they don't have to do anything. The option to contribute to nitrogen reduction in neighboring towns in the watershed could be a response to this.*
- *Do we know if there are areas in this watershed with high enough concentrations of nitrogen in the groundwater to make it worthwhile to install fertigation wells?* Mr. Owen responded that there is a way to calculate this. *A participant added that Brewster has*

been discussing it. Could possibly put them in near the middle school in Orleans.

- *A working group member commented that there is some uncertainty in some places about whether specific solutions (e.g. I/A systems currently in place) were put in before the MEP baseline data was taken or not. Is there info on public record to figure this out?* Ms. Daley responded that there are spreadsheets that are available that should allow you to answer those questions. It is all parcel based. A town's consultant can go back into the data and figure out what was taken into account for the baseline data.

IV. ADAPTIVE MANAGEMENT

Patty Daley explained the concept of adaptive management. The Commission's working definition is: a structured approach for addressing uncertainties by linking science and monitoring to decisions making and adjusting implementation, as necessary, to increase the probability of meeting water quality goals in a cost effective and efficient way.

Ms. Daley asked the working group to share their input about other things that should be included in this definition and in the Commission's approach to adaptive management. Working group members made the following comments and recommendations (in italics):

<u>Questions and comments around what adaptive management means:</u>

- *Adaptive management means that you're adapting to new information. Presumably you have the best information in the plan now, but new information will come along. The definition should reflect this.*
- *The description of adaptive management should be preceded by a description of the plan.*
- *The adaptive management plan should take into account uncontrollable nitrogen loads and what changes might have to be made if those change in future.*
- *A participant raised a concern that we may make a huge investment and may not end up fixing the water quality if some other factor changes (e.g. the embayment could silt up).* Mr. Michaud noted that the Commission will have to differentiate between TMDL compliance and how well a technology is performing.

<u>Questions and comments about timing:</u>

- *If you have an approved plan you should incorporate all possible alternative options, and not delay moving forward with the plan. But don't sit around and wait for the experimental things.*
- *What are the lifespans of these technologies, will the costs of replacing them be significant?* Mr. Owen responded that for each technology we've considered costs over 20 years. Traditional treatment plants also have to be updated after about 20 years.
- *The issue of timing should be reflected in the definition of adaptive management. The flow of which things you implement first, second, etc. is critical to the definition of adaptive management.* Ms. Smith added that this also relates to the risk management

issue: how long are you willing to wait to try solutions that may not be proven.

Questions and comments about monitoring/metrics:

- *The overall plan will have a number of different solutions within it and we may not have the luxury of waiting to see the outcome of the first solutions before we have to implement later solutions. Each solution should come with a defined feedback loop that includes the type of results we expect, clear monitoring, and a clear timeframe of expected information. The feedback might inform the next immediate solution, or it may be a slow loop that can only impact much later efforts.*
- Ms. Daley remarked that monitoring will be very site-specific. The Commission will put together a monitoring group during the next phase of the planning process.
- *Working group members discussed the importance of monitoring groundwater quality in the area. Some felt this is important for the 208 process, while others felt that monitoring water quality in the embayments was a better measure and that money should not be spent measuring groundwater. A participant added that, as a taxpayer, if we spend a lot of money and it turns out that the solution is not as effective as we'd hoped, I want to have a very specific reason why that happened. Others commented that even if you measure groundwater and know that nitrogen levels are high in certain areas, you still don't know what has caused it.*
- *We need to establish metrics that correlate to specific solutions we implement, so we can see what effect a specific solution has. Lower level metrics.*
- *What if we get the water chemistry back to what it should be, but the eelgrass and benthic community are not back to where they should be? How do these different metrics interact?* Eelgrass and the health of the benthic community will definitely be metrics used in monitoring. However, it's an open question who will do the measurements and how to create a uniform protocol.

V. PREPARING FOR 2014 JAN-JUNE

Erin Perry reminded the group that the draft plan is due at end of May 2014. The second six months of the process will focus on how to implement the plan. Ms. Perry shared the Commission's plans for continuing stakeholder engagement into 2014.

