208 Area Wide Water Quality Management Plan Update
Monitoring Subcommittee
April 22, 2014
1pm
Cape Cod Commission Conference Room

Attendance: Tom Cambareri, CCC
Erin Perry, CCC
Scott Horsley, Consultant to CCC
Amy Costa, Provincetown Center for Coastal Studies
Matt Reardon, MassDEP
Bob Duncanson, Town of Chatham
Marcel Belaval, EPA
Brian Dudley, MassDEP
Rich Delaney, Provincetown Center for Coastal Studies
George Heufelder, Barnstable County Department of Health and Environment
Robyn Hannigan, UMASS Boston
Tim Gleason, EPA

208 Plan Update – See presentation for associated slides

Tom Cambareri discussed the mission of the Subcommittee: To provide advice and guidance on appropriate monitoring protocols for technology efficiency and total maximum daily loads, while identifying a process for consolidating all available monitoring data in a central location and format.

He also discussed the roles and responsibilities:

- Establish performance monitoring protocols for technologies that may be a part of watershed permits in the future
- Establish compliance monitoring protocols for meeting TMDLs in the water body
- Establish process and structure for consolidating and cooperation of existing monitoring programs and data in to a centralized location
- Identify region-wide monitoring needs and develop proposals

He described the 11 watershed working groups and the 4 subregional working groups that make up the stakeholder process, including regular meetings of the committees and subcommittees associated with the process.

He described the standing meeting agendas for the subregional meetings, which include scenario planning, regulatory, legal and institutional issues, and implementation, as well

as the shared nature of the problem – 32 of the 57 embayment watersheds are shared by one or more towns.

He discussed the need to designate waste management agencies to implement the 208 plan update and the challenges to intermunicipal collaboration that were identified by the stakeholder groups.

Two approaches have been used in the 208 plan update process – the traditional approach and the non-traditional approach, including a list of all technologies included in our technologies matrix.

Using Three Bays as an example, Tom showed the 3 "footprints" generated for each watershed as part of the 208 plan update – the targeted footprint, the targeted footprint after a reduction in stormwater and fertilizer nitrogen, and the non-traditional footprint.

The triple bottom line model is decision support tool that allows one to compare up to three scenarios at once for environmental, social, and financial criteria.

The traditional and non-traditional technology frameworks were presented. The traditional framework is well understood and the non-traditional framework represents our preliminary thinking about the type and frequency of monitoring associated with each non-traditional technology.

The adaptive management framework, which shows how non-traditional technologies may be incorporated in to plans over time, with decision points every 5 years on effectiveness, was presented.

Current monitoring includes Groundwater Discharge Permit monitoring, non-profit organization monitoring, Massachusetts Estuaries Project (MEP) monitoring, etc. The questions include: how does this monitoring need to be evaluated and what role does it play in TMDL compliance and assessing the effectiveness of non-traditional technologies?

Discussion on how monitoring fits in with 208 Plan Update process and watershed management

Robyn Hannigan asked if we have considered spatial frequency needed and the frequency of monitoring needed at different sites.

Tom said that, through MEP, we have characterization of watersheds that have TMDLs, but we need to evaluate whether the sampling completed was too much or too little. Challenging because we have multiple basins as opposed to one to monitor and evaluate.

Bob Duncanson said there are really two issues – technology monitoring, which is more short term need, to get information to make decisions on whether or not a technology is a good option, and TMDL compliance, which for many towns is far down the road. For Chatham, it's a 30 year master plan. From the communities perspective, monitoring for technology effectiveness is probably a higher priority.

George Heufelder said that the technologies that are "water in water out" have some information associated with them and are easier to monitor. For the ones that don't have clear boundaries, it's more difficult to figure out where to monitor and that will drive costs up.

Bob said that many towns talk about inlet widening and you need some level of pre monitoring data. How many years of data do you need? For Muddy Creek, we have 12 years, so we should be able to determine whether it is effective.

George said he doesn't know how rare it is to have sentinel stations already being monitored, but those would be the locations to consider for demonstration projects.

Amy Costa said that sentinel stations are only monitored in July and August.

Tom Cambareri asked if there is a need to monitor outside of July and August.

George said it depends on what the final goal is.

Brian Dudley said that ultimately the requirement is to restore habitat, not just to meet the target concentration at the station, so it's a question of the loads going in and knowing that what you do in the winter won't impact what's happening in the summer.

Robyn said the key is to know – what are you doing in the winter and does it impact the water body in the summer. Are there things you can do in the winter differently?

George said that he assumed that MEP took in to account that information when designing the monitoring.

Brian said they did take the window they felt was most appropriate.

Scott Horsley said that we are trying to pull data from wherever we can get it, but the proof is when we put them in the ground here and come up with an objective agreed upon approach for each – what would the monitoring plan look like?

George said what the plan looks like will drive the cost. Sometimes you cannot tell what the effectiveness is going to be until you put it where you want it and monitor. Proposed monitoring schemes need to be worked out for each.

Scott said he thought it might be helpful to identify pilot monitoring schemes and long-term monitoring schemes. Applying cost of pilot monitoring to long-term projects will likely be overestimating costs.

Marcel Belaval said that really makes it 3 pieces – TMDL compliance monitoring, pilot scale monitoring, and long-term technology monitoring.

George said that there are a lot of long term changes in the effectiveness of these technologies, especially living technologies, which may change as plants grow and change.

Amy said the same is for oysters – in Wellfleet, the oysters have changed in just 2.5 years.

Tom said that appropriate deployment of technologies is important to consider – we should look at what pilots would make the best case.

There was general agreement that the traditional technology monitoring is well understood. However, Amy mentioned that, depending on the location, additional monitoring of the impacts on the ecosystem may be desired by a community.

Marcel said that one question we need to answer is whether we are reopening the assumptions that MEP made are appropriate or not.

George said if you go by the MEP model it should tell you what your ecosystem response is. If it doesn't, there are other problems that need to be addressed.

Bob said that we concentrate sampling when people are here, in the summer.

Brian said that we need to identify appropriate statistical samples for certain technologies, like I/A systems, if they are being used as part of a plan for TMDL compliance.

Bob said that those are the things you need to know, all of the solutions being used for TMDL compliance need to be aggregated for cost and compared to the other scenarios.

Scott said we need to determine the best and efficient way to complete the monitoring – right now it's a lot of people and organizations, so it can likely be more efficient.

George mentioned using probes and electronic reporting and that someone needs to cost that out.

He said that maybe the best approach is to pick some folks to take a stab at what monitoring or concerns about monitoring might be applied to those technologies. What would a draft monitoring program look like and what are some concerns that can be identified?

Rich Delaney said that part of this will be driven by EPA and DEP regulations because they have to approve permits – what are you comfortable with?

Brian said that they worked closely with the town of Falmouth on their monitoring protocols for the non-traditional pilot projects.

Scott asked Marcel if the Office of Research and Development at EPA could assist in this effort.

Tim Gleason said that they could look at where the expertise lies in ORD and get back to the group. There may be some remote monitoring information that will be useful.

Tom brought back up the draft protocols and asked George what more needs to be developed for the traditional technologies, especially I/A systems, for the 208 plan update.

George said there is good data that showcases the variability with I/A systems and cluster systems. But conventional treatment and satellite treatment is not as variable and little probably needs to be done by this group for those technologies.

We need to close in on outliers – most I/A systems will remove about 50%. Scott asked where effluent is measured and George said that it is as it leaves the box. Influent monitoring is needed on comparable households to better understand the effluent measurements. It's not a lot of work, but it will take some time.

Bob asked whose responsibility it becomes to refine the number for I/A systems better. Do we tack it on to a town's pilot project or do we give it to George to get the data? Can it be funded through the 208 Plan Update?

George said it should be a process that is identified that whatever responsible entity is identified has to go through.

Scott said he thinks we can use a combination of technologies to get us to the goal in some watersheds.

George said as you go to mix and match you need to have a better idea of what the numbers for effectiveness are.

Tom asked Brian if he thought we should reevaluate monitoring for conventional and satellite systems and Brian thought that we have a good handle on that for now.

A discussion on individual non-traditional technologies:

Fertigation wells – Scott thinks you can take the full load reduction because you are replacing the area that is fertilized, so you would not apply additional fertilizer there.

George asked if the fertilizer foregone the only credit you should get.

George said that he thinks monitoring should be done in the winter as well as summer because you have some legacy to deal with in the summer. What you've leached over the winter is on its way to the well.

Scott said that many of the places we looked at were down gradient with applications up gradient.

Bob said that the credit should be the reduction in lbs of nitrogen fertilizer applied.

Scott said you are reducing nitrogen from fertilizer, but also using nitrogen in groundwater, so reduction could be greater.

Tom said that maybe we would need to be able to demonstrate uptake to get the further credit. Can we monitor below the turf to determine this?

Matt Reardon said a lot of it may be uptake that will be leached later in the season. If uptake is in a forested area it may not leach back as quickly.

Scott said that we are trying to put together a nitrogen budget for Cape Cod and all of the sources are about the same – there is a lot fertilizer coming on to the Cape.

George asked if there is hope to define a monitoring protocol to determine a credit or is it just the lbs of nitrogen not applied.

Matt said that is going to be very expensive and George replied that, in that case, it should be used in areas only where there is known fertilizer application.

Bob said that public water should not be used for these types of projects, they must be drilled.

Tom started to wrap up the meeting and said that we anticipate the group will meet monthly because there is a lot to consider. Tom asked for suggestions on monthly meeting times.

Marcel asked if this group would generate a report that would generate credits and Tom said it would be descriptive of the monitoring needed and would supplement the technologies matrix. The focus of the monitoring is to establish what credit can be given to that technology, in addition to the long-term monitoring.

It was brought up that there should be an effort to consolidate all of the existing data in to a central location. It was mentioned that organizations have tried to do this in the past and it has been unsuccessful, but that it would be a worthwhile effort.

George said that the first cut for this group should be to look at monitoring and frequency proposed and make changes/develop consensus around those changes.

Second cut, is how much it might cost.

Tom said we would look to modify the monitoring framework based on this feedback and to come back next month and talk about the PRBs and aquaculture in more detail.

Everyone will take technology framework and develop a list of bullets/suggestions.

Next meeting: May 19th, 20th, or 21st – Tom will send a Doodle poll out for availability.

April 22, 2014

208 MONITORING
Subcommittee

SECTION 208 AREA WIDE WATER QUALITY MANAGEMENT PLAN

MONITORING SUBCOMMITTEE

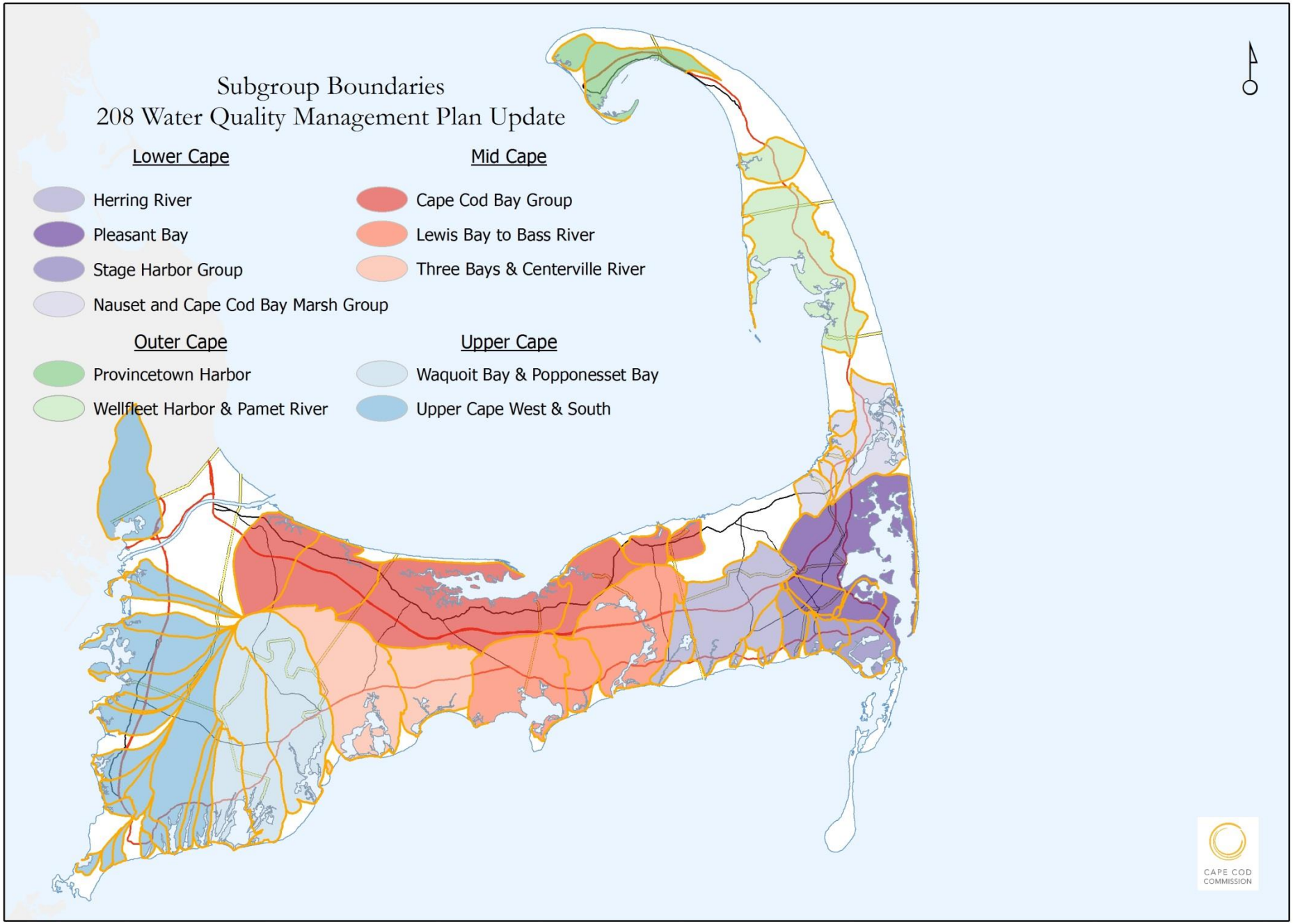
Mission:
To provide advice and guidance on appropriate monitoring protocols for technology efficiency and total maximum daily loads, while identifying a process for consolidating all available monitoring data in a central location and format.

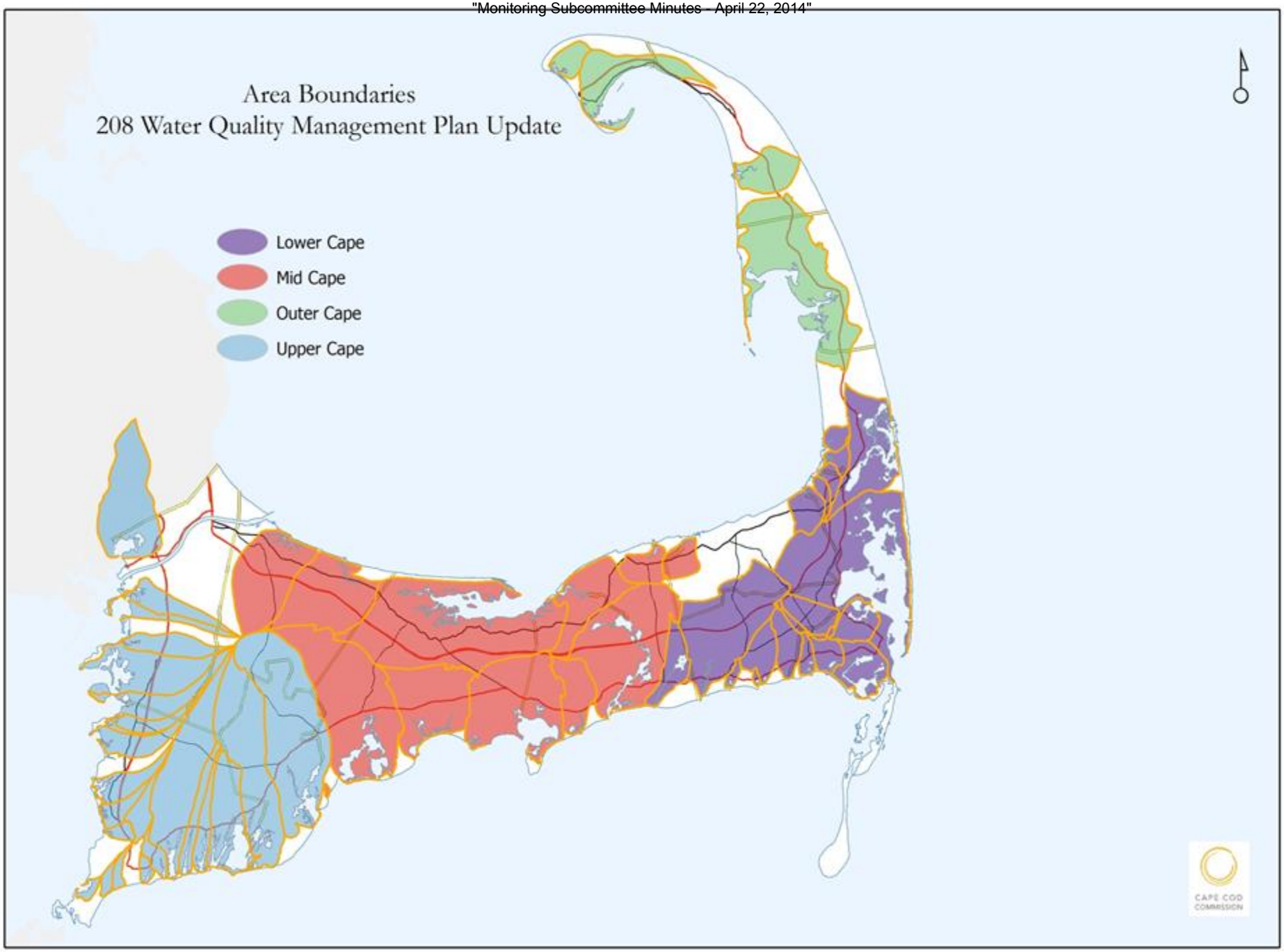
SECTION 208 AREA WIDE WATER QUALITY MANAGEMENT PLAN

