



Town of

Orleans
Massachusetts

Orleans Water Quality Advisory Panel

Stakeholder Workshop

February 17, 2016

Agenda

1. Approval of Meeting Minutes of January 20, 2016
2. Downtown Planning Study Summary and Next Steps
3. Tri-Town Septage Plant Transition Status Update
4. Collection, Treatment and Disposal Systems Update
5. Public-Private Partnership Options
6. Financial Plan Update
7. Summary of February 9, 2016 Cadmus Presentation
8. Monitoring and Modeling Plan (AMP) Update
9. NT Technology Demonstration Project Status
10. Public Information Activities
11. Other Items
12. Public Comment



Downtown Planning Study Update

Tasks

- ❖ Review Previous Studies
- ❖ Conduct Economic/Market Analysis
- ❖ Conduct 1st Workshop to Confirm Vision
- ❖ Confirm Current Development Conditions
- ❖ Develop Future Buildout Scenarios (high, low and medium growth)
- ❖ Conduct 2nd Workshop

Planning Status

- ❖ Economic/Market Analysis Completed
- ❖ Workshops #1 and #2 Conducted (Dec 2015 and Feb 2016)
- ❖ Future Buildout Scenarios Refined Based on Comments from Stakeholders
- ❖ WW Flows and Loads Being Predicted
- ❖ Identifying Impacts and Additional Considerations



Downtown Planning Study Update (cont.)

- ❖ Summary/Key Takeaways from Downtown Planning Workshop No. 2, February 4, 2016
 - Confirmation of Vision for TC/VC
 - Prioritize year-round residents and uses
 - Reverse decline of year-round population and youth
 - Target increased growth and higher density of residential uses
 - Target lesser increase in commercial square footage
 - Continuity of Commercial Space in Downtown Area is Important
 - Avoid “dead space” between commercial uses
 - Prioritize first floor space in VC core for land uses with walk-in trade
 - Considerations to be Addressed in Addition to Wastewater
 - Parking-consider creative approaches and consider reducing on-site parking requirements



Downtown Planning Study Update (cont.)

❖ Buildout Scenarios

- Scenario 0: Full Buildout Under Current Zoning with Wastewater Limitation
 - No wastewater collection / treatment provided and Title 5 systems can be constructed under parking
 - No local nutrient management regulations
- Scenario 1: Full Buildout Under Current Zoning without Wastewater Limitation
 - Wastewater collection / treatment provided
- Scenario 2: Growth Scenario to Reflect Vision to Increase Residential Density in the Town Center
 - Wastewater collection / treatment provided
 - Zoning and land use changes to reflect increased mixed use and residential density in Core Area and Select 6A Parcels, plus modest decrease in maximum commercial development in some locations outside Core Areas



Downtown Planning Study Update (cont.)

❖ Buildout Scenarios

- Scenario 3: 2050 Planning Horizon

- 3a: Historic Growth Rate

- Apply historic residential and non-residential growth rates
- Account for additional dwelling units associated with currently proposed Town Center development

- 3b: Consideration of Vision, Market Conditions, and Provision of Sewer

- Residential: Apply increased growth rate to account for vision, market conditions; and provision of wastewater collection and treatment; and account for additional dwelling units associated with currently proposed Town Center development
- Non-residential: Growth rate reflects market demand based on projected housing unit growth in Orleans and the Primary Trade Area, which includes Eastham and part of Brewster



Downtown Planning Study Update (cont.)

Draft Results for Town Center Study Area Existing Conditions and Buildout Scenarios¹						
Sector	2015 Existing Conditions	Scenario 0: Full Buildout Under Current Zoning with Wastewater Limitation	Scenario 1: Full Buildout Under Current Zoning without Wastewater Limitation	Scenario 2: Growth Scenario to Reflect Vision to Increase Residential Density in the Town Center	Scenario 3: 2050 Planning Horizon	
					Scenario 3a: Historic Growth Rate	Scenario 3b: Consideration of Vision, Market Conditions, and Provision of Sewer
Residential - Dwelling Units	800	914	1,245	1,502	1,021	1,073
Non-Residential - Square Footage	1,474,128	2,673,649	3,565,437	1,815,441	1,660,078	1,707,800

1. Table reports draft results that are subject to revision.

Scenario 2



TTSTP Transition Status Update

1. Tri-Town District IMA and Permit will expire on December 31, 2016
2. Three Towns have voted not to fund interim improvements estimated at ~\$1,000,000 for a 5-year extended life
3. Towns and BOM voted to cease receipt of septage on June 1, 2016
4. Plant decommissioning will take about 3-months
5. Towns voted to extend 3-month salary retention offer to employees to stay at the plant to conduct plant decommissioning process
6. Design of demolition will be procured and contracted after May 2016 Town Meeting



Collection, Treatment and Disposal Systems Update

Collection Systems Types

- ❖ Gravity Sewers
- ❖ Low Pressure Sewers
- ❖ Vacuum Sewers
- ❖ Septic Tank Effluent Pumping
- ❖ Septic Tank Effluent Gravity

Tasks

- ❖ Identify Evaluation Criteria
- ❖ Prepare Preliminary System Layouts
- ❖ Perform Evaluation
- ❖ Prepare Cost Estimate (Project, O&M, Replacement and Monitoring)



Collection, Treatment and Disposal Systems Update (cont.)

