Cape Cod 208 Area Water Quality Planning
Lewis Bay to Bass River Watershed Working Group

Meeting Three
Thursday, December 5, 2013 | 8:30 am – 12:30 pm
Dennis Town Hall; 485 Main Street, South Dennis

Meeting Agenda

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*

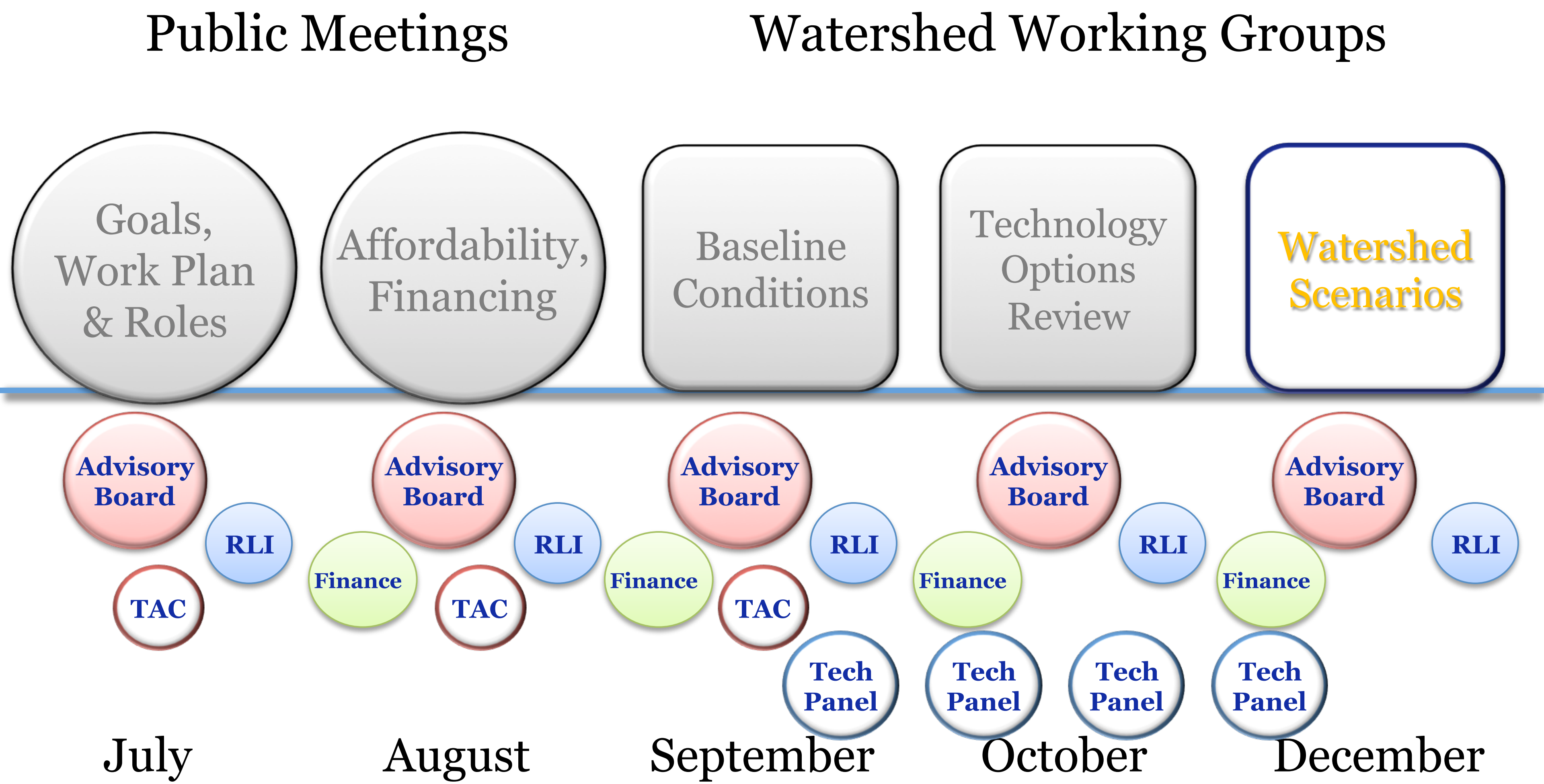
- Triple Bottom Line approach
- Identify Shared Principles and Lessons Learned
- Describe Next Steps

12:15 Public Comments

12:30 Adjourn

Lewis Bay to Bass River Group

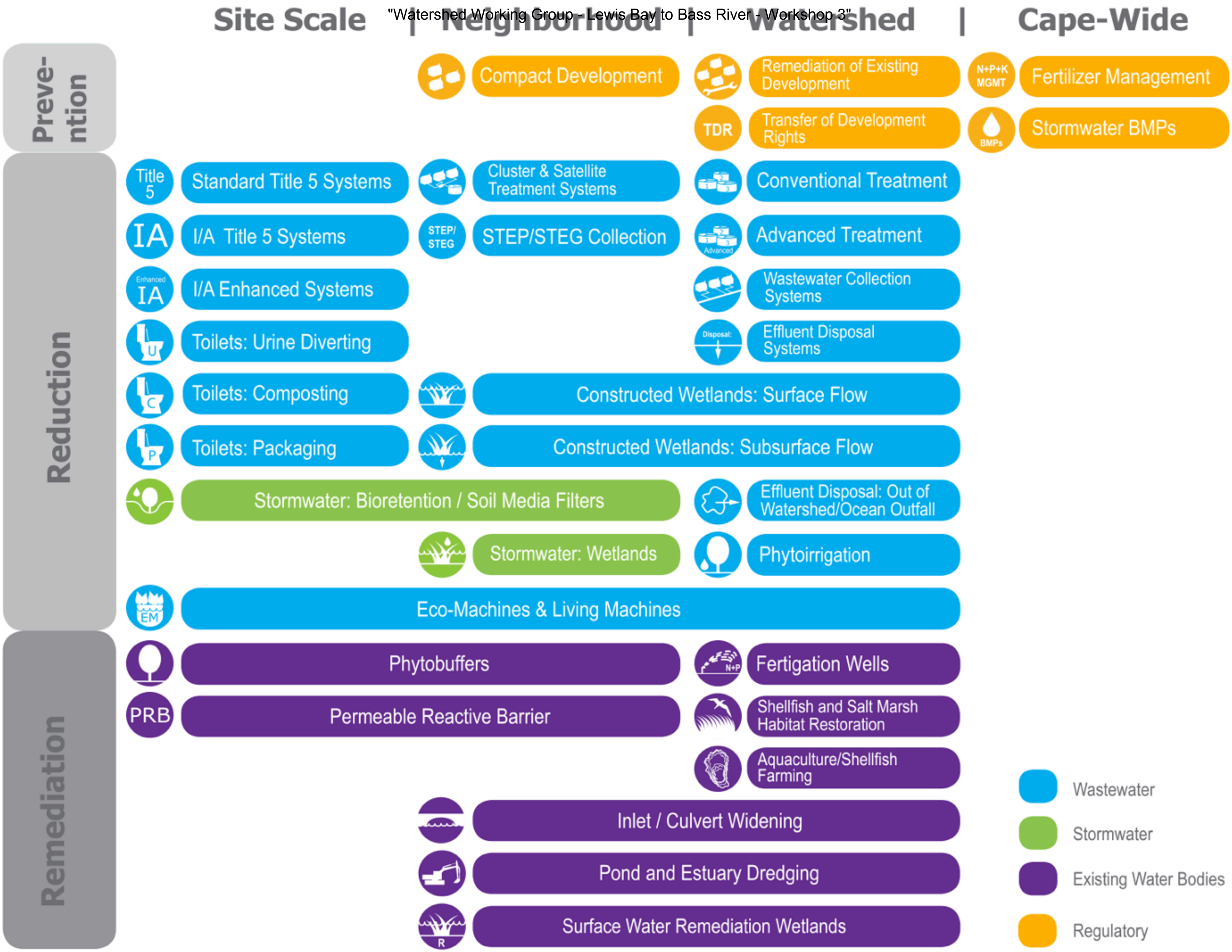
Watershed Scenarios



RLI Regulatory, Legal & Institutional Work Group

TAC Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process


Site Scale | Neighborhood | Watershed | Cape-Wide
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Compact Development
Remediation of Existing Development
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TDR
Transfer of Development Rights
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Stormwater BMPs
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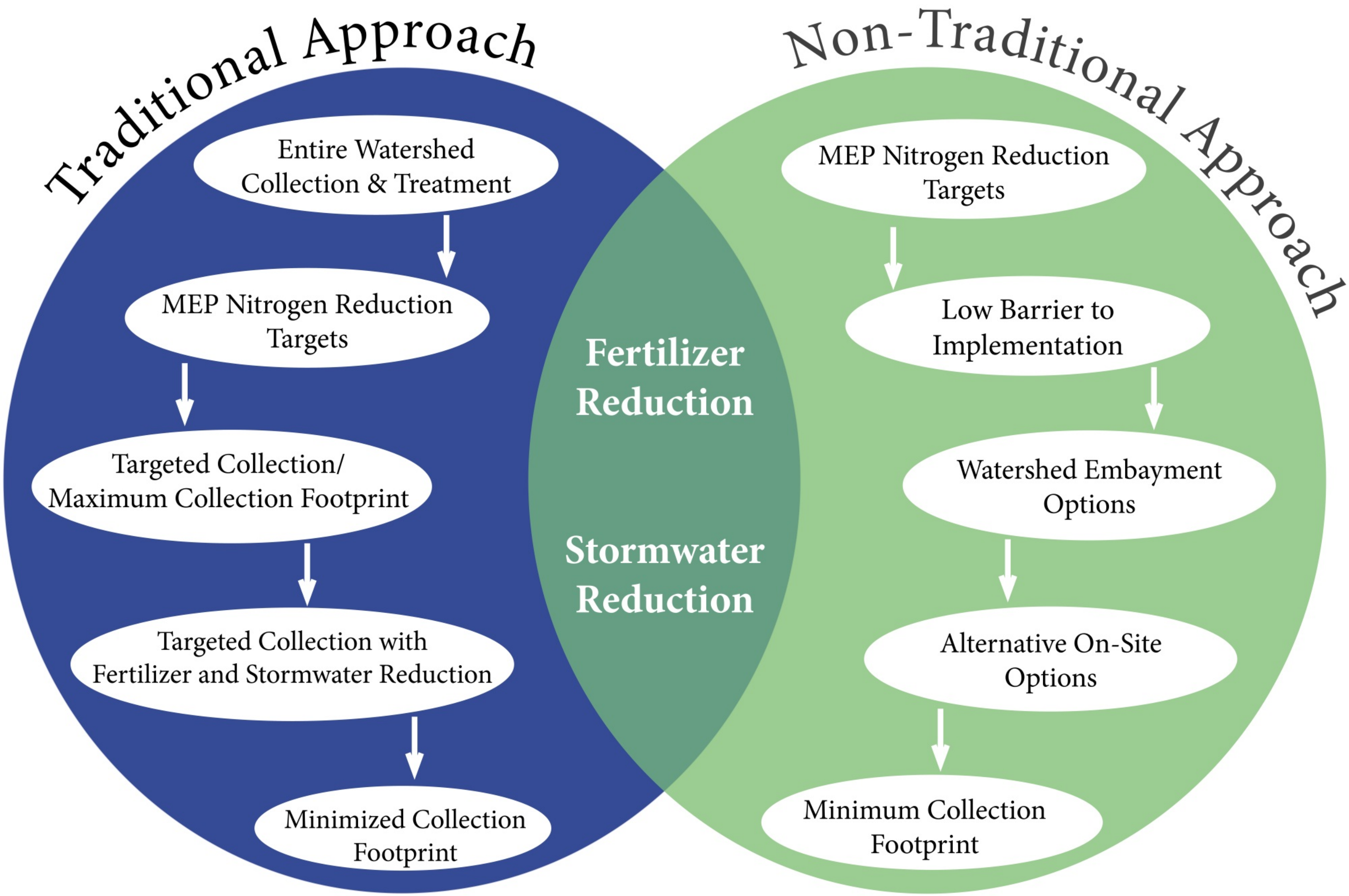
Aquaculture/Shellfish Farming
Inlet / Culvert Widening
Pond and Estuary Dredging
R
Surface Water Remediation Wetlands
Wastewater
Stormwater
Existing Water Bodies
Regulatory

