Orleans Water Quality Advisory Panel

Water Quality and Wastewater Planning Program Status Update

March 16, 2016

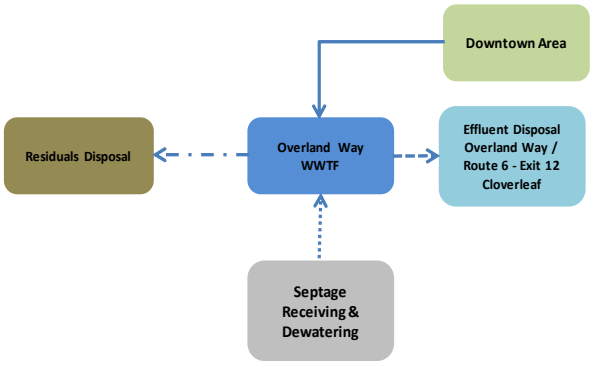
Agenda

1. Approval of Meeting Minutes of February 17, 2016
2. Downtown Planning Study Summary
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. Monitoring and Modeling Plan (AMP) Update
8. NT Technology Demonstration Project Status
9. 2015 Namskaket Vegetation Survey Update Summary
10. Public Information Activities
11. Other Items
12. Public Comment

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

Downtown Collection, Treatment and Disposal System



Downtown Area Flow Schematic

Wastewater Collection System (cont.)

Collection System Types

- Gravity Sewers (GS)
- Low Pressure Sewers (LPS)
- Septic Tank Effluent Pumping (STEP)
- Septic Tank Effluent Gravity (STEG)
- Vacuum Sewers (VS)
- Hybrid

Cost Evaluation

- Prepared Preliminary System Layouts
- Developed Quantities
- Developed Unit Prices
  - Project (Capital)
  - Operation and Maintenance
  - Replacement
  - Monitoring
- Prepared Life-Cycle Cost Analysis

AECOM

Wastewater Collection System (cont.) Assumptions / Considerations

- Conventional and Alternative Construction
  - Off Season
  - Full Roadway Restoration
  - No Topographic Survey or Geotechnical Investigations
- Compared with 100% of Each Collection System Type
- Present Value
  - 20 Years
  - 3% Inflation Rate
  - 3% Value of Money

AECOM

Wastewater Collection System (cont.)
Assumptions / Considerations

- Investigation of Capital Costs
  - Communities and Vendor Information
  - AECOM's Project Experiences
- Costs Adjusted to New England Market
  - Material Costs
  - Wage Rates
  - Local Conditions
- Land Purchase at $200,000 per Acre
- Design-Bid-Construct Format

Wastewater Collection System (cont.)

Project (Capital)

- Public Property
  - Pipes
  - Pump Stations
  - Force Mains
- Private Property
  - Service Pipes
  - Replace Septic Tanks
  - Pump/Valve Units, as Applicable
  - Abandonment of On-Site Systems, as Applicable

Operation and Maintenance

- 1 Full Time Employee Plus 260 Hours Per Pump Station
- Utilities, Chemicals, etc.
- Clean and TV 25% of Gravity Sewers per Year
- Clean 100% of Pressure Pipes per Year
- Private Property Components
- Pump-out Septic Tanks Every 3 Years, as Applicable

Wastewater Collection System (cont.)

Replacement

- Pump Stations at 1% of Capital Cost per Year
- Private Property Pumps/Valves at 5% of Total Number Installed

Monitoring

- Pump Stations at $2,500 per Year
- Private Property Pumps/Valves at 8 Hours Per Connection

Wastewater Collection System (cont.)
Present Value Comparison

Downtown Area						
	Gravity Sewers	Septic Tank Effluent Gravity	Low Pressure Sewers	Vacuum Sewers	Septic Tank Effluent Pumping	Hybrid (GS and LPS)
Capital	$ 26.82	$ 28.52	$ 18.71	$ 28.30	$ 19.46	$ 24.18
O&M	$ 0.82	$ 0.85	$ 0.67	$ 1.01	$ 0.70	$ 0.62
PV	$ 38.89	$ 41.10	$ 28.63	$ 43.33	$ 29.90	$ 33.36