Proposed Locations

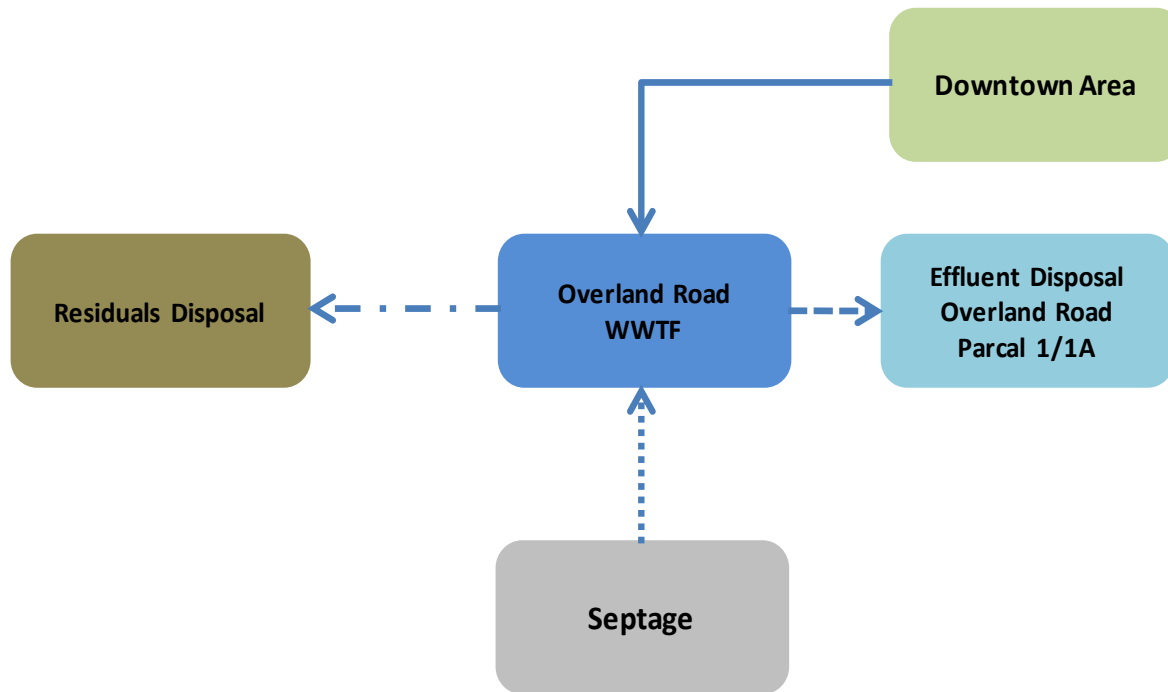
- ❖ Overland Road - Parcels 1/1A (Replacement of Route 6 - Interchange 12 Cloverleaf)
 - Downtown Area
- ❖ 223 Beach Road
 - Meetinghouse Pond Area

Tasks

- ❖ Hydrogeologic Site Evaluation
 - Proposed Scope Submitted to MassDEP
 - Install Monitoring Wells
 - Test Pit Investigation
 - Soils and Slug Testing and Data Analysis
 - Baseline Water Quality Analysis
 - Estimate of High Water Table
 - Perform Model Simulations
 - Estimate Groundwater Mounding
- ❖ Coordination with MassDEP
- ❖ Schedule and Conclusions



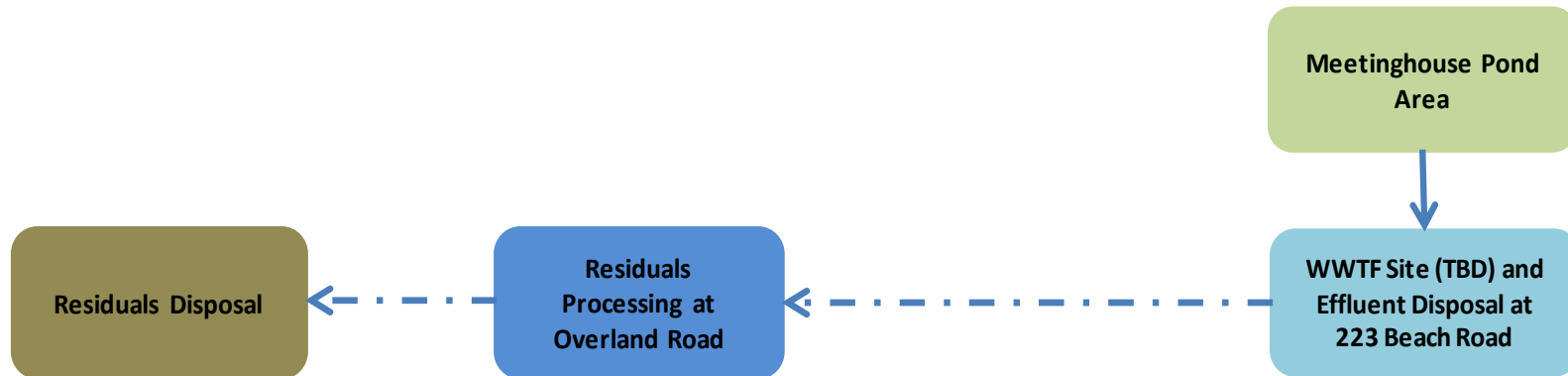
Collection, Treatment and Disposal Systems Update (cont.)



Downtown Area Flow Schematic



Collection, Treatment and Disposal Systems Update (cont.)



Meetinghouse Pond Area Flow Schematic



Collection, Treatment and Disposal Systems Update (cont.)

Scenario	Description for Preliminary Wastewater Flows (ADF) – Downtown Area	ADF (gpd)
---	Existing Conditions	152,000
0	Full Buildout Under Current Zoning Without Sewers	227,000
1	Full Buildout Under Current Zoning With Sewers	375,000
2	Full Buildout with Land Use and Zoning Changes Reflecting Increased Density With Sewers	285,000
3a	Historic Growth Rate	178,000
3b	Consideration of Vision, Market Conditions, and Provision of Sewer	184,000

Scenario	Description for Preliminary Wastewater Flows (ADF) – Meetinghouse Pond Area	ADF (gpd)
---	Existing Conditions	63,000
0	Full Buildout Under Current Zoning With Sewers	99,000



Collection, Treatment and Disposal Systems Update (cont.)

Effluent Disposal Location	Downtown Area	Meetinghouse Pond Area	Combined
Overland Road Parcel 1/1A	150,000	- - -	150,000
Marketplace Development	120,000	- - -	120,000
Hubler Property 223 Beach Road	<u>- - -</u>	<u>200,000</u>	<u>200,000</u>
Effluent Disposal Capacity	270,000	200,000	470,000
Preliminary Wastewater Flows	<u>285,000</u>	<u>99,000</u>	<u>384,000</u>
Difference	(15,000)	101,000	86,000

Note: All figures are Preliminary and are GPD - Average Daily Flows (ADF)



Public-Private Partnership Downtown Area

❖ BOS Workshop

- February 10, 2016, 6:30 pm
- Town Hall at 19 School Road

❖ Agenda Items

- Reset Study Review - Cape Cod Commission
- Marketplace Development - Todd Thayer
- Design-Build and Public-Private Partnerships - AECOM
- Downtown Planning - AECOM



Public-Private Partnership Options (cont.)