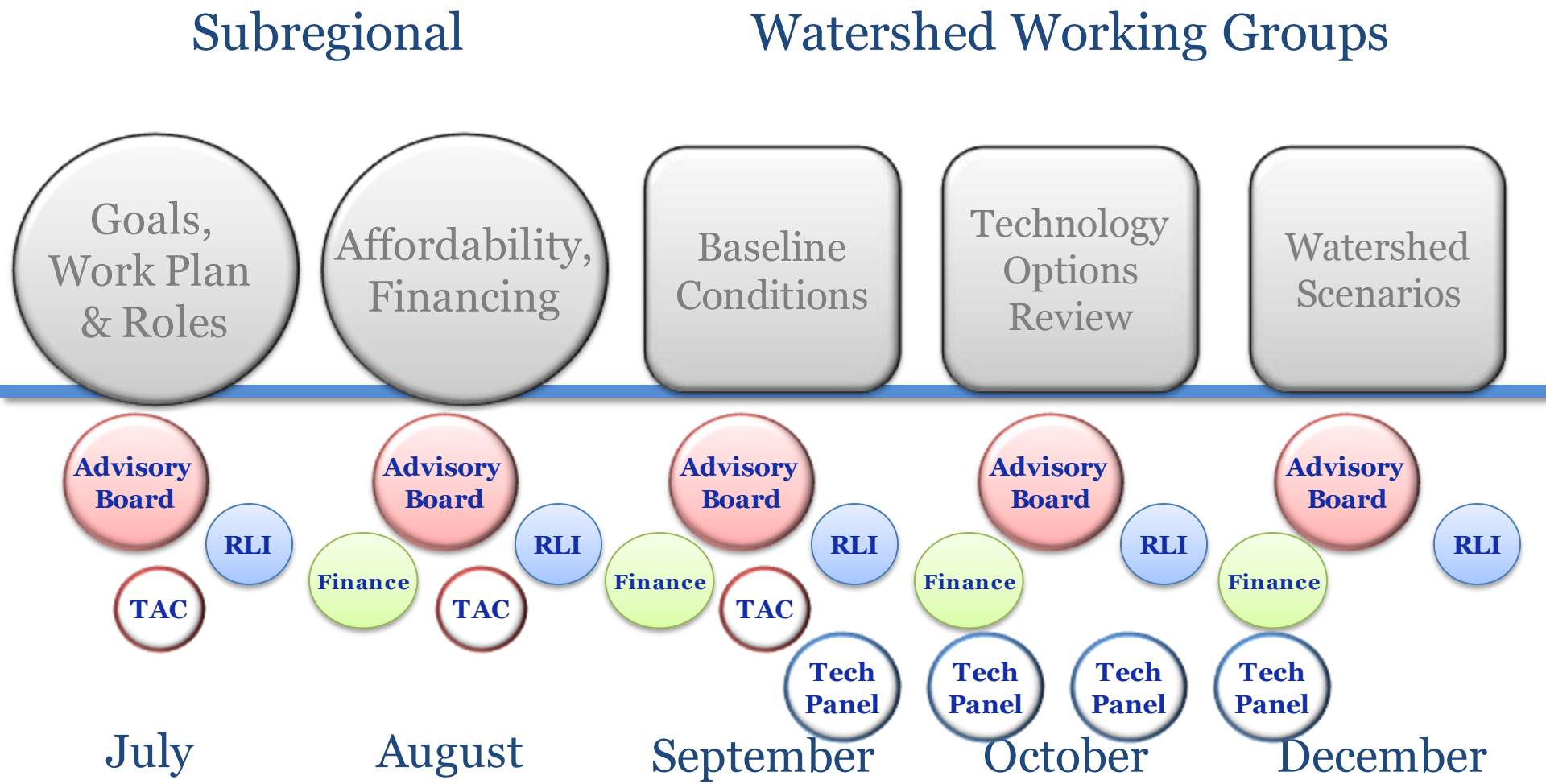
MONITORING SUBCOMMITTEE

Roles and Responsibilities:

- Establish performance monitoring protocols for technologies that may be a part of watershed permits in the future
- Establish compliance monitoring protocols for meeting total maximum daily loads (TMDLs) in the water body
- Establish process and structure for consolidating and cooperation of existing monitoring programs and data in to a centralized location
- Identify region-wide monitoring needs and develop proposals

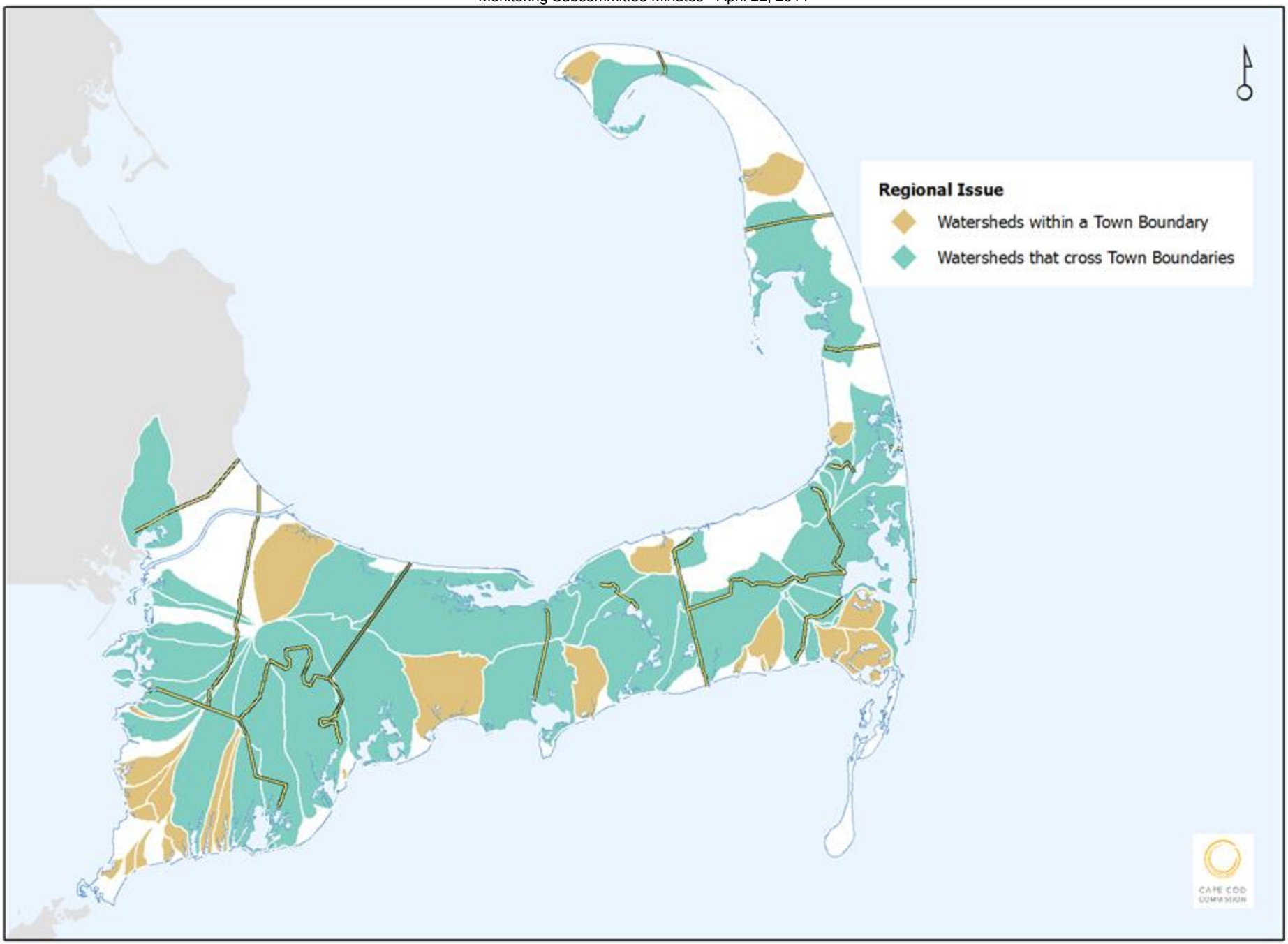

Subgroup Boundaries
208 Water Quality Management Plan Update
Lower Cape
Herring River
Pleasant Bay
Stage Harbor Group
Nauset and Cape Cod Bay Marsh Group
Mid Cape
Cape Cod Bay Group
Lewis Bay to Bass River
Three Bays & Centerville River
Outer Cape
Provincetown Harbor
Wellfleet Harbor & Pamet River
Upper 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


Subregional
Watershed Working Groups
Goals, Work Plan & Roles
Affordability, Financing
Baseline Conditions
Technology Options Review
Watershed Scenarios
Advisory Board
RLI
TAC
Finance
Tech Panel
July
August
September
October
December
RLI
Regulatory, Legal & Institutional Work Group
TAC
Technical Advisory Committee of Cape Cod Water Protection Collaborative
208 Planning Process

Standing Sub Regional Meeting Topics

	Scenario Planning	Regulatory, Legal, Institutional	Implementation
Mtg. 1	One representative watershed	Challenges & opportunities associated with permitting the watershed scenario	Adaptive management plans
Mtg. 2	**All shared watersheds & TBL model**	**Tools to support intermunicipal cooperation**	**Monitoring**
Mtg. 3	Subregional scenarios & TBL model	Structures for permitting	Financing & affordability


Regional Issue
Watersheds within a Town Boundary
Watersheds that cross Town Boundaries
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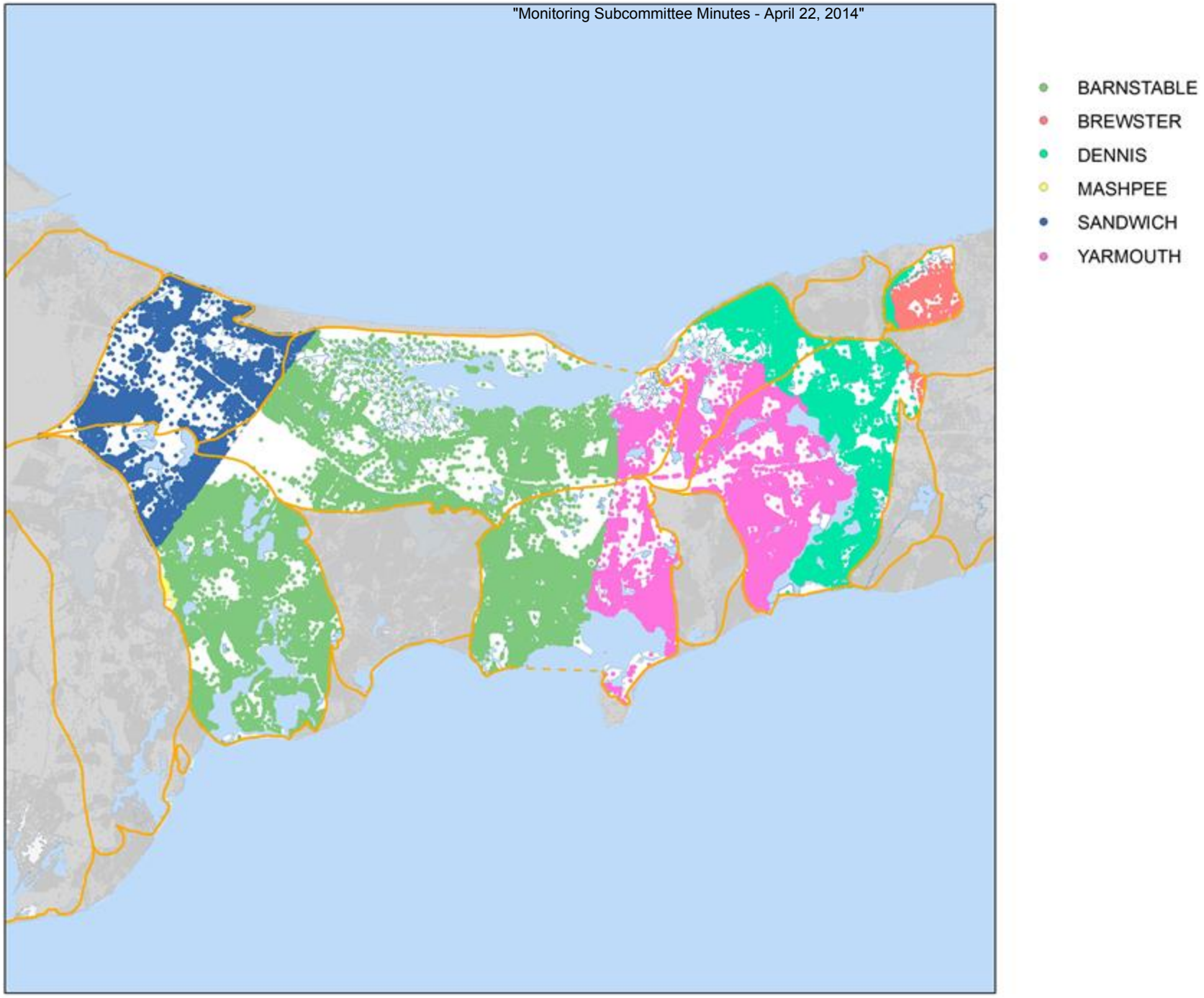

BARNSTABLE
BREWSTER
DENNIS
MASHPEE
SANDWICH
YARMOUTH

REQUIREMENTS OF CLEAN WATER ACT / EPA

208 plan requirement:

- State must designate one or more waste management agency (WMA)

WMA must be able to:

- Carry out plan
- Manage waste treatment
- Design & construct new, existing works
- Accept/utilize grants
- Raise revenues
- Incur indebtedness
- Assure each town pays its costs

COLLABORATION CHALLENGES

FROM SUB-REGIONAL MEETING 1

Who decides?

- Which solutions to implement and when and how to re-assess?
- Different levels of planning across towns (including approved CWMPs)
- Different town decision-making processes and publics
- Timeline required for building agreement
- Managing disagreement

Who pays?

- Coordinating multiple town funding approval processes
- Applying for and allocating off-Cape funding opportunities
- Differences in ability & willingness to pay
- Assigning responsibility for: capital funding, operation and maint., monitoring, data mgt., reporting
- Managing disagreement

Who manages?

- Preparing the watershed plan for permitting
- Building, operating, maintaining, monitoring, and reporting
- Ultimate responsibility for water quality outcomes
- Managing disagreement

Intermunicipal Agreements

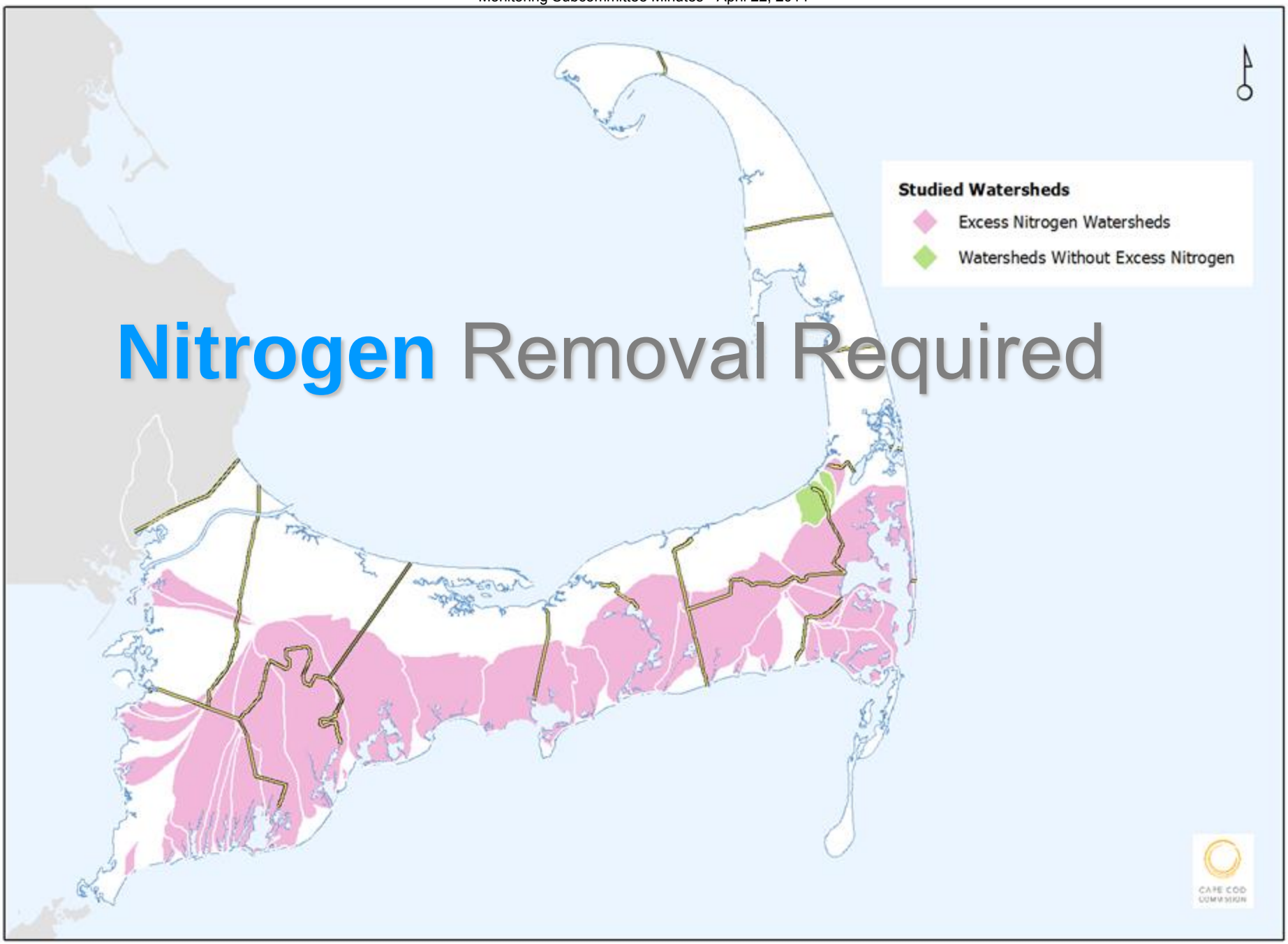
Federal/Municipal public-public partnerships