Note: Costs in Million of Dollars

Wastewater Collection System (cont.)
Present Value Comparison

Meetinghouse Pond Area						
	Gravity Sewers	Septic Tank Effluent Gravity	Low Pressure Sewers	Vacuum Sewers	Septic Tank Effluent Pumping	Hybrid (GS and LPS)
Capital	$ 32.35	$ 34.16	$ 21.92	$ 29.83	$ 22.73	$ 21.20
O&M	$ 1.33	$ 1.37	$ 0.74	$ 1.05	$ 0.77	$ 0.55
PV	$ 52.18	$ 54.55	$ 32.85	$ 45.40	$ 34.21	$ 29.40

Note: Costs in Million of Dollars

Effluent Disposal

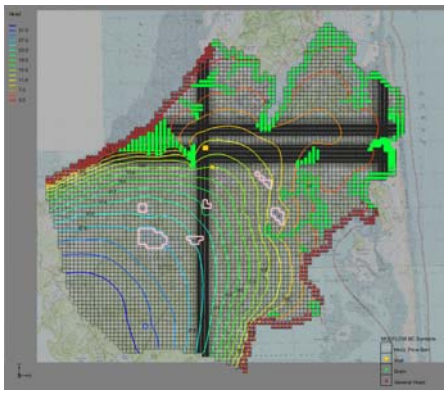
Proposed Locations

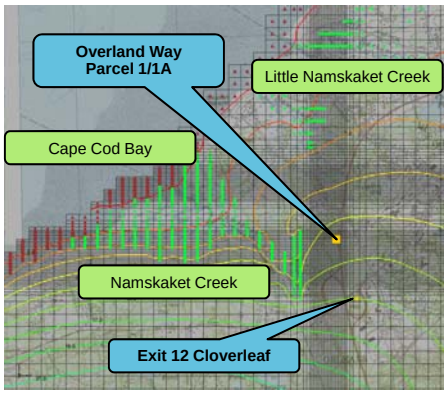
- Overland Way - Parcel 1/1A
- Route 6 – Exit 12 Cloverleaf

Hydrogeologic Site Evaluation

- Effluent Volume: 250,000 gpd
- Preliminary Hydrogeologic Evaluation – USGS Model
- Particle Tracking
- Watershed Flow Split

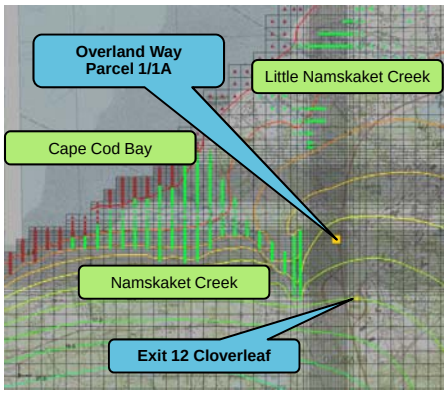
Overland Way – Parcel 1/1A and Route 6 - Exit 12 Cloverleaf

