Town of Orleans Massachusetts

Board of Selectmen
Water Quality and Wastewater Planning

March 15, 2017 and March 22, 2017

Agenda

- Task 10.3.C – P3 Development and Financial Analysis
- Design-Build-Operate
- Lonnies' Pond Aquaculture - Year 1 Review and Year 2 Funding
- Task 10.1.B.2 – PRB – Town Land Fill Assessment – Phase 2
- Task 10.1.C.4 – Update Collection System Type Evaluation and Preliminary System Configuration
- Draft FY18 Capital Budget Article for CWRMP Funding

Financial Analysis-Full
Lonnies' Pond-Full
Collection-Full
Draft FY Budget-Full

AECOM

Town of Orleans Massachusetts

Thank You

Board of Selectmen
Water Quality and Wastewater Planning

Task 10.1.C.4 – Update Collection System Type Evaluation and Preliminary System Configuration

March 22, 2017

Downtown Area PDR (25% Design) – Status

- **Topographic Survey**
  - Ground Survey
    - Survey at the Route 6A/Route 28/Canal Road Roundabout Has Been Completed
    - Differential Leveling for Benchmarks and Plan Check is on Going
    - Acquiring Sill Elevations in the Downtown Area Has Been Completed
  - Aerial Survey
    - Ground Control Survey Has Been Completed
    - Aerial Flight Completed on 2/27/17
    - Data Processing Scheduled to be Completed by 3/17/17
- **Subsurface Investigation**
  - 125 Locations
    - Over 94% Complete (117 Borings)
    - Scheduled to Complete by end of March
  - Nothing Unexpected Observed/Discovered to Date
    - Groundwater: Locus Road and Canal Road Area
    - Bike Path (Old Railroad) Bed Material: Old Pavement

Downtown Area PDR (25% Design) – Status (cont.)

- **Cultural Resource Evaluation**
  - Received Draft Report from PAL
    - Not Recommending Conducting Any Intensive Level Testing
    - Recommending Development of an Unanticipated Discoveries Plan and Monitoring During Construction
  - Preparing Draft Technical Memorandum
- **Update Collection System Type Evaluation and Preliminary System Configuration**
  - Added Sills
  - Updated Profiles Showing Gravity Sewer and Pressure Sewer
  - Updated Quantities
  - Reviewing Impacts from Existing Utilities

AECOM

Downtown Area PDR (25% Design) – Status (cont.)

- **Update WWTF Process Selection**
  - Design for Sewage and Septage Receiving/Treatment
  - Two Top Candidates Identified in Concept Design Phase Being Further Explored (SBR and MBR)
  - Design to Include Biosolids Thickening but Not Dewatering
- **Design Data**
  - Flows Derived from Collection System Evaluation
  - Sewage Strength (Assumed medium to strong)
    - Provincetown and Chatham Used as a Reference
  - Tri-town Septage Treatment Facility Data Used for Septage Characteristics
  - Anticipated Effluent Requirements
    - BOD & TSS <= 30 mg/l
    - TN <= 10 mg/l
    - Designing for Lower Limits

AECOM

Effluent Disposal Investigations

- **MassDEP Approved Hydrogeology Evaluations**
  - Orleans Market Place – 140,000 gpd
  - 223 Beach Road – 200,000 gpd
- **Ongoing / Planned Hydrogeology Evaluations**
  - Site 1/1A
  - Route 6 – Exit 12 Cloverleaf
  - Nauset Regional School District Pending FY18 Town Meeting Funding

The Town of Orleans Has Not Decided on the Location(s) for Effluent Disposal

Town of Orleans Massachusetts

Board of Selectmen
Water Quality and Wastewater Planning

Design-Build-Operate Workshop

March 22, 2017

Agenda

- Delivery Method Evaluation and Comparison Matrix
- Key Issues
- FY18 Funding Request Rationale

AECOM

Delivery Method Evaluation and Comparison Matrix

Comparison or Risk Area	Design-Bid-Build w/Contract Operations	Design-Build w/Contract Operations	Design-Build-Operate
Procurement Method			
Size of Bidder Pool	★★★	★★	★
Procurement Schedule	★	★★	★★★
Special Legislation	★★★	★	★
SRF Eligibility	★★★	★★★	★★★
Transaction Costs (Legal, Owner Engineer)	★★★	★	★★
Ease of Multi-Phased Implementation	★★	★★	★★★

Delivery Method Evaluation and Comparison (cont.)