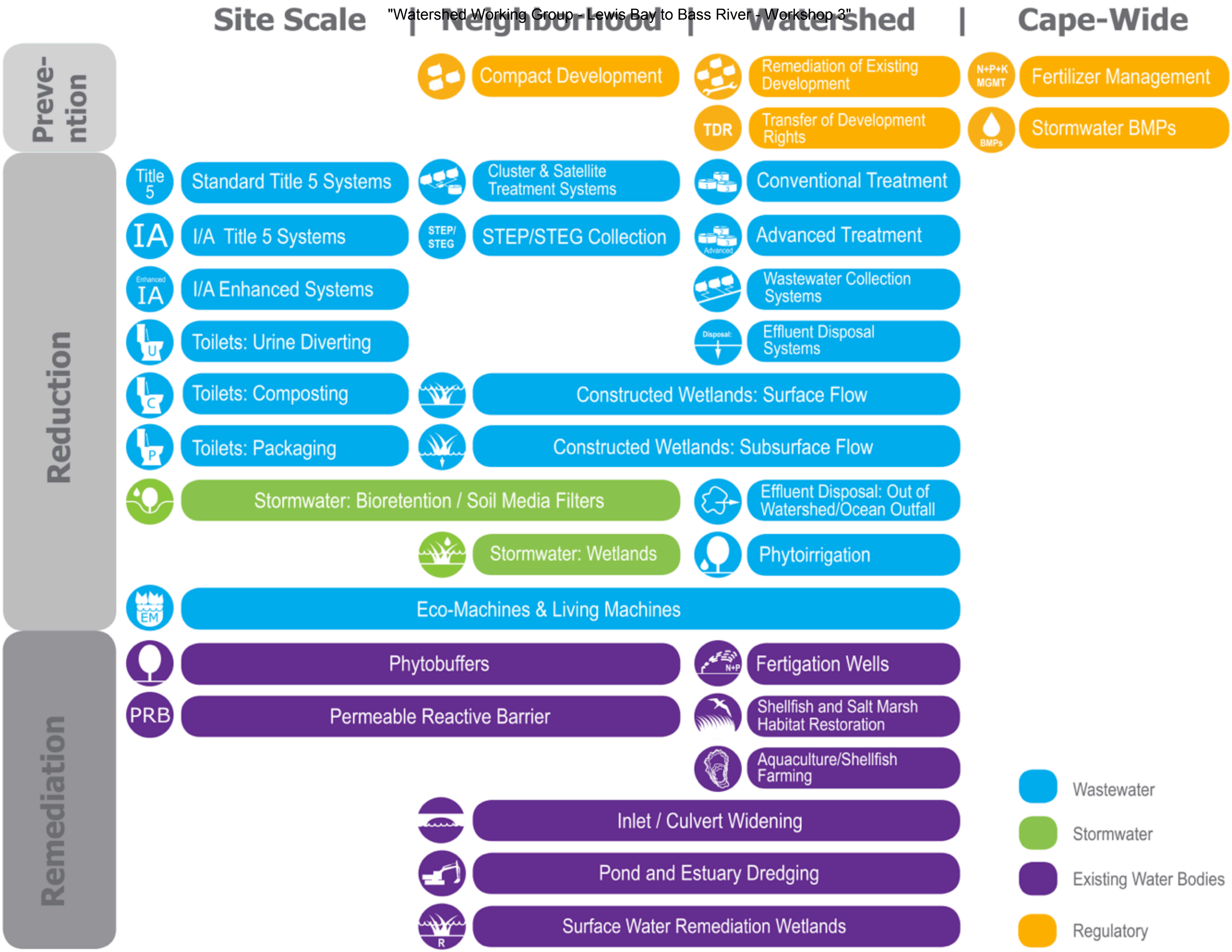
Watershed Scenarios

11 Working Group Meetings: Dec 2-11

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
Non-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
MEP Nitrogen Reduction Targets
Low Barrier to Implementation
Watershed Embayment Options
Alternative On-Site Options
Minimum Collection Footprint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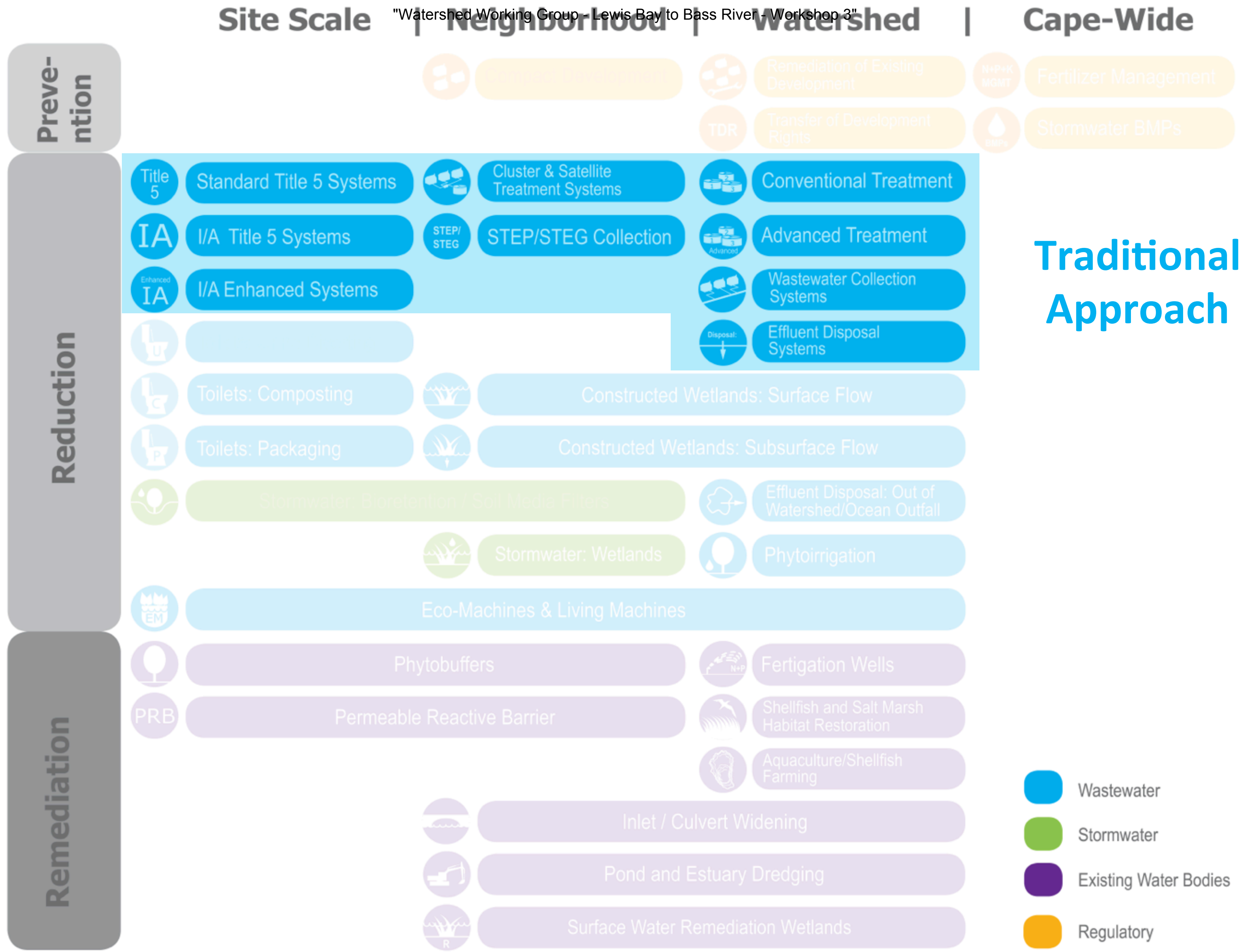
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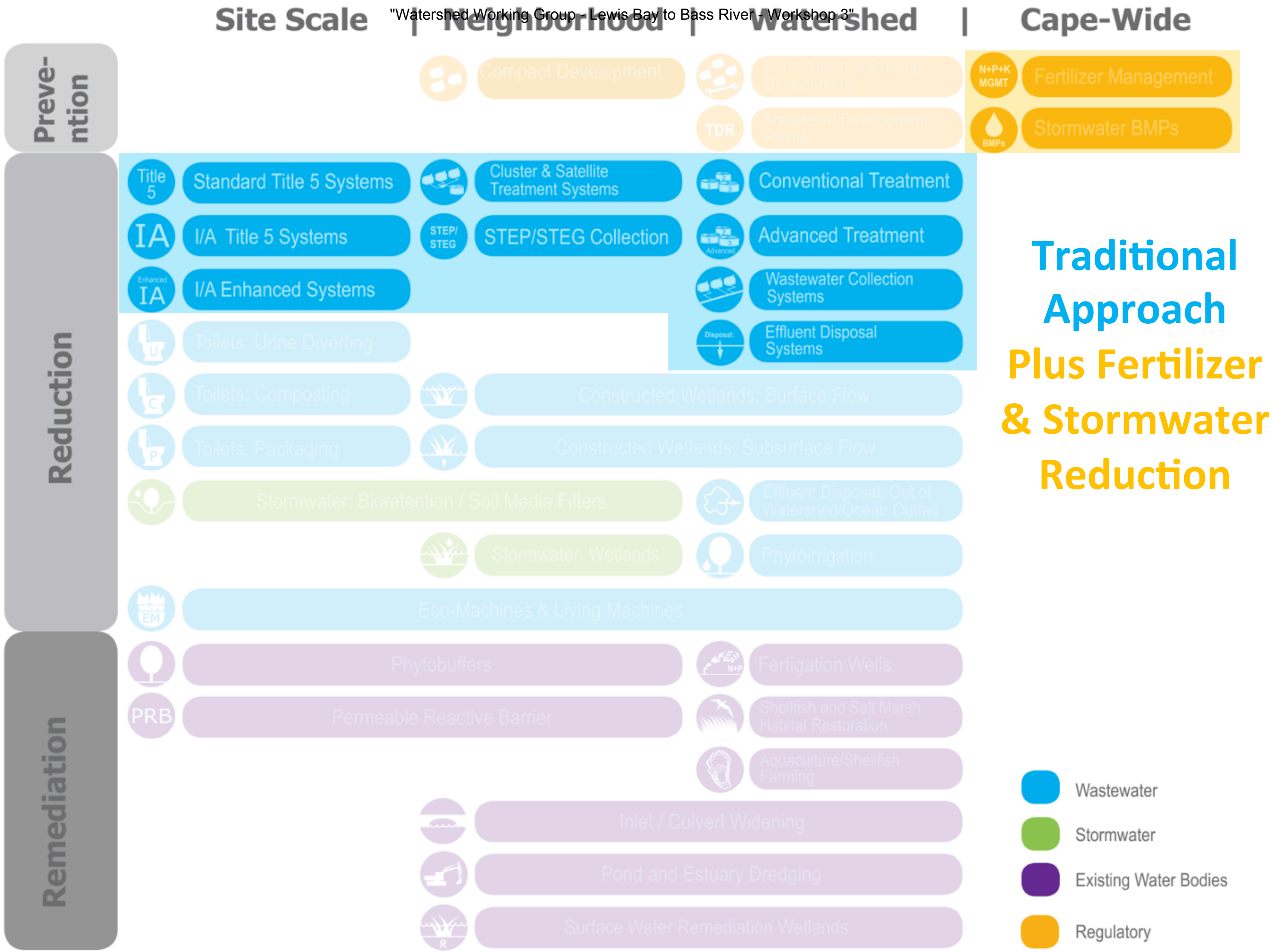