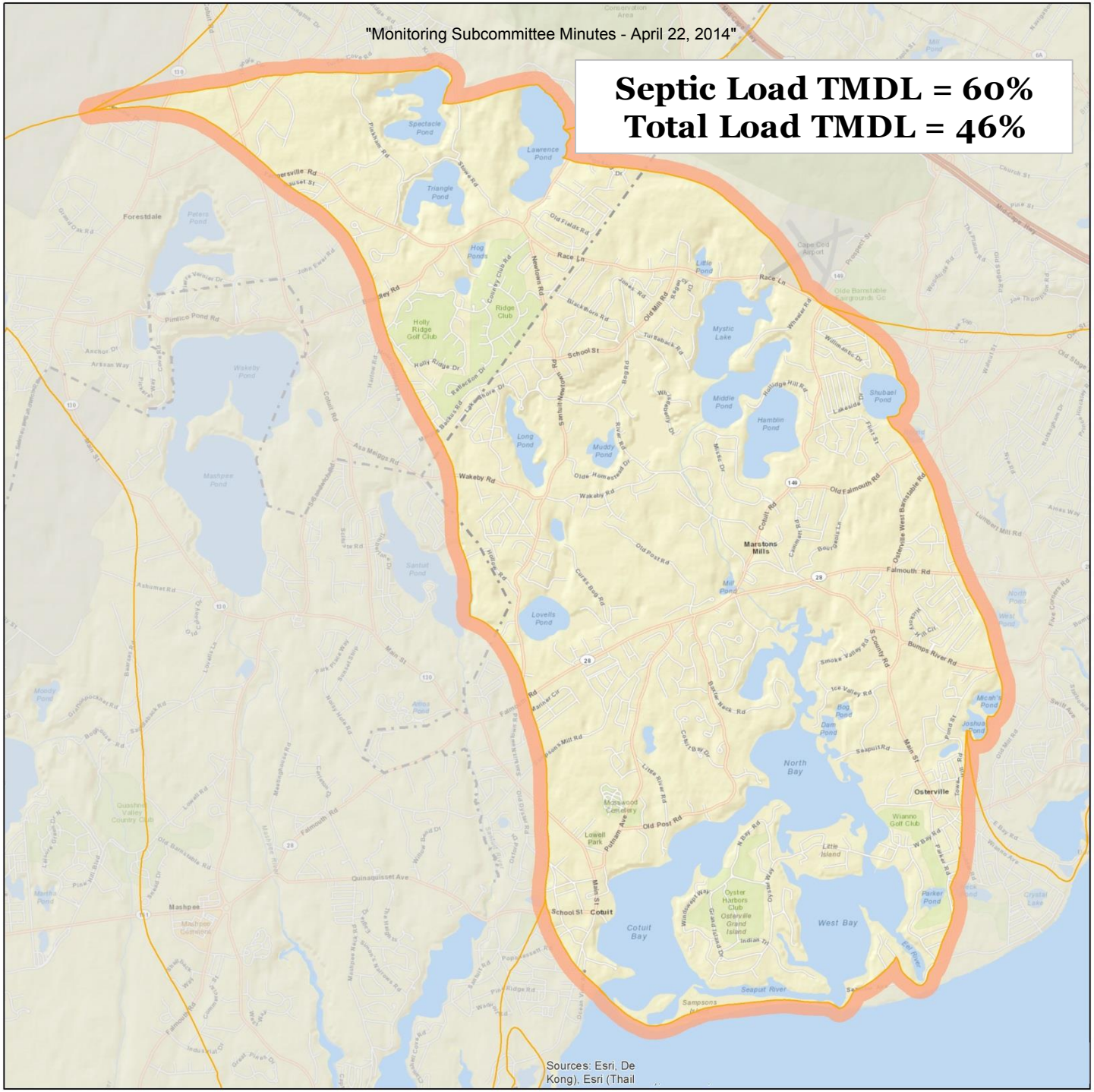
Independent Water and Sewer Districts

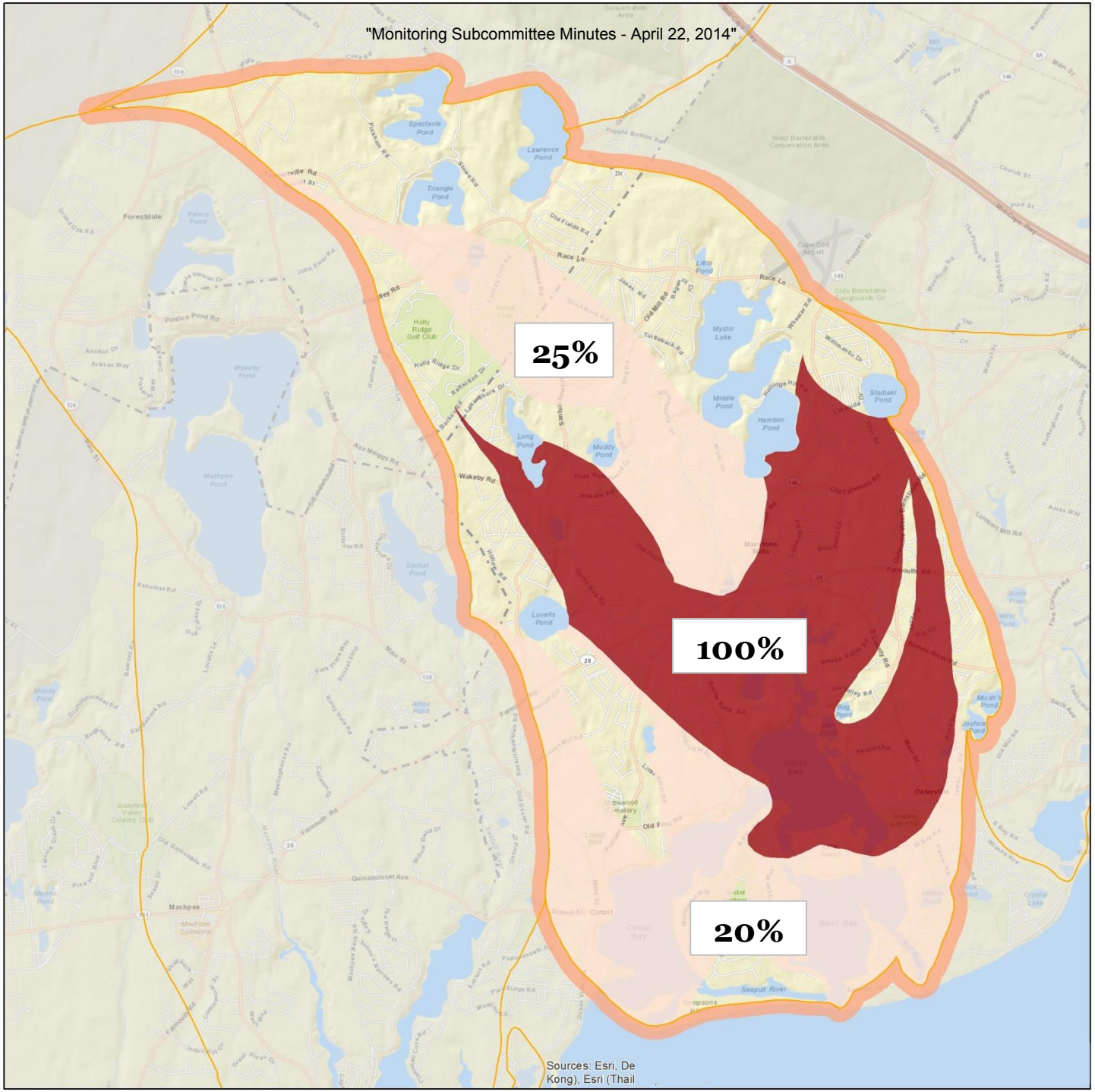
Water Pollution Abatement Districts

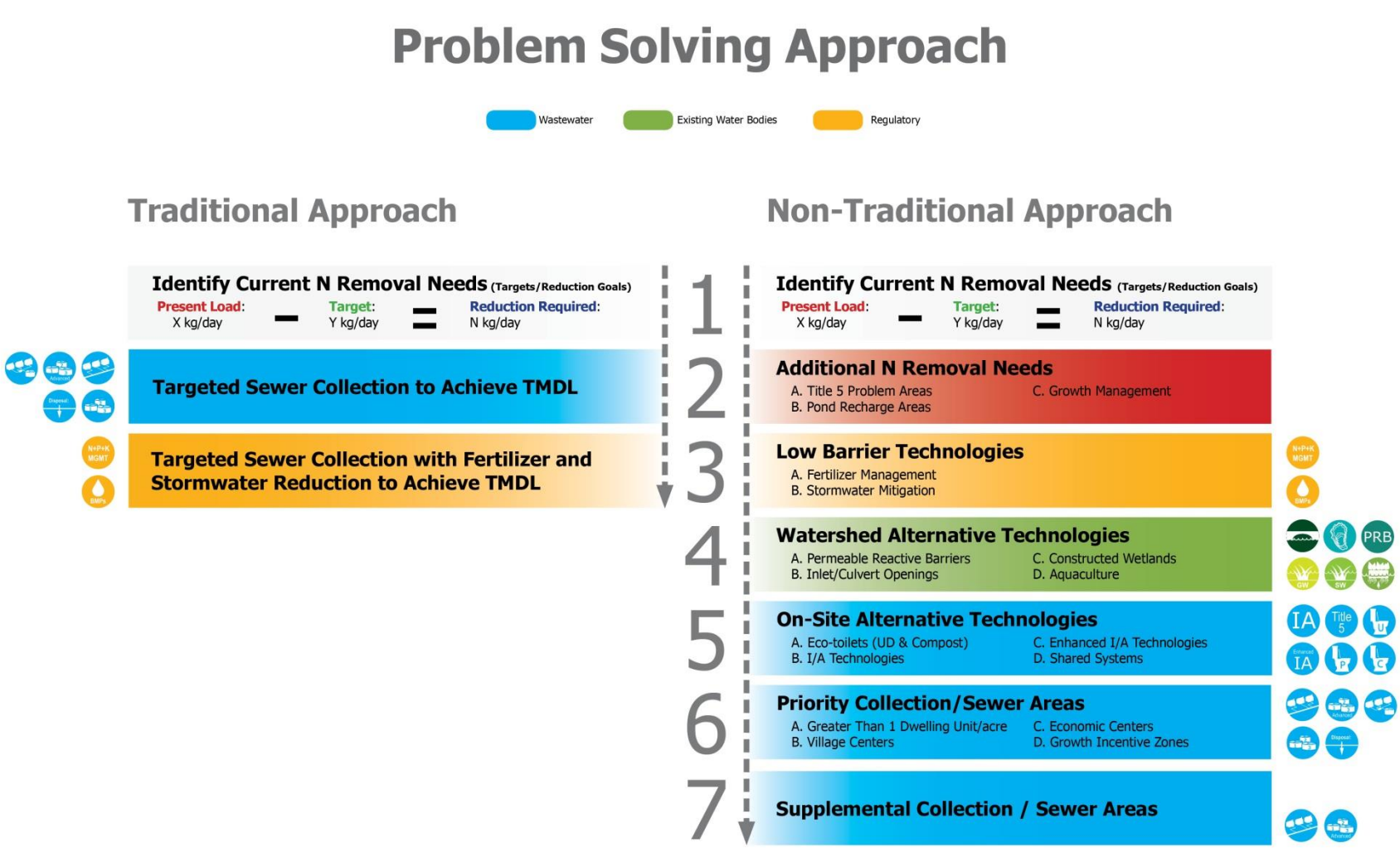
Independent Authority

Regional Health District


Studied Watersheds
Excess Nitrogen Watersheds
Watersheds Without Excess Nitrogen
Nitrogen Removal Required
CAPE COD COMMISSION

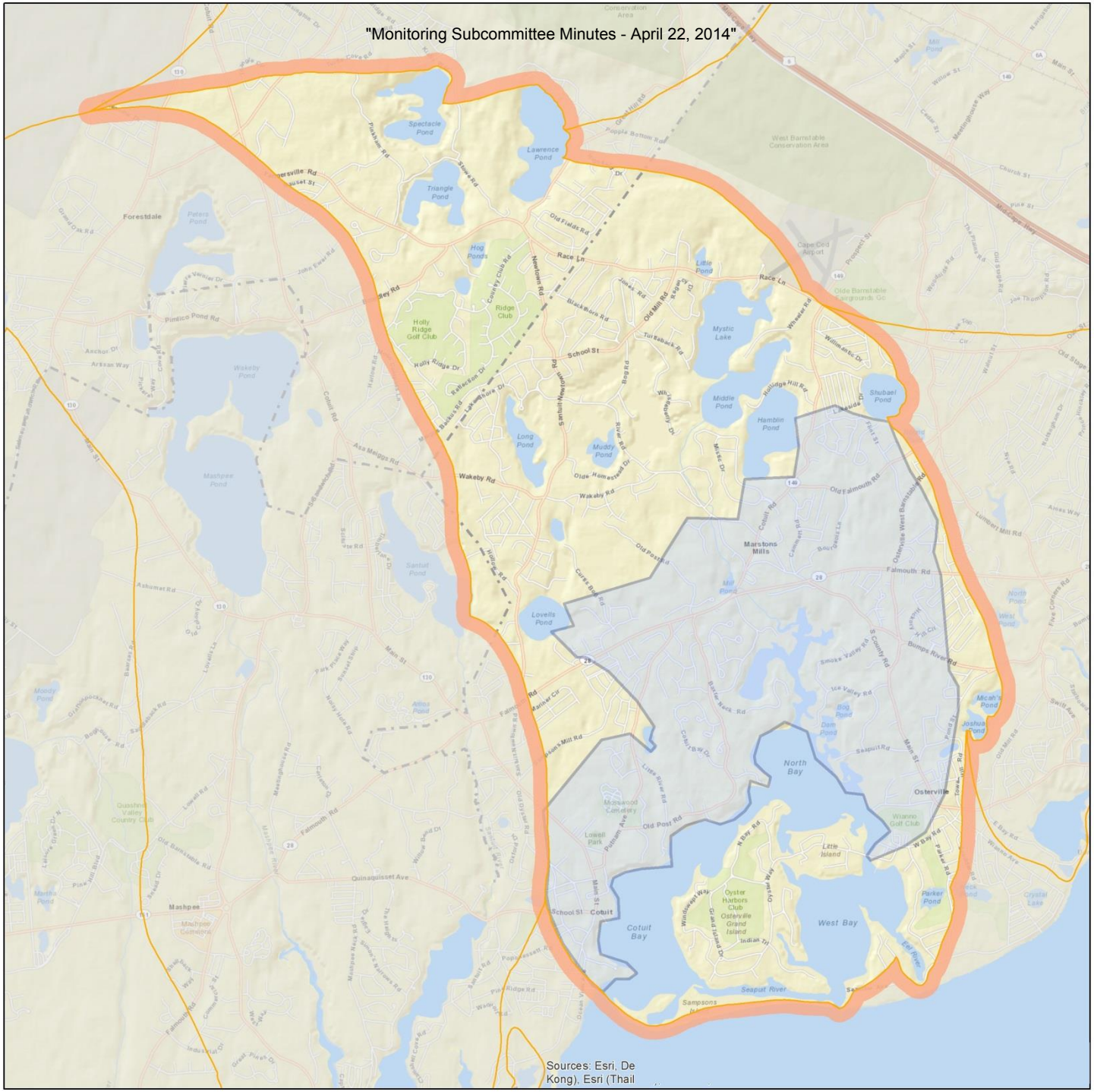

Septic Load TMDL = 60%
Total Load TMDL = 46%
Sources: Esri, De
Kong), Esri (Thail


25%
100%
20%
Sources: Esri, De
Kong), Esri (Thail


Problem Solving Approach
Wastewater
Existing Water Bodies
Regulatory
Traditional Approach
Non-Traditional Approach
Identify Current N Removal Needs (Targets/Reduction Goals)
Present Load: X kg/day
Target: Y kg/day
Reduction Required: N kg/day
Targeted Sewer Collection to Achieve TMDL
Targeted Sewer Collection with Fertilizer and Stormwater Reduction to Achieve TMDL
1
2
3
4
5
6
7
Identify Current N Removal Needs (Targets/Reduction Goals)
Present Load: X kg/day
Target: Y kg/day
Reduction Required: N kg/day
Additional N Removal Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management
Low Barrier Technologies
A. Fertilizer Management
B. Stormwater Mitigation
Watershed Alternative Technologies
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture
On-Site Alternative Technologies
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems
Priority Collection/Sewer Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
Supplemental Collection / Sewer Areas


Site Scale | Neighborhood | Watershed | Cape-Wide
Prevention
Reduction
Remediation
Remediation of Existing Development
Fertilizer Management
TDR
Transfer of Development Rights
Stormwater BMPs
Compact Development
Title 5
Standard Title 5 Systems
Conventional Treatment
IA
I/A Title 5 Systems
Cluster & Satellite Treatment Systems
Advanced Treatment
I/A Enhanced Systems
Wastewater Collection Systems
Effluent Disposal Systems
Toilets: Urine Diverting
Constructed Wetlands: Surface Flow
Toilets: Composting
Constructed Wetlands: Subsurface Flow
Toilets: Packaging
Stormwater: Bioretention / Soil Media Filters
Toilets: Incinerating
Stormwater: Wetlands
Phytoirrigation
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
Constr. Wetlands - Groundwater, Salt Water, Floating


Spectacle Pond
Lawrence Pond
Triangle Pond
Forestdale
Peters Pond
Hog Ponds
Holly Ridge Golf Club
Ridge Club
Little Pond
Mystic Lake
Middle Pond
Hamblin Pond
Shubael Pond
Long Pond
Muddy Pond
Wakeby Pond
Mashpee Pond
Santuit Pond
Lovells Pond
Marstons Mills
Mill Pond
Bog Pond
Dam Pond
North Bay
Osterville
Wianno Golf Club
Little Island
Parker Pond
West Bay
Cotuit Bay
Cotuit
Mashpee
Quashnet Valley Country Club
Moorswood Cemetery
Lowell Park
Oyster Harbors Club
Osterville Grand Island
Sampsons Island
Micah's Pond
Joshua Pond
Race Ln
Old Fields Rd
School St
Wakeby Rd
Falmouth Rd
Old Post Rd
Main St
Blinmps River Rd
Old Falmouth Rd
Osterville West Barnstable Rd
Holly Ridge Dr
Pimlico Pond Rd
Asa Meiggs Rd
Quinaquisset Ave
Sources: Esri, De
Kong), Esri (Thail


Spectacle Pond
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Wakeby Pond
Mashpee Pond
Santuit Pond
Marstons Mills
Mill Pond
North Bay
Osterville
Cotuit
Cotuit Bay
West Bay
Little Island
Oyster Harbors Club
Osterville Grand Island
Seapuit River
Parker Pond
Micah's Pond
Joshua Pond
Bog Pond
Dam Pond
Lowell Park
Wianno Golf Club
Quashnet Valley Country Club
Mashpee
Mashpee Cemetery
Moorswood Cemetery
Race Ln
Old Fields Rd
Holly Ridge Dr
School St
Wakeby Rd
Old Falmouth Rd
Falmouth Rd
Main St
Osterville West Barnstable Rd
Blinns River Rd
Old Post Rd
Quinaquisset Ave
Sampsons
Sources: Esri, De
Kong), Esri (Thail

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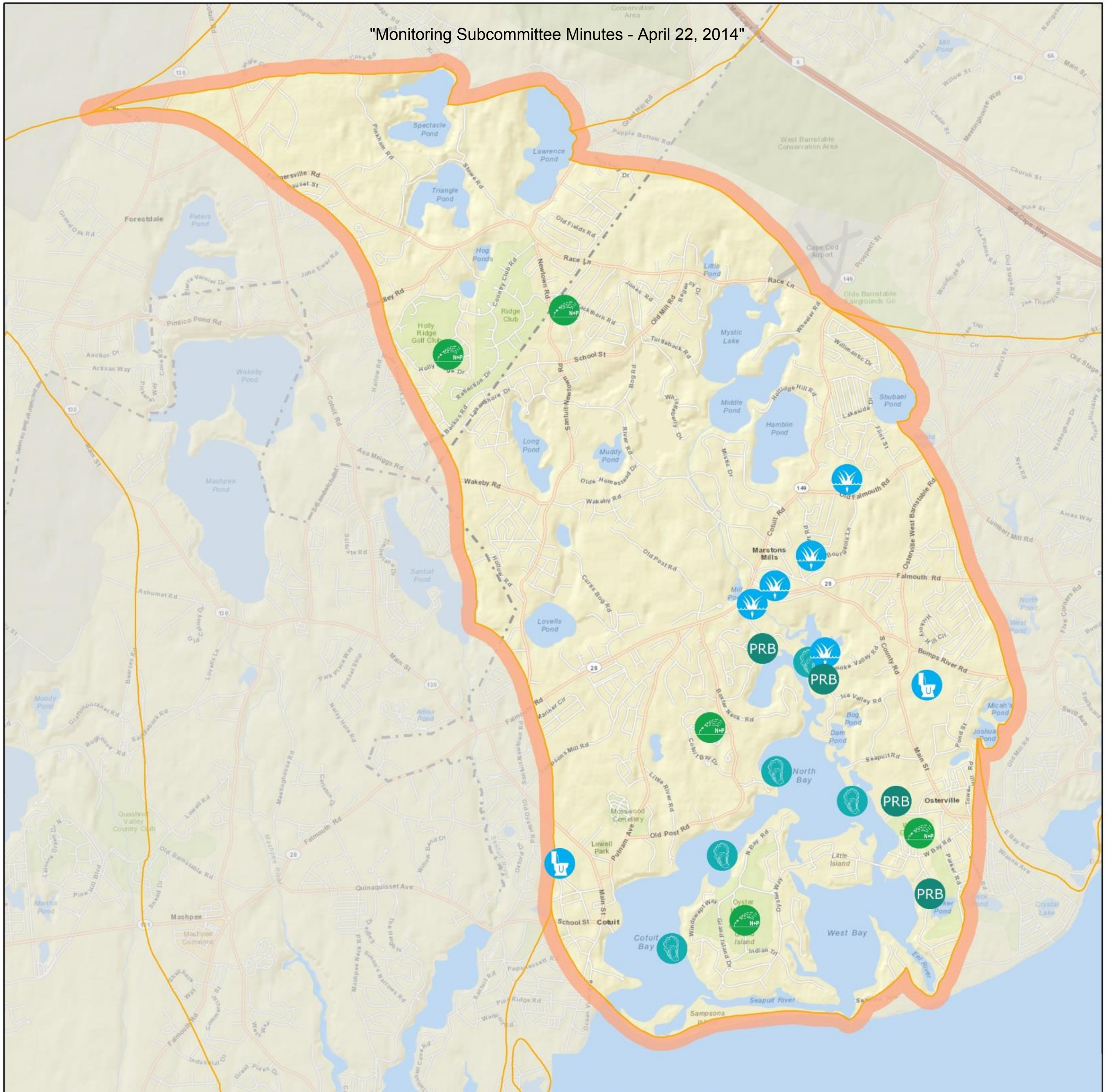


