

# OLD LYME, CT SHORELINE AREA WASTEWATER COLLECTION, TREATMENT AND DISPERSAL ALTERNATIVES ANALYSIS

WITH DETAILED ANALYSIS FOR

OLD COLONY BEACH CLUB ASSOCIATION &

OLD LYME SHORES BEACH ASSOCIATION

OCTOBER 2, 2012 – FINAL REPORT



**Submitted to:**

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## CLARIFICATION OF AUGUST 29, 2012 REPORT AND EXECUTIVE SUMMARY

Based upon comments received at the August 29, 2012 Board of Selectmen’s Meeting, this Report supersedes the Lombardo Associates, Inc. August 29, 2012 Report as well as other previous Working Draft versions, and has been issued for clarification purposes and to address the questions presented during that meeting. Additionally this Report:

- ✓ Integrates consideration of Old Lyme Shores
- ✓ Evaluates consideration of a system to serve the 1,200 - 1,500 beach area / shoreline properties
- ✓ Evaluates impact of Town assumption of land costs on project costs
- ✓ Evaluates consideration of Town owned land on project costs
- ✓ Focuses solely on Alternative # 1 of the August 29 Report

The Summary Table presented in the August 29, 2012 Report was unclear and did not include Old Lyme Shores, which is part of the Consent Order Plan. The Report also did not include costs missing from the Proposed Plan. We apologize for the confusion that may have ensued as a result of the perspective of the August 29 Report. Most importantly, as the cost analysis below illustrates, the perception that Alternative # 1 and the Proposed Plan are fiscally comparable is incorrect. Alternative # 1 is fiscally advantageous for the property owners as compared to the Proposed Plan – generally by \$2+/- million which is 16% capital cost savings and a 32% annual O&M cost savings. The total annual user charge savings are 23+/-%. Again we apologize for the confusion that caused the misperception.

The Alternative # 1 solution costs for Old Colony & Old Lyme Shores, with no Town funding, are presented below. The Town is willing to consider providing the land for Alternative # 1. Should this occur, property owner costs are projected to be reduced by an additional \$ 31- \$37 per year.

**Simply stated with Alternative # 1, each property owner would save \$443 in Old Colony and \$537 +/- every year for 20 years.** As Alternative # 1 would be 16 % less expensive than the proposed Plan on a net capital cost basis, see Table ES-1, and has a lower annual O&M by 32%, See Section 3, it is the more cost effective option on a life cycle cost basis. Consequently Lombardo Associates, Inc. recommends that the Town pursue Alternative # 1, as in our opinion the projected savings are achievable. Cost presented herein should be viewed with a range of -15% to +30%, as used in previous engineering reports.

**TABLE ES-1 OCBCA & OLSBA PROJECT COSTS**

Capital Costs - Old Colony & Old Lyme Beach Club Associations Wastewater Management Plan				
Major System Component	Proposed Plan	Alternative # 1 Plan	Savings	% Savings
<b>Total Wastewater System Cost</b>	<b>\$12,321,700</b>	<b>\$10,590,600</b>	<b>\$1,731,100</b>	<b>14%</b>
Projected CT DEEP Grant	(\$2,736,400)	(\$2,488,400)	(\$248,000)	9%
Additional Improvements	\$3,514,200	\$3,514,200		
<b>Net Cost w/Grant</b>	<b>\$13,100,000</b>	<b>\$11,617,000</b>	<b>\$1,483,000</b>	<b>11%</b>

Per user costs / savings are presented on Table ES-2 for the options of no Town funding of land costs and expanding service area to achieve cost sharing of interceptor costs to inclusion of these options. Please note, for comparison purposes house connection costs have been amortized as ineligible or eligible costs for grants and low interest loans. It is understood that the septic tank effluent collection system is eligible from the septic tank on and only the house connection cost to the septic tank is not eligible.

**TABLE ES-2 OCBCA & OLSBA PER USER COSTS – PROPOSED PLAN VS. ALTERNATIVE # 1**

<b>5a. Annual Capital Amortization &amp; O&amp;M Costs with all costs borne by OCBCA &amp; OLSBCA</b>								
	<b>Proposed Plan</b>		<b>Alternative # 1</b>		<b>Savings</b>		<b>% Savings</b>	
	<b>OCBCA</b>	<b>OLSBCA</b>	<b>OCBCA</b>	<b>OLSBCA</b>	<b>OCBCA</b>	<b>OLSBCA</b>	<b>OCBCA</b>	<b>OLSBCA</b>
<b>Total Annual</b>	\$2,315	\$2,909	\$1,872	\$2,372	\$443	\$537	24%	23%

<b>5b. Annual Capital Amortization &amp; O&amp;M Costs with all costs borne by OCBCA &amp; OLSBCA - except land, paid by Town</b>								
	<b>Proposed Plan</b>		<b>Alternative # 1</b>		<b>Savings</b>		<b>% Savings</b>	
	<b>512500</b>	<b>512500</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total Annual</b>	\$2,315	\$2,909	\$1,842	\$2,335	\$473	\$574	26%	25%

<b>5c. Annual Capital Amortization &amp; O&amp;M Costs with all costs borne by OCBCA &amp; OLSBCA - except land, paid by Town, and Force Main Costs shared by other Beach communities</b>								
	<b>Proposed Plan</b>		<b>Alternative # 1</b>		<b>Savings</b>		<b>% Savings</b>	
	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total Annual</b>	\$2,315	\$2,909	\$1,786	\$2,274	\$529	\$635	30%	28%

Regarding wastewater treatment, the analysis presented in this Report does not propose a specific technology with the following understandings:

1. Only technologies previously approved by CT DEEP or are understood would be readily approved by CT DEEP would be proposed.
2. Treatment system effluent quality of TN < 10 mg/l was specified due to discharge in groundwater classified as a possible drinking water aquifer. Treatment processes for emerging contaminant treatment, disinfection, phosphorus removal, as needed, would be used. Budgets estimated include costs for unit processes needed for those contaminants/nutrients of concern.

With expansion of the service area to include the other beach communities, an additional \$4 - \$5 million in savings, as compared to conventional systems are projected.

3. It is noted that golf course reuse will significantly reduce nutrient removal requirements (as the golf course would want the fertilizers) which may result in seasonal limits for nutrient removal. If this occurs, the appropriate treatment technology is expected to change.

Site studies for the major candidate disposal/reuse locations need to be performed to determine disposal capacity and treatment requirements. With golf course reuse, disposal requirements may be reduced.

# 1. INTRODUCTION AND PURPOSE

Lombardo Associates, Inc. (LAI) has been retained by the Town of Old Lyme to provide an executive level assessment to determine if there are technically viable and cost-effective alternatives that can satisfactorily address the wastewater challenges in the Old Colony Beach Club Association (OCBCA) and Old Lyme Shores Beach Club Association (OLSBCA) area. The Town is interested in being a contributing partner with OCBCA-OLSBCA, and neighboring areas, to address the wastewater management challenges of the Town's residents in the Old Lyme Beach-Shoreline area.

The Old Colony Beach Club Association (OCBCA) has entered into Consent Order # CO WR MU 12 001, dated August 14, 2012 that amongst other matters:

- ✓ Concluded that on-site wastewater solutions are not technically and economically viable for numerous areas within the boundaries of the OCBCA;
- ✓ Refers to the OCBCA Wastewater Management Plan, as described in the July 2012 Fuss & O'Neill (F&O) Addendum to the Wastewater Facilities Planning Reports for the Old Lyme Shores Beach Association (OLSBA) and Old Colony Beach Club Association, which proposes a wastewater system to serve the OCBCA and OLSBA via:
  - i. Conventional gravity wastewater collection system to pump stations within each of the Beach Associations;
  - ii. Force Main to a termination manhole in East Lyme;
  - iii. Treatment & disposal by the Picenti New London Wastewater Treatment Facility (WWTF) which discharges to the Thames River;
  - iv. Through Agreements with East Lyme, Waterford and New London WWTF.
    - ✓ Requires that by October 13, 2012, OCBCA retain one or more qualified consultants, acceptable to the CT DEEP Commissioner, to prepare the documents and implement or oversee the actions required by the Order;
    - ✓ Within 850 days of approval of the Wastewater Management Plan prepared by RFP Engineering dated October 25, 2011, revised by January 20, 2012, and amended by F&O on June 2012 (Plan) – (it is understood that date should be stated as July 2012), OCBCA shall submit contract documents, schedule and related materials for implementation of the wastewater system as described in the Plan;
    - ✓ Complete implementation of the Plan's wastewater system by June 30, 2016.