Comparison or Risk Area	Design-Bid-Build w/Contract Operations	Design-Build w/Contract Operations	Design-Build-Operate
Capital Cost			
Potential for Initial Capital Cost Savings	★	★★	★★★
Capital Cost Growth	★	★	★★★
Early Capital Cost Certainty	★★	★★★	★★★
Contractor Innovation Potential	★	★★	★★★

Delivery Method Evaluation and Comparison (cont.)

Comparison or Risk Area	Design-Bid-Build w/Contract Operations	Design-Build w/Contract Operations	Design-Build-Operate
Operation and Maintenance Costs			
Initial O&M Cost	★★	★★	★★★
Risk of O&M Cost Growth	★★	★	★★★
Schedule			
Design and Construction	★	★★★	★★★
Risk of Schedule Growth	★	★★★	★★★

AECOM

Delivery Method Evaluation and Comparison (cont.)

Comparison or Risk Area	Design-Bid-Build w/Contract Operations	Design-Build w/Contract Operations	Design-Build-Operate
Other			
Points of Accountability	★	★★	★★★
Design Issues during Construction	★	★★	★★★
Risk of Design Issues during O&M	★★	★	★★★
Performance Guaranties	★	★	★★★

AECOM

Delivery Method Rating/Ranking

Comparison or Risk Area	Design-Bid-Build w/Contract Operations	Design-Build w/Contract Operations	Design-Build-Operate
Procurement			
Size of Bidder Pool	8	4	2
Procurement Schedule	2	4	8
Special Legislation	8	2	2
SRF Eligibility	8	8	8
Transaction Costs (Legal, Owner Engineer)	8	2	4
Ease of Multi-Phased Implementation	4	4	8
Subtotal	**38**	**24**	**32**
Capital Cost			
Potential for Initial Capital Cost Savings	2	4	8
Risk of Capital Cost Growth	2	2	8
Early Capital Cost Certainty	4	8	8
Innovation Potential	2	4	8
Subtotal	**10**	**18**	**32**
Operation and Maintenance Costs			
Initial O&M Cost	4	4	8
Risk of O&M Cost Growth	4	2	8
Subtotal	**8**	**6**	**16**
Schedule			
Design and Construction	2	8	8
Risk of Schedule Growth	2	8	8
Subtotal	**4**	**16**	**16**
Other			
Points of Accountability	2	4	8
Design Issues during Construction	2	4	8
Risk of Design Issues during O&M	4	2	8
Performance Guaranties	2	2	8
Subtotal	**10**	**12**	**32**
Total	**70**	**76**	**128**

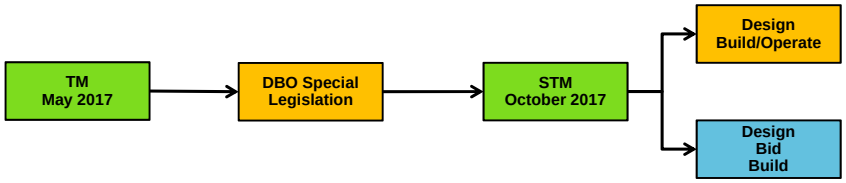
Rating System (the higher score = the better)

2 = Worst
4 = Medium
8 = Best

Key Issues

- **Legal Issues (Contract, etc.)**
- **Certainty of Cost**
- **Non-Traditional Technologies and Adaptive Management**
- **Performance Guaranties**

FY18 - Funding Request Rationale



Town of Orleans Massachusetts

Board of Selectmen
Water Quality and Wastewater Planning

Task 10.3.C – P3 Development and Financial Analysis

March 22, 2017

Financial Plan Development

- **Developed Detailed Model with Functionality**
- **Developed Initial Scenarios and Average Costs per User Category using Total Number of Users/Owners per User Area**
- **Incorporated Implementation Phasing Program for Downtown Area and Meetinghouse Pond Area Systems**
- **Incorporated Parcel Level Water Use and Property Assessment Data (to Better Refine Rates for User Categories)**
- **Updated and Adjusted Project Costs**
- **Estimated Average and Parcel-specific Rates for User Categories**
- **Compared User Costs to EPA Affordability Benchmark (2% MHI) and 2010 Approved CWMP**