SCENARIO 1 : Maximizing Sewer Option

Triple Bottom Line (TBL) Assessment Model

Environmental + Social + Financial Sustainability

CAPE COD COMMISSION

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

Select to add/remove/edit a strategy/technology: S1. Sewering - Sewershed #1

Select a Location (Watershed): Three Bays

SCENARIO NAME: Targeted Sewer

Current Application Stack: 1 Strategies/Technologies

View Scenario Overview | View Technology Performance | Compare Technologies

+ **Sewering Options**

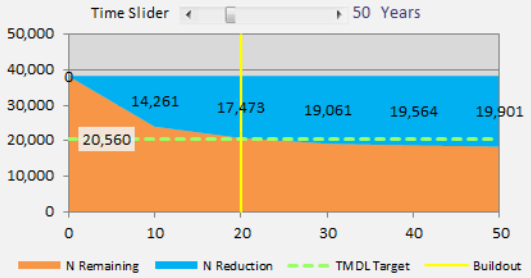
S1 **Sewering (Sewershed #1)**

	from Selection	
Total Number of Properties	4035	
Land Area (acres)	5743.2	
Existing Nitrogen Load (Kg/yr)	24794.7	
Future Nitrogen Load (Kg/yr)	24794.7	
Properties Already Sewered	2	
Application Suitability	4,033	
% Selected	100%	
Properties Impacted	4035	
Land Area Impacted	5,743.2	acre
Future Nutrient Load Impacted	24,794.7	Kg/Yr
Collection Systems	**Quantity**	
Main Sewer	421,894	linear feet
Sewer Laterals	201,750	linear feet
Force Main	2	miles
Pump Station	3	Each
On-Site Pump Station		Each
STEG - Collection		Linear Foot
STEP - Collection		
Force Main		Linear Foot
On-Site Pump Station		Each
Interior Plumbing Reconfiguration		Each
Treatment Systems		
Treatment System Included	Yes	
Location (within/outside waatershe	within	
% capacity for sewershed	100%	
Treatment Facility Type	Advanced	
Effluent Disposal	**Quantity**	
Infiltration Basins		Square Foot
Soil Absorption System (SAS)		Square Foot
Injection Well		Each
Wick Well		Each
Ocean Outfall		Linear Foot
Effluent Transport out of Watershed		Linear Foot

Clear Selection

Impacted Area: 5,743 Acres | 4,035 Properties | 4,033 Septic Systems

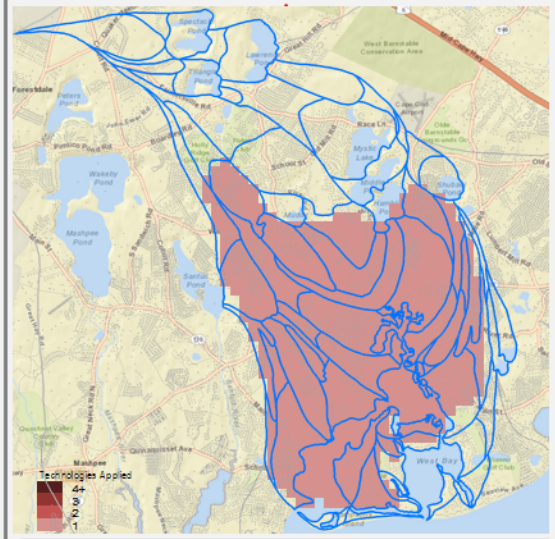
SCENARIO PERFORMANCE



N Load Reduced: 21,219 Kg/yr

N Load Remaining: 17,048Kg/yr

TECHNOLOGY APPLICATION MAP

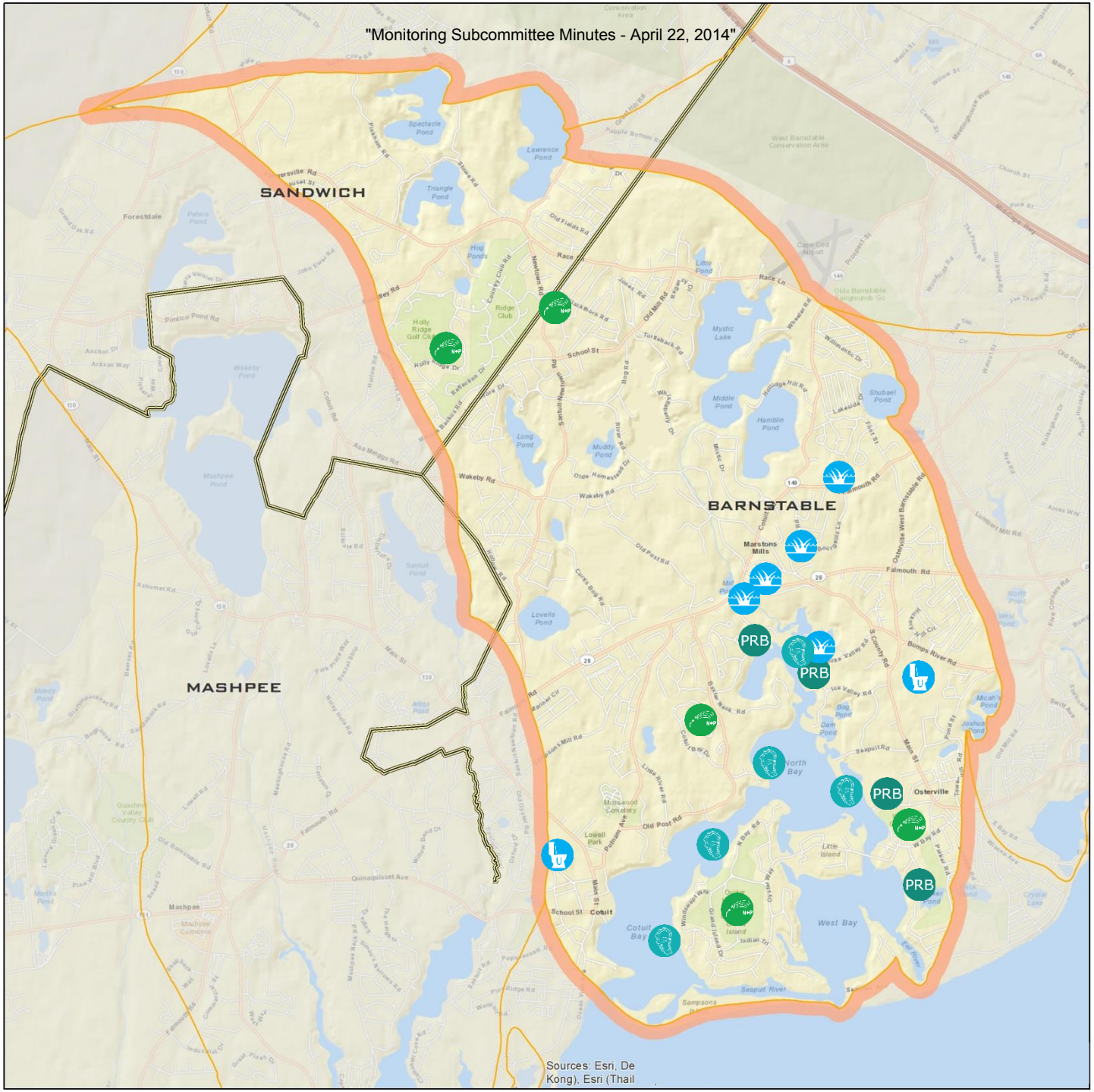


COMMUNITY IMPACTS SUMMARY

Quality Habitat Created	177.6	acres
GHG Reduced	418.4	MT CO2e/Yr
N Reduction Risk Ratio on Sea Level Rise	0.4	%
% Properties Increase in Property Value	54	%
New Employment added	179	jobs
Additional Cost per Household		$/HH/Yr

TRADITIONAL TECHNOLOGY MONITORING FRAMEWORK

Technology	Monitoring	Frequency
Conventional Treatment	GWDP Influent/ Effluent WQ + quantity	Quarterly - three down & one up gradient
SatelliteTreatment Systems	GWDP Influent/ Effluent WQ + quantity	Quarterly - three down & one up gradient
Cluster Treatment Systems	Board of Health performance monitoring similar but less rigorous than GWDP - varries based on conditions, groundwater monitoring may not be required	Varries
I/A Title 5 Systems	Influent/ Effluent WQ + quantity	Quarterly


SANDWICH
BARNSTABLE
MASHPEE
PRB
PRB
PRB
Osterville
Marstons Mills
Cotuit
Sources: Esri, De
Kong), Esri (Thail

NON-TRADITIONAL TECHNOLOGY MONITORING FRAMEWORK FOR PILOT PROJECTS (PRELIMINARY)

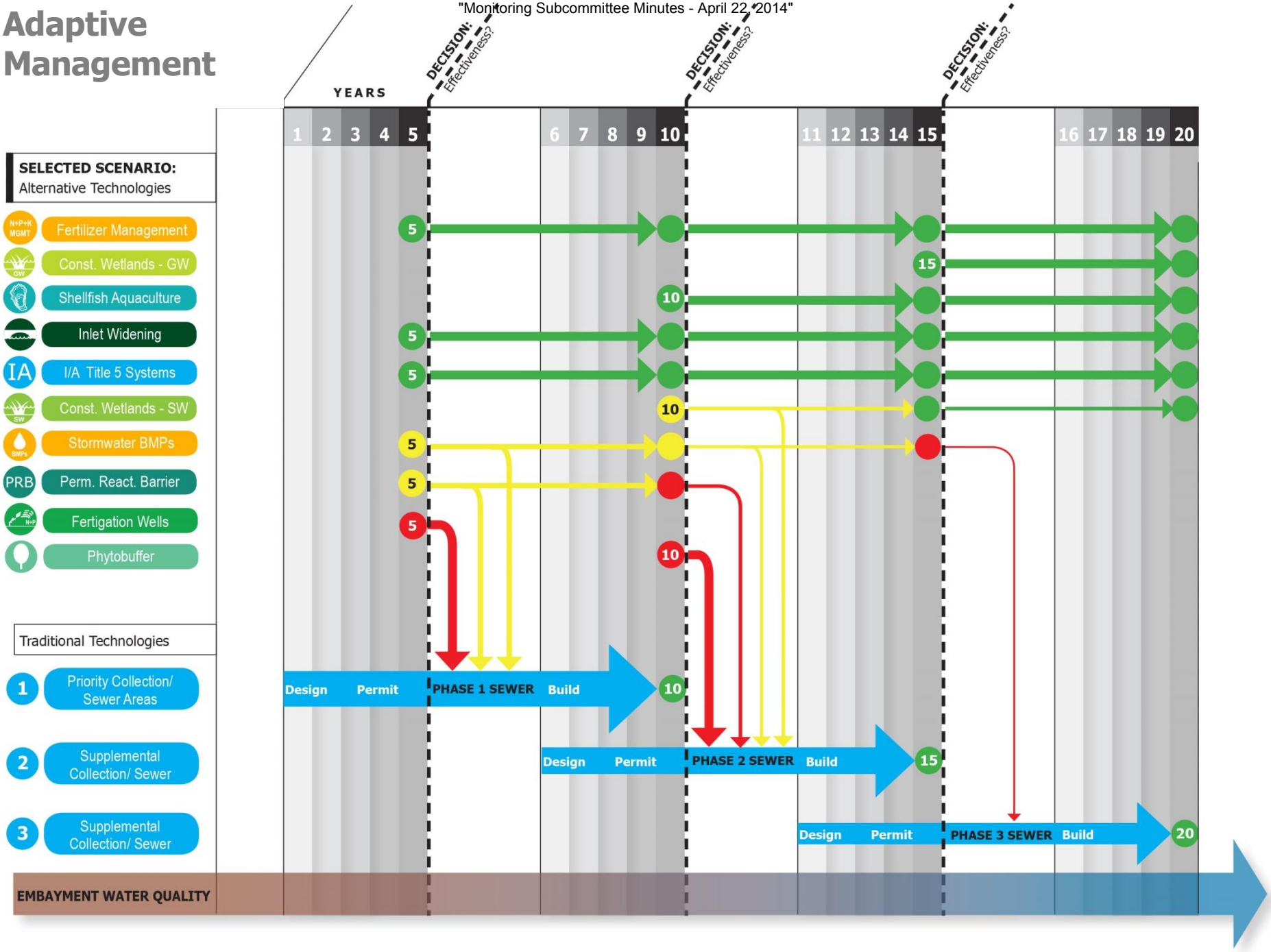
Technology	Monitoring	Frequency
Constructed Wetlands	WQ samples inlet/outlet (N)	Monthly during growing season
Pond Dredging	WQ samples inlet/outlet of pond (N/P)	Quarterly
Salt Marsh Restoration	Area of restoration, wetland types (GIS and field confirmation)	Annually
Shellfish Bed Restoration	Area of restoration/density of shellfish/landings N content of shellfish Denitrification in benthic (N,DO) WQ samples (N)	Annually Annually - composite 20 animals Annually - three locations Monthly during summer -three locations
Phytobuffer	WQ samples inlet/outlet (N)	Monthly during growing season
Fertigation Wells	Pumping volume/rate WQ samples (N)	Monthly Monthly during summer
Shellfish Aquaculture	Annual landings from each grant N content in shellfish	Annually Annually - composite 20 animals
Perm. React. Barrier	2 upgradient/2 downgradient wells – WQ samples (N, DO) Well in media - WQ samples (N, DO, N gas)	Quarterly Quarterly
Inlet Widening	Salinity measurements to confirm model WQ samples at sentinel station	Two tidal cycles Two tidal cycles
Eco Toilet Systems	Numbers/locations/types of installations WQ samples (N/P) - grey water	Running database Quarterly - three locations per watershed

Adaptive Management

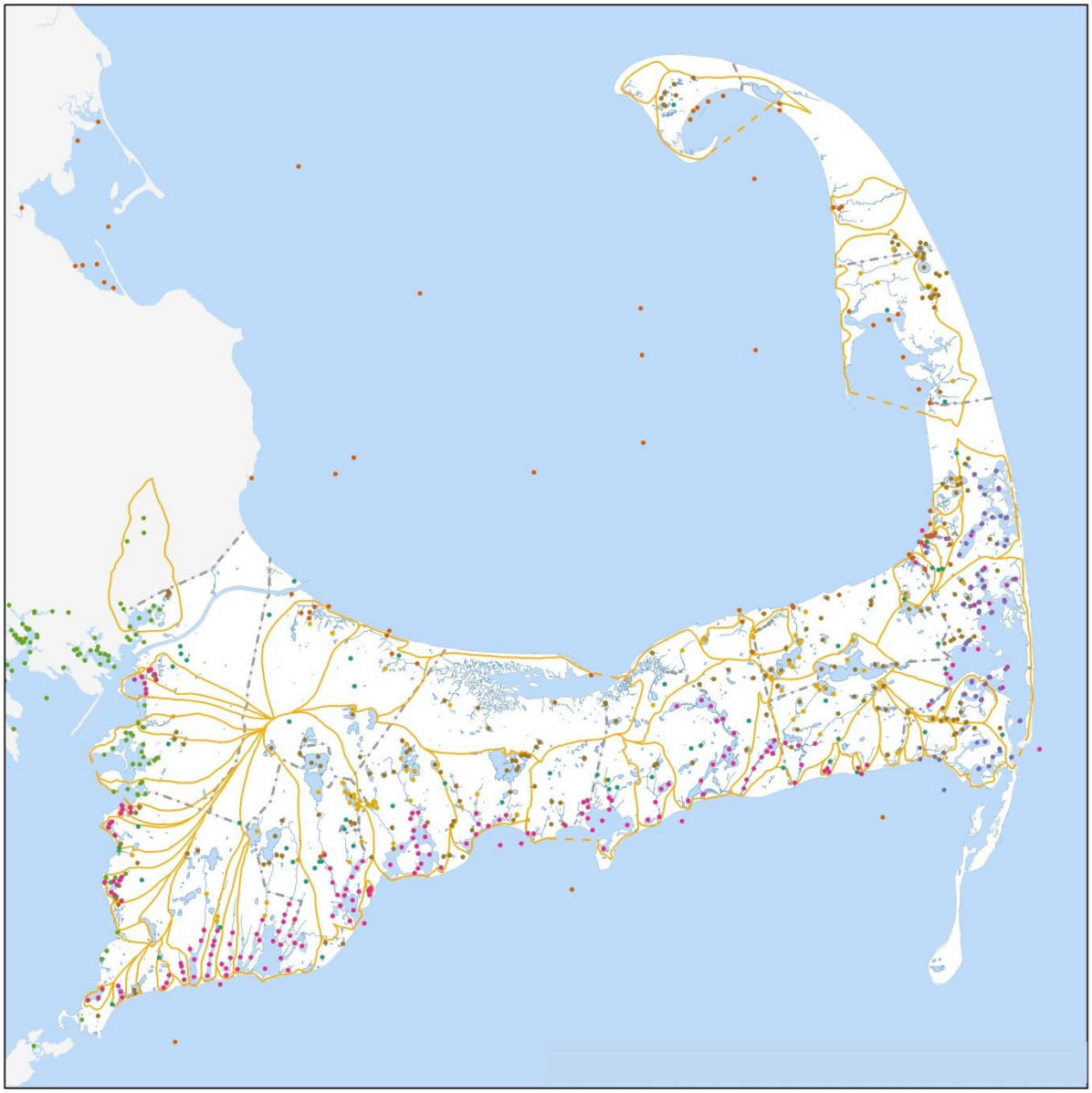
Definition

A structured approach that monitors outcomes for meeting water quality goals, assesses progress over time, and requires recalibration of plans and projects, as necessary, based on review and evaluation of monitoring.

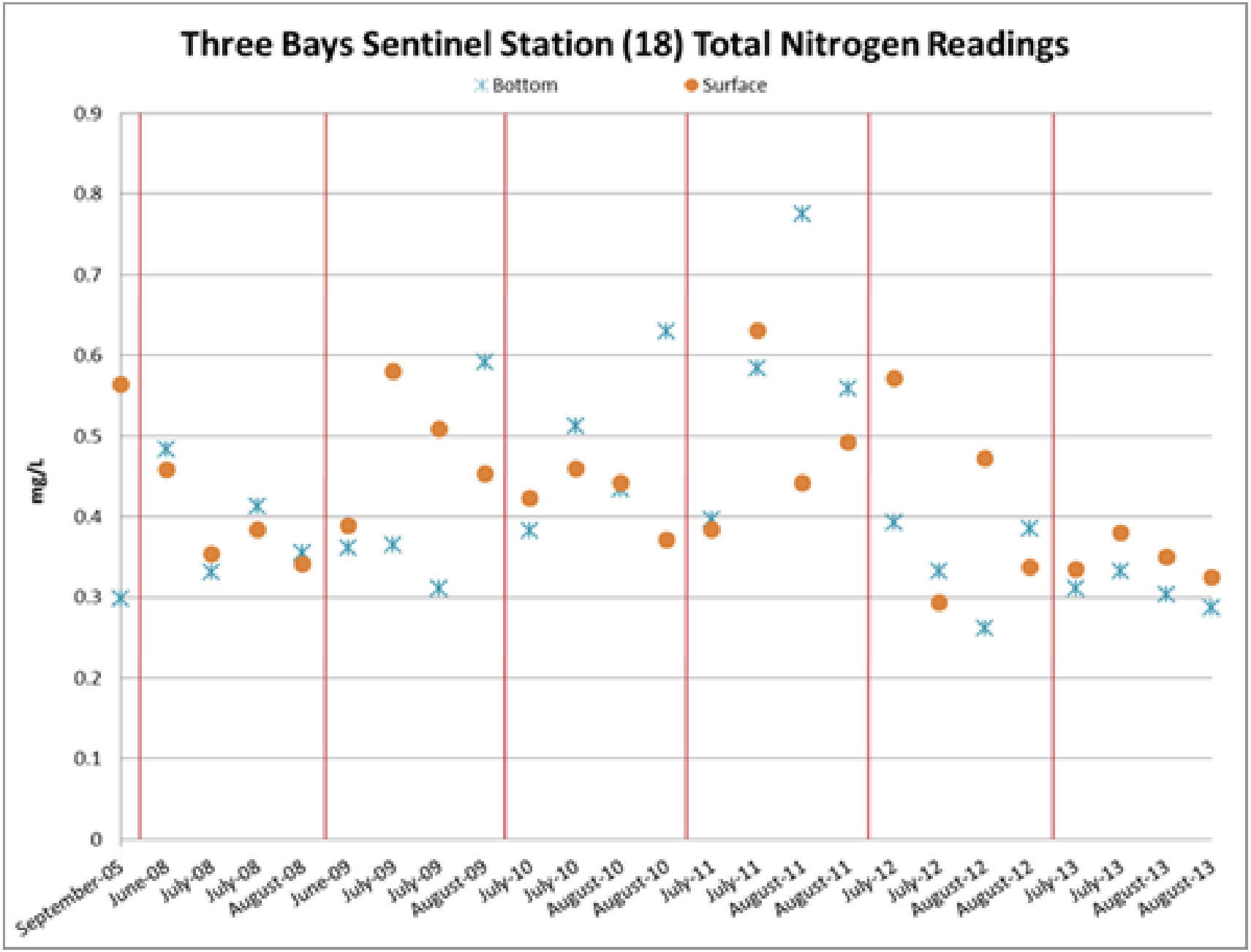
Adaptive Management



CURRENT WATER RESOURCE MONITORING



- Groundwater Discharge Permits
- Center for Coastal Studies Stations
- Pleasant Bay Alliance Stations
- Massachusetts Estuaries Project Stations
- Coalition for Buzzards Bay Stations
- DEP Water Management Group Stations
- Ponds & Lakes Stewardship Ponds