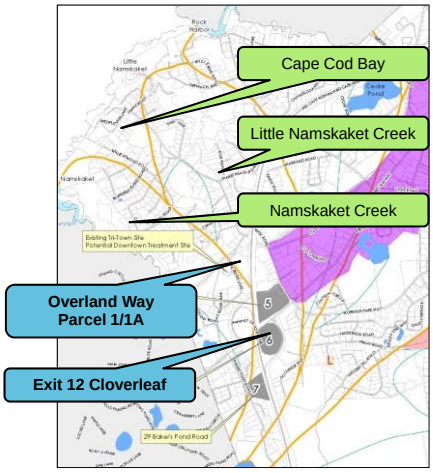




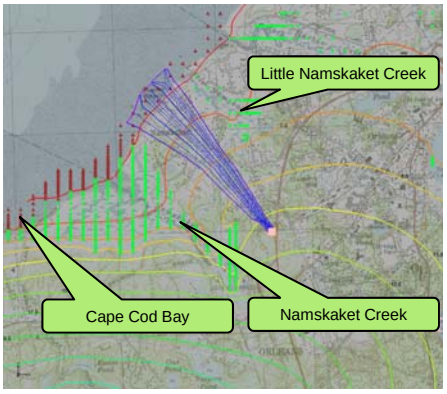
Model Domain and Grid

Watersheds

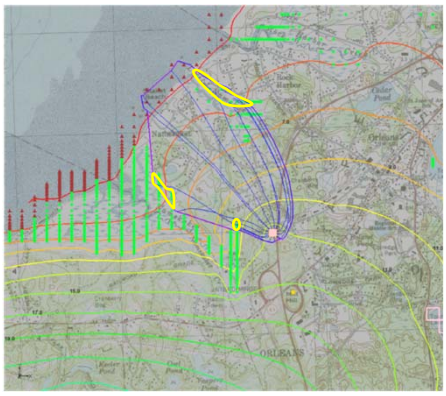




Overland Way – Parcel 1/1A



Steady State / Zero Discharge

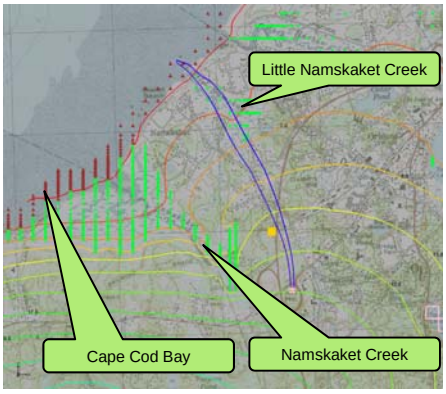


250,000 gpd Discharge

Watershed Flow Split

Overland Way – Parcel 1/1A							
Watershed	Steady State Base Flow (gpd)	Effluent Discharge (gpd)					
		25,000	50,000	100,000	150,000	200,000	250,000
Namskaket Creek	3,171,700	1,560 gpd 0.0005%	3,120 gpd 0.001%	6,240 gpd 0.002%	9,370 gpd 0.0029%	12,490 gpd 0.0039%	15,620 gpd 0.0049%
Little Namskaket Creek	363,550	7,950 gpd 0.022%	15,890 gpd 0.044%	31,790 gpd 0.087%	47,700 gpd 0.131%	63,590 gpd 0.175%	79,480 gpd 0.219%
Cape Cod Bay	29,324,000	15,490 gpd 0.0005%	30,990 gpd 0.0011%	61,970 gpd 0.0021%	92,940 gpd 0.0032%	123,920 gpd 0.0042%	154,900 gpd 0.0053%

Route 6 - Exit 12 Cloverleaf



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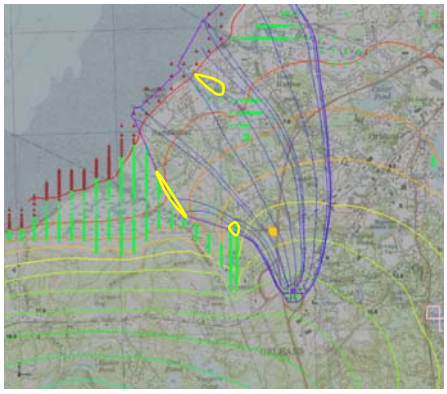