AECOM

Scenario Development and Assumptions

- **Produced Approximately 24 Scenarios (170 Runs)**
- **Key Considerations**
  - Cost Allocation Across User Groups
  - Direct and Indirect Benefit to the Users
  - Reasonable “Affordability” using EPA Affordability Benchmark
  - Contribution from Downtown Businesses
  - Delivery Options Feasibility and Savings

AECOM

Next Steps

- **Continue to Refine a Limited Number of Scenarios**
- **Follow-up Meetings and Review with Downtown Business Owners and Finance Committee**
- **Follow-up with BOS in April**

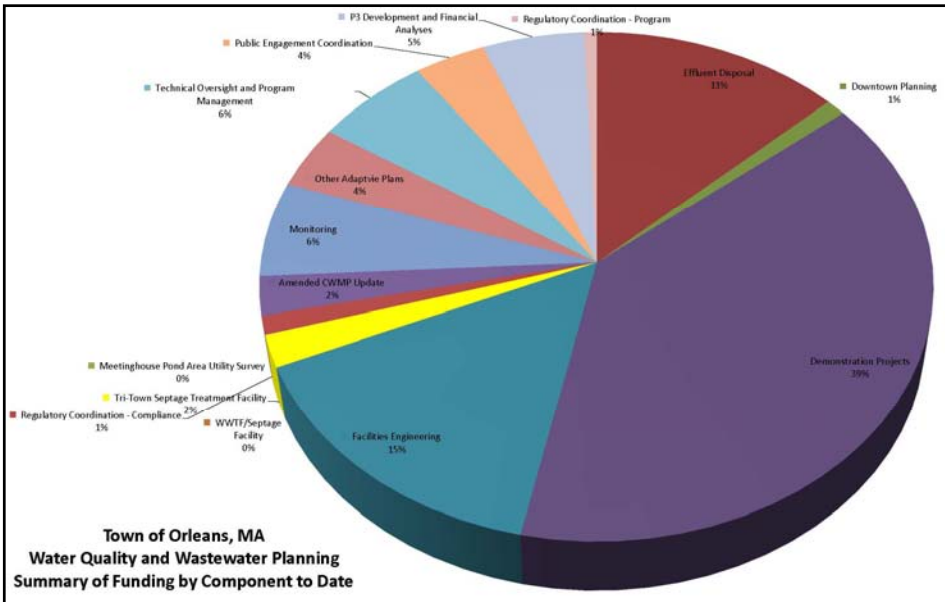
AECOM

Town of Orleans Massachusetts

Board of Selectmen
Water Quality and Wastewater Planning

Draft FY18 Capital Budget Article
for CWRMP Funding

March 22, 2017



Town of Orleans, MA
Water Quality and Wastewater Planning
Summary of Funding by Component to Date

AECOM

FY18 - Town Meeting Warrant Article Details Summary

Task	Description	Amount
1	Continued Planning and Engineering	$3,062,300
2	Adaptive Management Implementation	$416,000
3	Program Management, Financial Planning and Regulatory Coordination	$361,100
4	Miscellaneous	$139,100
	Total	$3,953,500