Three Bays Sentinel Station (18) Total Nitrogen Readings
Bottom
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mg/L
0.9
0.8
0.7
0.6
0.5
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0.3
0.2
0.1
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September-05
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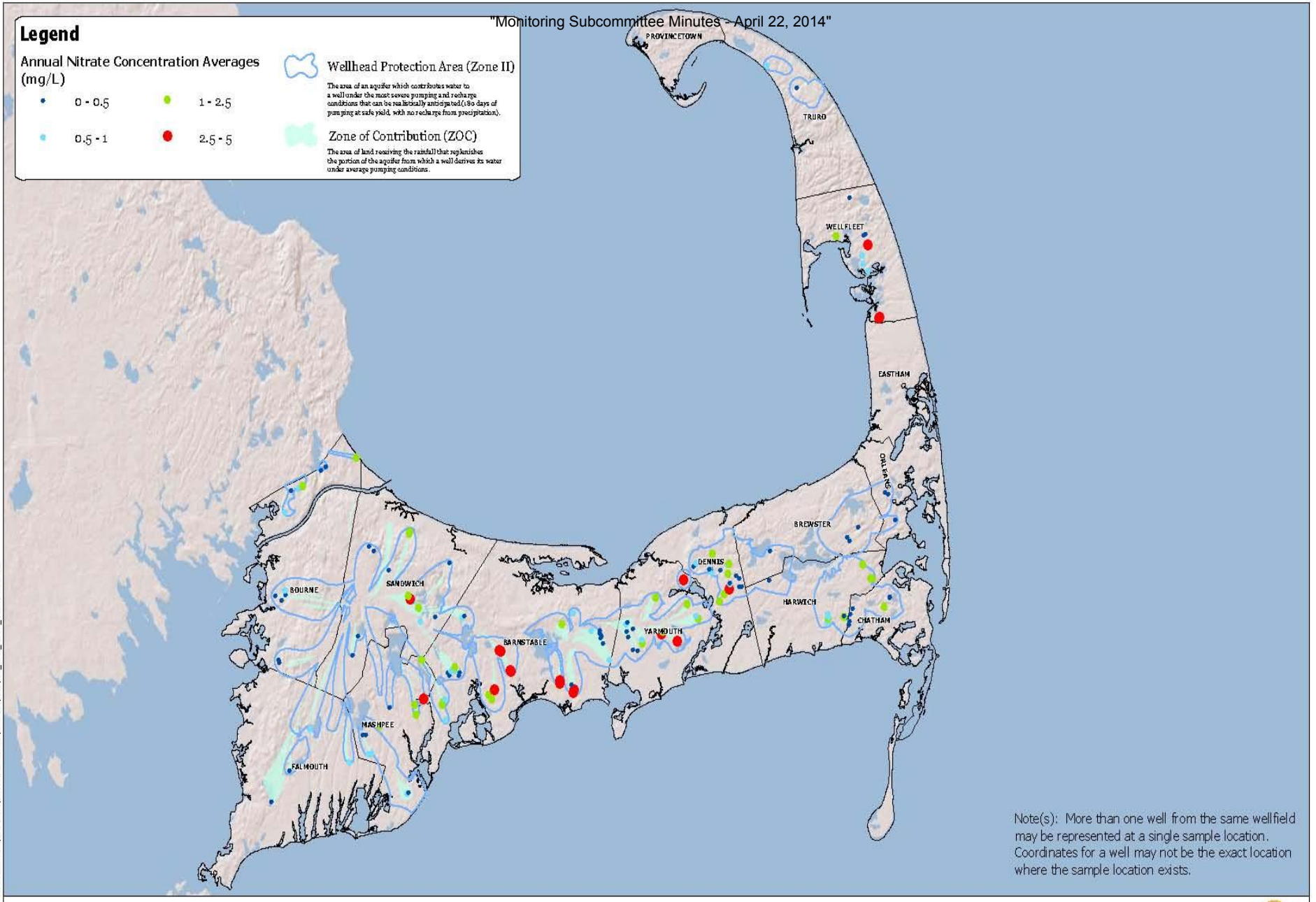
August-13


Nitrogen



Nitrate Concentrations in Cape Cod Public Supply Wells

User: mpaulet

Date: 7/18/2013

Service Layer Credits: Copyright © 2013 Esri
Sources: Esri, USGS, NOAA

Data sources: MassGIS, USGS, CCC

2 0 2 4 6
Miles

N

CAPE COD COMMISSION

The information depicted on these maps is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. It should not substitute for actual on-site survey, or engineered design research.

Implementation

MONITORING

SECTION 208 AREA WIDE WATER QUALITY MANAGEMENT PLAN

MONITORING SUBCOMMITTEE

Mission:
To provide advice and guidance on appropriate monitoring protocols for technology efficiency and total maximum daily loads, while identifying a process for consolidating all available monitoring data in a central location and format.

SECTION 208 AREA WIDE WATER QUALITY MANAGEMENT PLAN

MONITORING SUBCOMMITTEE

Roles and Responsibilities:

- Establish performance monitoring protocols for technologies that may be a part of watershed permits in the future
- Establish compliance monitoring protocols for meeting total maximum daily loads (TMDLs) in the water body
- Establish process and structure for consolidating and cooperation of existing monitoring programs and data in to a centralized location
- Identify region-wide monitoring needs and develop proposals

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

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

CAPE COD COMMISSION

Agenda

Section 208 Area-Wide Water Quality Management Plan Update
Monitoring Subcommittee
April 22, 2014
1pm
Cape Cod Commission Conference Room
3225 Main Street, Barnstable, MA

1. Introductions
2. 208 Plan Update
3. Roles/Responsibilities of the Committee
4. Other Business

April 22, 2014

208 MONITORING
Subcommittee

SECTION 208 AREA WIDE WATER QUALITY MANAGEMENT PLAN

MONITORING SUBCOMMITTEE

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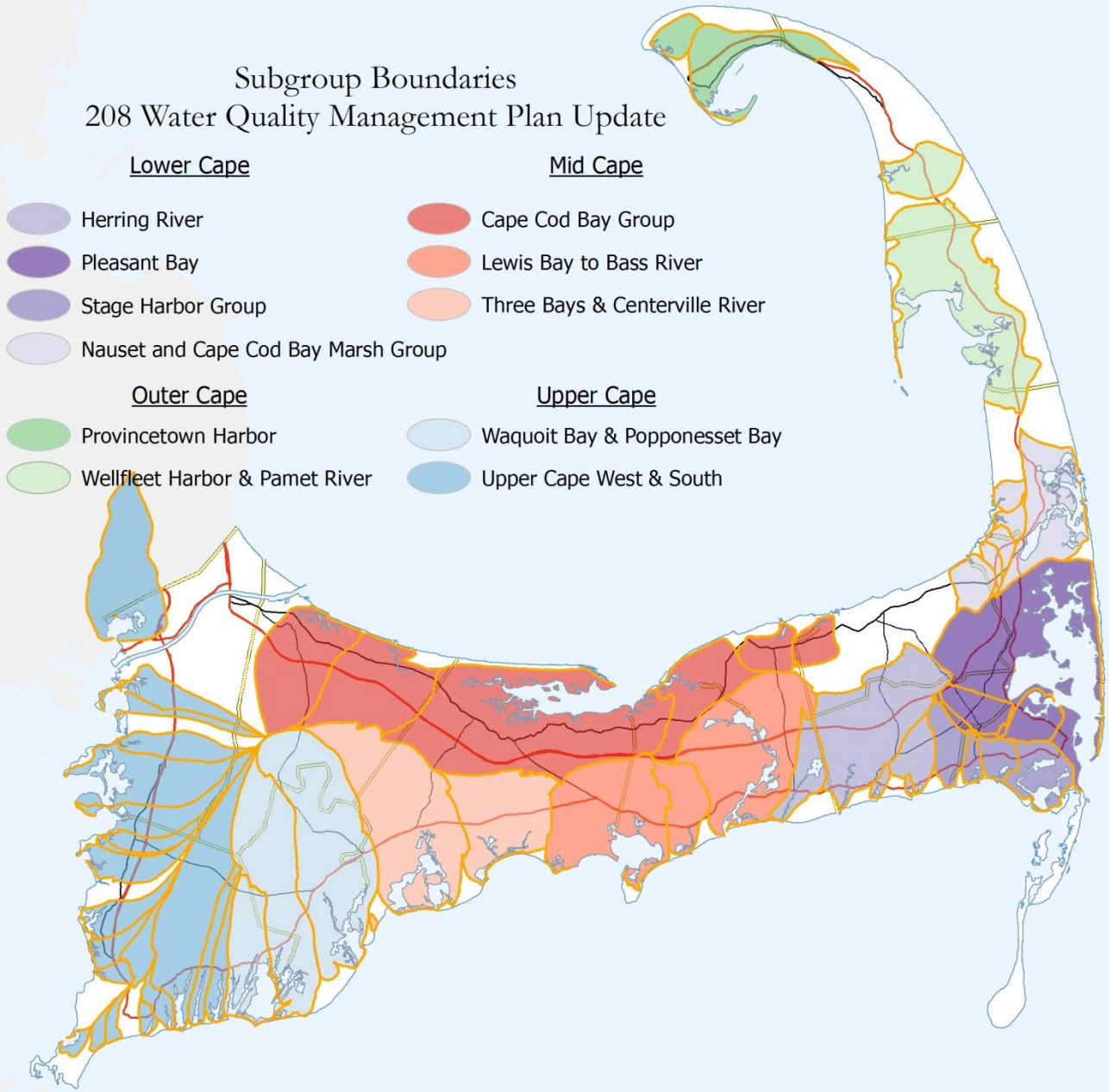
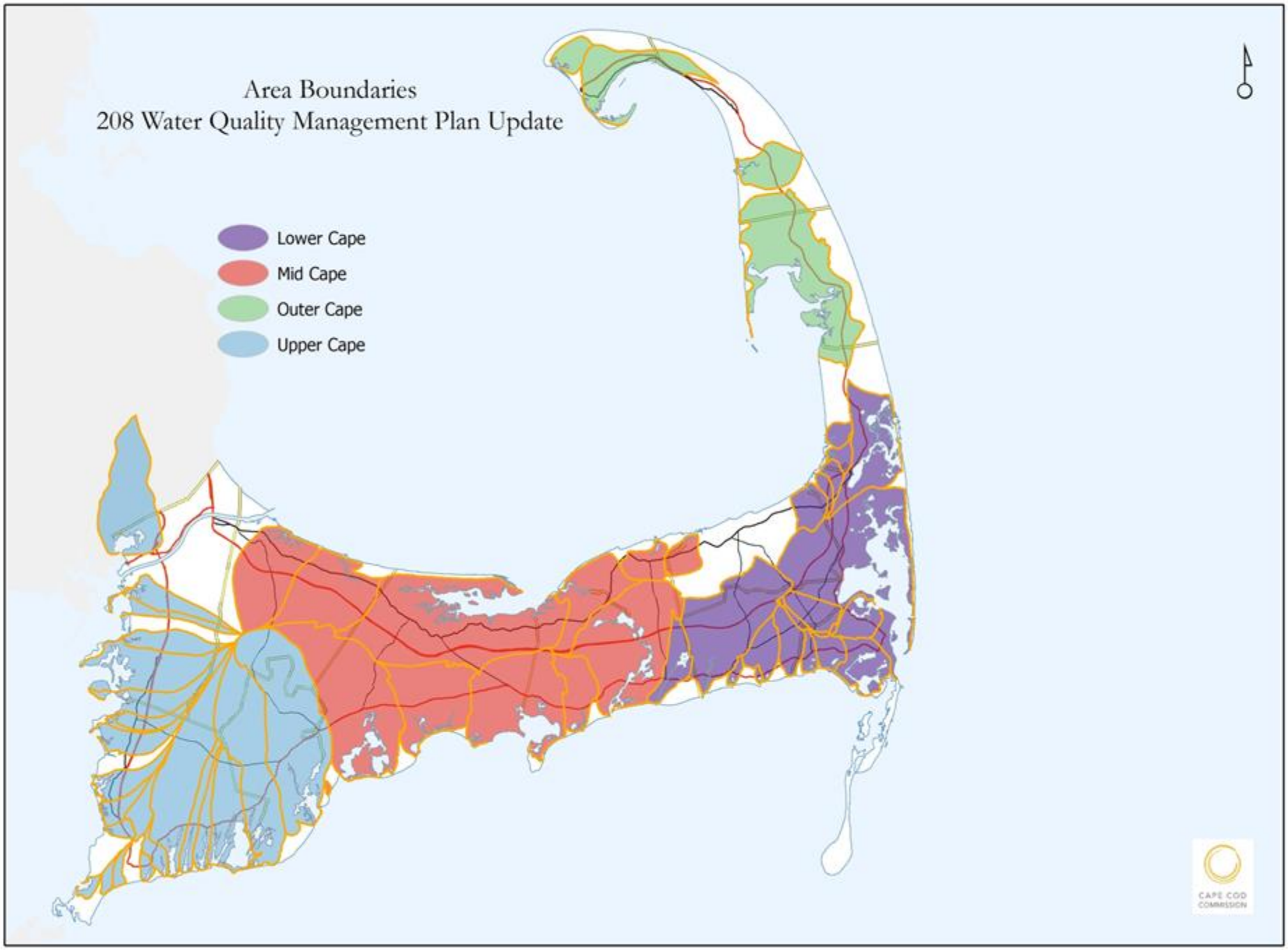
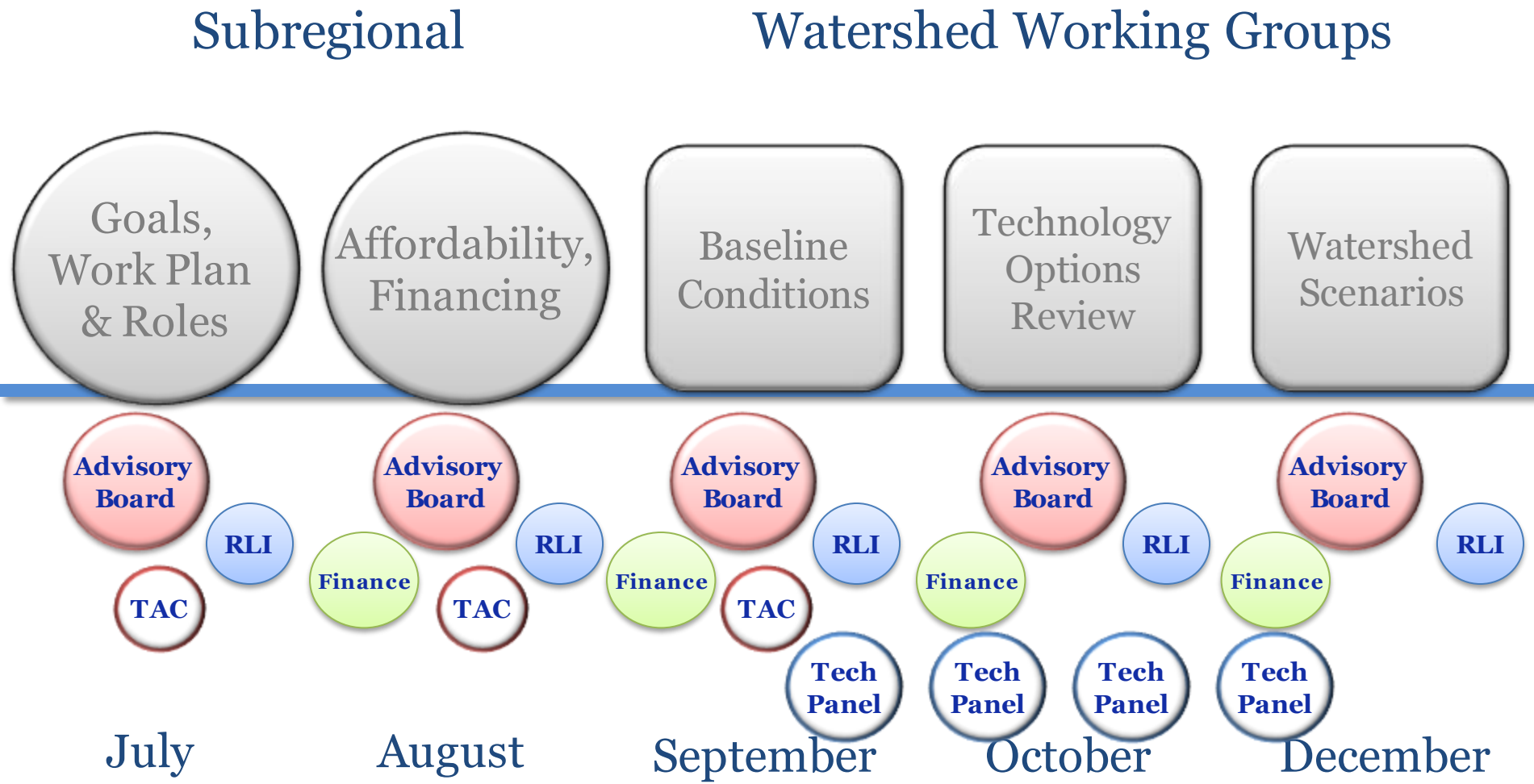
Subgroup Boundaries
208 Water Quality Management Plan Update