Design-Build-Operate

1. D, B and O bid simultaneously
2. 25% +/- design by owner required
3. Single-point contractor procured
4. D/B/O contractor responsible for performance & DEP compliance
5. Potential time (cost) savings
6. Predictable long-term total costs
7. Asset management built into contract
8. Operations scope adjustable to Orleans system needs
9. Requires special legislation

Public-Private Partnership

1. Private sector contributes up-front capital cost
2. Capital costs allocated by design flow and value to all 350 downtown users
3. Operating costs flow-based
4. Septage revenue to private sector contributors
5. Public sector retains system ownership
6. Combinations of grants, SRF loan and private and financing possible
7. Local Infrastructure Development Financing structure may apply



Public-Private Partnership Options (cont.)

Option No.	Plan	Collection System	WWTF	Effluent Disposal	Source of Capital	Revenue Sources
1	Public	Town	Overland Road (Town)	Parcel 1/1A (Town)	<u>WWTF/Disposal</u> SRF Grants/Debt Forgiveness <u>Collection</u> SRF Grants/Debt Forgiveness	<u>WWTF/Disposal</u> Special Assessments Connection Fees Taxes <u>Collection</u> Special Assessments Connection Fees Taxes
2	Private	Town	Old Colony Road (Private)	Marketplace Development (Private)	<u>WWTF/Disposal</u> Private Capital <u>Collection</u> SRF Grants/Debt Forgiveness	<u>WWTF/Disposal</u> Private Revenue Capital Recovery Fees <u>Collection</u> Special Assessments Connection Fees Taxes
3	P3	Town	Overland Road (Town)	Parcel 1/1A and Marketplace Development (Public-Private)	<u>WWTF/Disposal</u> SRF Grants/Debt Forgiveness Private Capital <u>Collection</u> SRF Grants/Debt Forgiveness	<u>WWTF/Disposal</u> Special Assessments Connection Fees Taxes <u>Collection</u> Special Assessments Connection Fees Taxes



Financial Plan Update

Objectives

- ❖ Updated Cost Estimates
- ❖ Fair, Value-based Cost Allocation Plan
- ❖ Affordability and Cost Impact Provisions
- ❖ Consideration of Public-Private Partnership Options

Tasks

- ❖ Define Cost and Revenue Components
- ❖ Define User Categories
- ❖ Allocate Costs by User Category and Value
- ❖ Define Financing Options
- ❖ Pursue Grant, Debt-Forgiveness options
- ❖ Test and Optimize Scenarios, Evaluate Affordability



Financial Plan Update (cont.)

Treatment Types	Type of Cost		Revenue Sources **	Users	Outputs
	Capital	Operating *			
Tri-Town WWTF	Capital Costs ***		Special Assessment	Sewered Commercial	Rate Scenarios By Customer Category
	Septic Capital Costs ***		Special Assessment	Sewered Residential	Parcel Specific
	Disposal Costs		Special Assessment		
	Connection Costs		Connection Fee		
		O, M, M & R Costs	User Charge		
Meetinghouse Pond WWTF	Capital Costs ***		Special Assessment	Sewered Residential	Rate Scenarios By Customer Category
	Disposal Costs		Special Assessment		Parcel Specific
	Connection Costs		Connection Fee		
			O, M, M & R Costs	User Charge	
Non Traditional	Capital Costs ***		Special Assessment	Nitrogen Sensitive Non Sewer	Rate Scenarios By Customer Category
	Connection Costs		Connection Fee		Average Parcel
			O, M, M & R Costs	User Charge	
				Management Fee	
On site Septic	Capital Costs		Management Fee	Non Nitrogen Non Sewer	Rate Scenarios By Customer Category
			O, M, M & R Costs	Management Fee	Average Parcel
Notes:					
* O = Operations; M = Maintenance; M= Monitoring; and R = Replacement					
** General Revenues - Taxes, Grants and Loan Forgiveness					
*** Planning, Design and Construction Capital Costs					



Financial Plan Update (cont.)

Component	Preliminary Project Cost	Preliminary Annual Costs				Present Value
		O&M	Replacement	Monitoring	Total	
<u>Downtown Area</u>						
Collection System	\$23,380,000	\$430,000	\$158,000	\$12,000	\$600,000	\$32,306,000
WWTF and Effluent Disposal	\$15,889,000	\$1,185,000	\$533,000	\$87,000	\$1,805,000	\$42,743,000
<u>Meetinghouse Pond Area</u>						
Collection System	\$21,094,000	\$212,000	\$91,000	\$3,000	\$306,000	\$25,647,000
WWTF and Effluent Disposal	\$6,809,000	\$709,000	\$235,000	\$143,000	\$1,087,000	\$22,981,000
<u>Non-Traditional Technologies</u>						
<u>Demonstration Projects</u>						
Floating Constructed Wetlands	\$3,247,000	\$11,000	\$74,000	\$384,000	\$469,000	\$10,225,000
Aquaculture/Shellfish Propagation	\$696,000	\$364,000	\$502,000	\$114,000	\$980,000	\$15,276,000
Permeable Reactive Barriers	\$973,000	\$0	\$75,000	\$375,000	\$450,000	\$7,668,000
<u>Non-Traditional Technologies</u>						
<u>Full Scale Projects</u>						
Floating Constructed Wetlands	\$10,823,000	\$38,000	\$246,000	\$1,279,000	\$1,563,000	\$34,076,000
Aquaculture/Shellfish Propagation	\$1,010,000	\$1,016,000	\$494,000	\$356,000	\$1,866,000	\$28,771,000
Permeable Reactive Barriers	\$3,796,000	\$0	\$101,000	\$563,000	\$664,000	\$13,675,000
Totals	87,717,000	3,965,000	2,509,000	3,316,000	9,790,000	233,367,000

Note: These are updated best estimates at this time.





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Pleasant Bay Water Quality: Analysis of 2000-2014 TRENDS

Summary of February 9, 2016 Presentation

The Cadmus Group, Inc.