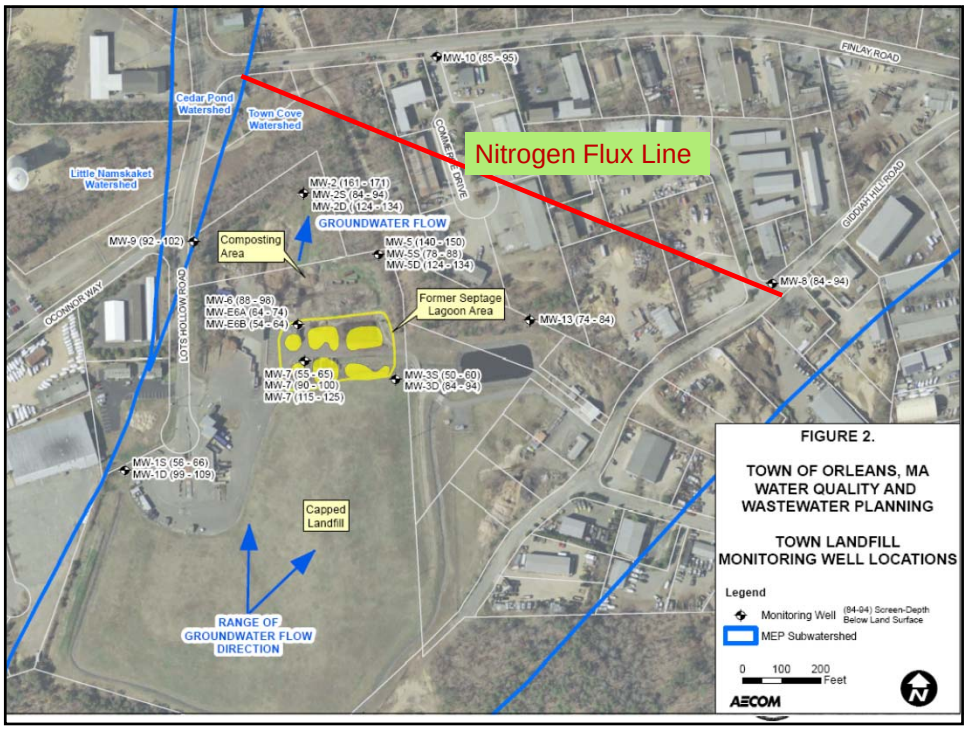
AECOM

Town of Orleans Massachusetts

Board of Selectmen
Water Quality and Wastewater Planning

Task 10.1.B.2 – PRB – Town Land Fill Assessment – Phase 2

March 22, 2017



Town of Orleans, Massachusetts
Water Quality and Wastewater Planning
Non-Traditional Technologies - Landfill Nitrogen Flux
Estimated Nitrogen flux (mass per time) from the Orleans Landfill.

Parameter	Units	Low Range Flux	High Range Flux	Mid Range Flux
Groundwater Seepage Velocity (variable)[1]	ft/d	2.00	4.00	3.00
Porosity	unitless	0.25	0.25	0.25
Darcy Velocity	ft/d	0.50	1.00	0.75
Vertical Extent	feet	60	60	60
Length of Affected Aquifer[2]	feet	1,540	1,540	1,540
Groundwater Flux	ft3 / d-ft length	30	60	45
Groundwater Flux	ft3 / day	46,200	92,400	69,300
Groundwater Flux	L/day	1,308,236	2,616,472	1,962,354
Groundwater Flux	Gallons/min	240	480	360
Nitrate Concentration (variable)[3]	mg/L	6.00	24.00	12.00
Nitrate Flux	kg /yr-ft length	1.86	14.88	5.58
Nitrate Flux	kg/year	2,865	22,920	8,595

1. Variable - sensitive to hydraulic conductivity Groundwater velocity is variable based on a range of hydraulic conductivity (Low 60 - High 250 ft./day)

2. Affected Aquifer length - line across watershed from corner Lots Hollow Rd and Finlay Rd. to Giddiah Hill Rd. at corner Industrial Way

3. Variable -sensitive to total nitrogen concentration - Data set average concentration 12 mg/L, range 1 mg/L to 27 mg/L, n=32

AECOM

Town of Orleans, Massachusetts
Water Quality and Wastewater Planning
Non-Traditional Technologies - Landfill Nitrogen Flux
Estimated Nitrogen flux (mass per time) from the Orleans Landfill.

Parameter	Units	Low Range Flux	High Range Flux	Mid Range Flux
Groundwater Seepage Velocity (variable)[1]	ft/d	2.00	4.00	3.00
Porosity	unitless	0.25	0.25	0.25
Darcy Velocity	ft/d	0.50	1.00	0.75
Vertical Extent	feet	60	60	60
Length of Affected Aquifer[2]	feet	1,540	1,540	1,540
Groundwater Flux	ft3 / d-ft length	30	60	45
Groundwater Flux	ft3 / day	46,200	92,400	69,300
Groundwater Flux	L/day	1,308,236	2,616,472	1,962,354
Groundwater Flux	Gallons/min	240	480	360
Nitrate Concentration (variable)[3]	mg/L	6.00	24.00	12.00
Nitrate Flux	kg /yr-ft length	1.86	14.88	5.58
Nitrate Flux	kg/year	2,865	22,920	8,595

1. Variable - sensitive to hydraulic conductivity Groundwater velocity is variable based on a range of hydraulic conductivity (Low 60 - High 250 ft./day)