CAPE COD COMMISSION

Area Boundaries
208 Water Quality Management Plan Update

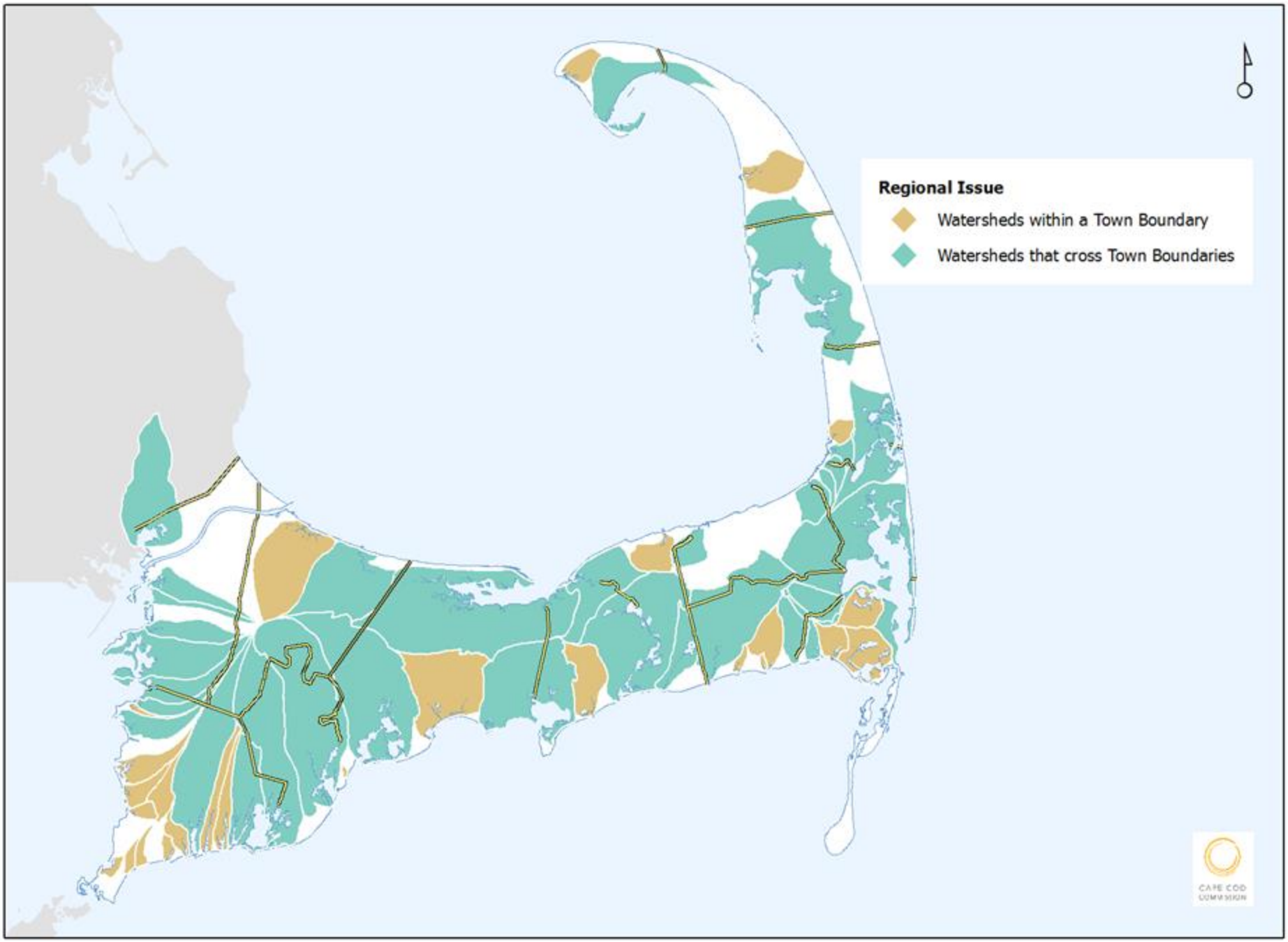


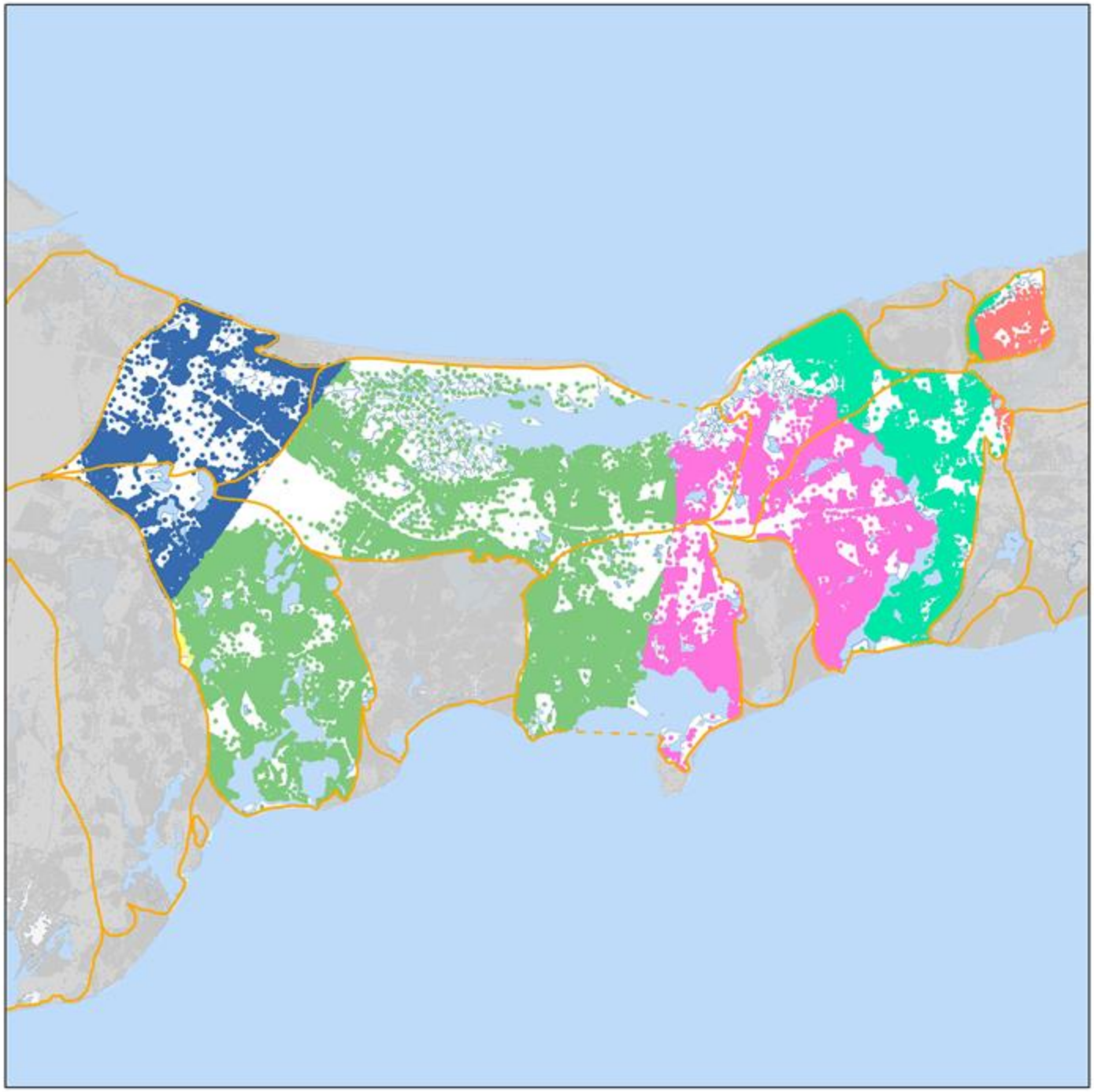


208 Planning Process

Standing Sub Regional Meeting Topics

	Scenario Planning	Regulatory, Legal, Institutional	Implementation
Mtg. 1	One representative watershed	Challenges & opportunities associated with permitting the watershed scenario	Adaptive management plans
Mtg. 2	**All shared watersheds & TBL model**	**Tools to support intermunicipal cooperation**	**Monitoring**
Mtg. 3	Subregional scenarios & TBL model	Structures for permitting	Financing & affordability


Regional Issue
Watersheds within a Town Boundary
Watersheds that cross Town Boundaries
CAPE COD COMMISSION


BARNSTABLE
BREWSTER
DENNIS
MASHPEE
SANDWICH
YARMOUTH

REQUIREMENTS OF CLEAN WATER ACT / EPA

208 plan requirement:

- State must designate one or more waste management agency (WMA)

WMA must be able to:

- Carry out plan
- Manage waste treatment
- Design & construct new, existing works
- Accept/utilize grants
- Raise revenues
- Incur indebtedness
- Assure each town pays its costs

COLLABORATION CHALLENGES

FROM SUB-REGIONAL MEETING 1

Who decides?

- Which solutions to implement and when and how to re-assess?
- Different levels of planning across towns (including approved CWMPs)
- Different town decision-making processes and publics
- Timeline required for building agreement
- Managing disagreement

Who pays?

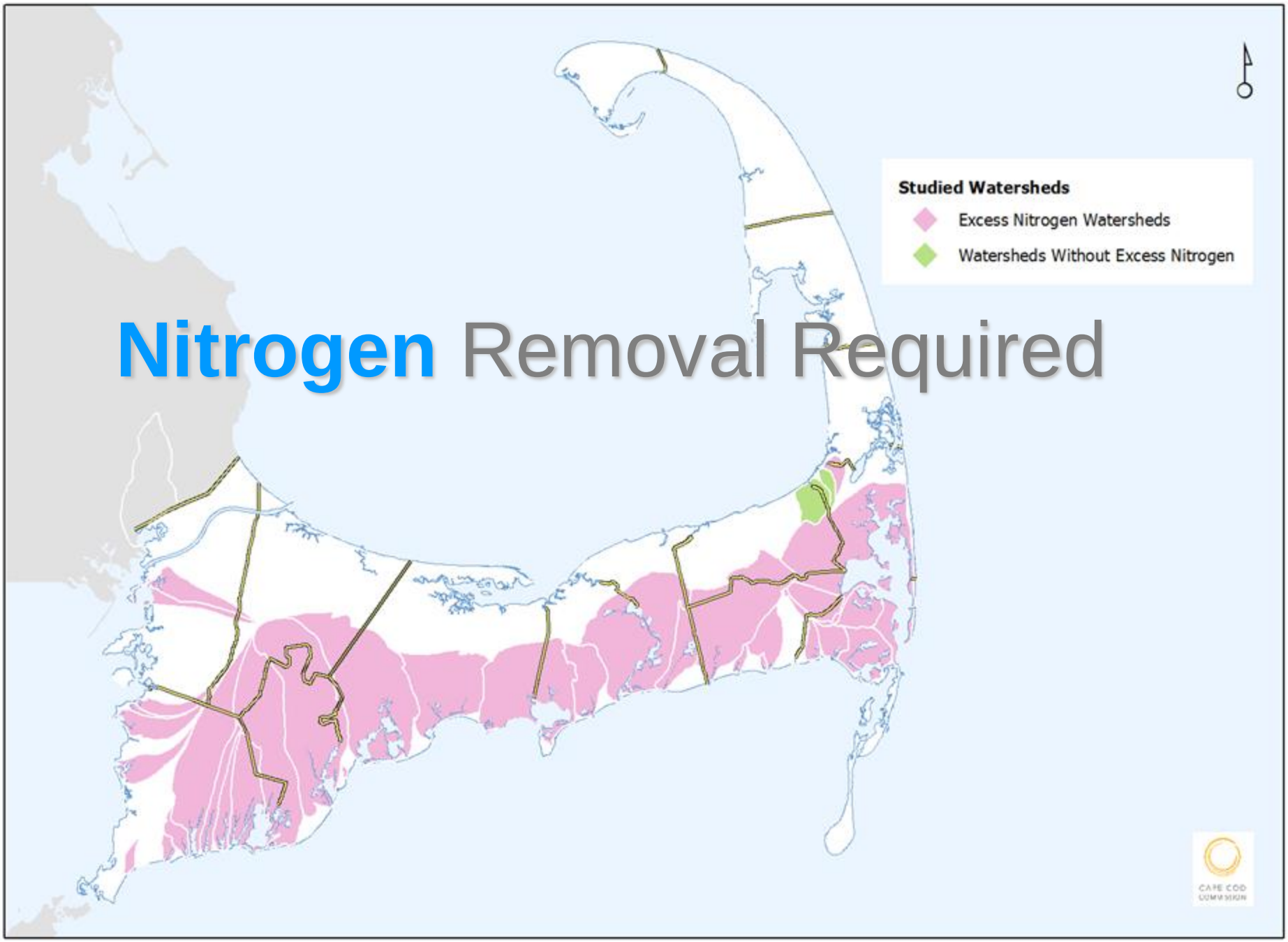
- Coordinating multiple town funding approval processes
- Applying for and allocating off-Cape funding opportunities
- Differences in ability & willingness to pay
- Assigning responsibility for: capital funding, operation and maint., monitoring, data mgt., reporting
- Managing disagreement

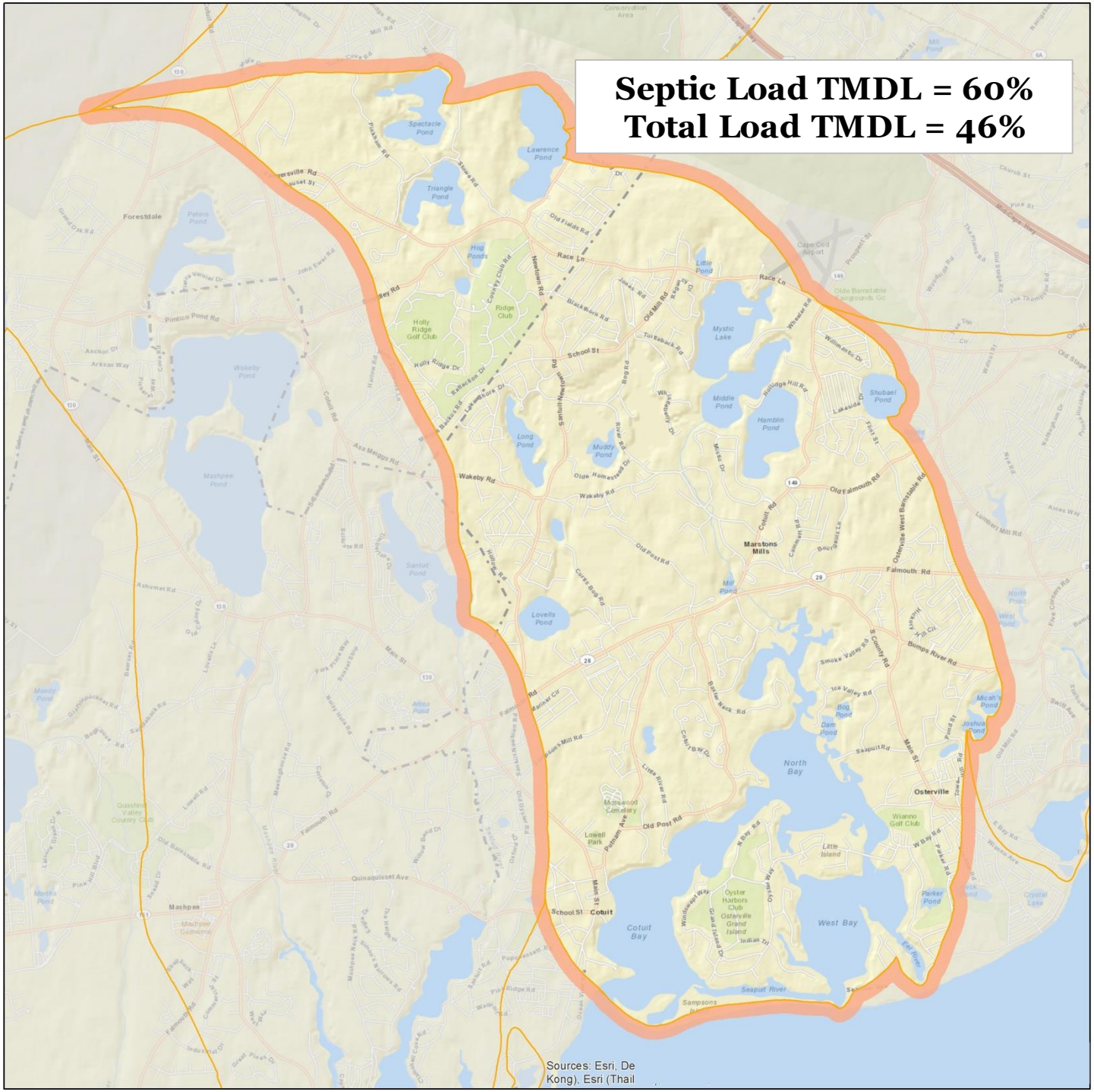
Who manages?

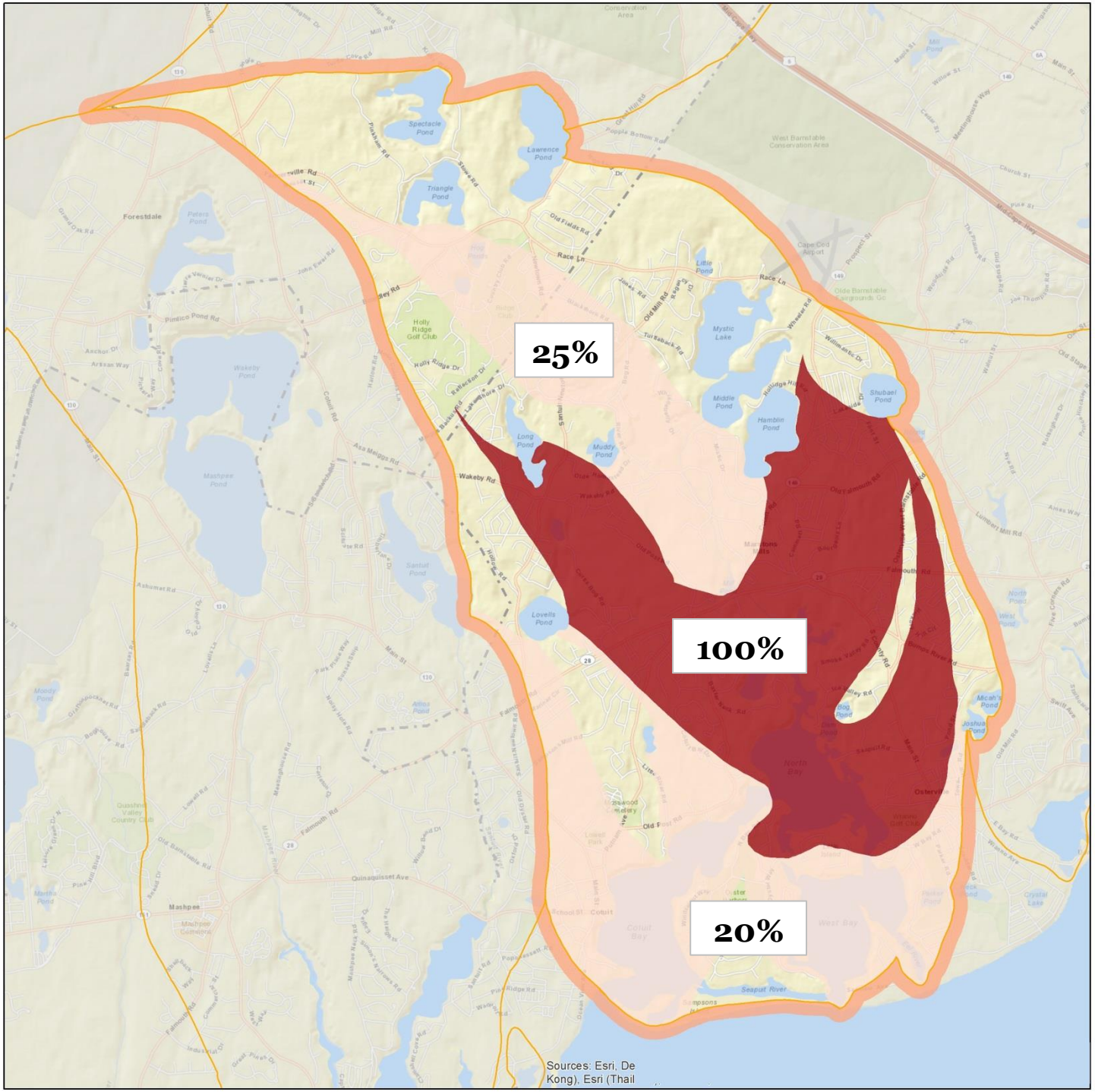
- Preparing the watershed plan for permitting
- Building, operating, maintaining, monitoring, and reporting
- Ultimate responsibility for water quality outcomes
- Managing disagreement

- Intermunicipal Agreements
- Federal/Municipal public-public partnerships
- Independent Water and Sewer Districts
- Water Pollution Abatement Districts
- Independent Authority
- Regional Health District

Nitrogen Removal Required




Septic Load TMDL = 60%
Total Load TMDL = 46%
Sources: Esri, De
Kong), Esri (Thail


25%
100%
20%
Sources: Esri, De
Kong), Esri (Thail

Problem Solving Approach

Wastewater | Existing Water Bodies | Regulatory

Traditional Approach

Identify Current N Removal Needs (Targets/Reduction Goals)

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

Targeted Sewer Collection to Achieve TMDL

Targeted Sewer Collection with Fertilizer and Stormwater Reduction to Achieve TMDL

Non-Traditional Approach

1. **Identify Current N Removal Needs** (Targets/Reduction Goals)

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

2. **Additional N Removal Needs**
   - A. Title 5 Problem Areas
   - B. Pond Recharge Areas
   - C. Growth Management

3. **Low Barrier Technologies**
   - A. Fertilizer Management
   - B. Stormwater Mitigation