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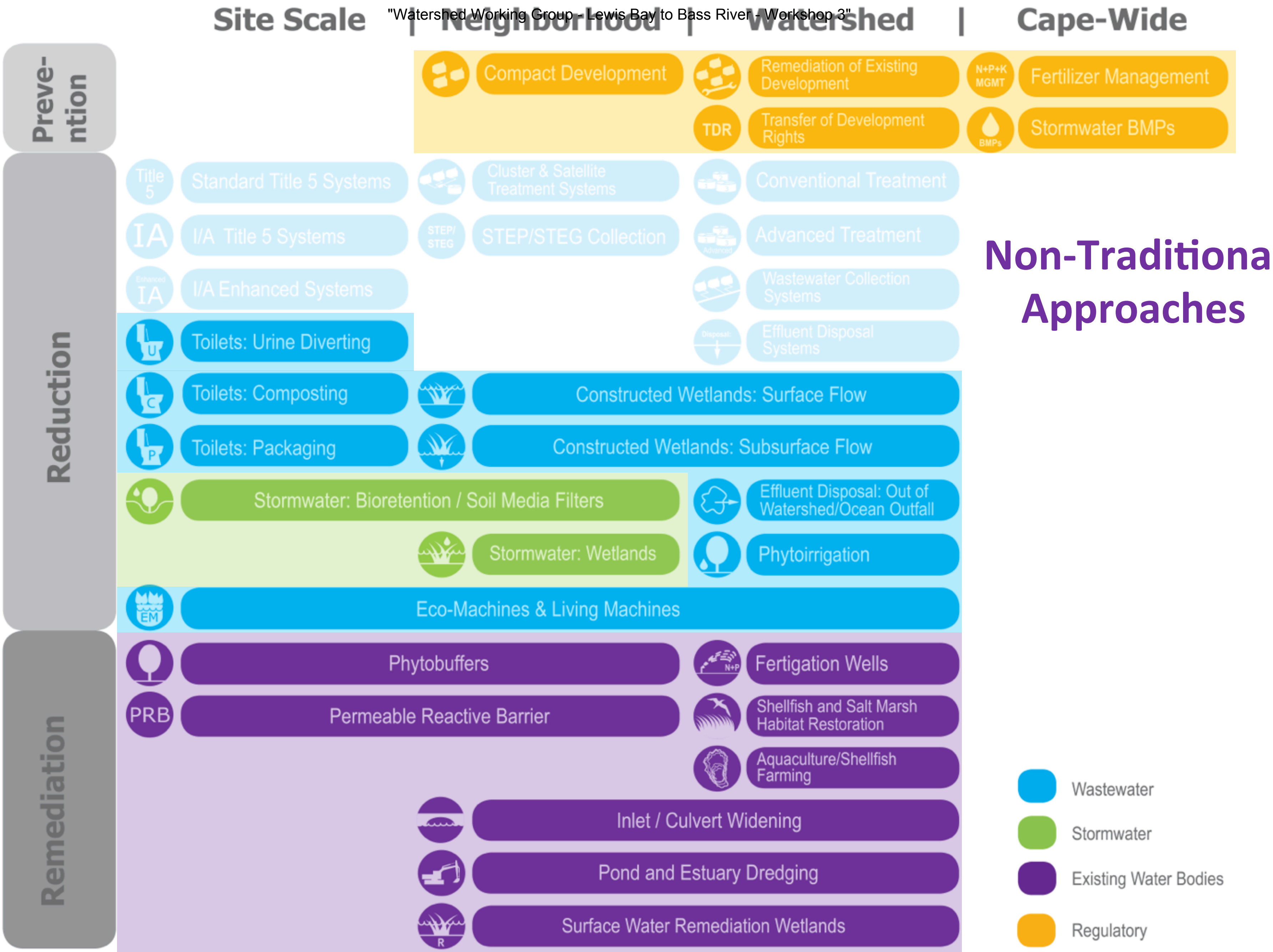
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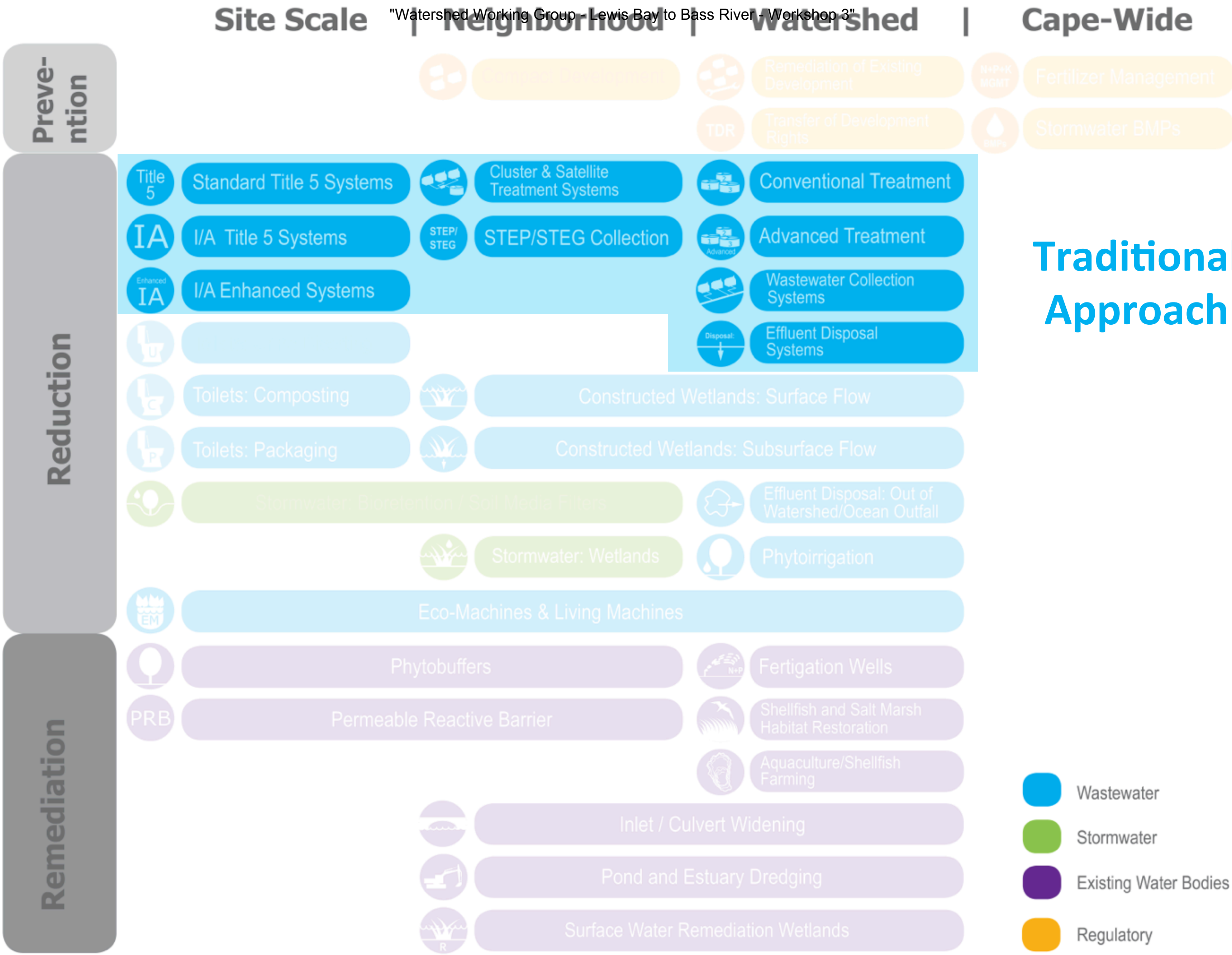
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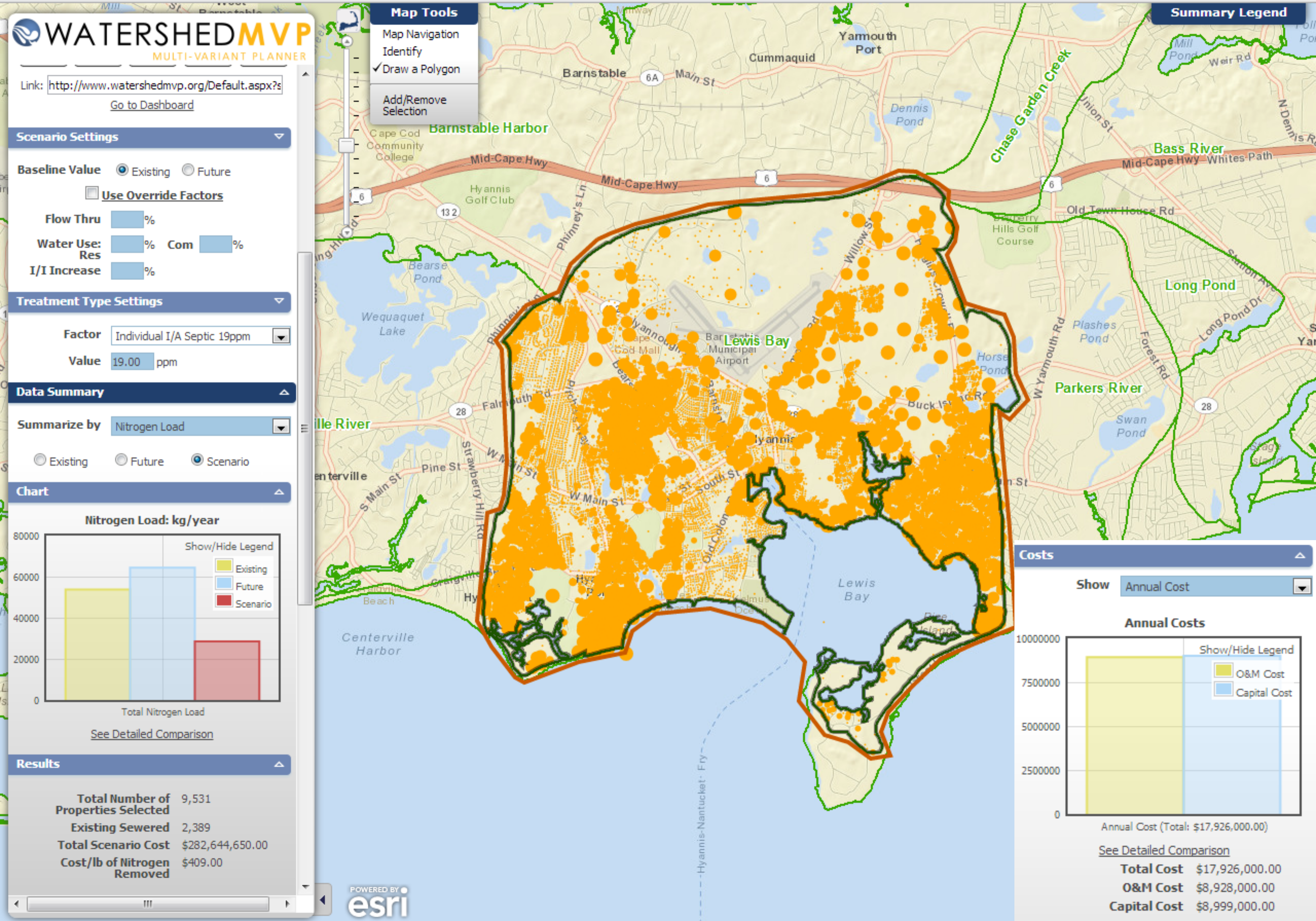
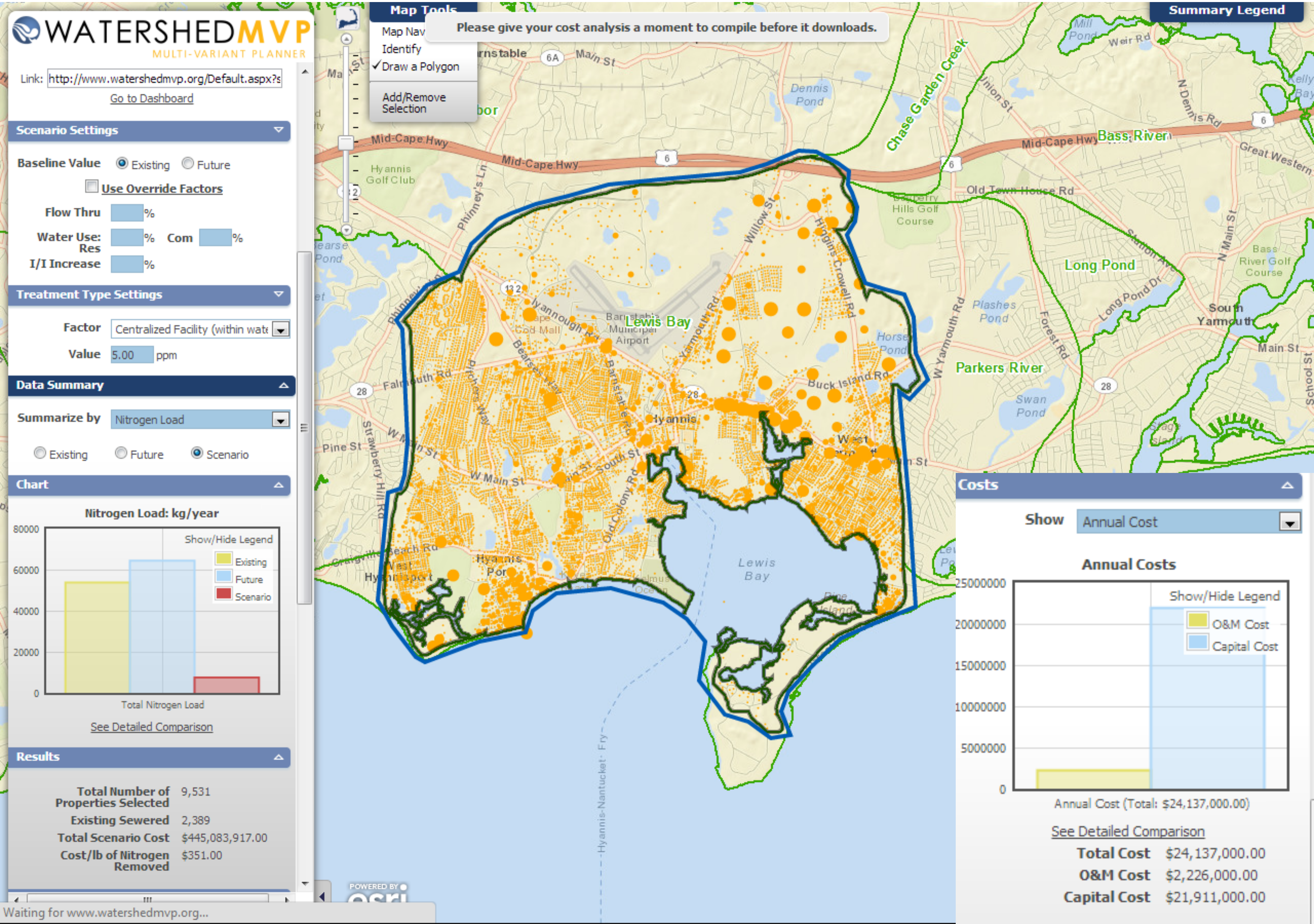
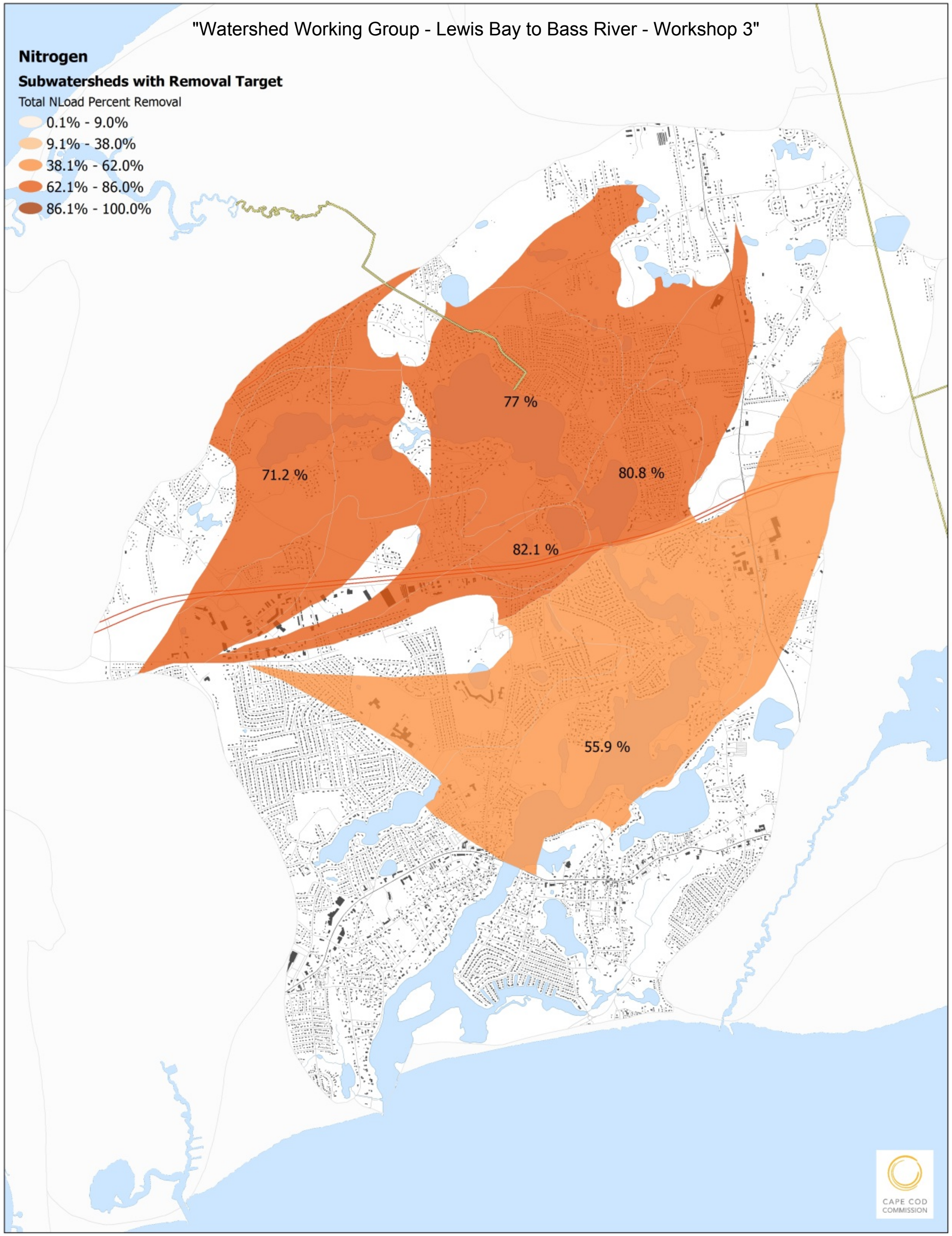
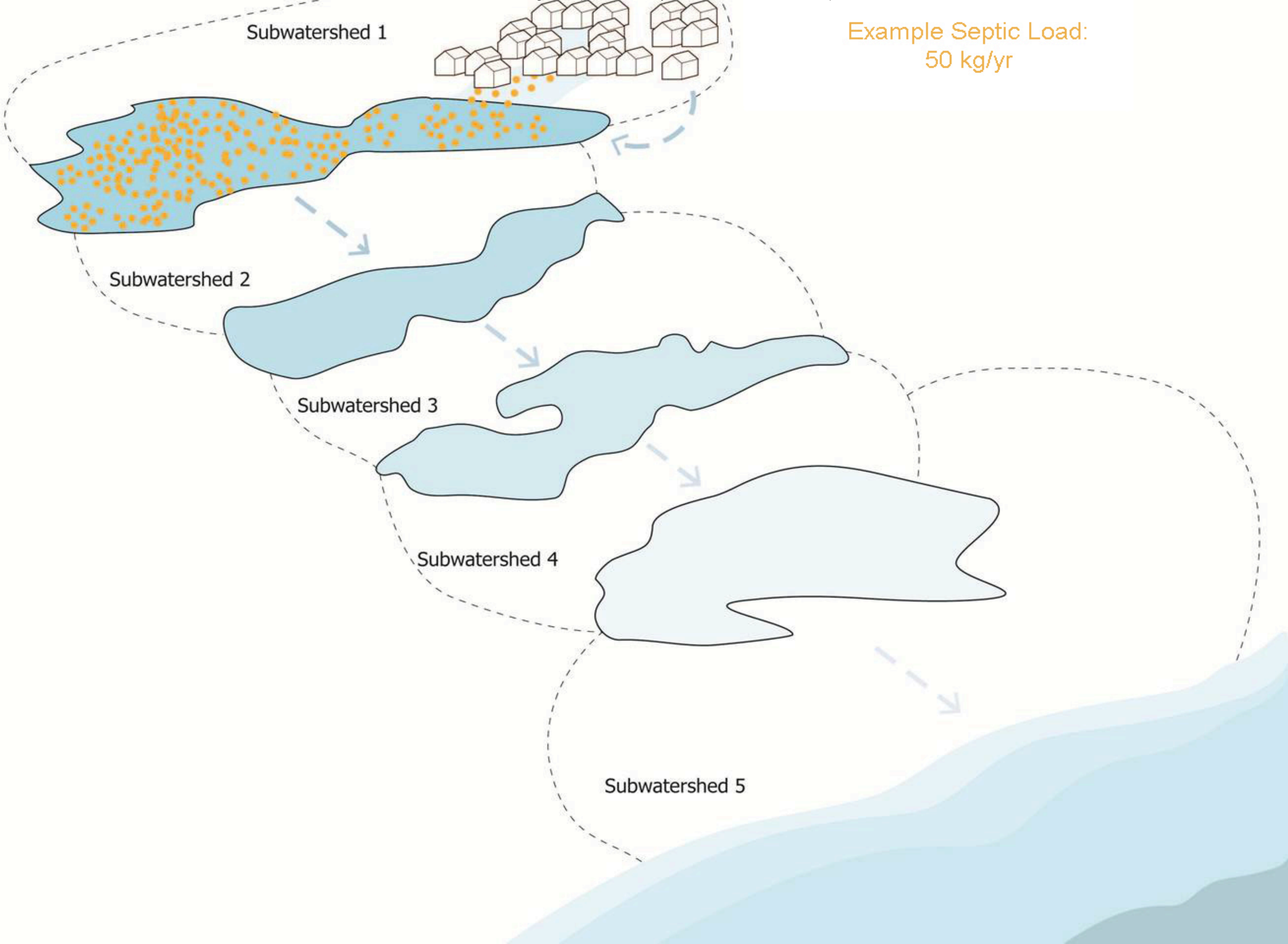
Watershed-Wide Innovative/Alternative (I/A) Onsite Systems