Trend Analysis Objectives

- ❖ Use 2000-2014 monitoring data to characterize changes over time in:
 - Dissolved Inorganic Nitrogen (DIN)
 - Bioactive Nitrogen (BioN)
 - Total Nitrogen (TN)
 - Phosphate
 - Total Phytopigments
 - Dissolved Oxygen
 - Salinity

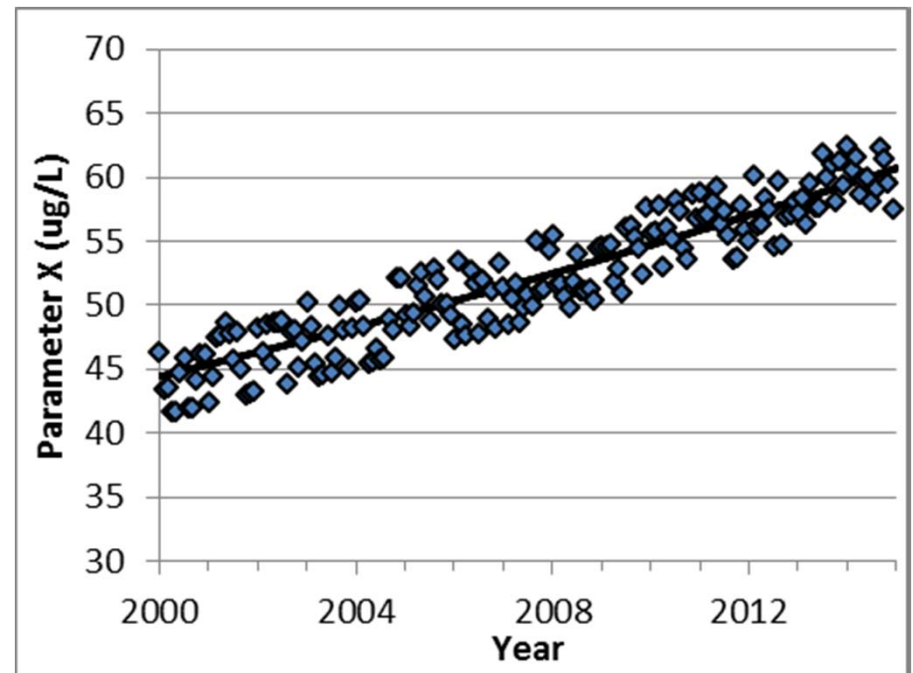
- ❖ Station-specific trends
 - Analyze samples from each station individually

- ❖ Bay-wide trends
 - Analyze samples from all stations together



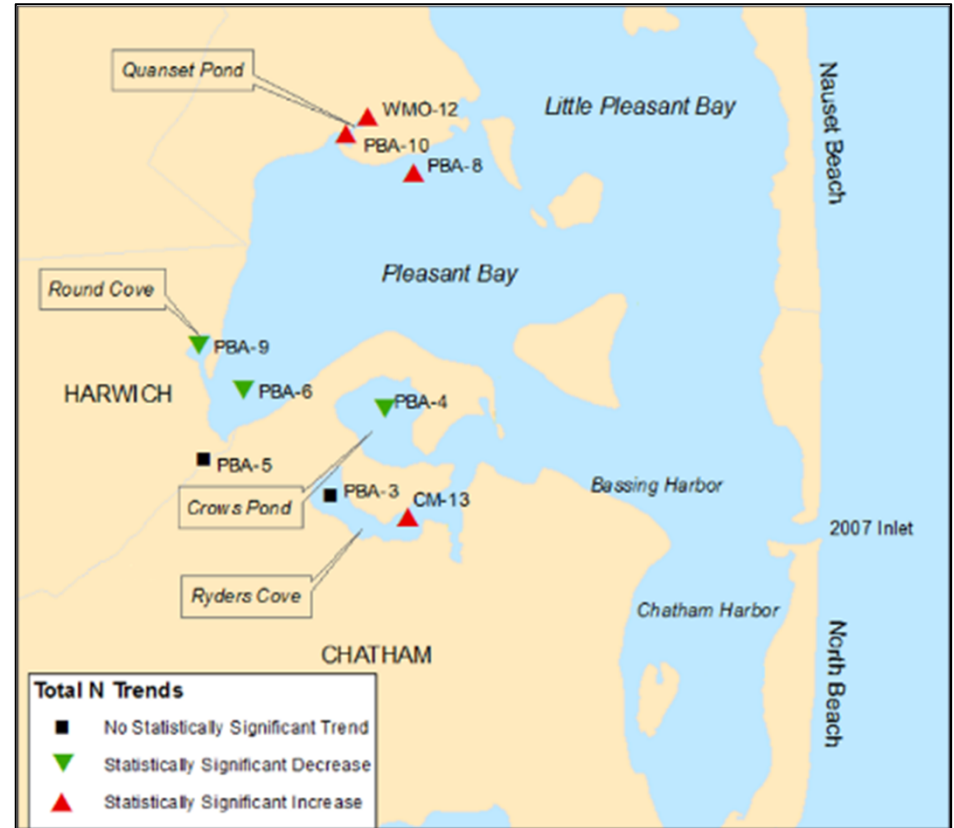
Trend Analysis Methods

- ❖ Fit trendline to sample data
- ❖ Evaluate statistical significance
 - Does trendline reflect a true trend over time or random variation in sample data?
- ❖ Trend analysis methods account for:
 - Variability in other covariates (sample depth, water temperature, etc.) to isolate trends over time
 - Station-to-station variability for isolating bay-wide trends
 - Potential changes in trends following the 2007 barrier beach break



Station-Specific Results

- ❖ Trends vary across stations for each parameter
- ❖ Example: Total Nitrogen
 - Increasing trend at 4 stations
 - Decreasing trend at 9 stations
 - No significant trend at 7 stations



Takeaways from station-specific trends...

- ❖ Trends vary across Pleasant Bay monitoring stations
- ❖ Detected trends are consistent with improvement at seven stations
 - Big Bay-SW, Paw Wah Pond, Namequoit-South, Meetinghouse Pond, Pochet Mouth, Namequoit River Mid, and River at Rattles Dock
- ❖ Detected trends are consistent worsened conditions at one station
 - Little Quanset Pond
- ❖ Stations with coupled trends of increased nitrogen concentrations but improved phytopigments & dissolved oxygen merit further investigation



Summary of post-break trends...

- ❖ Increased dissolved inorganic nitrogen and bioactive nitrogen
- ❖ Decreased phytopigments
- ❖ Increased dissolved oxygen

Parameter	Post-Break Trend
Dissolved Inorganic Nitrogen	▲
Bioactive Nitrogen	▲
Total Nitrogen	■
Phosphate	■
Total Phytopigments	▼
Dissolved Oxygen	▲



Takeaways from bay-wide trends...

- ❖ Evidence of increased nitrogen enrichment in the Pleasant Bay system since the 2007 break
- ❖ Trends of increased nitrogen (DIN and bioactive N) but improved phytopigments & dissolved oxygen highlight complexity of the Pleasant Bay ecosystem
 - Additional factors influence algae growth (light, water clarity, pH) and changes in these factors may have outweighed effect of higher nitrogen concentrations



Questions, Comments, Suggestions...