It is understood that the OLSBCA is about to enter into a similar Consent Order with CT DEEP. The F&O July 2012 Addendum proposes combining the OCBCA and OLSBA wastewater system solutions to achieve economies of scale by sharing costs for the force main connection costs to the New London WWTF, along with engineering, legal and administrative costs.

## 1.1 Proposed Wastewater Project Description

The Old Colony Beach Club Association consists of 225 lots with the Old Lyme Shores Beach Association consisting of 192 lots. Wastewater flows and collection systems within OCBCA and OLSBA are presented on Table 1-1. Figure 1-1 illustrates the proposed gravity sewer system layout. Figure 1-2, from the F&O July 2012 Addendum, illustrates the proposed sewer route and treatment plant, with Figure 1-3, also from the F&O Addendum, illustrates the proposed shared force main from OCBCA/OLSBA to the East Lyme connection. Figure 1-4 is the Google Earth aerial photograph of the OCBCA area and illustrates the development density.

**TABLE 1-1 OCBCA & OLSBA WASTEWATER COLLECTION SYSTEM**

OCBCA & OLSBA Wastewater Collection System					
		Old Colony Beach Association	Old Lyme Shores Beach Association	Total	
	No. Lots	225	192	417	
	Gravity Pipe (lf)	7,100	11,000	18,100	
	Gravity Pipe (lf)/lot	32	57		
	No. PS	1	1		
	People/house	2.39	2.39		
	Flow (gpd)/person	75	75		
	Flow (gpd)	40,331	34,416	74,747	
	l/l (gpd)	8,669	10,584	19,253	
	Avg (gpd)	49,000	45,000	94,000	
2	Max Summer (gpd)	98,000	90,000	188,000	
2	Peak Hour (gpm)	136	125	261	
	Pump Rate (gpm)	275	275		
	TDH	225	229		

**FIGURE 1-2 PROPOSED WASTEWATER SOLUTION FOR OCBCA AND OLSBA (F&O, 2012)**  
Regional Wastewater Map

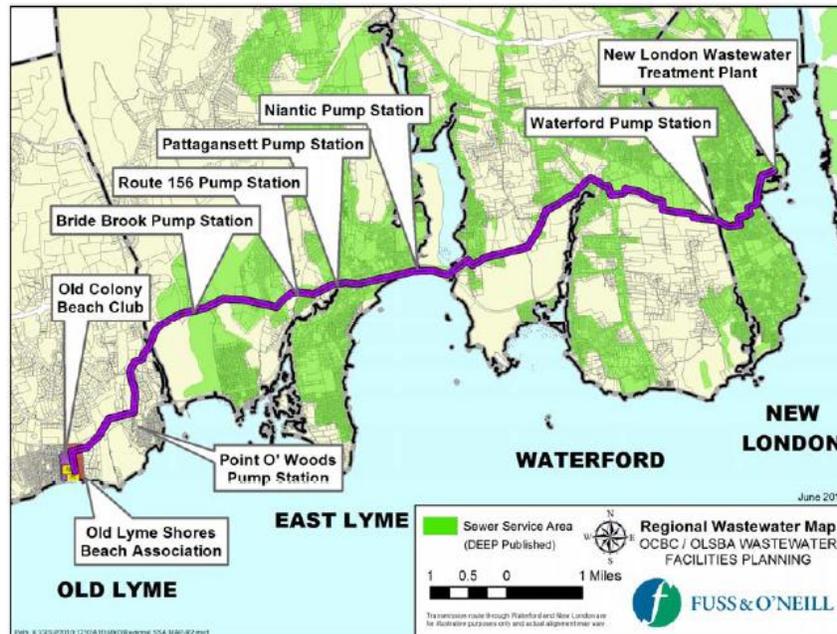


FIGURE 1-1 PROPOSED OCBCA/OLSBA COLLECTION SYSTEM (F&O, 2012)