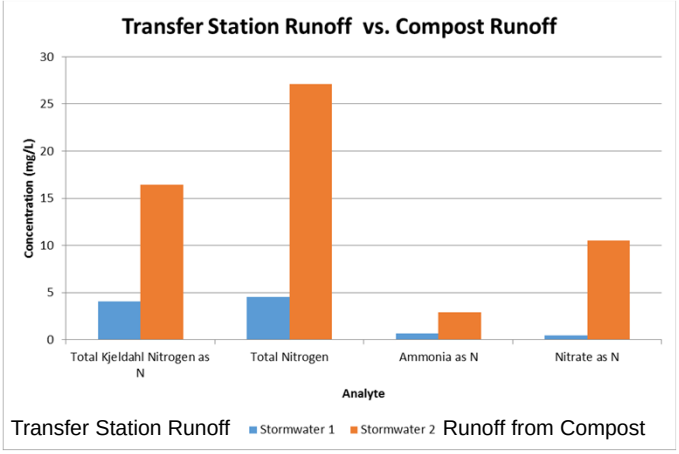
2. Affected Aquifer length - line across watershed from corner Lots Hollow Rd and Finlay Rd. to Giddiah Hill Rd. at corner Industrial Way

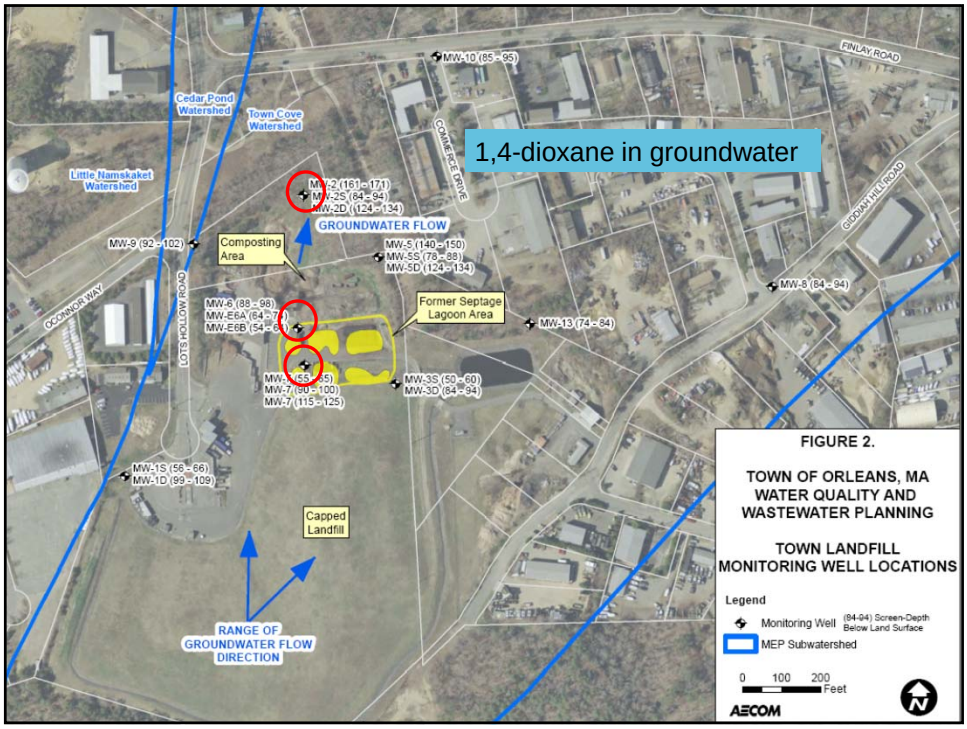
3. Variable -sensitive to total nitrogen concentration - Data set average concentration 12 mg/L, range 1 mg/L to 27 mg/L, n=32

AECOM

Sources of Nitrogen at the Landfill

Compost Operation Significant Nitrogen Source





Landfill - Summary

Sources of Nitrogen and 1,4-dioxane Identified

- 1,4-dioxane source appears to be deep solid waste in the Landfill
- Nitrogen from Landfill, Septage Lagoons, Compost area, stormwater

- **Nitrogen Flux Estimate to Town Cove: ~ 8,500 kg/yr. (mid-range)**
- **Time of travel and concentration (load) at Town Cove needs confirmation**
- **Nitrogen PRB at Landfill infeasible: Sources too deep**
- **Short- and long-term alternatives being developed**

1,4-Dioxane

- **Detected in three additional wells > 0.0003 mg/L limit**
- **Potential area of downgradient migration area in watershed to be confirmed**