- ❖ Trend assessments confirm/augment value of data set
- ❖ Look for ways to improve value of bay-wide trends...possibly augment with sub-regional trend assessments
- ❖ Need to understand/explain relationships between parameters (DIN/pigments, temperature/DO, DIN/Bio N, etc.)
- ❖ Trends at sentinel stations part of the story; trends at benthic infauna stations also critical
- ❖ Long-term effects of flushing and reductions of N load on sediment flux should be evaluated
- ❖ Recognize changing configuration of barrier beach and inlet will continue to influence flushing
- ❖ Look for ways to improve, simplify future trend assessments



Next Steps...

❖ SMAST Evaluation

- Comment on trend assessment approach
- Interpret trends, relationships between parameters
- How do trends inform monitoring



Non-Traditional Technologies Demonstration Project Task Progress

Technology

- ❖ Aquaculture/Shellfish Propagation
- ❖ Floating Constructed Wetlands
- ❖ Permeable Reactive Barriers

Tasks

- ❖ Identify Possible Sites
- ❖ Conduct Preliminary Field Survey
- ❖ Assemble Base Data
- ❖ Establish Criteria For Site Evaluations
- ❖ Evaluate and Select Site(s)
- ❖ Prepare for/Conduct for PRB Field Investigations



Aquaculture/Shellfish Propagation Locations Evaluated

- ❖ Little Pleasant Bay (Existing Aquaculture Grants, Oysters and Quahogs)
- ❖ Quanset Pond (Oyster Reef)
- ❖ Pochet (Oyster Reef)
- ❖ Arey's Pond (Oyster Singles in Floating Bags)
- ❖ Town Cove (Quahog Propagation)
- ❖ Mill Pond (Quahog Propagation)
- ❖ Lower River (Oyster Singles in Floating Bags)

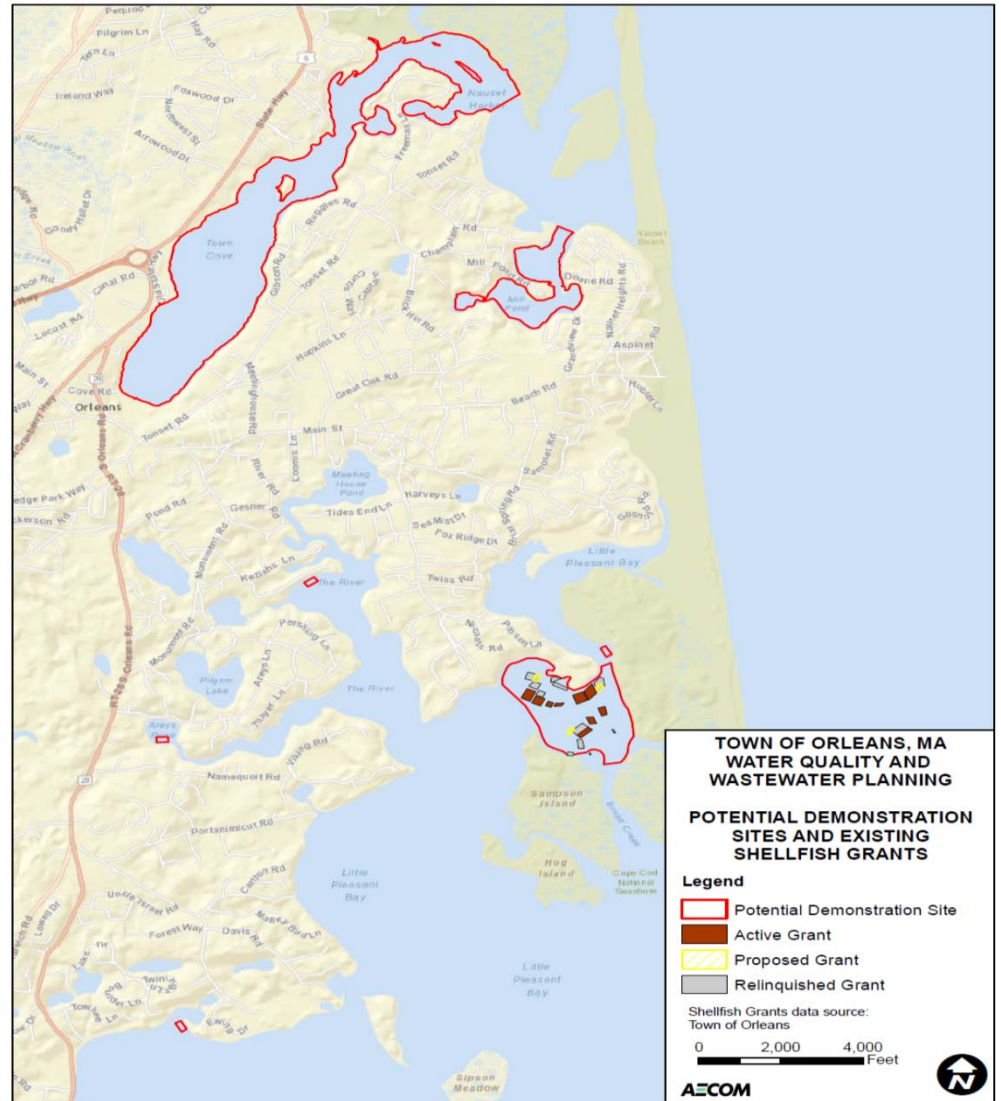


Aquaculture/Shellfish Propagation Top Ranked Locations

❖ Pleasant Bay

- Quanset Pond
- Little Pleasant Bay (existing grant areas)

❖ Follow up Discussion with Shellfish Growers to Confirm Locations on March 9, 2016



FCW Locations Evaluated

- ❖ Lonnie's Pond
- ❖ Namequoit River
- ❖ Paw Wah Pond
- ❖ Pochet Neck
- ❖ Quanset Pond