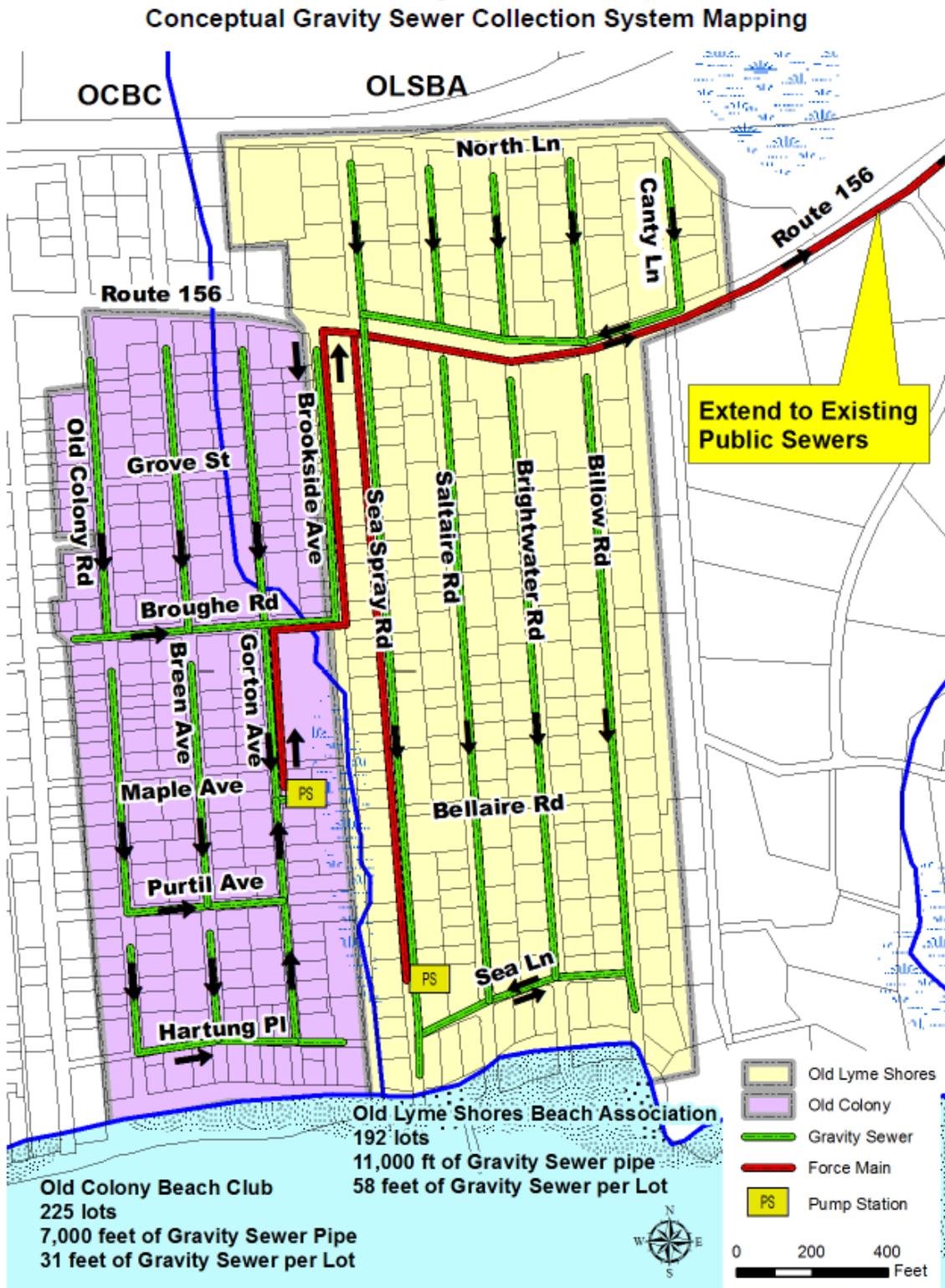
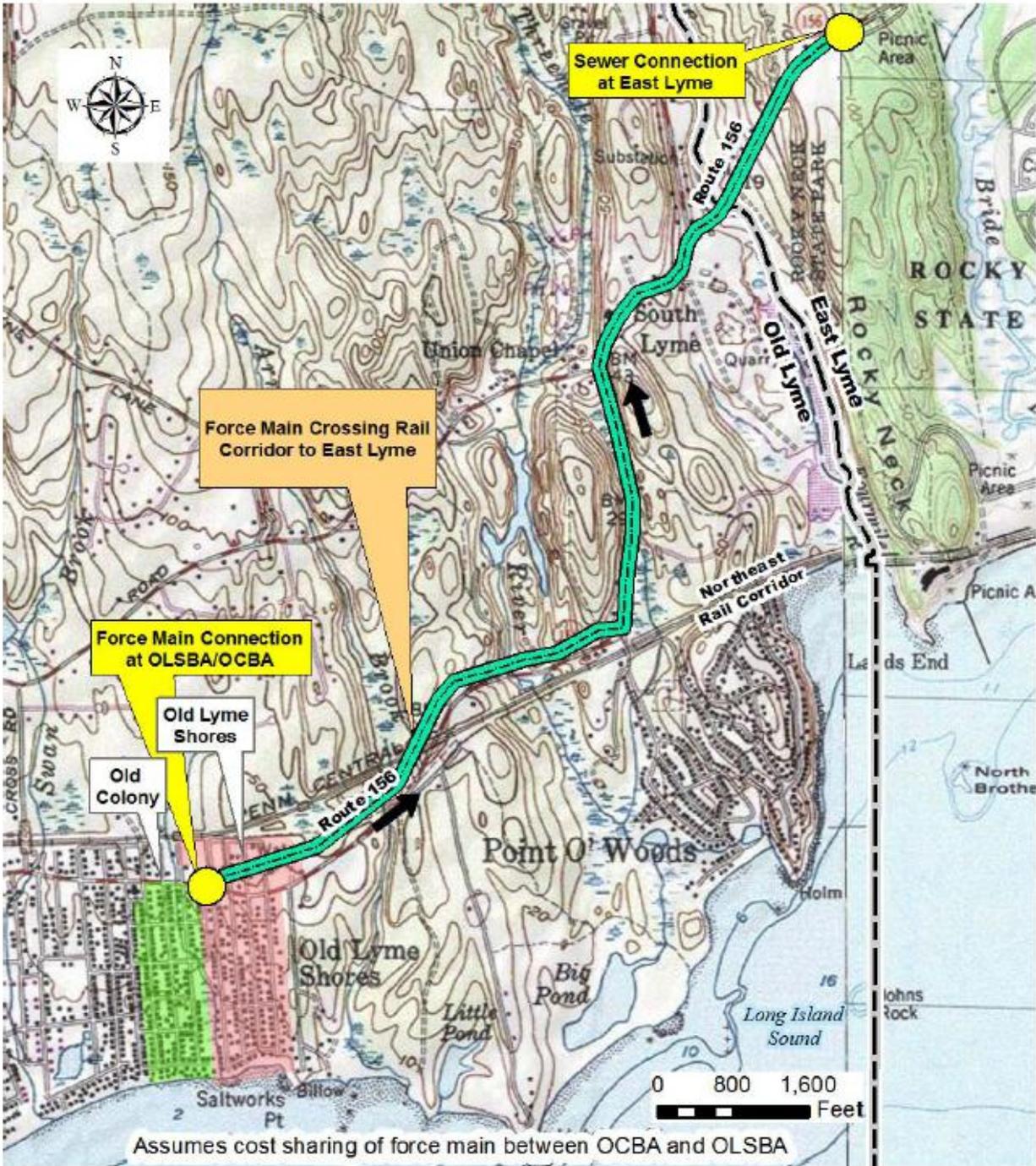
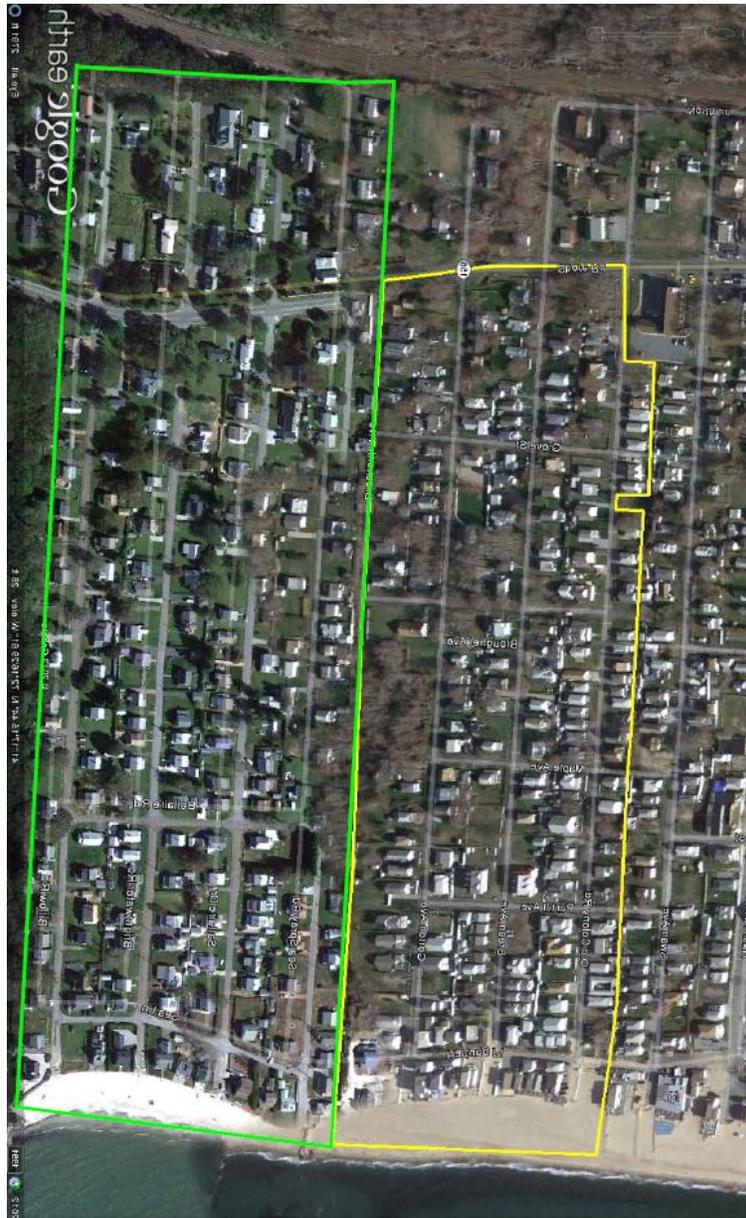


FIGURE 1-3 PROPOSED OCBCA/OLSBA FORCE MAIN ROUTE (F&O, 2012)

Shared Force Main from OCBC/OLSBA to East Lyme



**FIGURE 1-4: AERIAL PHOTO OF OCBC STUDY AREA**



## 1.2 Proposed Project Costs

Table 1-2a and 1-2b present a condensed version of the F&O (2012) estimated project costs for the OCBCA and OLSBA project areas respectively. Lombardo Associates, Inc. (LAI) has computed the estimated project costs from the F&O 2012 Addendum, which provided a range of -15% and +30% of the estimated costs. LAI has condensed the information solely for ease of viewing, without any comment on the veracity of the estimates. In Section 1.3, LAI provides its opinion on “issues” associated with the F&O 2012 estimates for which, project cost allowances/adjustments need to be made and have been made by LAI. The purpose of these proposed allowances/adjustments is to enable a proper/correct comparison with alternative approaches that are described and whose costs are estimated herein. House connection costs have been amortized at the ineligible bonding rate for comparison purposes.