250,000 gpd Discharge

Watershed Flow Split

Route 6 - Exit 12 Cloverleaf

Watershed	Steady State Base Flow (gpd)	Effluent Discharge (gpd)					
		25,000	50,000	100,000	150,000	200,000	250,000
Namskaket Creek	3,171,700	970 gpd 0.0003%	1,940 gpd 0.0006%	3,870 gpd 0.0012%	5,810 gpd 0.0018%	7,750 gpd 0.0024%	9,690 gpd 0.0031%
Little Namskaket Creek	363,550	6,880 gpd 0.022%	13,750 gpd 0.044%	27,520 gpd 0.076%	41,310 gpd 0.114%	55,060 gpd 0.151%	68,840 gpd 0.189%
Cape Cod Bay	29,324,000	17,150 gpd 0.0006%	34,310 gpd 0.0012%	68,610 gpd 0.0023%	102,880 gpd 0.0035%	137,190 gpd 0.0047%	171,470 gpd 0.0058%

Septage Management Plan

- Downtown Area WWTF to include Septage Receiving
  - Available for Current Service Area Towns
  - Plan for 6 mg/year +/-
  - Initial Capacity Supplemented in Incremental Units
- Process
  - Use Existing Storage Basins for Aeration
  - Store, Degrit and Dewater Only – No Solids Treatment
  - Solids Combined with WWTF Residuals to Y/D or Off-Cape
- Incremental Capital Cost ~ $500,000
- Incremental O&M Cost ~ $250,000 per year
- Septage Processing Cost at $0.06 - $0.08 per Gallon
- Net Revenue to Off-set O&M Costs

Financial Plan Update

Objectives

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

Status

- Created Model
- Tested Functionality
- Incorporated Cost Inputs
- Developed Scenarios
- Ongoing Testing and Coordination with the Finance Committee
- Evaluating Affordability

Non-Traditional Technologies Demonstration Project Task Progress

Technology	Status
❖ Floating Constructed Wetlands	❖ 50% Site Characterization Technical Memorandum
❖ Permeable Reactive Barriers	❖ 50% Preliminary Engineering Work Plan Technical Memorandum
❖ Aquaculture/Shellfish Propagation	

Purpose of Aquaculture/Shellfish Propagation Demonstration Project

- ❖ Evaluate the impacts of shellfish propagation or/and aquaculture system on water quality
  - Focus on areas/systems likely to result in high shellfish survival, maximizing potential for quantifying impacts in Year 1
  - Continue to evaluate viability of other species propagation; recommend additional projects for consideration in Years 2-5

Recommended Demonstration Projects for FY 2017

- Quahog Population Study in Town Cove and Pleasant Bay
  - Suitable bottom in these estuaries ideal for enhanced quahog planting
  - Establish baseline population count to quantify success of future propagation efforts
  - Populations of quahogs and other species will be counted in areas historically planted as part of municipal propagation
- Quanset Oyster Bed
  - Oyster beds are often created by growing remote set (spat-on-shell) in gear for a period of time, then bottom-planting on suitable bottom
  - Oyster beds have higher density than gear-based systems per unit area, and create diverse habitats that provide ecosystems services
  - Demonstration needed to determine whether oyster beds can be self-sustaining in Pleasant Bay
  - Predation and disease must be considered for this growing option

Recommended Demonstration Projects for FY 2017 (cont.)

- Oyster Beds in Pleasant Bay's Terminal Ponds
  - Water quality most degraded in terminal ponds
  - Oyster beds have higher density than gear-based systems per unit area, and create diverse habitats that provide ecosystems services
  - Demonstration needed to determine whether oyster beds can uptake nitrogen and make a measurable improvement in water quality in terminal ponds
  - Terminal ponds have fine-grained, soft sediment that is often anoxic, which precludes bottom-planting
  - Oyster beds will be maintained in trays that are kept off-bottom with footings
  - Predation and disease may be minimized by growing remote set (spat-on-shell) in covered trays that are off-bottom

Recommended Demonstration Projects for FY 2017 (cont.)