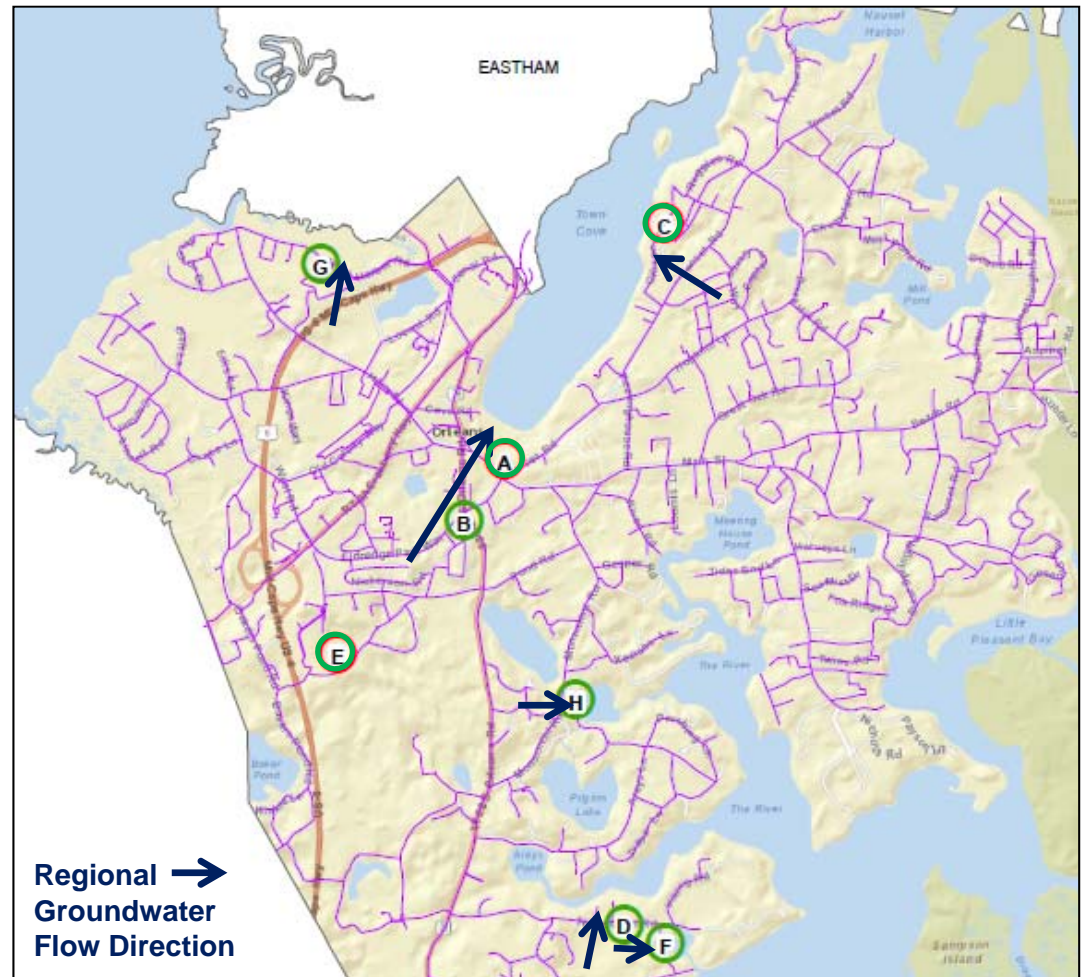
FCW Top Ranked Locations

- ❖ Lonnie's Pond
- ❖ Quanset Pond



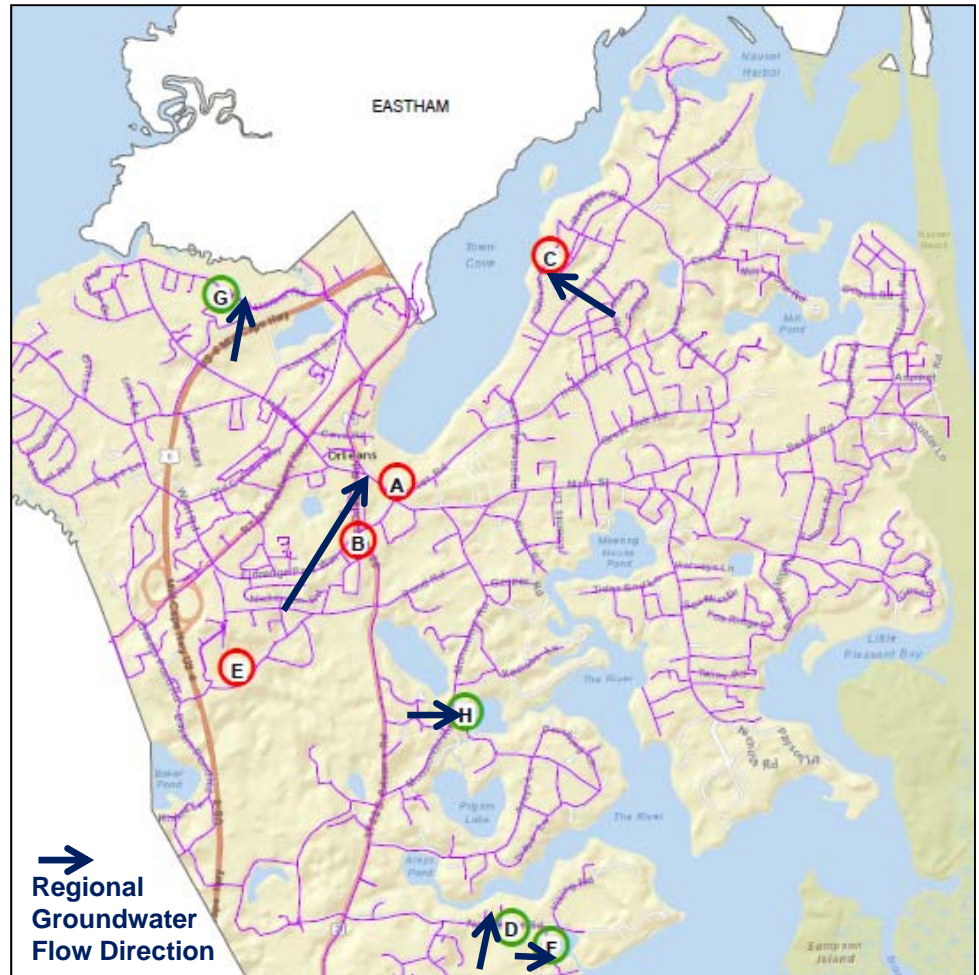
PRB Locations Evaluated

- A. Main Street and Tonset Road (Main Street)
- B. South Orleans Road at Tonset/Eldredge Parkway (Route 28 site)
- C. Town Cove Gibson Road
- D. Namequoit Road
- E. Town Landfill
- F. Paw Wah Pond
- G. Rock Harbor Road Area
- H. Kescayo Gansett Pond (Lonnie's Pond)