Triple Bottom Line approach

Ms. Perry explained that the Cape Cod Commission is developing the Triple Bottom Line (TBL) analysis tool to help communities weigh the pros and cons of the various scenarios. The Triple Bottom Line Approach model considers the economic, social, and environmental impacts of each scenario, including a 'no action' plan to help the groups illustrate the pros and cons of the various approaches. She walked the group through sample triple bottom line diagrams[3]. TBL analysis is used to identify the best alternative and to report to stakeholders on the public

[3] See presentation for diagrams at website.

outcomes of a given investment. It is helpful in order to consider the financial, environmental, and social consequences of water quality investment and policies on the Cape. It helps evaluate ancillary or downstream consequences of the scenarios.

Stakeholder Process: Summit and Working Groups

Ms. Perry explained that the Commission would be convening a 4-6 hour Stakeholder Summit with all 11 of the watershed subgroups in January/February. The goal of the summit is to give all 11 working groups a chance to talk about what they learned from the first phase of the process, and what we should do going into the next phase. The Commission will let the working group members know as soon as it has been scheduled. Ms. Smith added that this meeting is the transition point for the groups to hear about the commonality between and perspective of the other groups.

After this summit, the Commission will be aggregating the subgroups into 4 area working groups (representing the areas of: Lower Cape, Mid Cape, Outer Cape, and Upper Cape). These area working groups will include local residents and stakeholders, including some members of the watershed subgroups, as well as representatives from MA DEP and EPA. The subregional groups would be expected to meet in February, March, and April, and focus on some of the sub- and regional-scale issues of financing, growth management, and affordability. Ms. Smith noted that more detail would be provided in the coming weeks.

- *How do the 11 watersheds get broken up into the 4 groups, in terms of stakeholder representation?* Ms. Smith responded that this has not been completely determined yet. It will be similar to the process that was used to decide the working groups. Some of the issues will be high level, so there will be an emphasis on town staff and elected officials but not to the exclusion of others. All meetings will still be public. She asked that, if participants have suggestions for how the groups should be determined, please submit them to her.
- *A participant raised a concern that the Triple Bottom Line analysis doesn't take into account the specific risks of each individual technology and stakeholders' level of confidence with each technology.*

VI. PUBLIC COMMENTS

- *As an engineer I was always skeptical of oysters because I tend to think in terms of mechanical, hard systems. After discussing with people at both ends of the Cape, I'm surprised by how successful oysters have been. We should not disregard this option. They also have a very fast impact, whereas sewers are slow. Oysters have been very successful in Little Pond in Falmouth in only a year.* Ms. Daley added that the oysters are doing a great job in Little Pond, but the town is also sewering there because development is extremely dense and water quality has been severely impacted by wastewater.

- *I have major concerns about the use of the Commission's model to accurately model a very complex system of dynamic processes which normally requires iterative, discretized studies. It appears to be a very static model instead of a dynamic model. My concern was sparked by investigation into the Woods Hole study which was much more dynamic and showed a very high nitrogen input from the open ocean. The MEP study does not take into account oceanic nitrogen. When it comes to culvert widening and flushing, the model has no capacity to truly assess the impact of what would happen. The temperature of the water body also changes based on widening embayments, which can't be incorporated into this model. I appreciate the mindset that sewering should not be the default solution, however I want people to be able to have faith in the model you're using.* Ms. Daley responded that the Commission has been addressing these issues offline because they wanted to use these meetings to address other issues with stakeholders.

- *I am concerned that the Commission's approach doesn't take into account growth and the data being used is getting more and more inaccurate as growth occurs. You cant remove 100% of new nitrogen. The model needs to be updated according to time and potential growth.* Ms. Daley responded that they will get to this issue in the next part of the planning process. As we get to regional-level discussions, that's where we can start working more on solutions.

APPENDIX ONE: MEETING PARTICIPANTS

Primary Members:

Category	Name	Title
Local Elected Official	Linda Cebula	Harwich Board of Selectmen
	David Dunford	Orleans Selectman
	Florence Seldin	Chatham Board of Selectmen
	Sims McGrath	Orleans Selectman
Appointed/Committee	Russell Schell	Brewster Wastewater Committee
Town Staff	Robert Duncanson	Chatham, Program manger of CWMP
	George Meservey	Orleans Planning Director
	Sue Leven	Brewster Town Planner
Environmental and Civic Group	Mark Feigel (for 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
	Christine Cox	Chatham

Alternates and Members of the Public:

Lynn Bruneau
Ed Daly
Dan Milz
Ed Nash
Gordon Smith