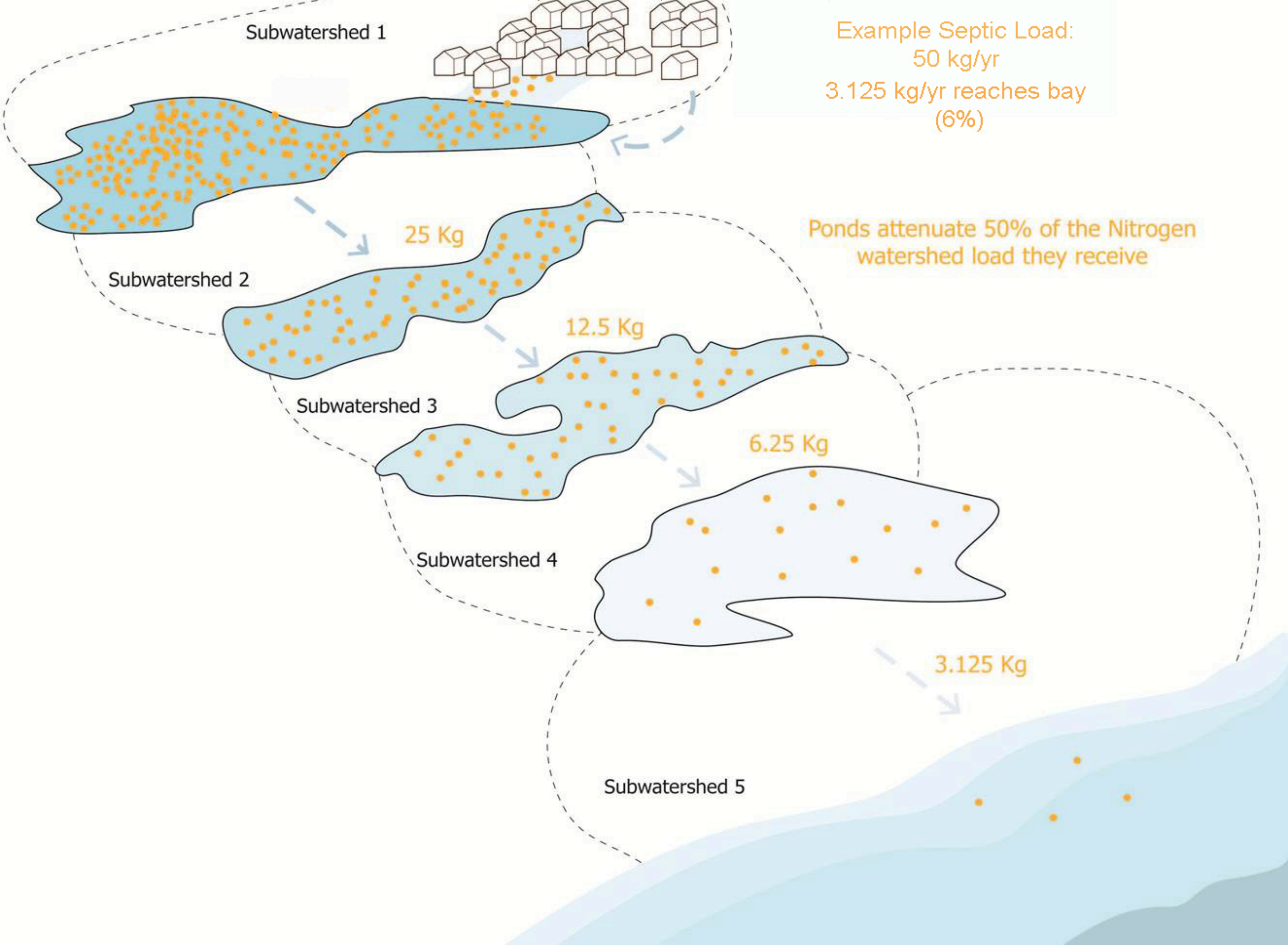


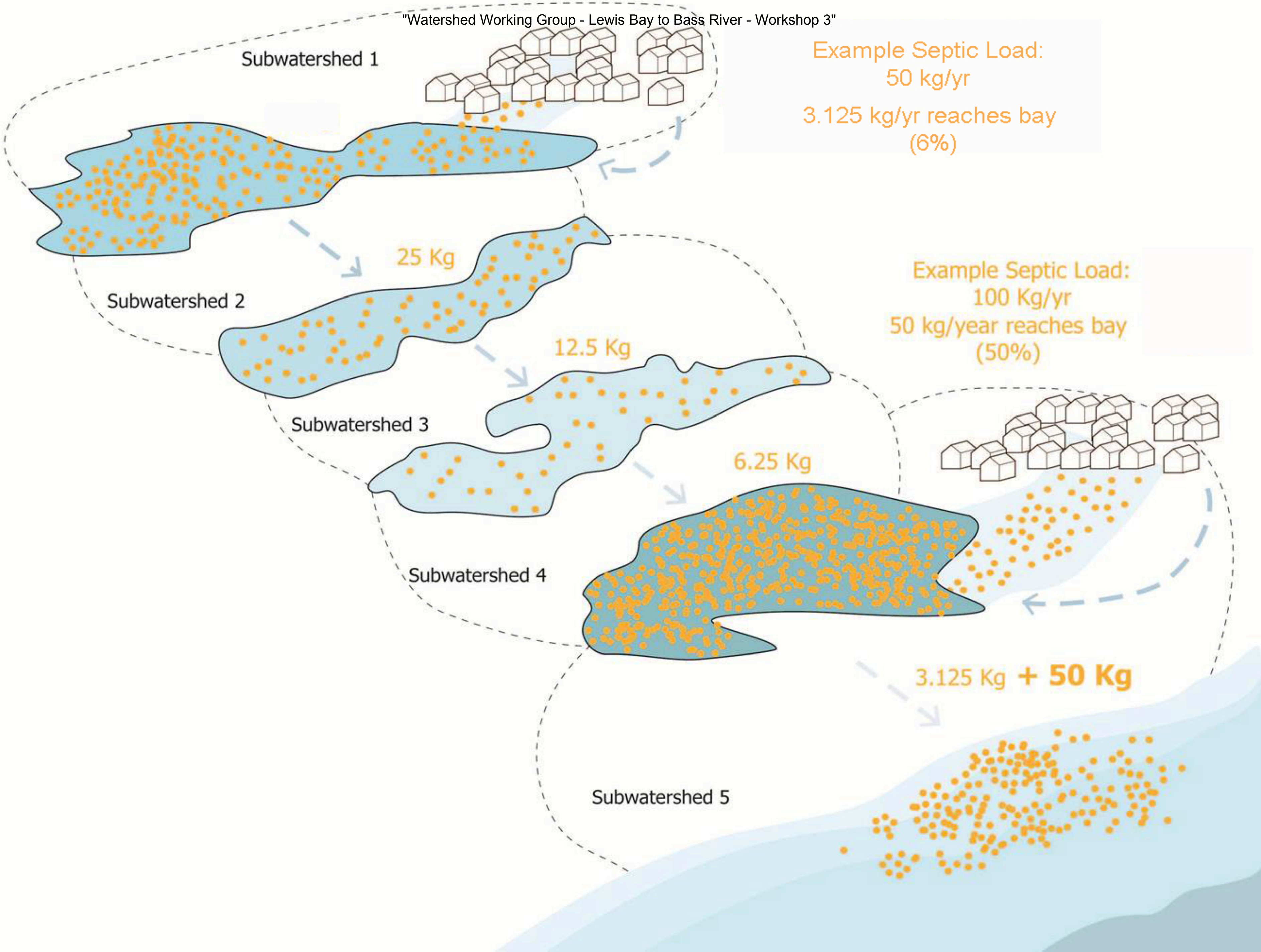
Watershed-Wide Centralized Treatment with Disposal Inside the Watershed




"Watershed Working Group - Lewis Bay to Bass River - Workshop 3"
Nitrogen
Subwatersheds with Removal Target
Total NLoad Percent Removal
0.1% - 9.0%
9.1% - 38.0%
38.1% - 62.0%
62.1% - 86.0%
86.1% - 100.0%
77 %
71.2 %
80.8 %
82.1 %
55.9 %
CAPE COD COMMISSION

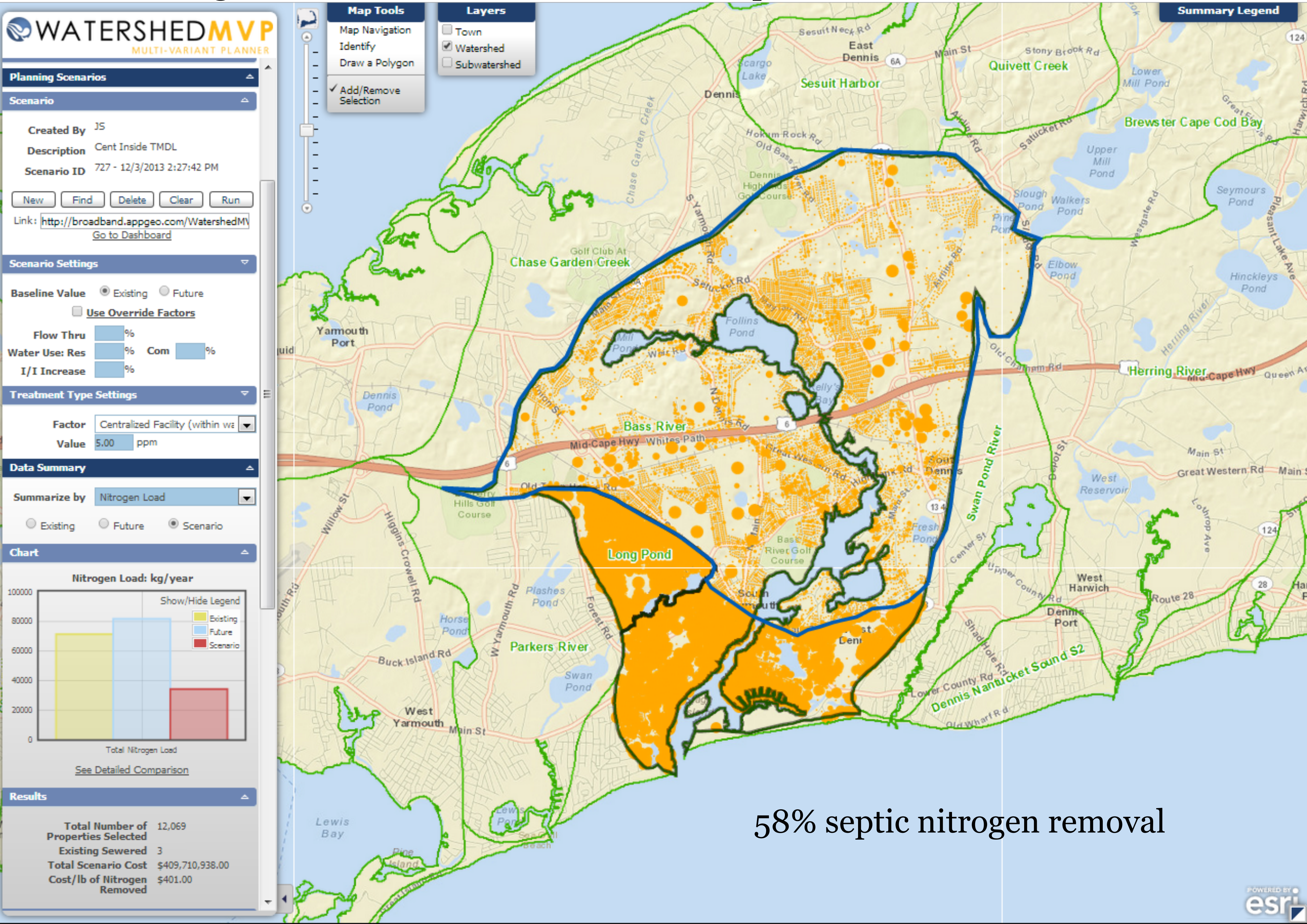

Subwatershed 1
Example Septic Load:
50 kg/yr
Subwatershed 2
Subwatershed 3
Subwatershed 4
Subwatershed 5


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

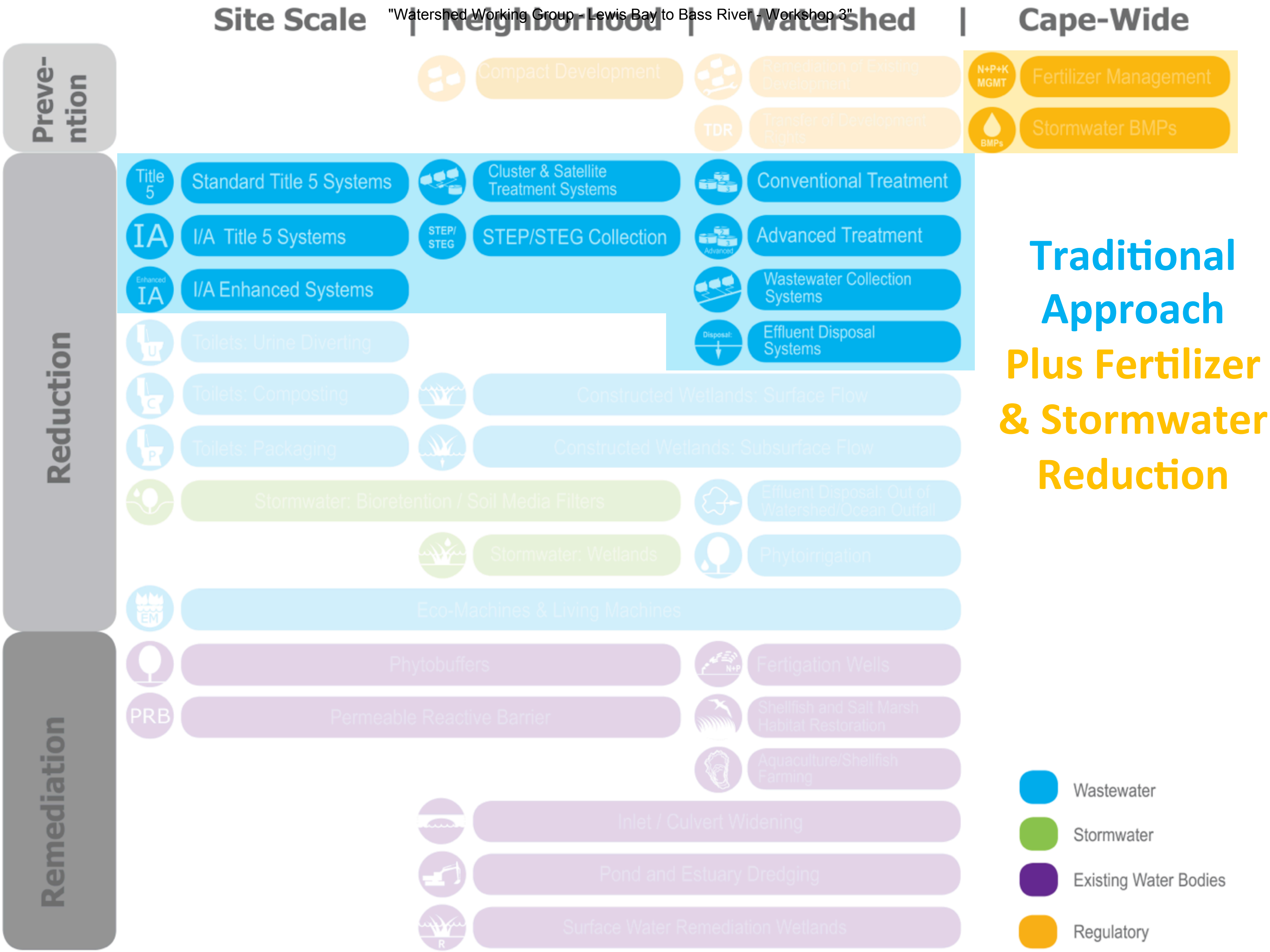


Subwatershed 1
Example Septic Load:
50 kg/yr
3.125 kg/yr reaches bay
(6%)
25 Kg
Subwatershed 2
12.5 Kg
Example Septic Load:
100 Kg/yr
50 kg/year reaches bay
(50%)
Subwatershed 3
6.25 Kg
Subwatershed 4
3.125 Kg + 50 Kg
Subwatershed 5