- Discuss Aquaculture with Growers in Pleasant Bay and Town Cove
  - In Orleans, there are twelve aquaculture leases in Pleasant Bay and one in Town Cove. Eastham has approximately thirteen leases in Town Cove
  - Aquaculture would provide way to increase the number of shellfish being grown in Orleans
  - Meaningful dialogue with growers needed to build an understanding of the practical extent to which shellfish aquaculture can contribute to the town's water quality goals
  - Working with growers will help define needs of this group relative to the town's numerical goals for shellfish
  - Explore possibility of additional leases in Town Cove

2015 Namskaket Vegetation Survey Update Summary

1. SMAST update of 1995 survey to 2015
2. Very small increase in phragmites (~1%) marsh-wide; mostly on perimeters in northwest area of marsh
3. Substantial increase in salt marsh vegetation due to reduction in wrack
4. Mixed stands of non-invasive species (e.g. spartina, scirpus) replacing phragmites
5. Increase in pore water salinity in plant root zone

2015 Namskaket Vegetation Survey Update Summary (cont.)

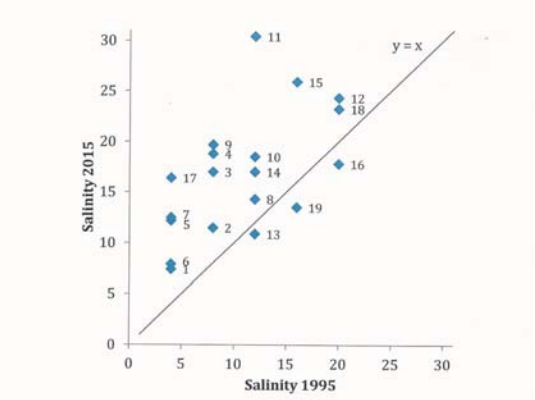

Figure #4. Pore water salinity from the plant rooting zone of major plant communities within upper Namskaket Marsh, 1995 vs. 2015 at each of the 19 sample locations shown in Figure #2. Points above the line indicate salinity levels in 2015 greater than in 1995. The only sites showing significant change, show increased salinity in 2015 vs. 1995.

2015 Namskaket Vegetation Survey Update Summary (cont.)

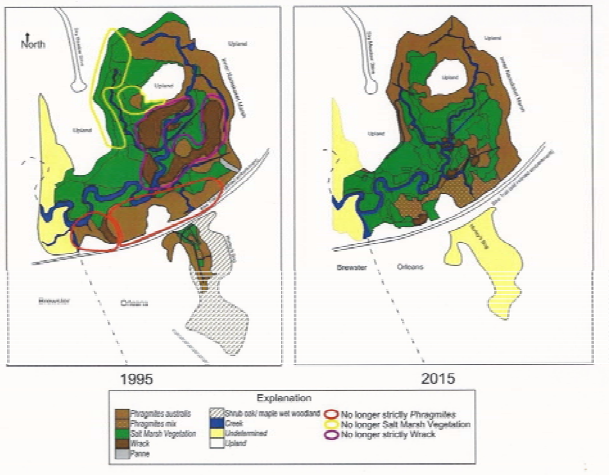

Figure #6: Simplified vegetation maps from 1995 and 2015 grouping *Phragmites* by itself and all other salt marsh vegetation together.

Public Information Activities

- Public Information Program Summary Report
  - OWQAP and Constituents
  - Minutes of Meetings
  - Future Public Relations Activities
- Board of Selectmen – Town Meeting Warrant Article Meetings
  - March 23, 2016 and March 30, 2016
  - Town Hall at 19 School Road
- Financial Committee – Town Meeting Warrant Article Meetings
  - March 24, 2016 and March 31, 2016
  - Town Hall at 19 School Road

Public Information Activities (cont.)

- Board of Selectmen – Town Meeting Warrant Article Meeting
  - April 6, 2016
  - Town Hall at 19 School Road
- OWQAP Workshop
  - April 20, 2016, 9:00 am to Noon
  - Town Hall at 19 School Road
- Others?

Other Items and Public Comment

- Comments and Questions

Town of Orleans Massachusetts

Thank You