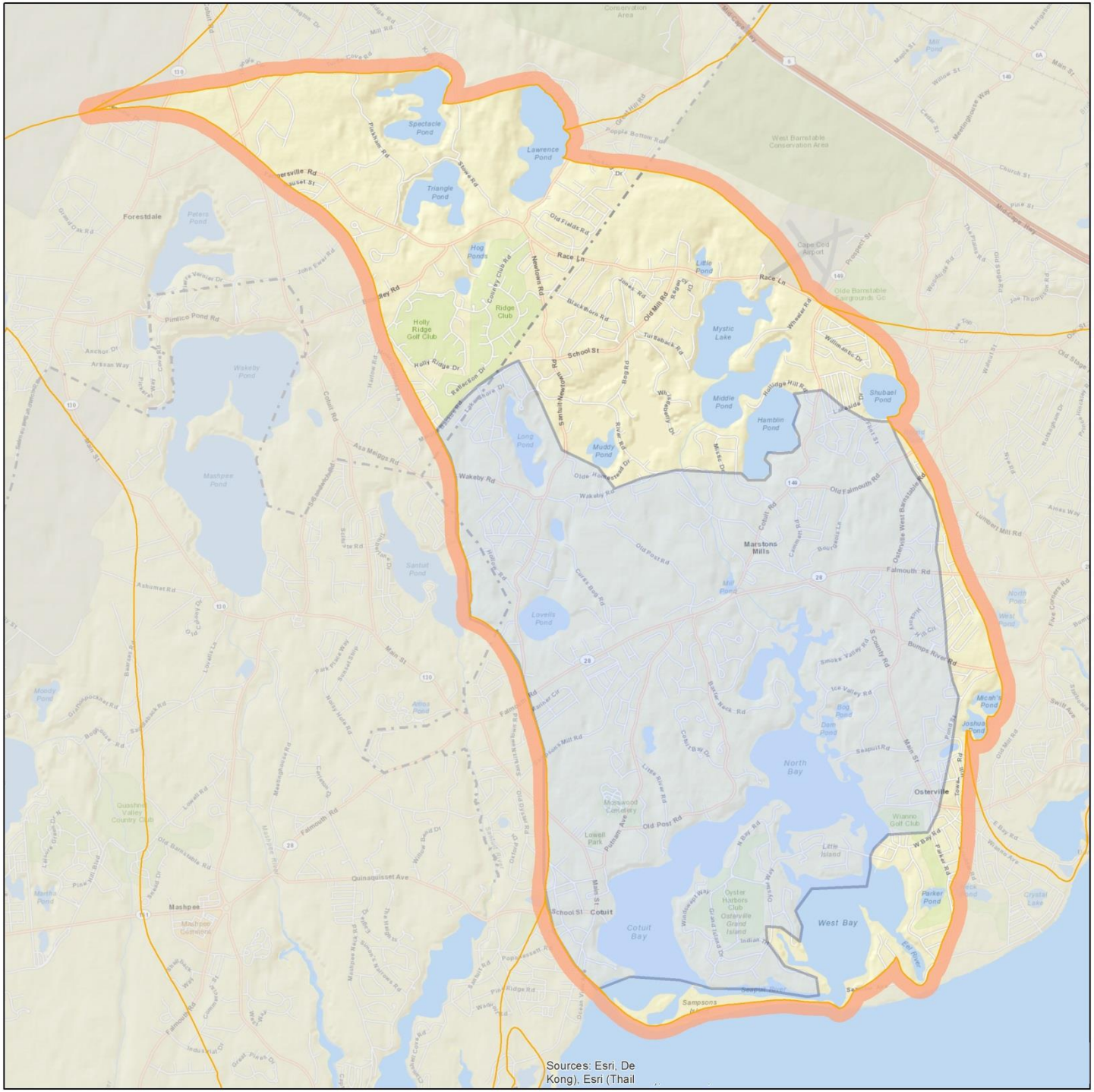
4. **Watershed Alternative Technologies**
   - A. Permeable Reactive Barriers
   - B. Inlet/Culvert Openings
   - C. Constructed Wetlands
   - D. Aquaculture

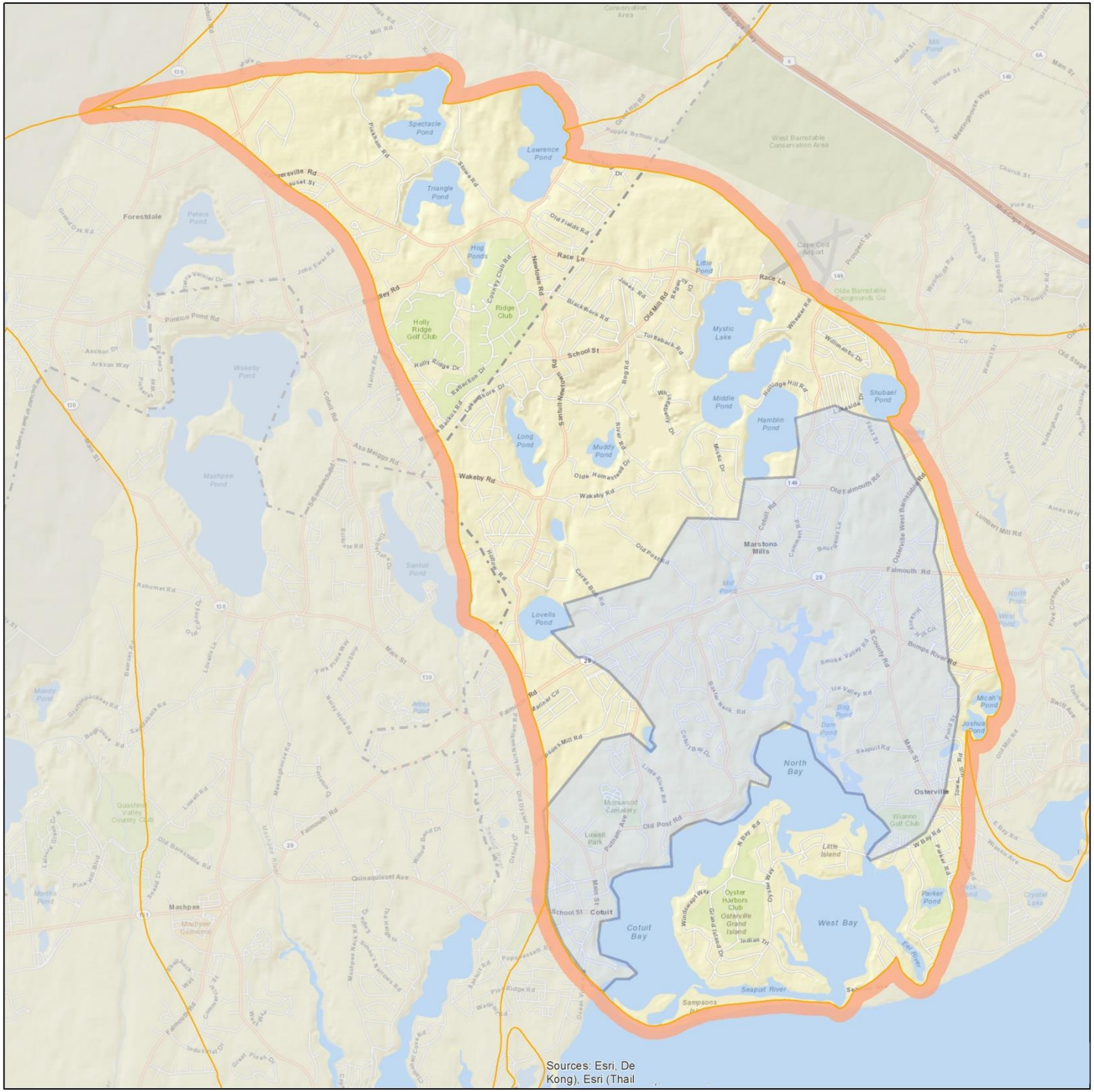
5. **On-Site Alternative Technologies**
   - A. Eco-toilets (UD & Compost)
   - B. I/A Technologies
   - C. Enhanced I/A Technologies
   - D. Shared Systems

6. **Priority Collection/Sewer Areas**
   - A. Greater Than 1 Dwelling Unit/acre
   - B. Village Centers
   - C. Economic Centers
   - D. Growth Incentive Zones

7. **Supplemental Collection / Sewer Areas**


Site Scale | Neighborhood | Watershed | Cape-Wide
| Prevention
Reduction
| Remediation
Remediation of Existing Development
Fertilizer Management
TDR
Transfer of Development Rights
Stormwater BMPs
Compact Development
Title 5
Standard Title 5 Systems
Conventional Treatment
IA
I/A Title 5 Systems
Cluster & Satellite Treatment Systems
Advanced Treatment
I/A Enhanced Systems
Wastewater Collection Systems
Effluent Disposal Systems
Toilets: Urine Diverting
Constructed Wetlands: Surface Flow
Toilets: Composting
Constructed Wetlands: Subsurface Flow
Toilets: Packaging
Stormwater: Bioretention / Soil Media Filters
Toilets: Incinerating
Stormwater: Wetlands
Phytoirrigation
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
Constr. Wetlands - Groundwater, Salt Water, Floating


Spectacle Pond
Lawrence Pond
Triangle Pond
Forestdale
Peters Pond
Hog Ponds
Holly Ridge Golf Club
Ridge Club
Little Pond
Mystic Lake
Middle Pond
Hamblin Pond
Shubael Pond
Long Pond
Muddy Pond
Wakeby Pond
Mashpee Pond
Santuit Pond
Lovells Pond
Marstons Mills
Mill Pond
Bog Pond
Dam Pond
North Bay
Osterville
Wianno Golf Club
Little Island
Parker Pond
West Bay
Cotuit Bay
Cotuit
Mashpee
Quashnet Valley Country Club
Moorswood Cemetery
Lowell Park
Oyster Harbors Club
Osterville Grand Island
Sampsons Island
Micah's Pond
Joshua Pond
Race Ln
Old Fields Rd
School St
Wakeby Rd
Old Falmouth Rd
Falmouth Rd
Main St
Old Post Rd
Quinaquisset Ave
Blinns River Rd
Sources: Esri, De
Kong), Esri (Thail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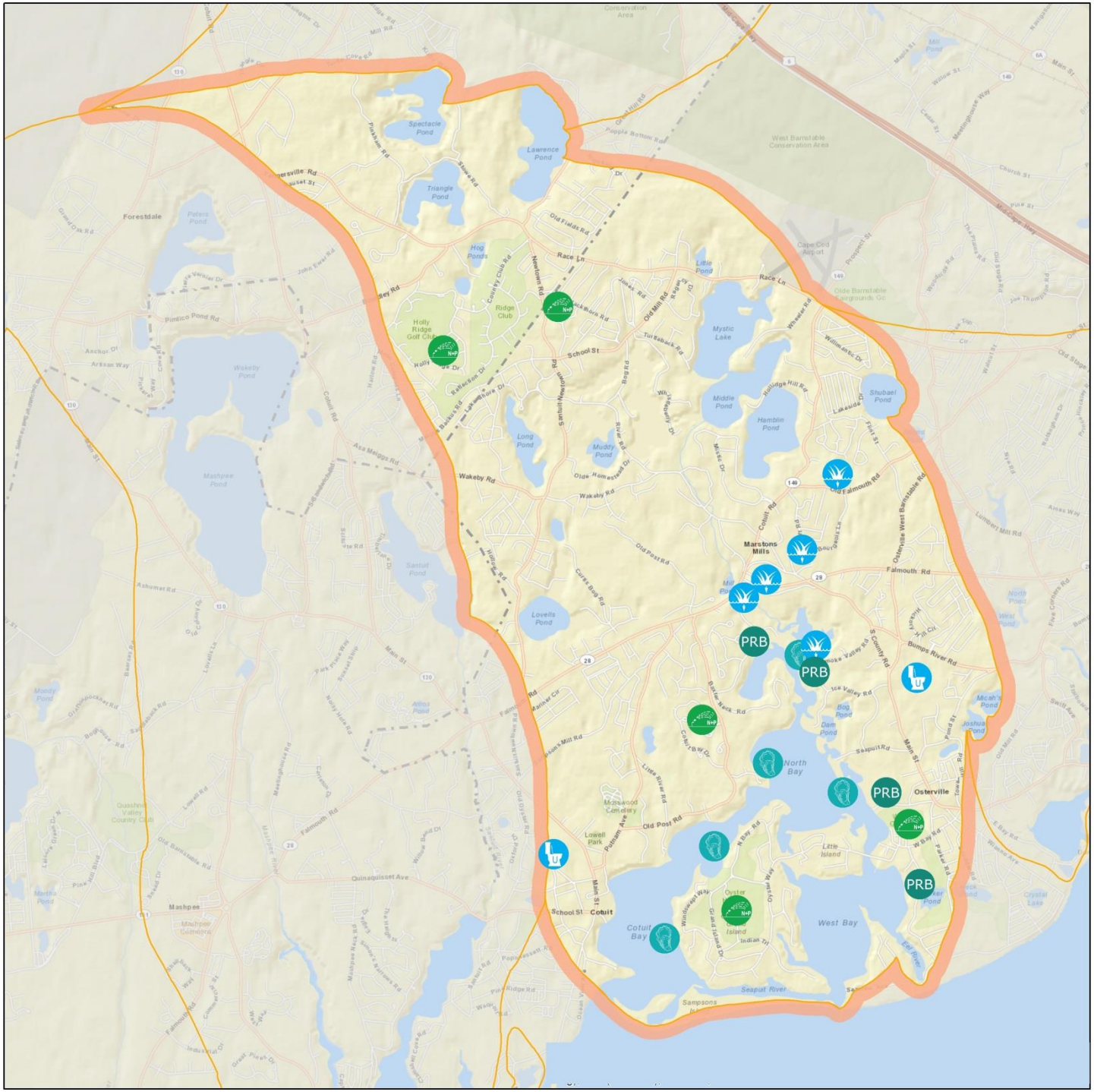
Cotuit
Seapuit River
Oyster Harbors Club
Osterville Grand Island
Wianno Golf Club
Mashpee
Quashnet Valley Country Club
Mashpee Commons
Lowell Park
Moorswood Cemetery
Race Ln
Old Fields Rd
Newtown Rd
School St
Old Mill Rd
Holly Ridge Dr
Pimlico Pond Rd
Wakeby Rd
Asa Meiggs Rd
Old Post Rd
Falmouth Rd
Old Falmouth Rd
Osterville West Barnstable Rd
Bumps River Rd
Main St
Quinaquisset Ave
Sources: Esri, De
Kong), Esri (Thail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Oyster Island
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Ridge Club
Quashnet Valley Country Club
Mashpee Cemetery
Moorewood Cemetery
West Barnstable Conservation Area
Cape Cod Airport
Olde Barnstable Fairgrounds Gc
PRB

SCENARIO 1 : Maximizing Sewer Option

Triple Bottom Line (TBL) Assessment Model

Environmental + Social + Financial Sustainability

CAPE COD COMMISSION

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

Select to add/remove/edit a strategy/technology: S1. Sewering - Sewershed #1

Select a Location (Watershed): Three Bays

SCENARIO NAME: Targeted Sewer

Current Application Stack: 1 Strategies/Technologies

+ **Sewering Options**

S1 **Sewering (Sewershed #1)**

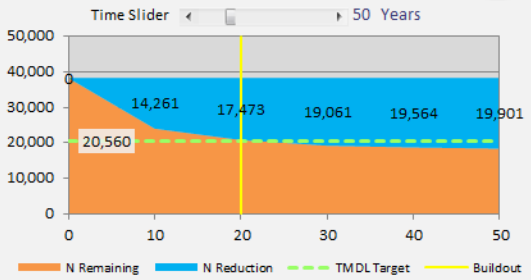
	from Selection	
Total Number of Properties	4035	
Land Area (acres)	5743.2	
Existing Nitrogen Load (Kg/yr)	24794.7	
Future Nitrogen Load (Kg/yr)	24794.7	
Properties Already Sewered	2	
Application Suitability	4,033	
% Selected	100%	
Properties Impacted	4035	
Land Area Impacted	5,743.2	acre
Future Nutrient Load Impacted	24,794.7	Kg/Yr
Collection Systems	**Quantity**	
Main Sewer	421,894	linear feet
Sewer Laterals	201,750	linear feet
Force Main	2	miles
Pump Station	3	Each
On-Site Pump Station		Each
STEG - Collection		Linear Foot
STEP - Collection		
Force Main		Linear Foot
On-Site Pump Station		Each
Interior Plumbing Reconfiguration		Each
Treatment Systems		
Treatment System Included	Yes	
Location (within/outside waatershe	within	
% capacity for sewershed	100%	
Treatment Facility Type	Advanced	
Effluent Disposal	**Quantity**	
Infiltration Basins		Square Foot
Soil Absorption System (SAS)		Square Foot
Injection Well		Each
Wick Well		Each
Ocean Outfall		Linear Foot
Effluent Transport out of Watershed		Linear Foot

Clear Selection

View Scenario Overview | View Technology Performance | Compare Technologies

Impacted Area: 5,743 Acres | 4,035 Properties | 4,033 Septic Systems

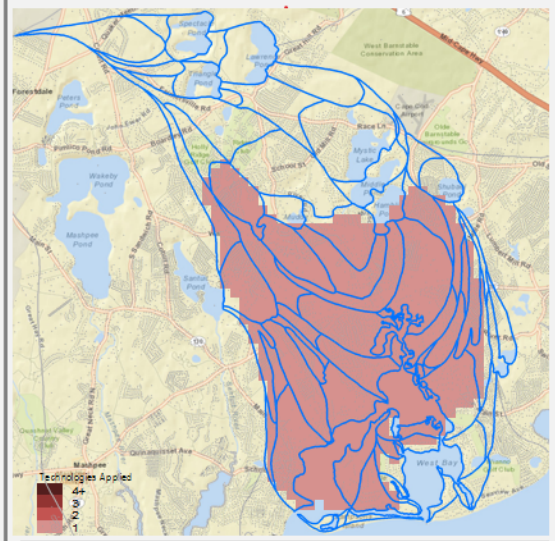
SCENARIO PERFORMANCE



N Load Reduced: 21,219 Kg/yr

N Load Remaining: 17,048Kg/yr

TECHNOLOGY APPLICATION MAP

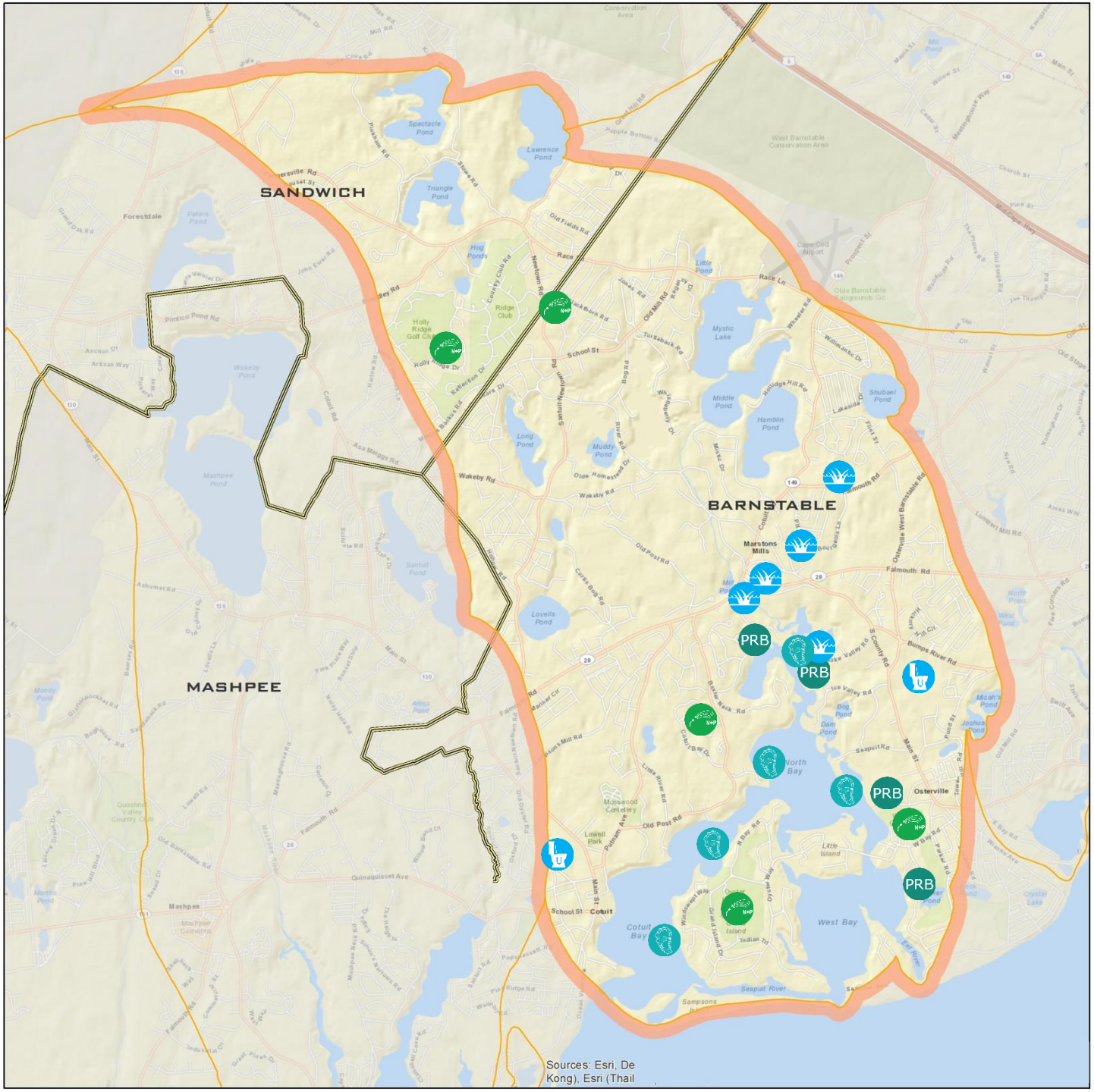


COMMUNITY IMPACTS SUMMARY

Quality Habitat Created	177.6	acres
GHG Reduced	418.4	MT CO2e/Yr
N Reduction Risk Ratio on Sea Level Rise	0.4	%
% Properties Increase in Property Value	54	%
New Employment added	179	jobs
Additional Cost per Household		$/HH/Yr