**TABLE 1-2A OCBCA WASTEWATER SYSTEM F&O OPINION ON COSTS**

<b>I. Base Plan: OCBCA</b>	<b>Est. Cost</b>	<b>Subtotal</b>
<b>Procure Agreements for Recommended Plan</b>		
1. Technical Services to Procure Stakeholder Agreements	\$12,500	
2. Legal and Administrative Services to Procure Stakeholder Agreements	\$20,000	
<b>3. Total - Procure Agreements for Recommended Plan (rounded)</b>		<b>\$32,500</b>
<b>Project Construction</b>		
4. Construction Cost - Gravity Sewer w/Central Pump Station	\$2,506,500	
5. Construction Cost - Force Main Along Route 156 to East Lyme	\$2,874,980	
6. Construction Cost - Cost-Sharing Along Route 156	-\$1,437,490	
7. Buy-In Fee to East Lyme / Waterford / New London	\$500,000	
7a. Capacity Upgrades for Downstream Pump Stations	\$512,500	
8. Technical Services - Design, Permitting & Construction Administration	\$684,000	
9. Legal & Administrative	\$171,000	
<b>10. Total - Project Construction Costs (Rounded)</b>		<b>\$5,811,000</b>
<b>DEEP CWF Eligible Design &amp; Construction Costs</b>		
11. Procure Agreements for Recommended Plan (excluding Legal & Admin)	\$12,500	
12. Project Construction Costs (Excluding Legal & Admin&House connect)	\$5,107,500	
<b>13. Total - DEEP CWF Loan Eligible Costs (Rounded)</b>		<b>\$5,120,000</b>
<b>DEEP Ineligible Costs</b>		
14. Short Term Financing at 1.5%	\$0	
15a. Legal and Administrative Fees (Table Line Items #2, #9)	\$191,000	
15b. House Connection Costs	\$532,500	
<b>16. Total - DEEP Ineligible Costs (Rounded)</b>		<b>\$724,000</b>
<b>Estimated Local Share</b>		
17. DEEP CWF Loan Eligible Costs	\$5,120,000	
18. DEEP Ineligible Costs	\$724,000	
<b>19. Estimated Local Cost Share (Total Capital Cost)</b>		<b>\$5,844,000</b>
<b>20. DEEP CWF 25% Design &amp; Construction (Small Community) Grant Amount</b>		<b>\$1,280,000</b>
	<b>Grand Total</b>	<b>\$4,564,000</b>

<b>II. Additional Association Improvements:</b>		
<b>Additional Association Improvements (Ineligible Costs)</b>		
21. Storm Drainage Improvements	\$235,000	
22. Extensive Road Reconstruction	\$1,030,000	
23. Fire Hydrants	\$0	
24. Drinking Water System Improvements	\$0	
25. Technical Services - Design, Permitting & Construction Administration	\$253,000	
<b>26. Total - Additional Association Improvements</b>		<b>\$1,518,000</b>

<b>I. Base Plan w/Grant</b>	<b>Capital</b>	<b>O&amp;M</b>	<b>Total</b>
<b>Project Costs - With CT DEEP Grant, No Association Improvements</b>	<b>\$4,564,000</b>	<b>\$86,250</b>	<b>\$4,564,000</b>
<b>Gross Cost per EDU</b>	<b>\$21,400</b>		
<b>Annual Capital Cost per EDU (20-yr. Term, 2%)</b>	<b>\$1,300</b>	<b>\$405</b>	<b>\$1,705</b>

<b>II. Base Plan w/Grant and Association Improvements</b>	<b>F&amp;O Capital Costs with 20-yr. Term, 2%</b>	<b>Capital Costs with 2%, 20 yrs for eligible costs &amp; 4.5%, 20 Yr. on Ineligible Costs</b>			<b>O&amp;M</b>	<b>Total Annual Cost</b>
		<b>Eligible</b>	<b>Ineligible</b>	<b>Total</b>		
<b>Project Costs - With Association Improvements, With CT DEEP Grant</b>	<b>\$6,082,000</b>	<b>\$3,840,000</b>	<b>\$2,242,000</b>	<b>\$6,082,000</b>	<b>\$86,250</b>	
<b>Gross Cost per EDU</b>	<b>\$28,600</b>	<b>\$18,000</b>	<b>\$10,500</b>	<b>\$28,500</b>	<b>\$405</b>	
<b>Annual Capital Cost per EDU</b>	<b>\$1,700</b>	<b>\$1,100</b>	<b>\$810</b>	<b>\$1,910</b>	<b>\$405</b>	<b>\$2,315</b>

**TABLE 1-2B OLSBA WASTEWATER SYSTEM F&O OPINION ON COSTS**

<b>I. Base Plan: OLSBA</b>	<b>Est. Cost</b>	<b>Subtotal</b>
<b>Procure Agreements for Recommended Plan</b>		
1. Technical Services to Procure Stakeholder Agreements	\$12,500	
2. Legal and Administrative Services to Procure Stakeholder Agreements	\$20,000	
<b>3. Total - Procure Agreements for Recommended Plan (rounded)</b>		<b>\$32,500</b>
<b>Project Construction</b>		
4. Construction Cost - Gravity Sewer w/Central Pump Station	\$3,041,000	
5. Construction Cost - Force Main Along Route 156 to East Lyme	\$2,874,980	
6. Construction Cost - Cost-Sharing Along Route 156	-\$1,437,490	
7. Buy-In Fee to East Lyme / Waterford / New London	\$500,000	
7a. Capacity Upgrades for Downstream Pump Stations	\$512,500	
8. Technical Services - Design, Permitting & Construction Administration	\$802,000	
9. Legal & Administrative	\$149,000	
<b>10. Total - Project Construction Costs (Rounded)</b>		<b>\$6,442,000</b>
<b>DEEP CWF Eligible Design &amp; Construction Costs</b>		
11. Procure Agreements for Recommended Plan (excluding Legal & Admin)	\$12,500	
12. Project Construction Costs (Excluding Legal & Admin & House Connect)	\$5,813,000	
<b>13. Total - DEEP CWF Loan Eligible Costs (Rounded)</b>		<b>\$5,826,000</b>
<b>DEEP Ineligible Costs</b>		
14. Short Term Financing at 1.5%	\$0	
15a. Legal and Administrative Fees (Table Line Items #2, #9)	\$169,000	
15b. House Connection Costs	\$480,000	
<b>16. Total - DEEP Ineligible Costs (Rounded)</b>		<b>\$649,000</b>
<b>Estimated Local Share</b>		
17. DEEP CWF Loan Eligible Costs	\$5,826,000	
18. DEEP Ineligible Costs	\$649,000	
<b>19. Estimated Local Cost Share (Total Capital Cost)</b>		<b>\$6,475,000</b>
<b>20. DEEP CWF 25% Design &amp; Construction (Small Community) Grant</b>		<b>\$1,456,375</b>
<b>Grand Total</b>		<b>\$5,018,625</b>

<b>II. Additional Association Improvements:</b>		
<b>Additional Association Improvements (Ineligible Costs)</b>		
21. Storm Drainage Improvements	\$235,000	
22. Extensive Road Reconstruction	\$794,000	
23. Fire Hydrants	\$160,000	
24. Drinking Water System Improvements	\$474,500	
25. Technical Services - Design, Permitting & Construction Administration	\$332,700	
<b>26. Total - Additional Association Improvements</b>		<b>\$1,996,200</b>

<b>I. - Base Plan w/Grant</b>	<b>Capital</b>	<b>O&amp;M</b>	<b>Total</b>
<b>Project Costs - With CT DEEP Grant, No Association Improvements</b>	<b>\$5,019,000</b>	<b>\$86,250</b>	<b>\$5,019,000</b>
<b>Gross Cost per EDU</b>	<b>\$26,100</b>		
<b>Annual Capital Cost per EDU (20-yr. Term, 2%)</b>	<b>\$1,600</b>	<b>\$449</b>	<b>\$2,049</b>

<b>II. - Base Plan w/Grant and Association Improvements</b>	<b>F&amp;O Capital Costs with 20-yr. Term, 2%</b>	<b>Capital Costs with 2%, 20 yrs for eligible costs &amp; 4.5%, 20 Yr. on Ineligible Costs</b>			<b>O&amp;M</b>	<b>Total Annual Cost</b>
		<b>Eligible</b>	<b>Ineligible</b>	<b>Total</b>		
<b>Project Costs - With Association Improvements, With CT DEEP Grant</b>	<b>\$7,014,825</b>	<b>\$4,369,625</b>	<b>\$2,645,200</b>	<b>\$7,014,825</b>	<b>\$86,250</b>	
<b>Gross Cost per EDU</b>	<b>\$36,500</b>	<b>\$22,800</b>	<b>\$13,800</b>	<b>\$36,600</b>	<b>\$449</b>	
<b>Annual Capital Cost per EDU</b>	<b>\$2,200</b>	<b>\$1,400</b>	<b>\$1,060</b>	<b>\$2,460</b>	<b>\$449</b>	<b>\$2,909</b>

### 1.3 Issues and Recommended Additional Cost Allowances with Recommended Plan

During our review of the Plan documents, LAI observed the following issues that we believe need to be addressed and cost allowances provided for a transparent and thorough understanding of project capital and on-going O&M cost so that a comparison with any alternatives can be fairly performed. LAI has added allowances that in our professional opinion are appropriate, and are presented on Table 1-3.