Targeted Centralized Treatment with Disposal Inside the Watershed



58% septic nitrogen removal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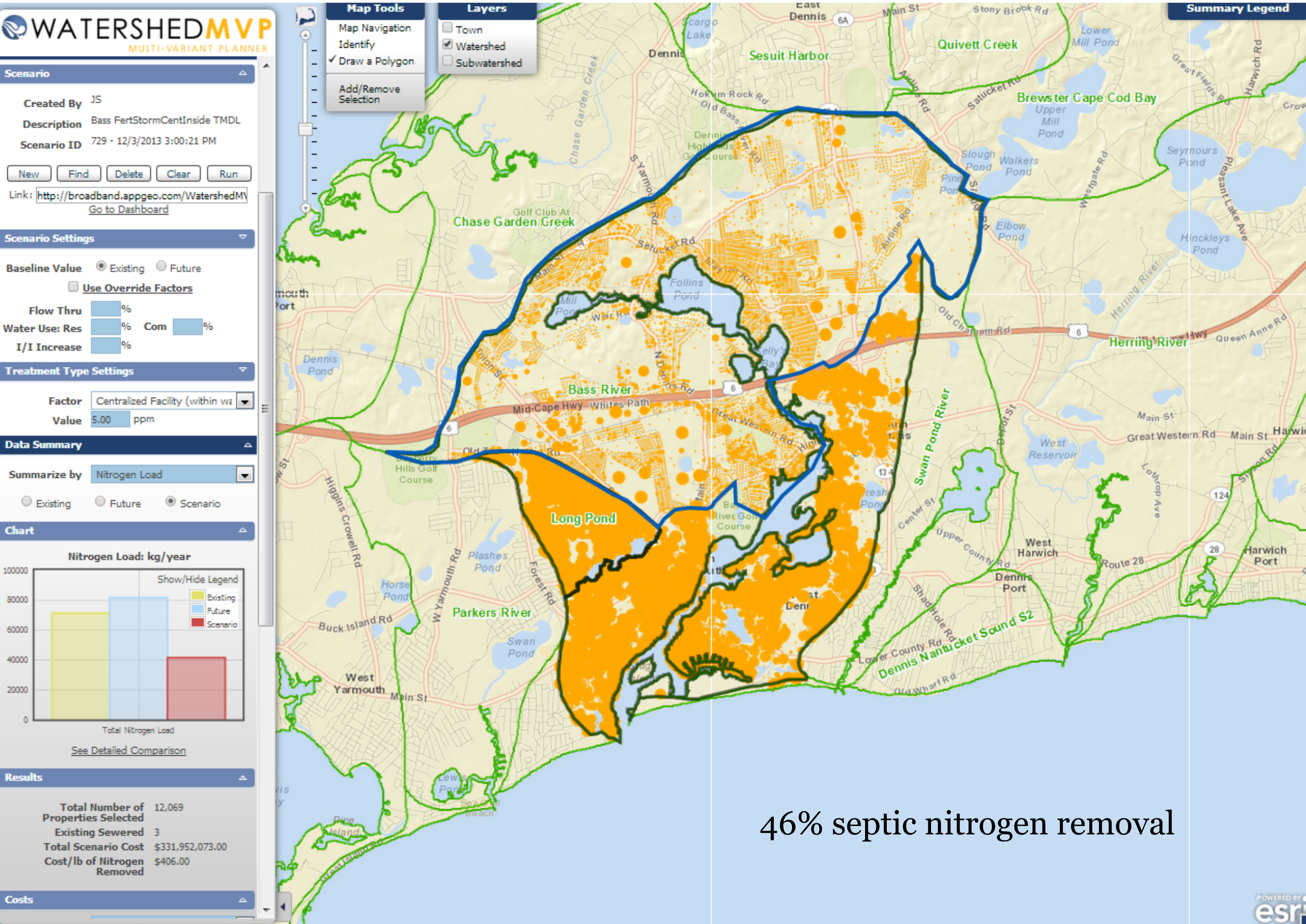
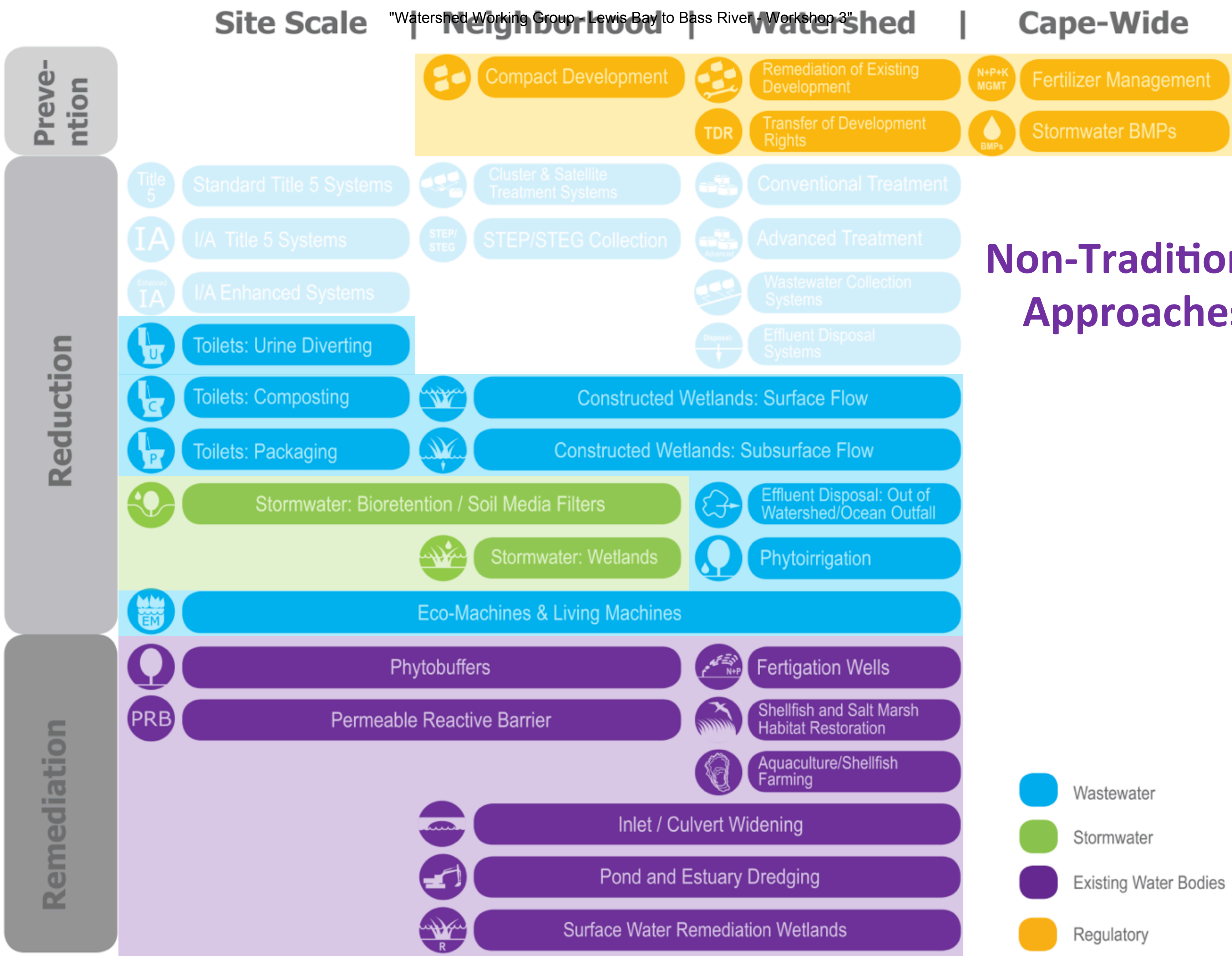
Targeted Centralized Treatment with a 50% Reduction in Fertilizer and Stormwater



46% septic nitrogen removal

Non-Traditional Approaches



Problem Solving Approach

Wastewater | Existing Water Bodies | Regulatory

1 Targets/Reduction Goals

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

2 Other Wastewater Management Needs

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

3 Low Barrier to Implementation

A. Fertilizer Management
B. Stormwater Mitigation

4 Watershed/Embayment Options

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

5 Alternative On-Site Options

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

6 Priority Collection/High-Density Areas

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

7 Supplemental Sewering

MEP Targets and Goals:		**kg/day**	**Nitrogen (kg/yr)**
Present Total Nitrogen Load:		0	79,497
wastewater		0	66,905
fertilizer			6,296
stormwater			6,296
Target Nitrogen Load:		0	41,756
Nitrogen Removal Required:		**0**	**37,741**
Total Number of Properties:	9153		

Watershed Calculator BASS RIVER

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Other Wastewater Management Needs	Ponds	Title 5 Problem Areas	Growth Management

Low Barrier to Implementation:	**Reduction by Technology (Kg/yr)**	**Remaining to Meet Target (Kg/yr)**	**Unit Cost ($/lb N)**
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Stormwater Mitigation	3,148	31,445	

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Oyster Beds/Aquaculture	40	acres	10,000	14,085	$0

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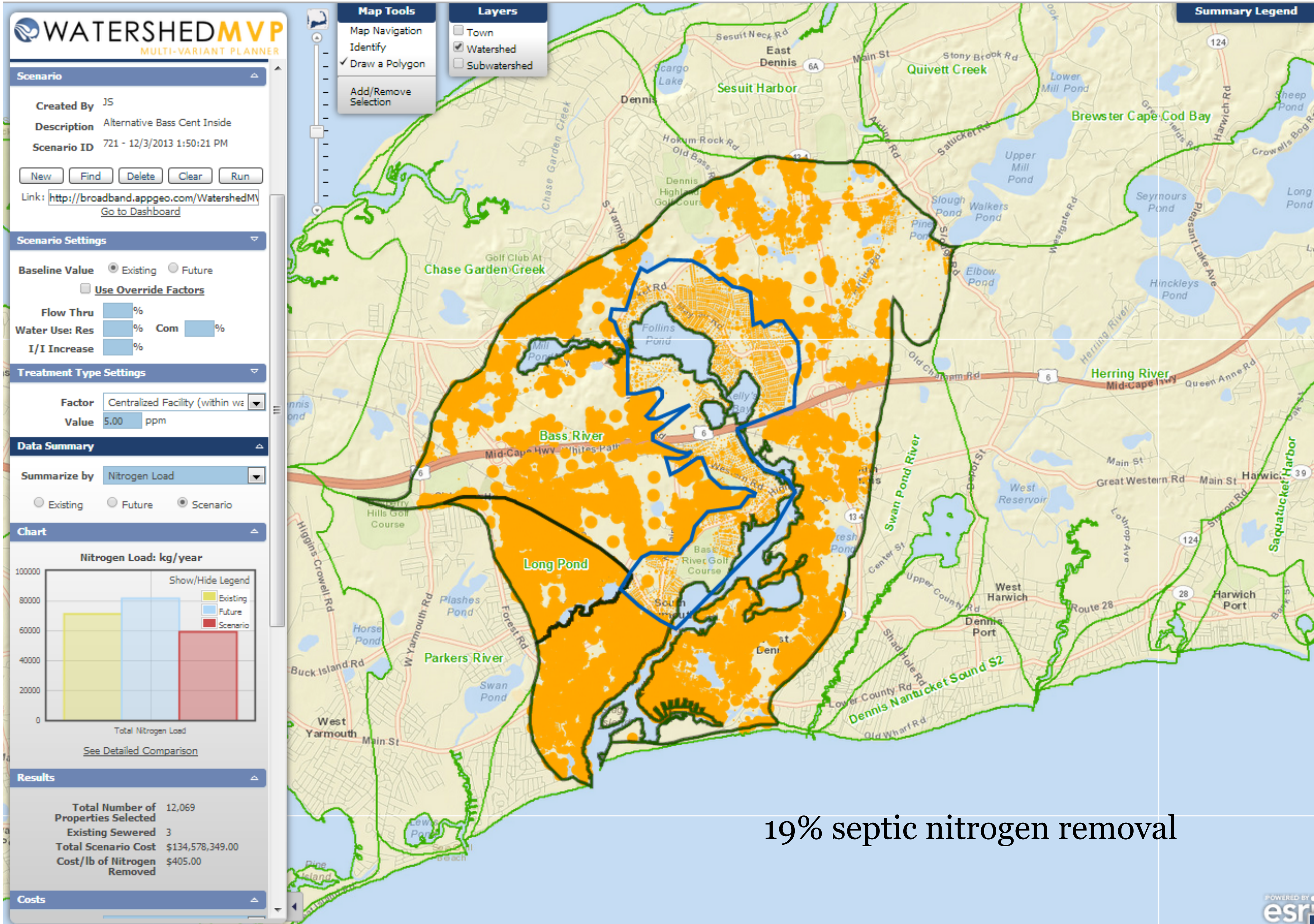
Watershed/Embayment Options:					
Permeable Reactive Barrier (PRB)	1220	homes	3,757	27,687	$452
Constructed Wetlands	3	acres	1,698	25,989	$521
Phytoirrigation/phytobuffers	12	acres	1,632	24,357	$596
Fertigation Wells	2	golf course	272	24,085	$438
Oyster Beds/Aquaculture	40	acres	10,000	14,085	$0
Alternative On-Site Options:					
Ecotoilets (UD & Compost)	458	homes	1,812	12,273	$1,265

Watershed Calculator BASS RIVER

"Watershed Working Group - Lewis Bay to Bass River - Workshop 3"

MEP Targets and Goals:			**kg/day**	**Nitrogen (kg/yr)**	
Present Total Nitrogen Load:			0	79,497	
wastewater			0	66,905	
fertilizer				6,296	
stormwater				6,296	
Target Nitrogen Load:			0	41,756	
Nitrogen Removal Required:			**0**	**37,741**	
Total Number of Properties:	9153				
Other Wastewater Management Needs	Ponds		Title 5 Problem Areas		Growth Management
Low Barrier to Implementation:			**Reduction by Technology (Kg/yr)**	**Remaining to Meet Target (Kg/yr)**	**Unit Cost ($/lb N)**
Fertilizer Management			3,148	34,593	
Stormwater Mitigation			3,148	31,445	
Watershed/Embayment Options:					
Permeable Reactive Barrier (PRB)	1220	homes	3,757	27,687	$452
Constructed Wetlands	3	acres	1,698	25,989	$521
Phytoirrigation/phytobuffers	12	acres	1,632	24,357	$596
Fertigation Wells	2	golf course	272	24,085	$438
Oyster Beds/Aquaculture	40	acres	10,000	14,085	$0
Alternative On-Site Options:					
Ecotoilets (UD & Compost)	458	homes	1,812	12,273	$1,265
Sewering	2789	homes	12273	0	$1,000
			Total To Meet Goal (Kg/yr):	0	$580

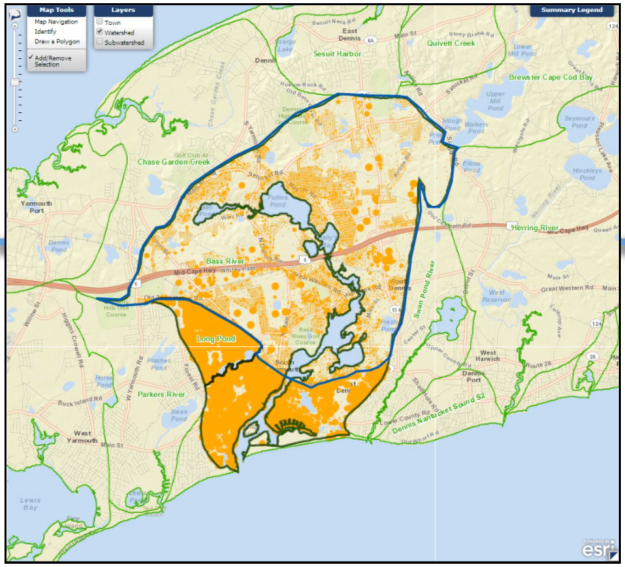
Targeted Centralized Treatment after Applying Alternative Strategies (12273 kg N/yr)



19% septic nitrogen removal

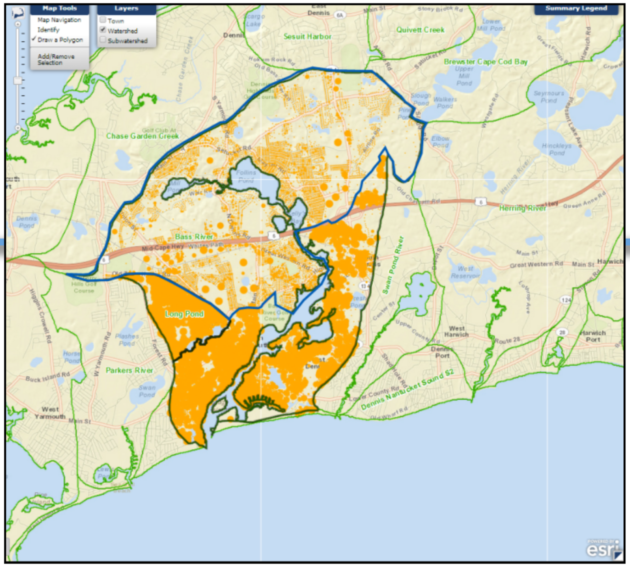
Scenario Comparison

Targeted Collection



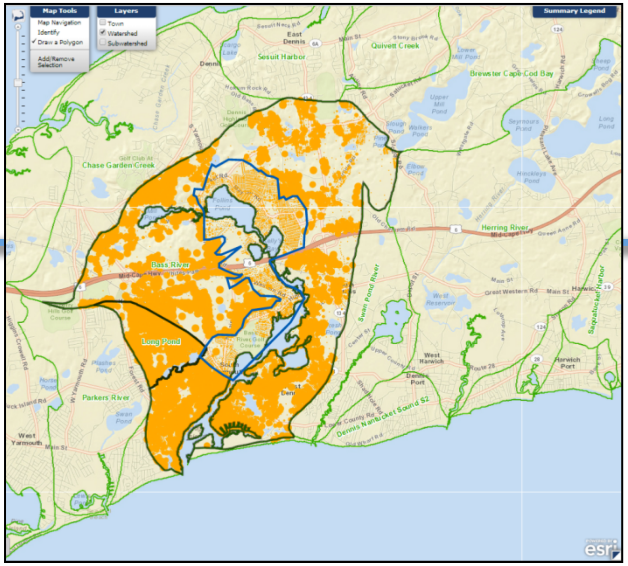
- Achieves TMDL[1]
- Total Cost = $410 Million
- Cost/lb N = $401
- Treated Flow = 1,316,000 gpd

Targeted Collection after a 50% reduction in fertilizer and stormwater



- Achieves TMDL[1]
- Total Cost = $332 Million
- Cost/lb N = $406
- Treated Flow = 1,055,000 gpd