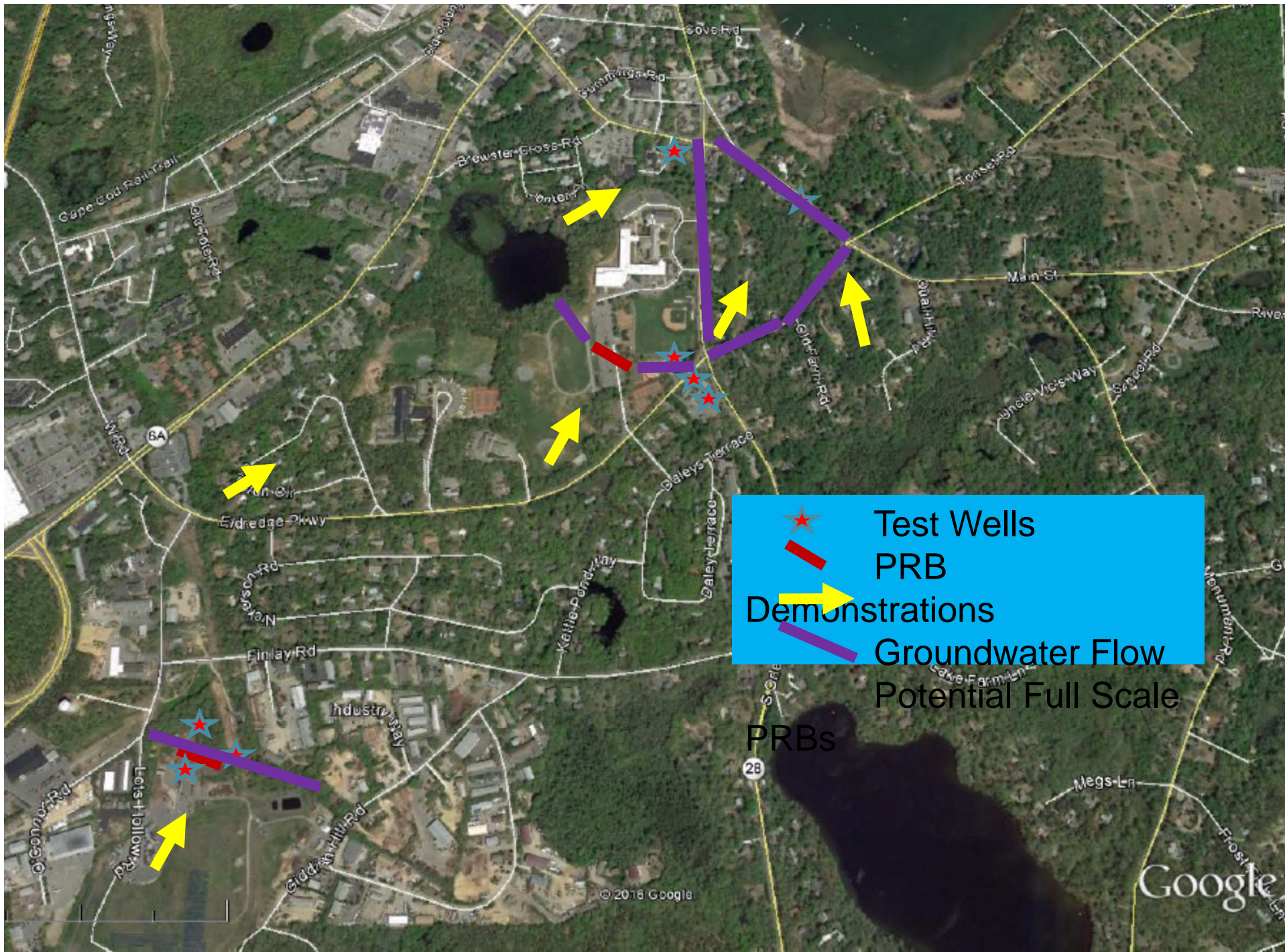
PRB Top Ranked Locations

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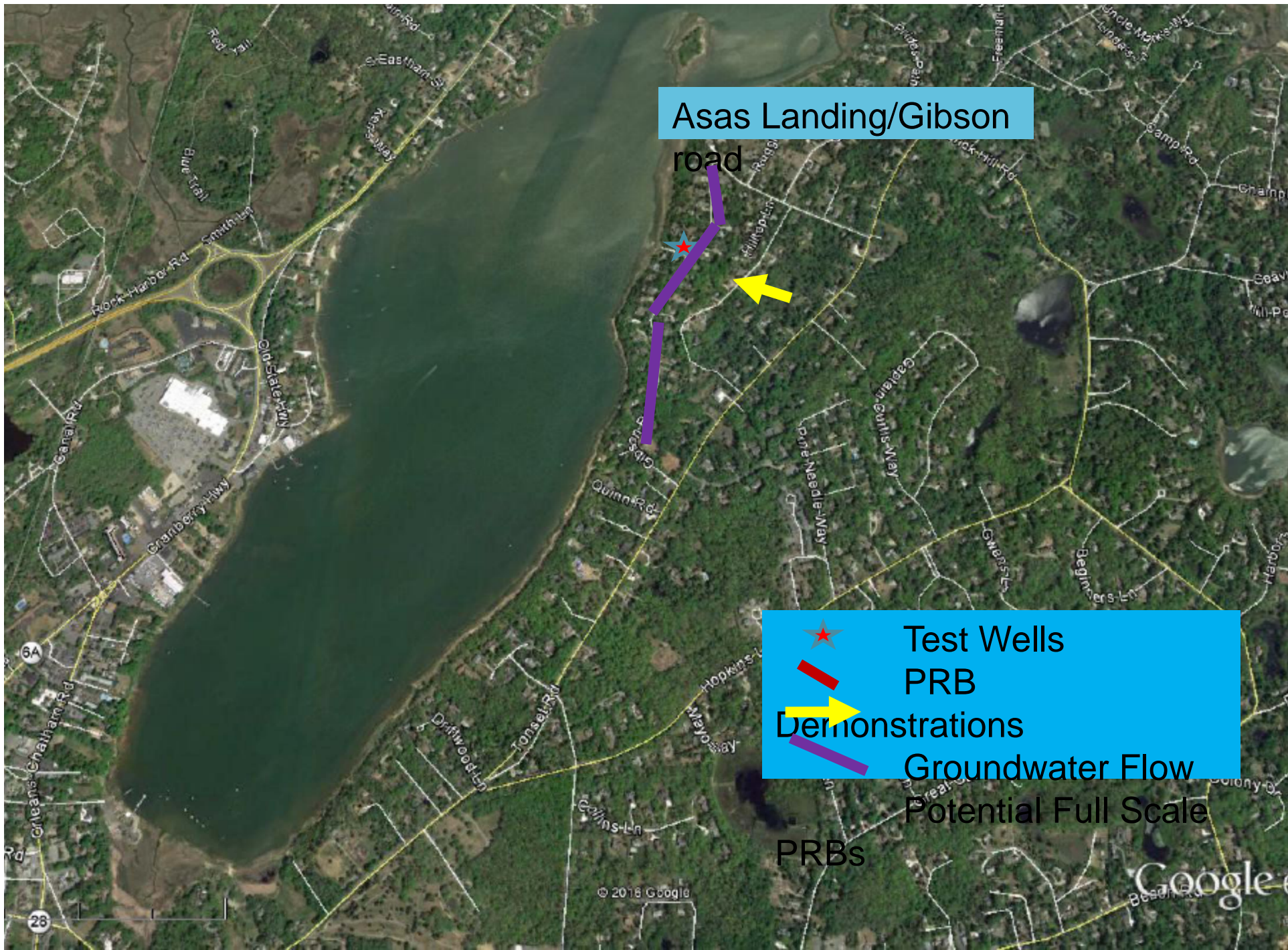