**TABLE 1-3 LAI ADJUSTMENTS FOR UNACCOUNTED FOR CAPITAL COSTS**

Unaccounted for Capital Costs	
1 Upgrades to Downstream Pump Stations	\$ 400,000
2 Studies - East Lyme & Waterford	\$ 125,000
3 EL (DOC), Waterford & New London WWTP - add'l cost	\$ 500,000
<b>Total \$ 1,025,000</b>	

#### 1.3.1 Financial

##### 1.3.1.1 Interest Rate on Project Ineligible Costs

In computing the annual capital cost per user in the F&O Report, all financing was assumed to be 2% for 20 years, which are the CT DEEP State Revolving Fund (SRF) loan terms. It is understood that ineligible costs are not funded by the SRF loan program. Therefore the OCBCA will need to obtain bond funding. Given its lack of bond rating, we have assumed financing for ineligible costs would be obtained at 4.5% for 20 years.

#### 1.3.2 East Lyme Capacity Limitations

According to the Fuss & O'Neill December 2011 Old Lyme Shores Beach Association Wastewater Facilities Planning Report, on page 98 and as pasted below, there appears to be no additional capacity in the East Lyme wastewater conveyance system. Clarification/resolution of this critical matter needs to be addressed.

Please note below 3<sup>rd</sup> paragraph, which states, "East Lyme does not appear to have additional unallocated capacity for sewer extensions to neighboring communities west of the Bridle Brook Pump Station." As can be seen from Figure 1-2, OCBCA and OLSBA are west of the Bridle Book Pump Station.

#### 1.3.3 Pump Station and Conveyance System Upgrades

The various RFP Engineering and F&O Engineering Plans identified a number of issues associated with pump stations and conveyance systems in East Lyme and Waterford that appear to need to have budget allowances provided for required studies and likely required improvements. These include:

East Lyme	Evaluate hydraulic capacity of infrastructure Assess Bride Brook & Route 156 PS
Waterford	Corrosion & Odor Study



### 1.3.4 New London Treatment Plant Costs

The F&O 2012 Plan provides a \$1,000,000 connect fee for OCBCA only, and states that the fee would be the same with the addition of OLSBA wastewater resulting in each paying \$500,000. No basis has been provided for these fees. The New London Wastewater Treatment Plant fee remaining the same with the flow doubling is counterintuitive and not normal practice.

An official statement from New London for the connect fee should be obtained. We have added \$500,000 for this line item.

### 1.3.5 Operations & Maintenance (O&M) Costs

The F&O 2012 Addendum O&M costs are presented as Table 1-3.

**TABLE 1-4 F&O 2012 ESTIMATED ANNUAL O&M COSTS**

**Estimated Annual O&M Cost for Centralized Sewer System to East Lyme**

O&M COSTS (2012)	Gravity Sewers
Contract Operation Fee	\$10,000
Annual Payment to East Lyme for flow treatment at New London WPCF <sup>(1)</sup>	\$25,000
Annual Payment to Point O' Woods for shared pump station cost <sup>(2)</sup>	\$0
Grinder pump equipment short lived asset account <sup>(4)</sup>	\$0
Gas and oil for generator(s)	\$200
General Engineering/Legal	\$2,000
Audit	\$500
Discretionary Fund	\$500
Odor Control	\$20,000
Short lived asset account (Reserve for capital non-reoccurring)	\$10,000
State fees	\$300
Billing & Collection	\$5,000
<b>Annual O&amp;M Cost (Rounded)</b>	<b>\$74,000</b>

1) Based on an assumed \$5/1000 gallons of wastewater

2) Based on an assumed \$5/1000 gallons of wastewater

3) Based on i=4%, t=20 years, PV=\$100,000

4) Based on \$40 per Grinder Pump per year

Comments on the O&M costs are:

- a. The basis for the annual payment to East Lyme for treatment plant costs at \$5 / 1,000 gallons should be stated.
- b. It appears that the annual payment to East Lyme for treatment plant costs assumes flow at 33% of design flow – which should be stated in the footnotes as costs will increase with more full time use at the properties.
- c. No electricity costs are included in Annual O&M costs. Electricity costs of \$2,500+ will be incurred for the force main pump stations in OCBCA and OLSBA. Additional

electricity costs will be incurred at each of the 5 pump stations in East Lyme and Waterford.

- d. Pump stations and collection system O&M costs should be provided.

Table 1-5 presents LAI's adjusted O&M costs for OCBCA & OLSBCA.

**TABLE 1-5 LAI UPDATED F&O 2012 ESTIMATED ANNUAL O&M COSTS**

<b>O&amp;M Costs - Gravity Sewer, Pump Station and Treatment Costs</b>	<b>OCBCA Only</b>	<b>Shared System</b>
Contract Operation Fee	\$10,000	\$18,000
Annual Payment to East Lyme for flow treatment at New London WPCF	\$25,000	\$50,000
<b>Total Pumping Cost (Flow Pumped 6 Times Prior to New London WPCF)</b>	<b>\$12,750</b>	<b>\$25,500</b>
Grinder pump equipment short lived asset account	\$0	\$0
Gas and oil for generator(s)	\$200	\$400
General Engineering / Legal	\$2,000	\$3,000
Audit	\$500	\$500
Discretionary Fund	\$500	\$1,000
Odor Control	\$20,000	\$40,000
Short Lived Asset Account (Reserve for capital non-reoccurring)	\$10,000	\$20,000
State Fees	\$300	\$300
Billing and Collection	\$5,000	\$7,500
<b>Annual O&amp;M Cost</b>	<b>\$86,250</b>	<b>\$166,200</b>

## 2. OCBCA ALTERNATIVES CONSIDERED TECHNICALLY VIABLE

The following alternatives to the proposed connection to New London Wastewater Treatment Facility (WWTF) are considered technically viable and will be discussed in this Section after which a cost effectiveness analysis will be performed.

Proposed Plan - OCBCA & OLSBCA Neighborhoods Collection, Transmission for 3+/- miles to East Lyme and treatment/disposal by the New London WWTF.

- a. Alternative #1 – OCBCA & OLSBCA Neighborhood Collection, Local Treatment and Nearby Off-Site Disposal/Reuse
- b. Alternative #2 – OCBCA Neighborhood Collection, Treatment and Disposal with treatment and disposal system located within OCBCA

Only OCBCA was examined for the August 29, 2012 report. As the Town is not interested in pursuing this option, only the OBCA option is presented.

- c. Alternative #3 – OCBCA Hybrid Combination of local Small Cluster Systems

Only OCBCA was examined for the August 29, 2012 report. As the Town is not interested in pursuing this option, only the OBCA option is presented.

Due to complexities associated with the lot by lot analysis of Alternative #3 and identification of sufficient land with proper soils and groundwater characteristics for Alternatives # 2 and 3 and limited time and budget, LAI has provided preliminary opinions on the costs and technical viability of Alternatives # 2 and # 3. As Alternative # 1 has the capability to serve all beach-shoreline communities with increasing economies of scale and OCBCA-OLSBCA property owners may prefer an off-site solution, LAI recommends public review of the options to determine the locally preferred option.