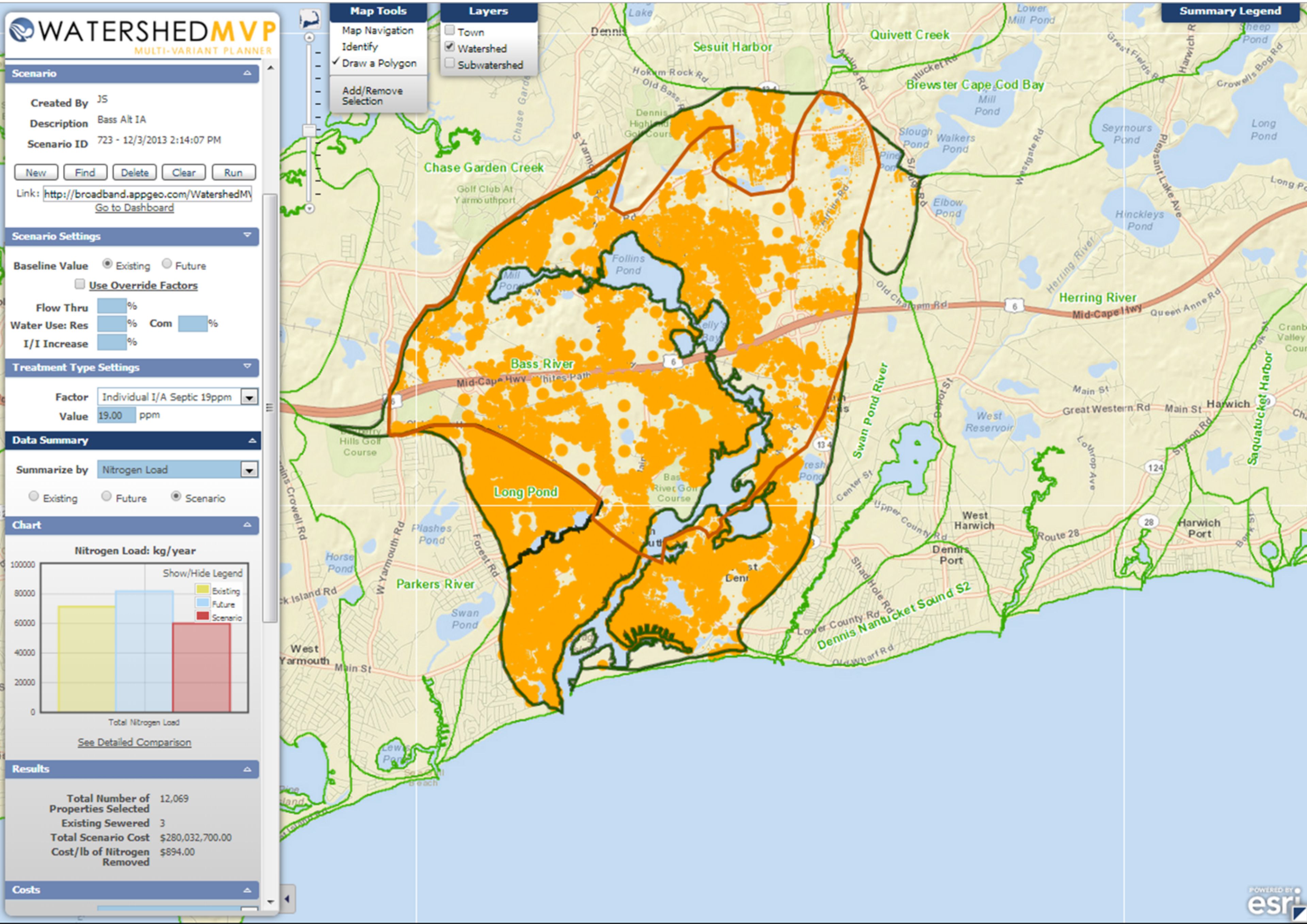
Targeted Collection after a 50% reduction in fertilizer and stormwater & after applying alternative approaches



- Achieves TMDL[1]
- Total Cost = $135 Million
- Cost/lb N = $405
- Treated Flow = 397,000 gpd

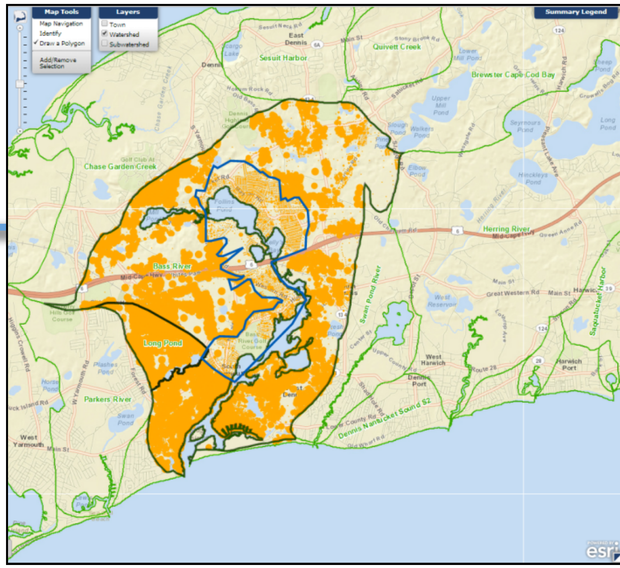
[1] within 5% of goal

Innovative/Alternative On-Site Systems after Applying Alternative Strategies (12273 kg N/yr)



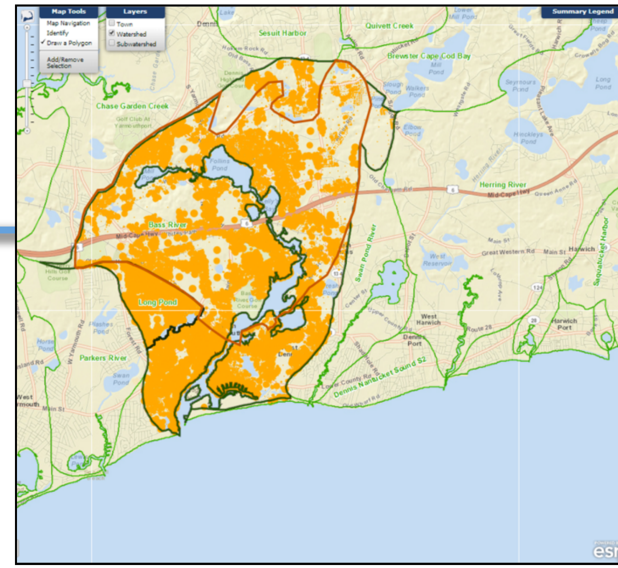
Scenario Comparison

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



- Achieves TMDL[1]
- Total Cost = $135 Million
- Cost/lb N = $405
- Treated Flow = 397,000 gpd

Innovative/alternative on-site systems after a 50% reduction in fertilizer and stormwater & after applying alternative approaches



- Achieves TMDL[1]
- Total Cost = $280 Million
- Cost/lb N = $894
- Treated Flow = 1,172,000 gpd

[1] within 5% of goal

"Watershed Working Group - Lewis Bay to Bass River - Workshop 3"

"Watershed Working Group - Lewis Bay to Bass River - Workshop 3"

"Watershed Working Group - Lewis Bay to Bass River - Workshop 3"

Adaptive Management:

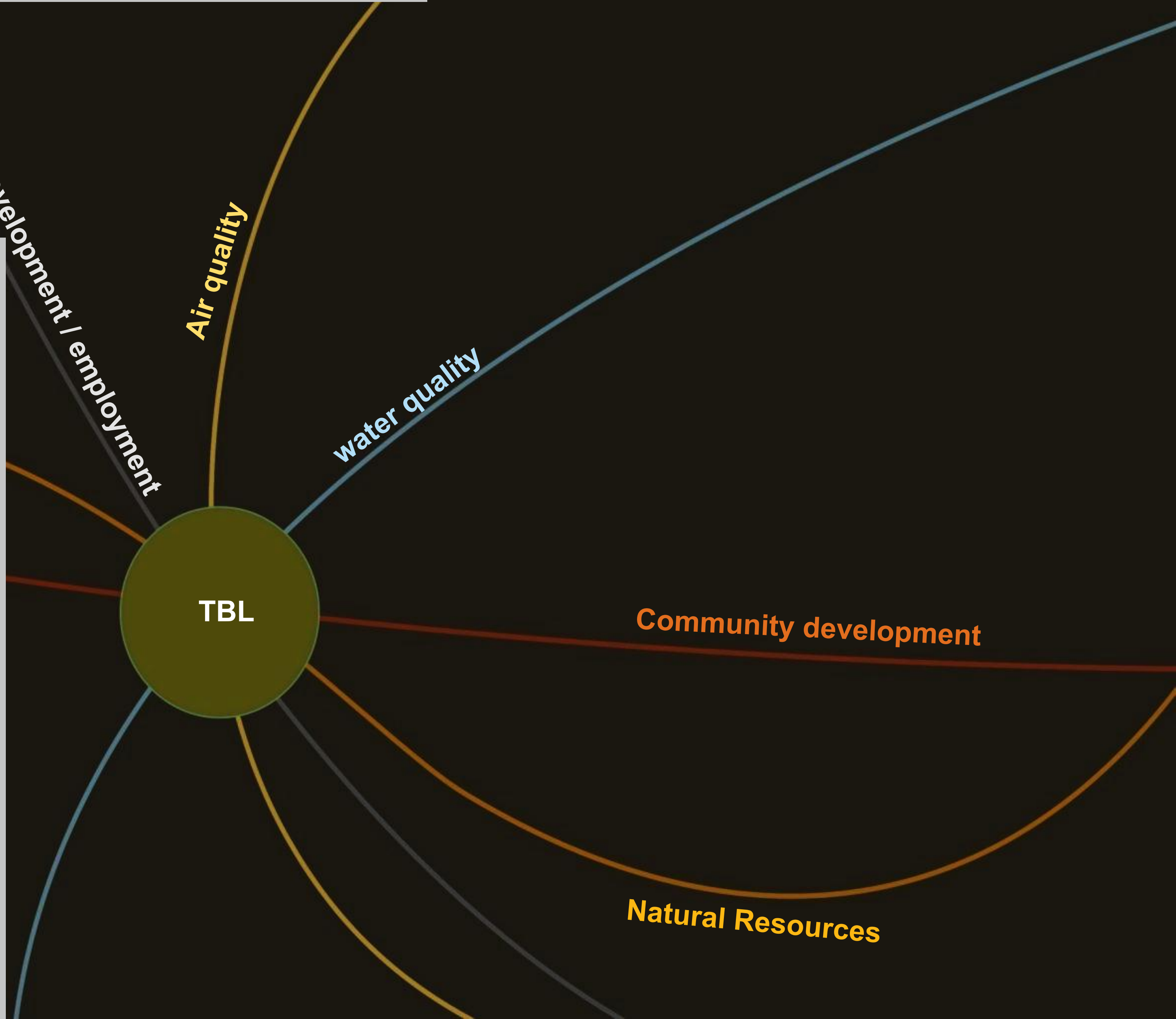
A structured approach for addressing uncertainties by linking science and monitoring to decision-making and adjusting implementation, as necessary, to increase the probability of meeting water quality goals in a cost effective and efficient way.

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

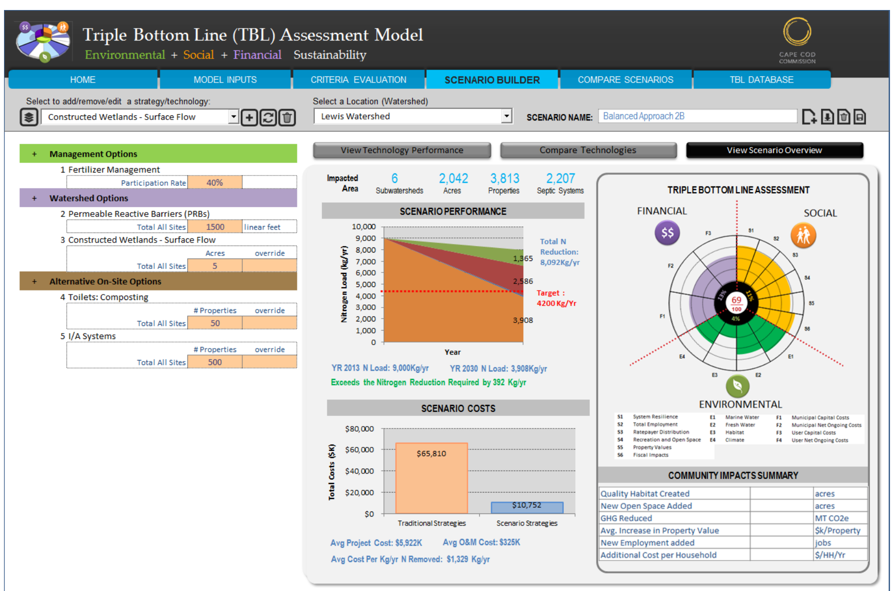
Often "TBL" analysis is used to identify the best alternative and to report to stakeholders on the public outcomes of a given investment.

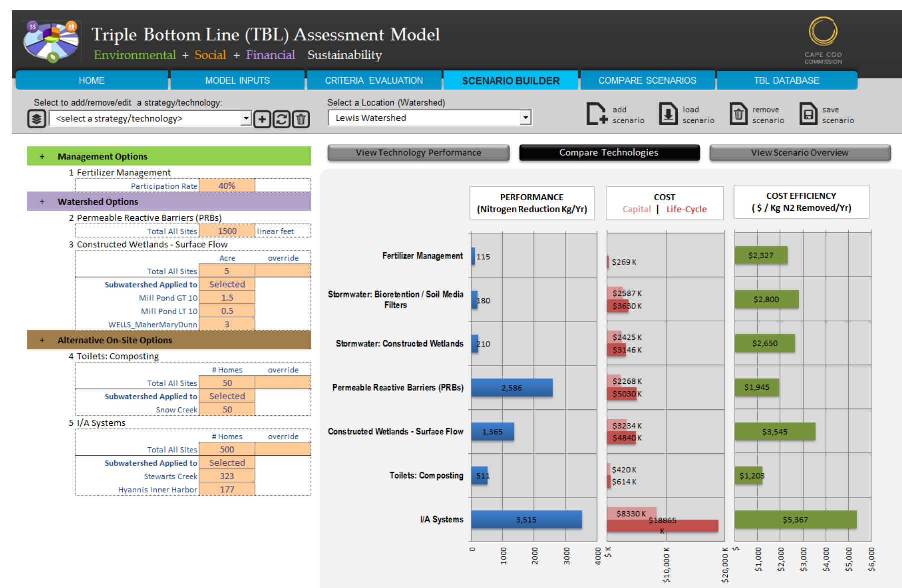


Why develop a TBL model?