Corrective Actions: Landfill Nitrogen/Dioxane Issues

Near-Term Actions

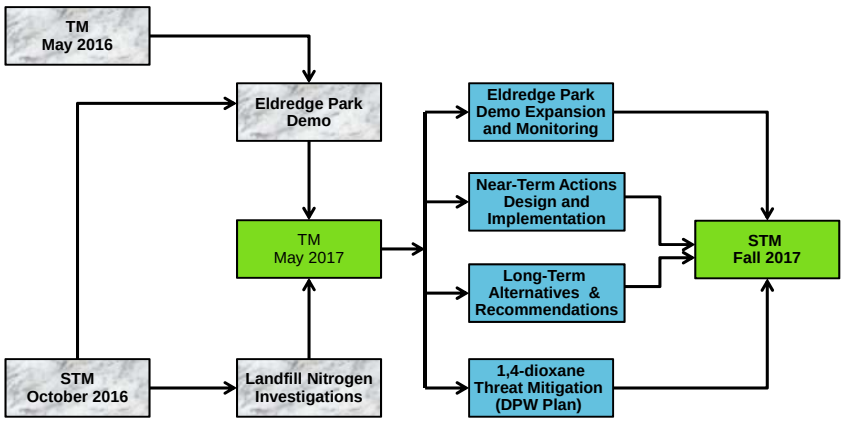
- **Work with DPW to eliminate discharge of Transfer Station stormwater and /landfill cap drainage through the Septage Lagoon area**
- **Cap or cover Septage Lagoon area to eliminate further nitrogen addition to plume**
- **Move Compost Operation to a location with an impermeable surface (already in planning by DPW)**
- **Connect remaining 2-4 private potable wells to Town water system to eliminate 1,4 Dioxane threat**

Corrective Actions: Landfill Nitrogen/Dioxane Issues (cont.)

Long-Term Actions

- **Add monitoring well to reduce uncertainty in Nitrogen flux estimates in down-gradient watershed**
- **Confirm MEP model estimates of N-reduction requirements based on recent findings at landfill**
- **Evaluate cost-benefit of alternatives for N-reduction to Town Cove**
  - "Pump & Treat" technology using nitrogen bio-filter(s) for landfill plume
  - Downgradient Injection PRBs at multiple locations
  - Increase traditional and non-traditional technologies in other Town Cove drainage areas
  - Maximize use of shellfish/aquaculture in Town Cove
- **Proposed FY2018 Landfill PRB Budget**
  - Needs adjustment to reflect Near-Term Action capital costs and additional alternatives evaluation up to Fall TM

FY18 - Funding Request Rationale for Permeable Reactive Barriers



AECOM

Town of Orleans Massachusetts

Board of Selectmen
Water Quality and Wastewater Planning

Lonnies Pond Aquaculture
Year 1 Review and Year 2 Funding

March 22, 2017

Shellfish/Aquaculture
Adjustment of General Approach

- **Purpose of Shellfish Demo Projects is to Reduce Capital Costs from approved CWMP Baseline**
- **Very Good Year-one Results from Lonnies Pond**
- **Focused on Science of Oyster N-reduction Process and Growth Rates**
- **Continue but Reduce Scope of Year-2 Lonnies Program**
- **Focus on Management, Permitting, Regulatory, Siting, Marketability, Grower's Capacity, Town Resource Needs**
- **Work Closely with DMF, DEP on Conceptual Town-wide Plan**
- **Engage New and Existing Growers in Implementation**

AECOM

Shellfish/Aquaculture – Year 2 Plan (cont.)

Lonnies Pond

- Expand from 200,000 oysters to 500,000 oysters, rather than 1.2 million
- Determine viable density of oysters per bag and bags per acre
- Prepare Year-2 Report and Year-3 Plan
- Focus on Town-wide Management Plan
- Modify SMAST Scope per Peer Review and Confirm Denitrification Rates (lower level of effort)

Kent's Point

- Evaluating plan based on DMF input
- Shellfish Constable will determine most beneficial placement plan

Shellfish/Aquaculture – Year 2 Plan (cont.)

Existing Grant Expansion

- Build on Interest and Capacity of Current Growers
- Develop Mechanisms for Providing Support
- Work with Town to adapt Management Program
- Provide SMAST technical support as Needed

Town Cove

- Additional Coordination & Meetings with Growers
- Develop Detailed Plan for Implementation in Late Summer – Early Fall
- Provide SMAST Technical Support as Needed