TRADITIONAL TECHNOLOGY MONITORING FRAMEWORK

Technology	Monitoring	Frequency
Conventional Treatment	GWDP Influent/ Effluent WQ + quantity	Quarterly - three down & one up gradient
SatelliteTreatment Systems	GWDP Influent/ Effluent WQ + quantity	Quarterly - three down & one up gradient
Cluster Treatment Systems	Board of Health performance monitoring similar but less rigorous than GWDP - varries based on conditions, groundwater monitoring may not be required	Varries
I/A Title 5 Systems	Influent/ Effluent WQ + quantity	Quarterly


SANDWICH
BARNSTABLE
MASHPEE
Marstons Mills
Osterville
Cotuit
PRB
PRB
PRB
Sources: Esri, De
Kong), Esri (Thail

NON-TRADITIONAL TECHNOLOGY MONITORING FRAMEWORK FOR PILOT PROJECTS (PRELIMINARY)

Technology	Monitoring	Frequency
Constructed Wetlands	WQ samples inlet/outlet (N)	Monthly during growing season
Pond Dredging	WQ samples inlet/outlet of pond (N/P)	Quarterly
Salt Marsh Restoration	Area of restoration, wetland types (GIS and field confirmation)	Annually
Shellfish Bed Restoration	Area of restoration/density of shellfish/landings N content of shellfish Denitrification in benthic (N,DO) WQ samples (N)	Annually Annually - composite 20 animals Annually - three locations Monthly during summer -three locations
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Perm. React. Barrier	2 upgradient/2 downgradient wells – WQ samples (N, DO) Well in media - WQ samples (N, DO, N gas)	Quarterly Quarterly
Inlet Widening	Salinity measurements to confirm model WQ samples at sentinel station	Two tidal cycles Two tidal cycles
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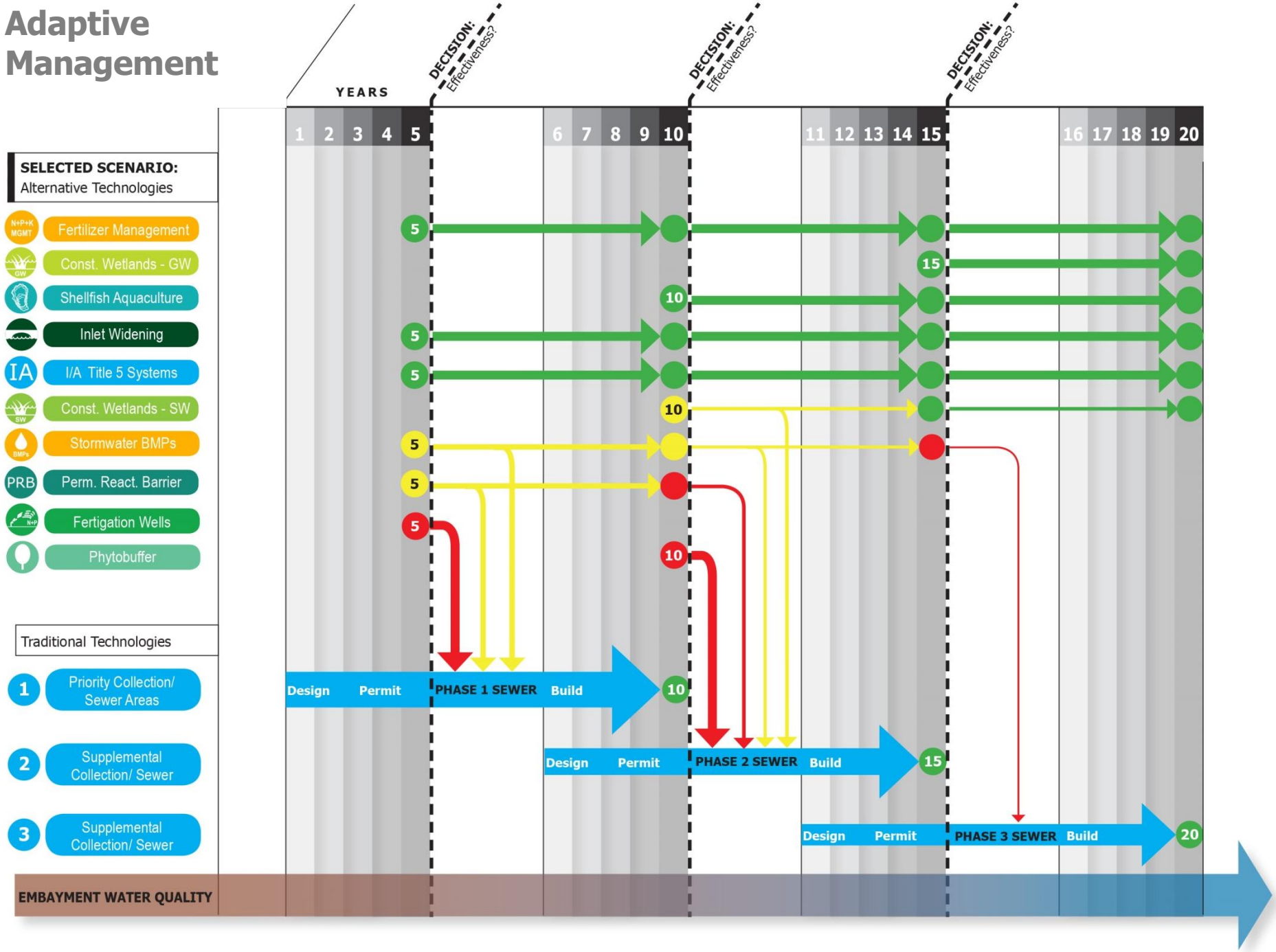
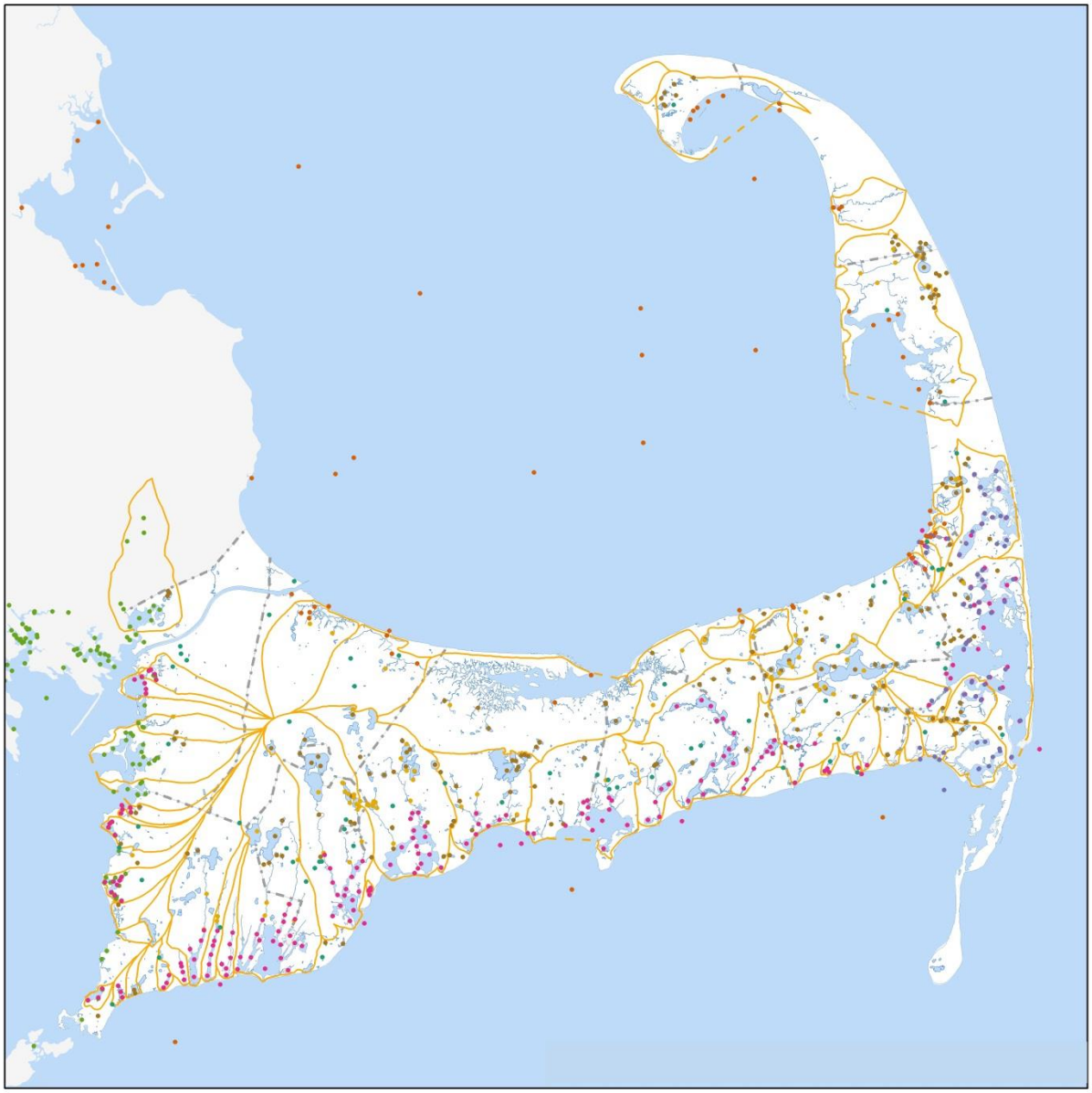
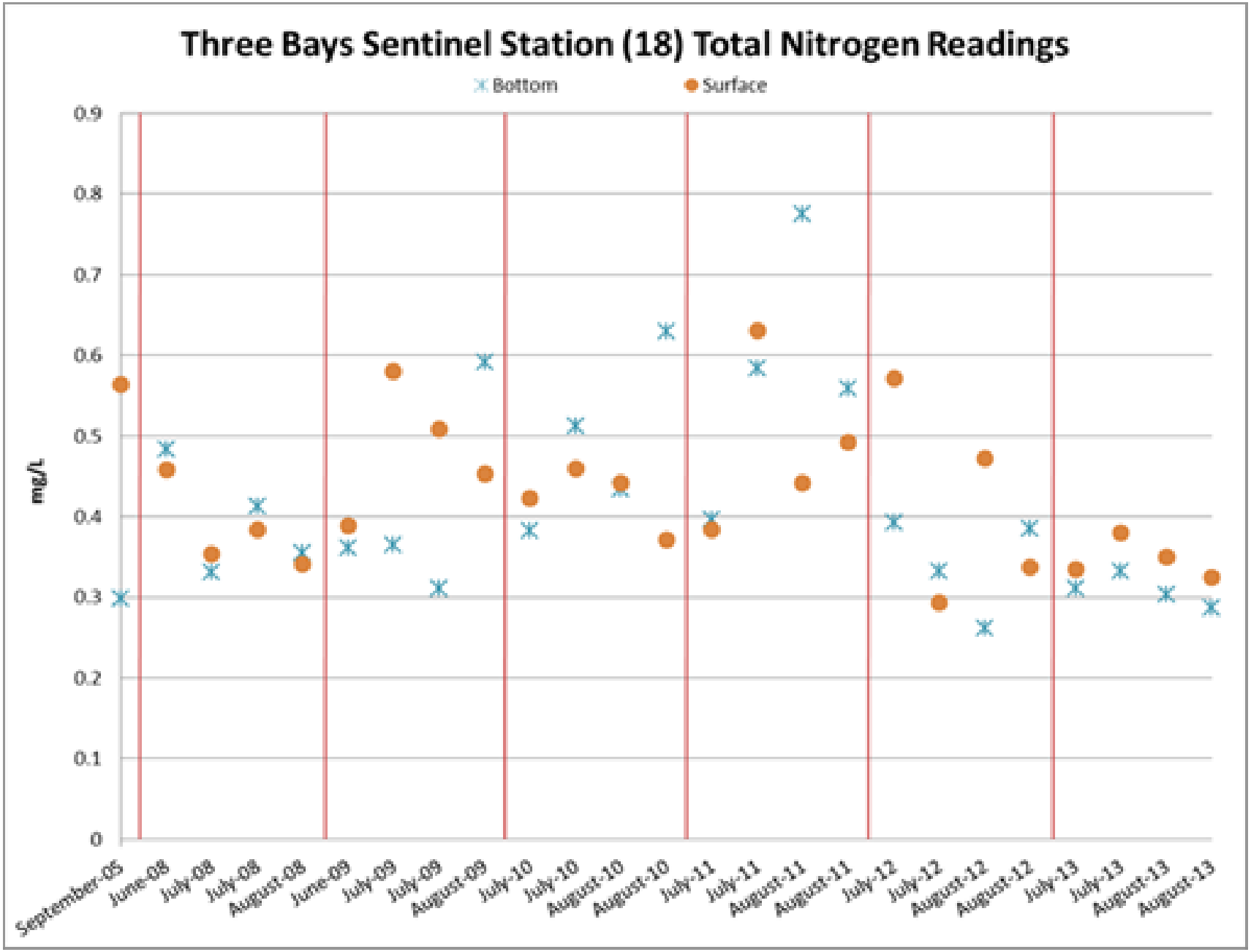
Adaptive Management



CURRENT WATER RESOURCE MONITORING




Three Bays Sentinel Station (18) Total Nitrogen Readings
Bottom
Surface
mg/L
0.9
0.8
0.7
0.6
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0.4
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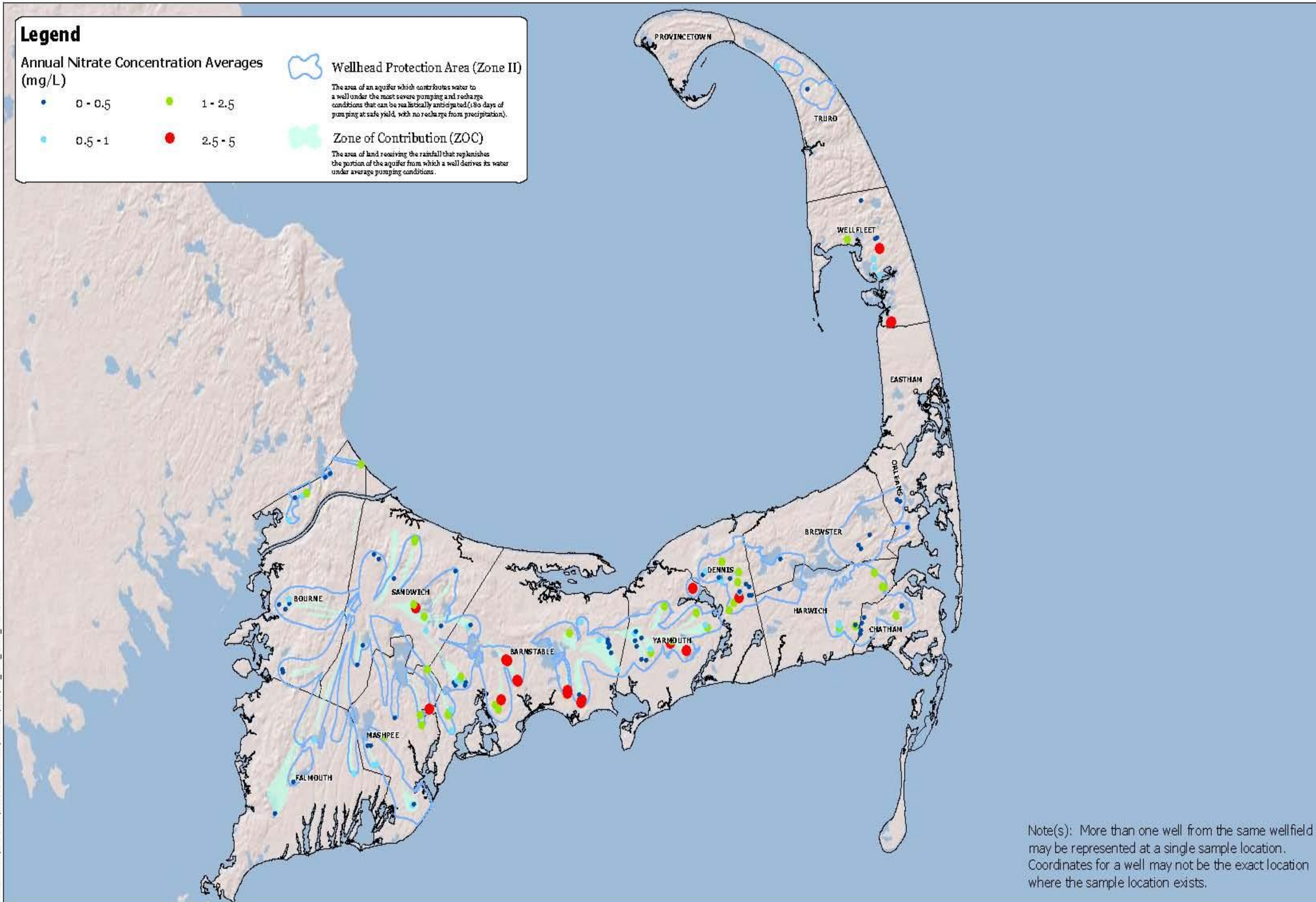
Nitrogen



Nitrate Concentrations in Cape Cod Public Supply Wells

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Sources: Esri, USGS, NOAA

Data layers: MassGIS, USGS, CCC

CAPE COD COMMISSION

Implementation

MONITORING

SECTION 208 AREA WIDE WATER QUALITY MANAGEMENT PLAN

MONITORING SUBCOMMITTEE

Mission:
To provide advice and guidance on appropriate monitoring protocols for technology efficiency and total maximum daily loads, while identifying a process for consolidating all available monitoring data in a central location and format.

SECTION 208 AREA WIDE WATER QUALITY MANAGEMENT PLAN

MONITORING SUBCOMMITTEE

Roles and Responsibilities:

- Establish performance monitoring protocols for technologies that may be a part of watershed permits in the future
- Establish compliance monitoring protocols for meeting total maximum daily loads (TMDLs) in the water body
- Establish process and structure for consolidating and cooperation of existing monitoring programs and data in to a centralized location
- Identify region-wide monitoring needs and develop proposals