- 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

"Watershed Working Group - Lewis Bay to Bass River - Workshop 3"

Environmental + Social + Financial Sustainability

CAPE COD COMMISSION

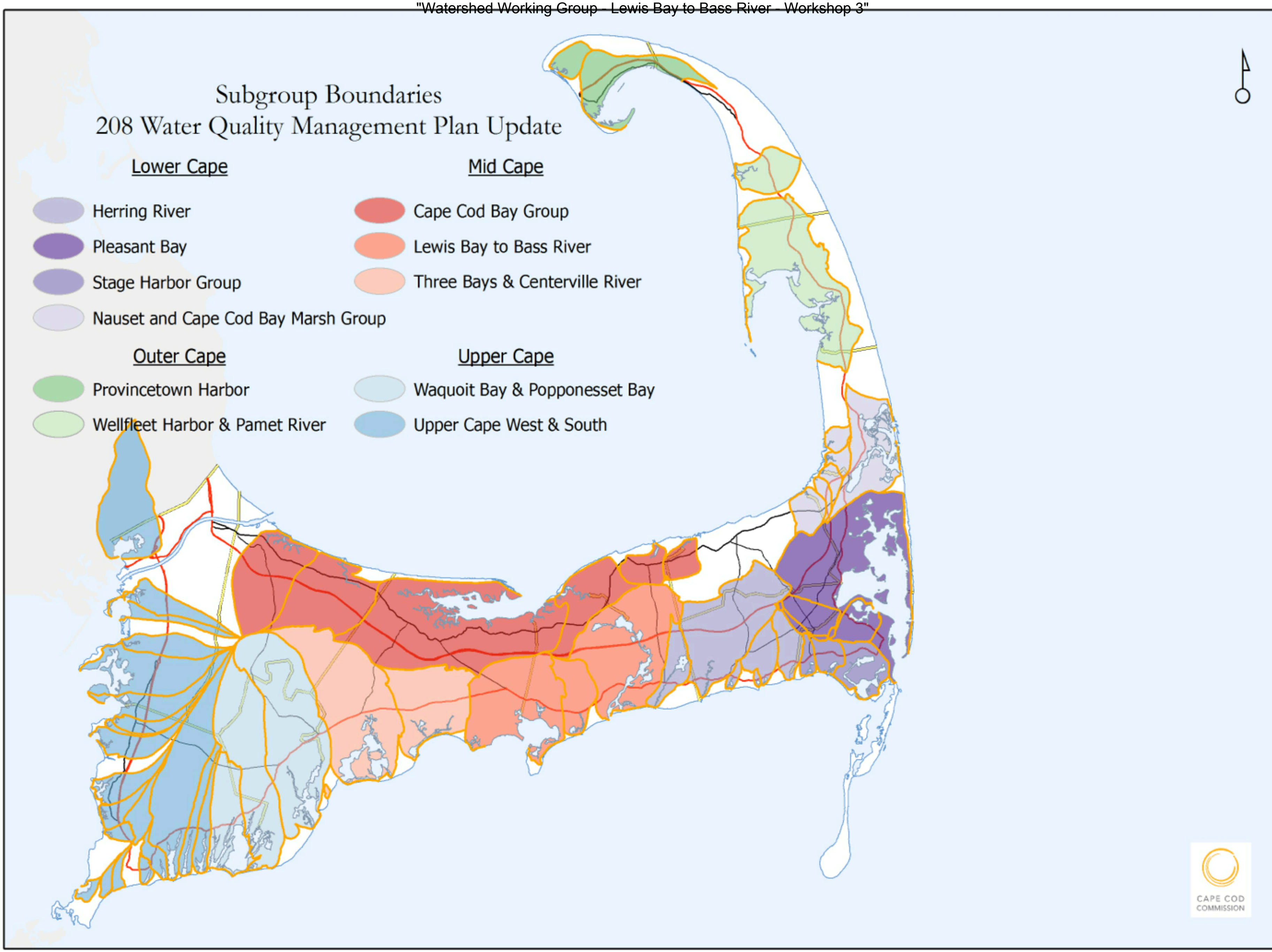
	Scenario 1	Scenario 2	Scenario 3
	Minimum Cost	Cost Effective	Maximum Performance

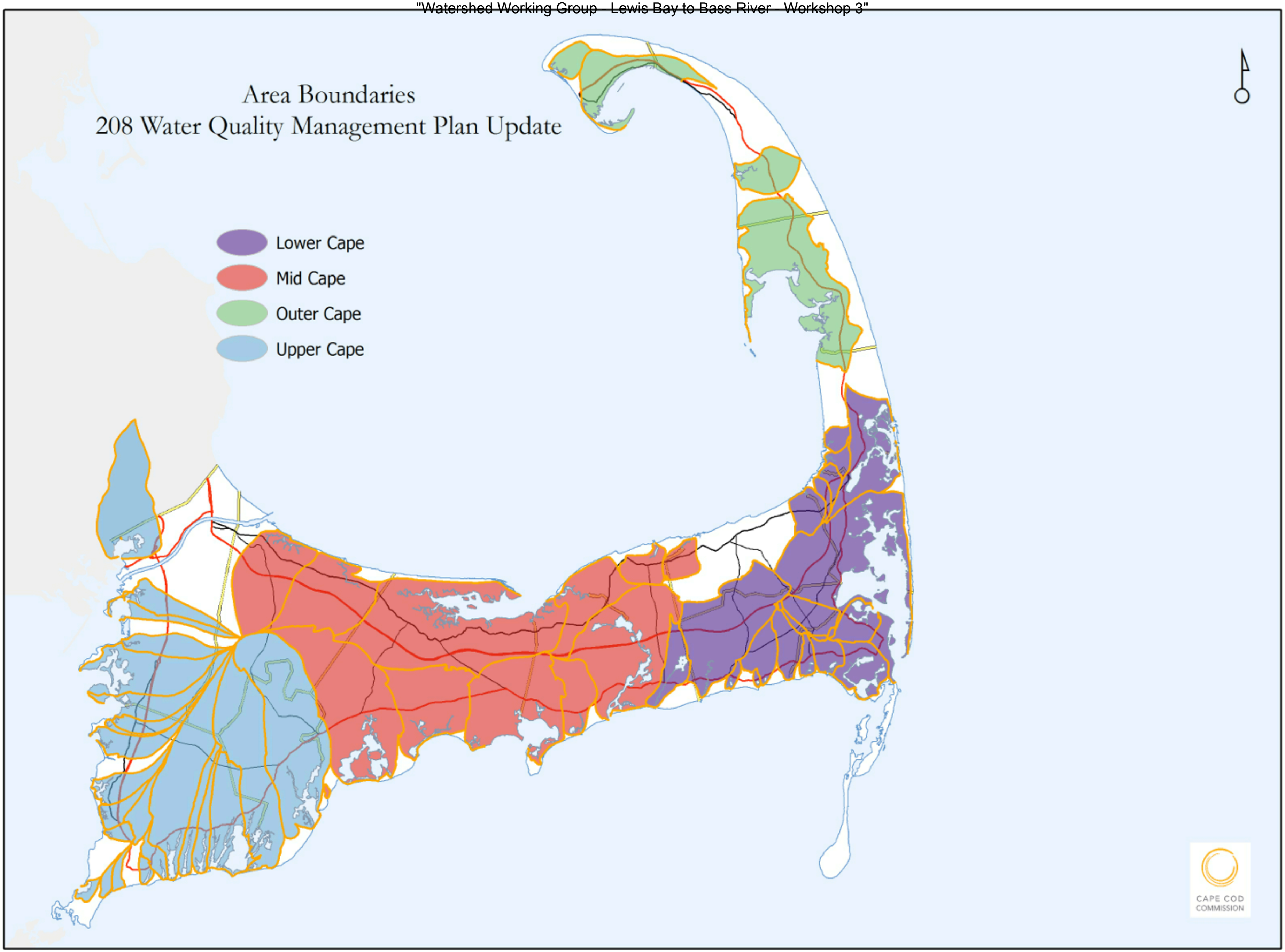
Criterion Scores

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

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
Lewis Bay to Bass River Watershed Working Group

Meeting Three
Thursday, December 5, 2013
8:30 AM – 12:30 PM
Dennis Town Hall

Meeting Summary

I. ACTION ITEMS

Working Group

- Contact the Cape Cod Commission if interested in participating in the Mid Cape sub-regional watershed group
- Contact the Commission if interested in participating in January ad hoc meeting on monitoring issues

Consensus Building Institute

- Draft and solicit feedback from Working Group on Meeting Three summary

Cape Cod Commission

- Publish report on Lewis Bay watershed on the working group's website
- Share information about date and time of the January stakeholder meeting and the ad hoc monitoring with the Working Group within the next week

II. WELCOME AND OVERVIEW

Carri Hulet, 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's task for the day would be to provide input on a few different scenarios the Commission had prepared to show how wastewater could be managed in the Bass River sub-watershed. The group would also be asked to evaluate the method by which the scenarios were developed, as it is expected that the same method will be applied to Lewis Bay and all other sub-watersheds on the Cape. She explained that the Cape Code Commission would only show the scenarios for the Bass River watershed at the meeting as an example, for the sake of time.

Scott Horsley, Area Manager and Consultant to the Cape Cod Commission, welcomed participants and offered an overview of the 208 Update stakeholder process.[1] In July, public meetings were held across the Cape to present the 208 Plan Update goals, work plan, and

[1] The PowerPoint Presentation made at this meeting is available at: http://watersheds.capecodcommission.org/index.php/watersheds/mid-cape/lewis-bay-to-bass-river

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 focused on exploring technology options and approaches. The third round of meetings of the Watershed Working Groups focus on evaluating watershed scenarios. These scenarios are informed by the Working Groups' discussions at previous meetings about baseline conditions, priority areas, and technology options and approaches.

Mr. Horsley shared the 208's Plan team's progress since Meeting 2, which includes:

- Meetings with the Advisory Board, the Tech Panel, the Finance Group, the Regulatory-Legal-Institutional Group, and the TAC.
- Further developed and shared the Technology Matrix, showing possible traditional and non-traditional technologies at the site, neighborhood, watershed, and cape-wide scales.

Mr. Horsley then reviewed the goals 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 using 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.

III. INITIAL SCENARIOS FOR THE BASS RIVER WATERSHED

Mr. Horsley explained the Commission's process to develop watershed scenarios. Two teams were formed: one team is exploring traditional (or "conventional") technologies and approaches (e.g. sewering and I/A systems) and another team is exploring non-traditional (or "alternative") technologies and approaches. The teams are both working under the assumption that fertilizer and stormwater reductions will be incorporated into all of the final scenarios, but for now, the traditional approach team also looked at two scenarios that do not include fertilizer and stormwater management in order to provide baseline estimates for comparison.

Traditional Approaches

Tom Cambareri, Water Resources Program Manager at the Cape Cod Commission, worked on the team that developed the "conventional" approaches and led this part of the discussion. 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 (not shown in the current scenarios), technology costs, and other factors.

He noted that the nitrogen TMDL for the overall watershed can be met if 47% of existing wastewater nitrogen load is removed from the system, as determined by the MEP studies.

He offered three main scenarios for the Bass River watershed[2]:

- Comparative I/A scenario
    - The installation of I/A systems in all homes in the Bass River watershed, which could reduce nitrogen to 19 parts per million and would remove 27% of the target nitrogen load, costing $430 per pound of nitrogen, and almost $18 million in total.
- Centralized treatment scenario
    - Modeled a hypothetical scenario in which treated water is put back into the watershed with nitrogen levels of 5 parts per million, resulting in an 81% reduction in nitrogen levels, costing $351 per pound, and $24 million in total.
- Targeted collection and treatment scenario
    - Mr. Cambareri explained that, according to the watershed MEP, 50% of nitrogen is attenuated when passing through a pond or lake, which can be modeled to find more effective remediation scenarios by focusing on downstream watersheds. Thus, it makes more sense to remove downstream nitrogen.
    - Mr. Cambareri also noted that fertilizer and stormwater runoff contribute significantly to nitrogen loads.
    - When fertilizer and stormwater runoff are reduced by 50% a smaller centralized sewering footprint or a reduced number of I/A systems can be utilized to address the target.

Working Group members had the following questions and comments about the conventional scenarios (Working Group questions and comments in italics; responses are from Mr. Cambareri unless otherwise noted):

- *Is the calculation of nitrogen in the sub watersheds in these models current or potential?* They show current loads.
- *If additional development came into the area, would it change the calculation?* Yes, future growth will be taken into consideration in the final analysis. *If we discussed future development contributing to 40% of mitigation needs at past meetings, then this could be a big deal.* Yes, we are showing a solid example of what is known today, but we need to be cognizant of future loads as well.
- Mr. Horsley noted that many of the technologies can be adapted to handle additional buildout. He added that Mr. Cambareri's analysis showed multiple ways to reduce the sewering footprint, which his techniques will also do.
- Ms. Hulet reminded the group that today presentation primarily serves to explain the Commission's approach, and that the final scenarios will be refined to take future development and other issues the working groups raise into account. She also

[2] See full presentation for details: http://watersheds.capecodcommission.org/index.php/watersheds/mid-cape/lewis-bay-to-bass-river

explained that Mr. Cambareri showed three approaches that prioritize sewers and I/A systems. She said Mr. Horsley would approach the same problem from the other end of the spectrum, by prioritizing non-traditional methods first.

Alternative Technology and Approaches

Mr. Horsley led the discussion of "alternative" technologies and approaches. He explained that the scenarios were developed for discussion purposes and encouraged the working group members to offer their own modifications and suggestions. He introduced the group to the watershed calculator his team used to evaluate these scenarios. The calculator starts with the nitrogen reduction target, then deducts the nitrogen load reduction potential (kg/yr) of a given technology. It then calculates the remaining nitrogen reduction needed to meet the target load (kg/yr), and the unit cost per pound of nitrogen removed ($/lb).

Mr. Horsley walked the Working Group through the proposed non-traditional scenario for Bass River watershed, showing how much nitrogen would be reduced by the addition of each alternative technology. The approach starts by assuming a 50% reduction in stormwater and fertilizer runoff because programs to achieve these reductions are assumed to be in place.

The proposed Bass River scenario seeks to meet the nitrogen reduction goal of 37,741 kg N/yr. Mr. Horsley noted that this watershed also has to be concerned with ponds, Title V problem areas, and growth management.

Stormwater and Fertilizer

Stormwater mitigation could remove 3,148 kg N/year. Massachusetts DEP also provides credits for stormwater management programs. Fertilizer management could remove 3,148 kg/year. This is done through better turf management and the CCC DCPC.

Permeable Reactive Barriers (PRBs)

PRBs could be placed perpendicular to roadways in several locations (see slides for detail). It is estimated that PRBs at the proposed locations could remove the nitrogen from 1220 homes, which would be equivalent to 3,757 kg N/yr.

Constructed Wetlands

If built in the proposed locations, 3 acres of constructed wetlands could remove 1,698 kg N/yr. These wetland locations were selected to intercept nitrogen-enriched groundwater downgradient from high-density septic areas.

Phytoirrigation/phytobuffers

In the proposed locations, 12 acres could remove 1,632 kg N/yr. Mr. Horsley explained that come phytobuffer plants could reach nitrogen in the underlying groundwater up to 20 feet deep because of their extensive root systems.

Fertigation Wells

These were proposed on 2 golf courses and could remove 272 kg N/yr. Mr. Horsley explained that fertigation wells on golf courses may not remove a great deal of nitrogen because the groundwater by golf courses often has low nitrogen levels due to better fertilizer management on the course, but groundwater downgradient from high density septic areas could be collected and pumped to golf courses and used as fertilizer. This option might also have return revenues (realized as fertilzer cost reductions) and existing wells could likely be used in some cases.

Oyster beds/aquaculture
40 acres of shellfish could remove 10,000 kg N/yr. The Commission used conservative removal numbers by using data that looked only at the amount of nitrogen in oyster meat and ignoring the shells and the benthic zone dentrification beneath the shellfish areas. This technology could be deployed either in aquaculture cages or reef beds.

Ecotoilets
Urine Diversion (U/D) and composting toilets in 458 homes (or 5% of the total number of homes in the Bass River watershed) could remove 1,812 kg N/yr. Mr. Horsley explained that 5% is an estimated number that might be adopted by future homeownere chosen by the team working on this approach. Some said that over a ten-year period, many more than 5% of the homes might want an eco-toilet. Others felt it was too much.

Sewering
After applying all of the previous alternative technologies, 12,273 kg N/yr remained to meet the target. Sewering 2,789 homes in targeted locations could meet that goal and would cost $580 per pound of nitrogen removed, or a total of $135 million.

Working Group Reactions, Questions, and Discussion
Ms. Hulet reviewed some of the priorities and concerns the participants had raised at past Working Group meetings. She asked if, given these priorities and concerns, they had feedback about the proposed technologies or suggestions on additional technologies that might be appropriate for this watershed. Working Group questions and comments follow in italics; responses are from Mr. Horsley unless otherwise noted.

Sewering

- *Would the effluent from a centralized treatment plant be released in or outside of our watershed?* Presumably it would be inside the watershed, unless an agreement could be made with another watershed, but no site has yet been identified.
- *The cost per pound is the same between the scenario with 'targeted collection after a 50% reduction in fertilizer and stormwater' and the 'scenario with targeted collection after a 50% reduction in fertilizer and stormwater and after applying alternative approaches,' but the second one has an overall lower cost. Why is this?* The first shows the additional sewering cost with a larger footprint. The second scenario allows a smaller footprint, which allows the town to be more efficient by targeting denser areas.