★ Test Wells
— PRB
→ Demonstrations
— Groundwater Flow Potential Full Scale PRBs

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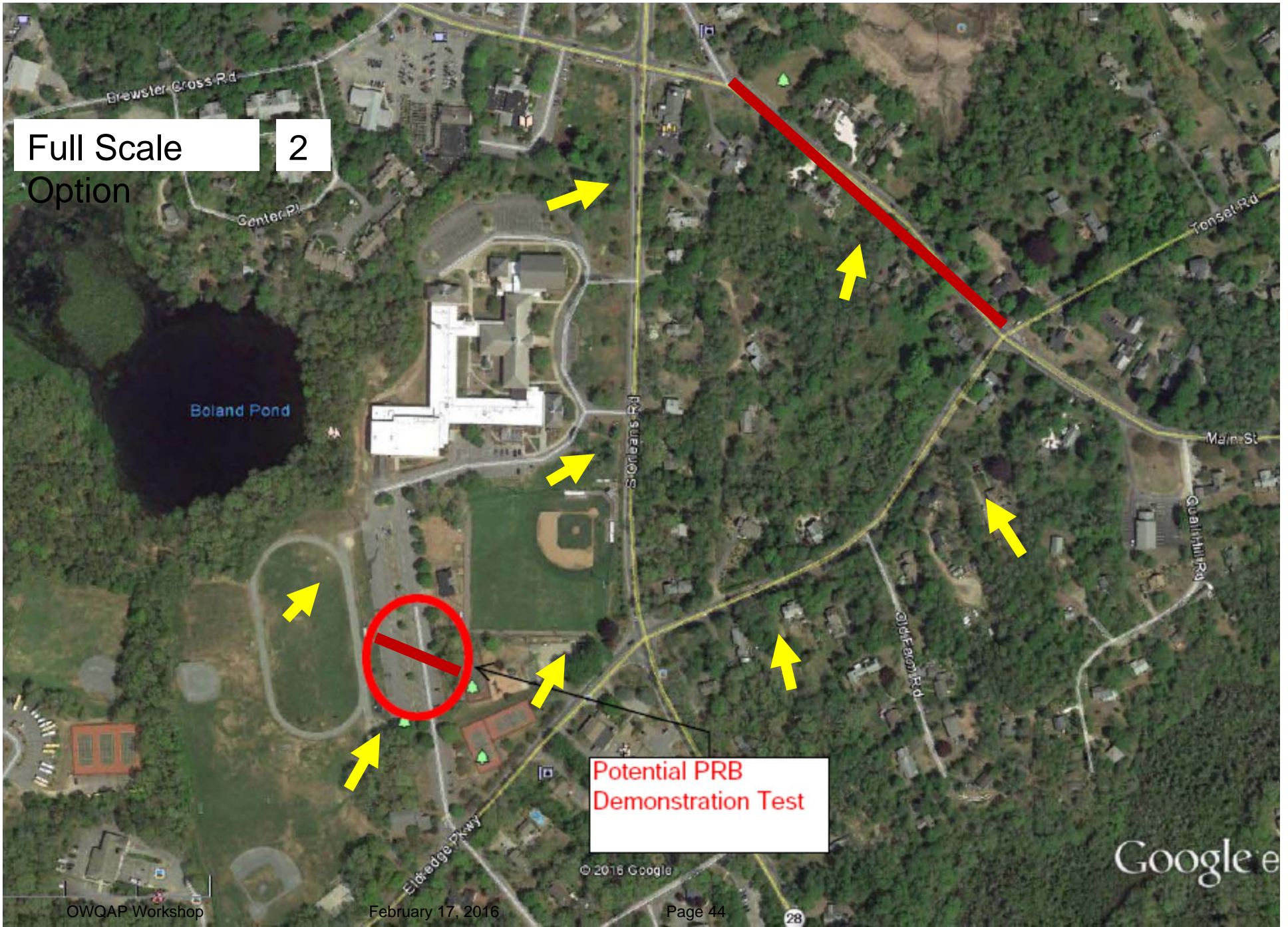
Potential PRB
Demonstration Test



Full Scale
Option

1

Potential PRB
Demonstration Test



Full Scale
Option 2

Potential PRB
Demonstration Test



Full Scale
Option

3

Potential PRB
Demonstration Test



Full Scale
Option

4

Potential PRB
Demonstration Test



Full Scale Option 5

Potential PRB Demonstration Test



Full Scale
Option 6

Potential PRB
Demonstration Test



Full Scale
Option 7

Potential PRB
Demonstration Test

Public Information Activities

- ❖ Public Information Program Summary Report
 - OWQAP and Constituents
 - Minutes of Meetings
 - Future Public Relations Activities

- ❖ Adaptive Management Workshop
 - Part 1 - February 9, 2016 - Completed
 - Part 2 - TBD
 - Town Hall at 19 School Road

- ❖ Joint BOS and Finance Committee Workshop – Financial Model
 - February 18, 2016, 6:30 pm
 - Town Hall at 19 School Road



Public Information Activities (cont.)

- ❖ OWQAP Subcommittee Workshop – Aquaculture
 - March 9, 2016, 11:00 am
 - Town Hall at 19 School Road

- ❖ OWQAP Workshop
 - March 16, 2016, 9:00 am to Noon
 - Town Hall at 19 School Road

- ❖ Others?



Other Items and Public Comment

❖ Comments and Questions





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Thank You