The wastewater system technical approach that in LAI's 40 years of experience can be the least costly option for Alternatives # 1, # 2 and cluster solutions of # 3 is:

Wastewater Collection	Septic tank effluent collection system
Treatment	Recirculating media filters with nitrogen removal to achieve Total Nitrogen < 10 mg/l, typically TN 3+/- mg/l. Nitrogen and phosphorus would displace fertilizer demand and not be removed when treated effluent is used for landscape irrigation and fertilization. Treatment system is modular and can easily respond to changes in wastewater flow.
Disposal/reuse	Spray irrigation and, as applicable, subsurface drip irrigation for golf course / landscape irrigation with effluent disposal during periods of no irrigation demand.  Leaching chambers or other CT DEEP approved disposal systems

## 2.1 Alternative # 1 - Neighborhood Collection System with Off-Site Treatment & Disposal/Reuse

This alternative utilizes a Septic Tank Effluent Gravity (STEG) collection system as shown on Figure 2-1, to convey wastewater within OCBC & OLSBCA to a central pump station. While opportunities for an optimized layout exist, LAI did not alter the Fuss & O'Neil layout shown previously on Figure 1-1. The proposed STEG system would combine two homes on one new septic tank (which LAI has successfully engineered starting in 1982, with a common effluent pipe connecting to the sewer line in the street. It is noted that due to the high development density and good quality of roads, STEG lines may be placed on both sides of roads and thereby avoiding a significant amount of road excavation and repairs. Existing septic tanks in good condition would be retained.

**FIGURE 2-1: SEPTIC TANK EFFLUENT COLLECTION SYSTEM**



STEG systems have the following cost-saving advantages:

1. Small diameter pipes & less slope required
2. Cleanouts instead of manholes

Alternative #1 proposes to use one or more of the sites presented in Figure 2-2.

The primary cost savings associated with this alternative comes from the STEG collection system and the reduced length of the force main – reduced from 15,000 feet to 4,000+/- feet. This alternative also reduces the number of intergovernmental agreements that will be necessary for implementation as all properties of interest are in the Town of Old Lyme.

The critical path issue for any Shoreline community system, with or without OCBCA & OLSBCA, is the availability of technically viable land for disposal and/or reuse of the treated wastewater within an economically competitive distance from wastewater generation. A number of properties have been identified within 4,000 – 10,000 feet of OCBCA that, based upon USDA

NRCS soils and a brief review of Town of Old Lyme files, which include borings and permeability testing at the Driving Range site, have suitable soils and have sufficient depth to

**FIGURE 2-2: POTENTIAL TREATMENT AND DISPERSAL SITES**



groundwater and hydraulic characteristics to be able to be successfully used for treated wastewater effluent disposal/reuse.

The candidate sites include:

**Reuse/Disposal**

1. Cherrystone's Driving Range - approx. 3,500 feet from OCBCA, 1 stream crossing
  - ✓ 218 Shore Road
  - ✓ Appears to be 29 +/- acres, Zoned C-30, Assessed Valuation \$300,000.
 Cherrystone's Driving Range - Owner: 100 Acres, LLC  
 218 Shore Road  
 Old Lyme, Connecticut [06371](http://www.06371.com)  
 (860)434-1721

2. Black Hall Golf Club - approximately 5,500 feet from OCBCA, 2 stream crossings  
Buttonball Road. Area of property 125-150 acres, turf area 50-75 acres

Philip Neaton, Black Hall Golf Club Superintendent  
[bhsuper@sbcglobal.net](mailto:bhsuper@sbcglobal.net)  
(860) 434-2051

Based upon meeting with Club Superintendent Philip Neaton on August 24, 2012, an easement exists from Route 156 to the golf course.

### **Disposal Only**

3. Land west of White Sands Beach area - approx. 8,500 feet from OCBCA, 3+/- stream crossings
4. Land west of Farm Lane - approx. 5,500 feet from OCBCA, 2 stream crossings

### **2.2 Alternative # 2 - Neighborhood Collection, Treatment and Disposal within OCBCA**

This alternative is similar to Alternative # 1 with treatment and disposal to occur on properties within OCBCA. A very preliminary identification of potential candidate sites within OCBCA is shown on Figure 2-3. Sites along the eastern border may be eliminated due to proximity to the brook. Also, additional properties appear available just north of Route 156 & OCBCA.

### **2.3 Alternative # 3 - Hybrid On-Site and Small Cluster Systems**

This alternative consists of a combination of on-site and small cluster systems. The primary technical constraints on this approach are:

- ✓ shallow depth to groundwater and
- ✓ space limitations

As the OCBCA area is located in a potentially drinking water aquifer and due to the limited rainfall dilution available to achieve drinking water standard of Total Nitrate-Nitrogen (TN) of <10 mg/l, it is assumed that wastewater systems will be required to produce effluent with TN < 10 mg/l.

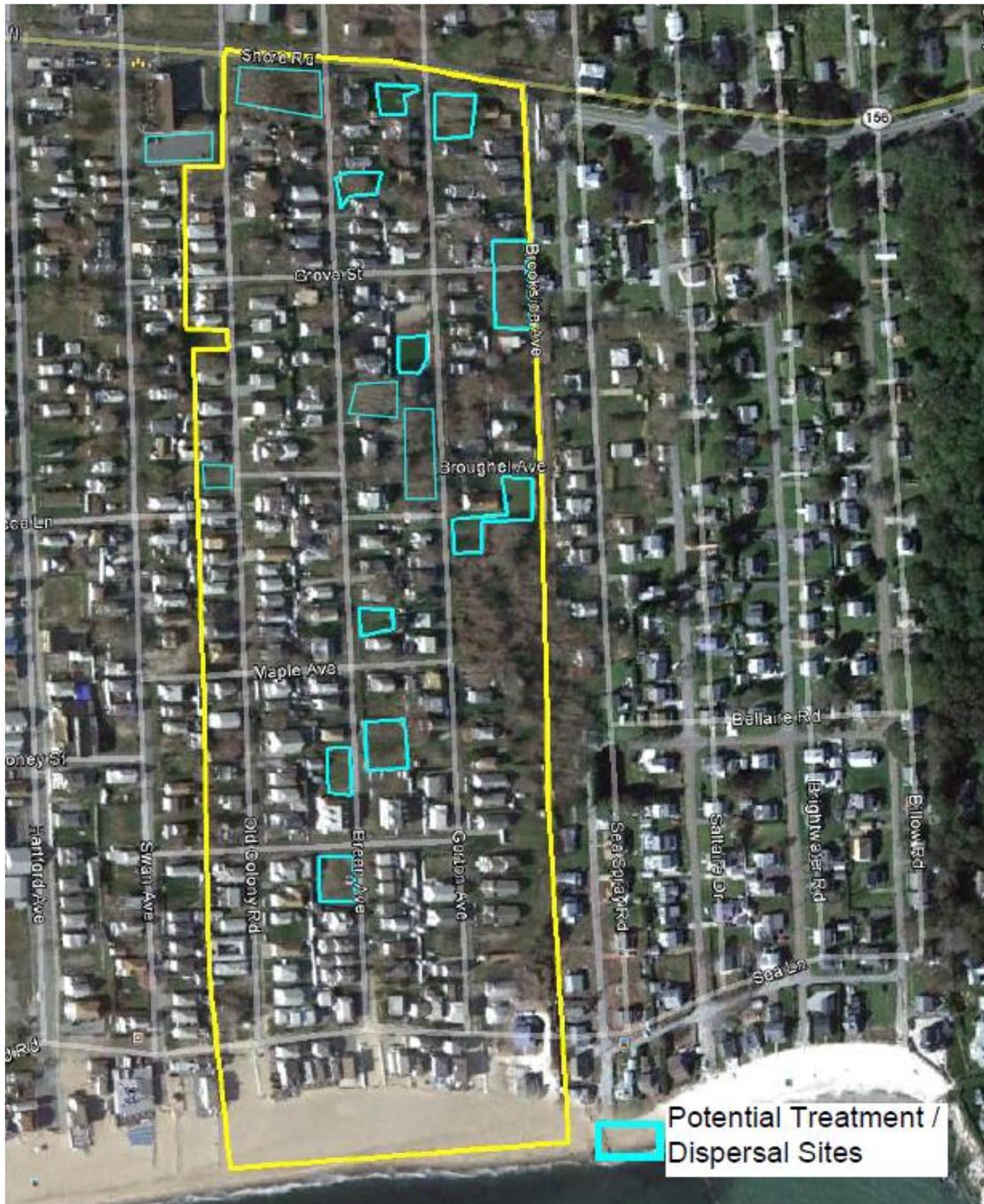
#### **2.3.1 Individual On-Site Systems**

Space requirements for a wastewater system producing TN < 10 mg/l for an individual property are:

- |                                  |                                     |
|----------------------------------|-------------------------------------|
| ✓ Septic tank & treatment system | 200 square feet (sf)                |
| ✓ Disposal system                | <u>200 sf</u>                       |
| ✓ Total                          | 400 sf or an area 20 feet x 20 feet |

Figure 2-3 illustrates such a treatment system for an individual property. Please note the pre-treatment system can be located on top or to the side of the septic tank.