- *How many homes are sewered in each of the four scenarios?* There are about 9,000 in the first (sewer everything), 7,000 in the second (targeted sewering), 6,000 in the third (targeted sewering after fertilizer and stormwater management), and 3,000 in the fourth (sewering after fertilizer and stormwater management and applying various non-traditional technologies).
- *Are the public and private costs shown for sewering?* The capital costs and maintenance costs are included. Mr. Cambareri added that the life cycle costs were not included.
- *Shouldn't we consider areas where sewering will be required anyway (areas of dense future development)* Yes.
- *Sewering near shorelines might be problematic, as storms could destroy them and create disagreements about who should pay for the repair costs.*
- *Some areas will inevitably need to be sewered no matter what. These projects should be prioritized and built as soon as possible.*

Aquaculture

- *Though oyster beds have tremendous potential, there should not be too much optimism as there are currently limited seed supplies, and the final product may not be consumable because of water quality issues*. *There may also be disposal costs.* There are many details that would need to be worked out. If the oysters can be sold and consumed, this approach could generate revenue and private citizens and companies would be interested. If not, there could be some costs to the public to grow the beds.
- *In Barnstable, oysters could be moved to a clean water body after a certain point, which makes them consumable. They are also an immediate solution because you see the effects after just one season.*
- *How realistic is the proposed acreage for oysters?* The number was based on other studies. Mr. Horsley asked the group how it compared to the actual situation in Bass River. Some said there is potential for 40 acres.
- *Additional oyster beds have been established since the release of the MEP reports. Presumably those beds have reduced the nitrogen load already. We should get credit for that.* Another participant responded, saying *there has also been more population growth since the MEP reports were issued.*
- *Oyster reefs can be vulnerable to pollution from stormwater and other contaminants.* Yes, the technologies go hand in hand, so stormwater management could potentially improve water quality and boost aquaculture.

Ecotoilets

- *Ecotoilets get picked on for not being "permitted," but they are approved, just not for nitrogen credit. The other systems also do not have credit approval yet.* You are correct. They are allowed under Title V, but the nitrogen credit has not yet been worked out. *It should be easy to get approval for them, as all the human waste is contained inside the system.*

- *Having ecotoilets in 458 homes seems conservative to me. We might not be able to sewer 3,000 homes, so we will need to do a cost/benefit analysis and if ecotoilets make economic sense compared to tying into sewers, people will likely be attracted to whichever option is cheaper.*
- *There should not be a choice: new developments should be required to install ecotoilet systems. The general public would rather push the cost to developers. There could be permiting guidelines that require the adoption of eco-toilets for the some high percentage of the new homes.*
- *Any requirements like that could inhibit future growth.*
- *Are there also issues of seasonality? If you only use it in the summer, is that a problem?* (this question was not directly responded to, but one person said *sewers can also have problems with seasonality.*
- In the future, Mr. Horsley said, resistance toward ecotoilets will hopefully decrease with public education efforts, especially those directed at school children now.
- One participant suggested a specific method for getting more than 5% of the homes to use ecotoilets. He said *if 3% of septic systems need new permits each year anyway, and it costs them $10,000 for a septic upgrade, we should encourage homeowners to install eco-toilets instead. We could possibly increase adoption by 1 to 2% a year this way.*
- *If we build a sewer system for 3,000 people, we might just encourage more development.*
- *It's going to take 5 to 10 years to get approval for something like ocean outfall. We could spend that time installing other systems, such as ecotoilets.*
- *The cost of installing ecotoilets in homes is directly on the homeowners.* That depends on the policy, which might include incentives, said Mr. Horsley, and he confirmed that the Commission is looking into costs with financial models.
- One person asked *whether the town has the authority to require certain technologies (such as an ecotoilet) or if it can simply regulate the amount of nitrogen that needs to be managed.* It is more of the latter, though they can suggest and incentivize a proposed alternative system, and the Cape Cod Commission has some zero limit regulations for larger developments.
- *Another problem with ecotoilets is that the maintenance is left to the owner.* Yes. At the community scale, we need to consider long-term operations and maintenance management strategies. Some of those might involve the government. One person said *he didn't think people would want the government coming into their homes to inspect their system. Another person said they already do something similar with boiler inspections, while another said it's unavoidable so people will have to get used to it.* Ms. Hulet summarized the conversation by saying that privacy issues are a concern that need to be taken into account.

<u>Other Technologies and Overarching Technology Questions</u>

- One person recommended expanding the calculator sheet to include timeframes for implementation and impact.

- One person asked *whether PRBs are less effective if the groundwater hits them from the side, rather than straight on? PRBs would be designed to intercept groundwater flow perpendicular, not from the side.*
- *For dredging, when looking at the TMDL, can we consider the benthic sink contribution, and what are we doing relative to that?* The MEP report breaks down nitrogen into controllable and non-controllable sources, and benthic environments are considered non-controllable unless dredged.
- *Will costs be added to each of the technologies?* Yes, to the extent they can be predicted. It's assumed that non-traditional technologies will only be pursued if the costs are lower than those of traditional approaches. But it appears now that most of them are cheaper, especially aquaculture. Many of them also have co-benefits, such as return revenues and job creation. A participant seconded the value of looking at job creation when evaluating these technologies.
- *How old is the nitrogen reduction target*? The MEP report uses some data that is 10 years old. Since that time, the towns have better controlled nitrogen, but growth has also changed. Mr. Horsley acknowledged that updated information would be helpful.
- *Will these technologies also deal with emerging contaminants?* Yes, the Commission is considering this issue, though the main focus is nitrogen. It is discussing phosphorous in lakes, high microbe levels, and emerging contaminants. The problem is that, since they are still emerging, reducing them is somewhat of a moving target.
- *Have you planned these technologies with the understanding that atmospheric nitrogen levels are decreasing?* Yes, we will talk more about this in the adaptive management presentation.

Approach
Ms. Hulet reviewed the 7-step approach and asked the Working Group for their thoughts on the method.

<u>Considerations to incorporate into the plan</u>
Several members of the Working Group praised the approach, noting its flexibility. Others supported the approach but noted that it should include a more solid timeframe and consider other issues on the Cape, including TMDLs for bacteria, lake and estuary protection, and areas with vulnerable Title V systems, which may require sewering. Mr. Horsley agreed that weighing other considerations is important, and cited the potential adverse effects of sea level rise on septic systems as an example of a changing condition that needs to be taken into consideration.

A participant underscored the importance of protecting drinking water sources in Cape Cod, stating that the 208 Plan should prioritize the protection of drinking water wells with high levels of nitrogen. Mr. Horsley said that, overall, the drinking water has been well protected and agreed that any new approach should not trade improvements in nitrogen reduction for harm to drinking water. Mr. Cambareri added that open space protection and zoning have been quite effective at protecting drinking water, but still some wells have approached 5 parts per million for nitrogen. He said this was mostly because of development that occurred over forty years ago and is only now making it to the wells.

A group member asked how the process would handle interactions between towns as most of the watersheds have more than one community. Mr. Horsley highlighted the importance of collaborative work and added that the process might involve watershed-level rather than town-level permitting. This would require agreements between the towns.

Public Education

Some members said they were impressed with the approach and the tools it offers, as it makes the process easier to see with clear math and numbers. One person said the information might work well with STEM education in schools. Kristy Senatori, Deputy Director of the Cape Cod Commission, noted that students were very engaged in the Cape-2-O game, and one of the awards went to a Falmouth STEM program. Another participant added that public education, as well as seeking low hanging fruit, would be critical for overcoming resistance to the plan. A member of the public audience commented that the public would more easily digest the technologies if they were not proposed as sewer or wastewater issues, but instead as green space or transportation measures.

Political Appeal

A Working Group member noted that passing publicly-funded measures to manage wastewater has been very challenging on the Cape. One person said the Commission should consider public-private partnerships, and to what extent these solutions can be implemented at private cost rather than public. Others said sharing the cost among taxpayers is the only way the target will be met. Another said we need to be looking for money from federal sources. Mr. Horsley noted that voters may be more ready to choose alternatives than we think given the positive reception these approaches have received in the working groups. Ms. Hulet added that one of the areas of focus in the next six months will be figuring out how to create political will to pursue these solutions. A Working Group member added that, once homeowners need to be involved in the process, it becomes a nightmare, so a moderate approach that affects everyone equally and includes some of the alternative technologies will be more likely to succeed. He added that he was more optimistic about the process today than in the past because of the clear presentation of alternatives and outreach to the Working Groups.

Lewis Bay

A Working Group member asked if the Commission is considering any technologies for the Lewis Bay watershed, especially ones that target herbicide runoff. Mr. Horsley responded that the Commission is preparing a scenario for Lewis Bay, which is different because of its scale, sewer system, and PRB considerations. He said that herbicide mitigation is not the focus of the project but will be addressed in the report. Another participant asked if they could comment on the Lewis Bay plan once it is completed. Mr. Horsley said the Commission will have more meetings for people to engage in this and will also place the information on the website.

IV. ADAPTIVE MANAGEMENT

Scott Horsley explained the concept of adaptive management as:

> 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 ways.

He noted that adaptive management does not mean endlessly waiting for new data before taking action. He said adaptive management is a way to move ahead, even in a situation with a great deal of uncertainty due to new technologies and a changing environment, as well as other dynamic factors. He emphasized that an adaptive management plan needs to meet the set water quality goals, while being cost effective and time sensitive. Mr. Horsley and Ms. Hulet then led the group in a discussion about how to construct this plan – including the critical elements of the plan and how to communicate and manage it.

Timeframe and Prioritization

Ms. Hulet asked the group to think about where you would start – what you would try first, and how you would propose to match up the monitoring and evaluation with the decision points to stick with the experiment or give up and go to another option.

A Working Group member, referring to sewering, stated that everything is adaptive management until the problem is solved with more expensive and permanent solutions having a longer timeframe and requiring more monitoring. Ms. Hulet asked if sewering should be part of a one- to five-year plan, or if it is a last resort. A participant supported including it in the plan from the start, adding that the process takes several years to plan and fund before it gets built anyway, and some places "we already know will need to be sewered."

Another participant said we should focus on low-hanging fruit, like PRBs and aquaculture to build confidence in the adaptive management approach, and to then be better positioned to implement more ambitious, longer term plans later. Another group member added that these low hanging fruit could include retrofitting projects and systems that will work immediately, such as urine diversion. A participant added that projects that involve co-benefits should also be highly prioritized.

Management Structure

A Working Group member emphasized the importance of an authoritative body to lead the process, consider the details, transcend town lines, and oversee the lengthy implementation and monitoring stages. One person said the Cape Code Commission is the default option. Another participant agreed that the plan needs to be dealt with cooperatively. One person cited the towns' cooperation on transportation as a successful example of cross-boundary coordination. Another said stormwater management provides some precedent for Cape-wide collaboration. Others worried that pushing for county level institutions would engender anti-government sentiment and recommended having a few towns work together or tasking the

Cape Cod Commission with orchestrating collaboration among several smaller watershed groups.

Private Sector

Several working group members said the private sector needs to be brought into the process, as the low-hanging fruit are also potentially profitable (including ecotoilets, aquaculture, fertigation, fertilizer management, etc.). One said developers could also be partners with the right incentives. Mr. Horsley responded that this makes sense and has already accomplished in certain areas, noting that several developments have been designed and permitted that actually result in a net reduction of nitrogen, commonly by providing sewering to neighboring developments that are currently on septic systems. A participant noted that several hotels in Yarmouth have old systems and would likely be willing to join together with a new development to build a treatment plant.

Summary of Adaptive Management Comments

Ms. Hulet summarized the comments on the adaptive management plan by highlighting some critical elements:

- Timing: What gets implemented when? How is it monitored and when do you know whether to go to Plan B or C?
- Prioritize co-benefits
- Incentivize and partner with the private sector
- Implementability – who will make sure the plan gets followed? How? With what authority and funds?
- Look to both retrofit and build better in the future
- Consider growth management

V. PREPARING FOR 2014 JAN-JUNE

Kristy Senatori, Deputy Director of the Cape Cod Commission, shared the Commission's plans for continuing stakeholder engagement into 2014.

Triple Bottom Line approach

Ms. Senatori presented on the work that the Commission has done with AECOM to develop a Triple Bottom Line model. First, she defined Triple Bottom Line Analysis as a full accounting of the financial, social, and environmental consequences of investments or policies. She also noted that TBL analysis is often used to 1) evaluate scenario alternatives and rank them against each other; and 2) report to stakeholders on the public outcomes of a given investment. To explain why the Commission has decided to pursue a TBL model, Ms. Senatori shared that it will allow the Commission to:

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

- Evaluate the "ancillary" or downstream consequences of water quality investments, not just direct phosphorous or nitrogen level reductions.

She also explained that AECOM is working with Commission staff and stakeholders to develop criteria that integrate social, environmental, and financial considerations into the TBL model. These include:

- **Social**: System Resilience (i.e. how communities respond to natural hazards), Employment, Property Values, Ratepayer Distribution, Recreation and Open Space, Fiscal Impacts
- **Environmental**: Marine Water Quality, Fresh Water Quality, Climate, Habitat
- **Financial**: Municipal Capital Costs, Municipal Other Costs, Property Owner Capital Costs, Property Owner Other Costs.

Ms. Senatori then showed how three different hypothetical scenarios (minimum cost, cost effective, and maximum performance), when run through the model, rank comparatively, taking into consideration these social, environmental, and financial factors. She explained the model will be finalized by January or February 2013, and that the Commission will be using it over the next six months to assist in scenario evaluations.

In response to questions from the Working Group, Ms. Senatori and Ms. Hulet explained that all of the proposed scenarios will meet the water quality goals, and triple bottom line analysis is a tool for choosing among different scenarios that all meet the regulatory requirements. They noted that costs are factored into the social considerations through Cape property values, with the model will potentially be able to shed light on the trade-offs between economic development and nitrogen reduction costs.

Stakeholder Process: Summit and Working Groups
Ms. Senatori explained the next steps of the 208 Plan Update, which include:

January 2014	Assemble all 175 stakeholders across Cape Cod for a one-day Stakeholder Summit (tentatively scheduled for Jan 31) to discuss further planning, share the outcomes from stakeholder meetings, and form four sub-groups representing the Upper-, Mid-, Lower-, and Outer-Cape. These groups will likely meet three more times (Feb, March, April) and guide discussions over the next six months. The Commission may also convene an ad-hoc meeting to discuss monitoring protocols for different technologies.
February 2014	Meetings with the four sub-groups to further develop local scenarios and run them through the TBL model.

March 2014	Analysis performed by the Regulatory, Legal, and Institutional Work Group. The scenarios developed by the four sub-groups will be evaluated based on this analysis.
April 2014	Meetings with the four sub-groups to discuss monitoring and financial considerations of implementation.
June 1, 2014	Draft plan submitted to DEP.
June – Dec 2014	Public comment period on the draft plan.
January 2015	Submit final plan to DEP.

A Working Group member said it is import to maintain focus on individual watersheds, rather than regional or even municipal boundaries. Ms. Senatori said the Commission is encouraging watershed-level coordination.

VI. PUBLIC COMMENTS

One person said what many call pollution is not waste, but a resource that is put in the wrong place. Ecosystems provide everything to us, and, as they function naturally, they have no waste. She expressed dismay at the focus of the discussion on removing nitrogen rather than using nitrogen, and said if we do not follow the rules of nature, we will destroy something somewhere else. We see this in the economy. She said phosphorous is another good example – we are running out of it and cannot grow food without, but then trying to remove and dispose of it elsewhere in the ecosystem. She said, when this is considered, ecotoilets become a no brainer.

Another person complemented the Commission and the group on its work and said if we truly embrace the triple bottom line approach, we will take into account the value of the specific use of a technology as a benefit, which is critical to sustaining our community.

APPENDIX A: MEETING PARTICIPANTS

Name	**Affiliation**
Working Group Members	
Linda Bollinger	Hyannis Park Civic Association
Debra Dagwan	Barnstable Town Council
Steven Didsbury	Nitrogen Neutral, Centreville
Terry Hayes	Town of Dennis, Health Director
Jan Hively (on the phone for half the meeting)	Civic Groups, Yarmouth

Rick Lawlor	Golf Course Superintendents Assoc., Yarmouth
Spiro Mitrokostas	Dennis Chamber of Commerce
Charles Spooner	Resident of Yarmouth
Mike Trovato	Town of Barnstable
Sam Wilson	Sotheby Realty, Barnstable
CCC Staff / Facilitators	
Scott Horsley	Consultant, Watershed Area Manager
Tom Cambareri	Cape Cod Commission
Erin Perry	Cape Cod Commission
Carri Hulet	Consensus Building Institute
Griffin Smith	Consensus Building Institute
Public/observers	
Brian Bradigan-Smith	Lark Bay Researcher
Tara Corseri	LBRC
John C. Dorris	Centerville Civic
Hilde Maingay	The Green Center
Ellen Merritt	LBRC
Dan Milz	University of IL, Inst. of Envir. Science & Policy
Rulon Wilcox	LBRC