**FIGURE 2-3: POTENTIAL TREATMENT AND DISPERSAL SITES WITHIN OCBC**



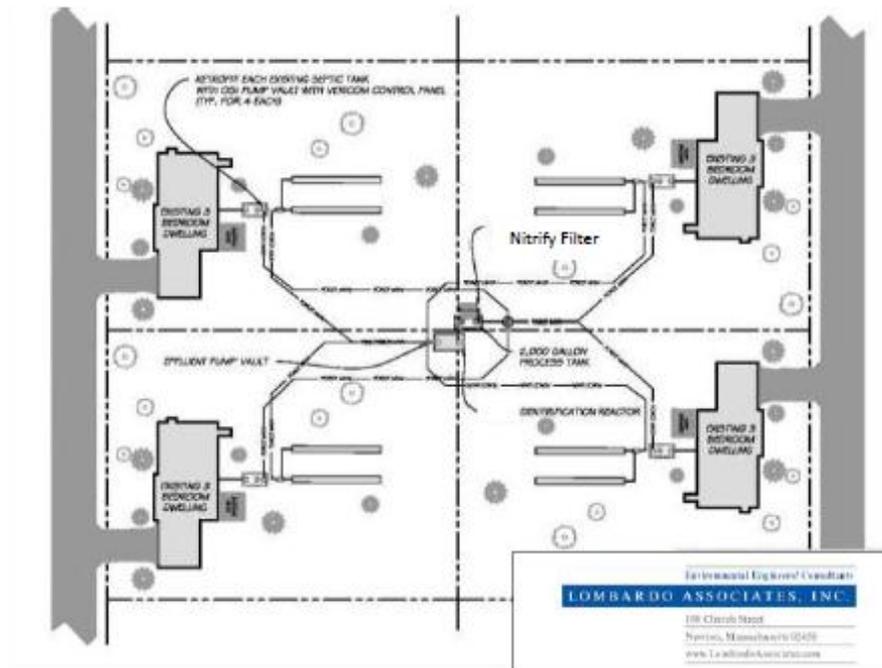
**FIGURE 2-3: INDIVIDUAL PROPERTY WASTEWATER SYSTEM PRODUCING EFFLUENT TN < 10 MG/L**



**2.3.2 Small Cluster On-Site Systems**

This technical approach consists of combing a small number of properties on one system to address space limitations and achieve economies of scale. Figure 2-5 illustrates the potential layout of a small cluster system serving four (4) properties. The number of properties on a small cluster system would be dictated by local site conditions. It is noted that the treatment and even disposal systems could be located under paved areas, such as parking lots and/or roads, as illustrated on Figure 2-6.

**FIGURE 2-5: SMALL CLUSTER WASTEWATER SYSTEM PRODUCING EFFLUENT TN < 10 MG/L**



**FIGURE 2-6: SMALL CLUSTER WASTEWATER SYSTEM UNDER PAVED AREA**



### **2.3.3 Large Cluster On-Site Systems**

Due to space limitations and depth to groundwater limitations, large cluster wastewater system(s) may be necessary and as it expands it will resemble parts of Alternatives # 1 and # 2.

### **2.3.4 Combination of Individual and Cluster Wastewater Systems**

The Alternative # 3 combination of individual and cluster systems will require numerous setback variances and easements. Also given that all properties cannot be served by individual systems, either OCBCA or Town will need to assume ownership for properties without individual systems.

It is not possible at this juncture to determine the optimal technical combination of individual and cluster wastewater systems. In addition to technical issues, property owner preferences should be considered. It is noted that Alternative # 3 will require dedication of lands to wastewater systems whereas Alternatives # 1 and # 2 require easements. This land use impact and property owner management of the wastewater system, especially for the small lots, needs to be a factor in decision making.

To address the attractiveness of the individual and cluster system approach without a detailed technical viability assessment, LAI will render an opinion on the economic competitiveness of this option in Section 3.

### 3. COST ANALYSIS OF EXISTING AND PROPOSED ALTERNATIVES

#### 3.1 Proposed Plan Costs

Section 1 presented the Proposed Plan project costs as developed by F&O.

#### 3.2 Alternative #1 Costs

The Capital and Annual O&M costs for Alternative # 1 are presented on Tables 3-1 through 3-4. In developing these cost estimates LAI has focused primarily on collection system technology change and force main length options, without altering many of the assumptions used in the F&O analysis. No technology has been proposed for treatment due to the numerous variables that affect selection, as previously stated. It is LAI's opinion that additional cost savings can be achieved by value engineering – in particular relocating collection lines to minimize road repair/restoration costs.

**TABLE 3-1A ALTERNATIVE # 1 COLLECTION SYSTEM CONSTRUCTION COSTS - OCBC**

Septic Tank Effluent Gravity Sewer Collection in OCBCA Study Area					
	Units	No. Units	Unit Cost	Total Cost	
1	4 inch gravity sewer	FT	7,600	\$ 40	\$ 304,000
2	4 inch force main, cleanouts & Valve chambers	FT	1,800	\$ 40	\$ 72,000
3	4 inch service connections	FT	1,125	\$ 40	\$ 45,000
4	Cleanouts	EA	25	\$ 1,000	\$ 25,000
5	OCBA Pump Station	EA	1	\$ 250,000	\$ 250,000
6	Pump Station Land easement	EA	1	\$ 25,000	\$ 25,000
7	Rock Excavation	CY	-	\$ 90	\$ -
8	Construction Mobilization	LS	1	\$ 50,000	\$ 50,000
9	Temporary Bituminous Pavement Repair (Association Road)	LF	9,200	\$ 13	\$ 119,600
10	Mill and Overlay (Association Road)	SY	10,200	\$ 17	\$ 173,400
11	Temporary Bituminous Pavement Repair (State Road)	LF	-	\$ 15	\$ -
12	Permanent Bituminous Pavement Repair (State Road)	LF	-	\$ 20	\$ -
13	Mill and Overlay (State Road)	SY	-	\$ 50	\$ -
14	Septic Tanks	EA	120	\$ 2,500	\$ 300,000
15	House Connections- Septic tank to street sewer	LF	5,325	\$ 20	\$ 106,500
					<b>\$ 1,471,000</b>
16	Ineligible House connection to ST	LF	3,195	\$ 20	\$ 63,900
	House Connection Length	50	Total w/H.C.		\$ 1,534,900

**TABLE 3-1B ALTERNATIVE # 1 COLLECTION SYSTEM CONSTRUCTION COSTS - OLSBCA**

Septic Tank Effluent Gravity Sewer Collection in OLSBA Study Area					
Description	Units	No. Units	Unit Cost	Total Cost	
1 4 inch gravity sewer	FT	10,800	\$ 40	\$ 432,000	
2 4 inch force main, cleanouts & Valve chambers	FT	2,220	\$ 40	\$ 88,800	
3 6 inch service connections	FT	1,920	\$ 50	\$ 96,000	
4 Cleanouts	EA	36	\$ 1,000	\$ 36,000	
5 OLSBA Pump Station	EA	1	\$ 250,000	\$ 250,000	
6 Pump Station Land easement	EA	1	\$ 25,000	\$ 25,000	
7 Rock Excavation	CY	1,700	\$ 90	\$ 153,000	
8 Construction Mobilization	LS	1	\$ 50,000	\$ 50,000	
9 Temporary Bituminous Pavement Repair (Association Road)	LF	12,400	\$ 13	\$ 161,200	
10 Mill and Overlay (Association Road)	SY	14,400	\$ 17	\$ 244,800	
11 Temporary Bituminous Pavement Repair (State Road)	LF	35	\$ 15	\$ 525	
12 Permanent Bituminous Pavement Repair (State Road)	LF	35	\$ 20	\$ 700	
13 Mill and Overlay (State Road)	SY	100	\$ 50	\$ 5,000	
14 Septic Tanks	EA	96	\$ 2,500	\$ 240,000	
15 House Connections- Septic tank to street sewer	LF	5,760	\$ 20	\$ 115,200	
				<b>\$ 1,898,000</b>	
16 Ineligible House connection to ST	LF	2,880	\$ 20	\$ 57,600	
House Connection Length	60		Total w/H.C.	\$ 1,955,600	

**TABLE 3-2 ALTERNATIVE # 1 COMMON FORCE MAIN SYSTEM CONSTRUCTION COSTS**

Force Main From OCBCA to Cherrystone's Driving Range					
Force Main Component	Units	# of Units	\$/ Unit	Total Cost	
1 6-inch Force Main, Clenouts and Valve Chambers	FT	4,200	\$ 85	\$ 357,000	
2 OLSBA Pump Station Pump Size Increase	EA	-	\$ 60,000	\$ -	
3 Rock Excavation	CY	233	\$ 90	\$ 20,994	
4 Temporary Bituminous Pavement Repair (State Road)	LF	4,200	\$ 15	\$ 63,000	
5 Permanent Bituminous Pavement Repair (State Road)	LF	4,200	\$ 20	\$ 84,000	
6 Mill & Overlay (State Road)	SY	5,622	\$ 50	\$ 281,077	
7 Stream Crossing	EA	2	\$ 30,000	\$ 60,000	
8 East Lyme Sewer Connection Fee	ALL	-	\$ 100,000	\$ -	
9 Railroad Bridge Crossing Premium	ALL	-	\$ 200,000	\$ -	
				<b>Total Common Force Main Construction Cost</b>	
				<b>\$866,070</b>	

**TABLE 3-3: ALTERNATIVE #1 COMMON TREATMENT PLANT CONSTRUCTION COSTS**

Shared System WWTF + Disposal Field Construction Costs		
1	Equalization Tank	\$ 370,000
2	Treatment System	\$ 3,022,560
3	Dispersal System	\$ 275,814
4	Emergency Gen. / Control Bldg	\$ 42,500
5	Site Work	\$ 107,900
	Subtotal	\$ 3,818,774
6	Land	\$ 300,000
	<b>Grand Total</b>	<b>\$ 4,118,774</b>

**TABLE 3-4: ALTERNATIVE #1 ANNUAL O&M COSTS – COMMON TREATMENT PLANT**

Annual O&M Cost - Alternative #1		Shared System
1	Contract Operations	\$39,000
2	Sampling	\$10,400
3	Septage Pumping	\$16,000
4	Electricity	\$6,800
5	Phone Service	\$480
6	Sludge Pumping and Disposal	\$3,860
7	Engineering Oversight / Fees	\$4,200
8	Equipment Replace Asset Account	\$23,200
9	Bilings & Collection & Misc	\$9,000

**Annual O&M Cost \$113,000**

Tables 3-5a and 3-5b present a summary of Alternative # 1 project costs for OCBCA and OLSBA respectively, in the same format as the F&O July 2012 Report.

### 3.3 Alternative #2 Costs

Alternative #2 was only developed for OCBCA, with its own, smaller treatment facility and shorter transmission force main. The Town does not wish to pursue this alternative, so it is presented here for reference purposes only.

The Capital and Annual O&M costs for Alternative # 2 are virtually identical to Alternative # 1 except that the force main would be to local/nearby in OCBCA sites, with the Alternative # 2 force main construction costs presented on Table 3-6. Table 3-7 presents a summary of Alternative # 2 project costs in the same format as the F&O July 2012 Report.

**TABLE 3-6 ALTERNATIVE # 2 FORCE MAIN SYSTEM CONSTRUCTION COSTS**

Force Main to Treatment and Dispersal Sites - in Same Trench as Sewers					
	Force Main Component	Units	# of Units	\$/ Unit	Total Cost
1	6-inch Force Main, Clenouts and Valve Chambers	FT	8,000	\$ 20	\$ 160,000
	<b>Total Common Force Main Construction Cost</b>				<b>\$160,000</b>

**TABLE 3-5A ALTERNATIVE #1 OPINION OF PROBABLE COSTS – OCBCA**

<b>I. Treatment &amp; Disposal Off OCBCA property - initially Driving Range Property</b>	<b>Est. Cost</b>	<b>Subtotal</b>
<b>Procure Agreements for Recommended Plan</b>		
1. Technical Services to Procure Stakeholder Agreements	\$12,000	
2. Legal and Administrative Services to Procure Stakeholder Agreements	\$20,000	
<b>3. Total - Procure Agreements for Recommended Plan (rounded)</b>		<b>\$32,000</b>
<b>Project Construction</b>		
4. Construction Cost - Gravity Sewer w/Central Pump Station	\$1,471,000	
5. Construction Cost - Force Main Along Route 156 to Driving Range	\$434,000	
5a. Construction Cost - House Connections to ST	\$63,900	
6. Treatment System	\$1,718,000	
7. Dispersal System - includes Site Work & Land Cost see Table 3-3	\$192,000	
Land Costs	\$150,000	
8. Technical Services - Design, Permitting & Construction Administration	\$776,000	
9. Legal & Administrative	\$194,000	
<b>10. Total - Project Construction Costs (Rounded)</b>		<b>\$4,999,000</b>
<b>DEEP CWF Eligible Design &amp; Construction Costs</b>		
11. Procure Agreements for Recommended Plan (excluding Legal & Admin)	\$12,000	
12. Project Construction Costs (Excluding Legal & Admin& House to ST Costs)	\$4,677,200	
<b>13. Total - DEEP CWF Loan Eligible Costs (Rounded)</b>		<b>\$4,689,000</b>
<b>DEEP Ineligible Costs</b>		
14. Short Term Financing at 1.5%	\$0	
15a. Legal and Administrative Fees (Table Line Items #2, #9)	\$277,900	
15b House Connection to Septic Tank	\$63,900	
<b>16. Total - DEEP Ineligible Costs (Rounded)</b>		<b>\$342,000</b>
<b>Estimated Local Share</b>		
17. DEEP CWF Loan Eligible Costs	\$4,689,000	
18. DEEP Ineligible Costs	\$342,000	
<b>19. Estimated Local Cost Share (Total Capital Cost)</b>		<b>\$5,031,000</b>
<b>20. DEEP CWF 25% Design &amp; Construction (Small Community) Grant Amount</b>		<b>\$1,172,300</b>
	<b>Grand Total</b>	<b>\$3,858,700</b>

<b>II. Additional Association Improvements:</b>		
<b>Additional Association Improvements (Ineligible Costs)</b>		
21. Storm Drainage Improvements	\$235,000	
22. Extensive Road Reconstruction	\$1,030,000	
23. Fire Hydrants	\$0	
24. Drinking Water System Improvements	\$0	
25. Technical Services - Design, Permitting & Construction Administration	\$253,000	
<b>26. Total - Additional Association Improvements</b>		<b>\$1,518,000</b>

II. Alternative #1 w/Grant and Association Improvements	Capital Costs	3.25%, 20 Years on Ineligible Costs			O&M	Total
		Eligible	Ineligible	Total		
Project Costs - With Association Improvements, With CT DEEP Grant	\$5,376,700	\$3,516,700	\$1,860,000	\$5,376,700	\$56,500	
Gross Cost per EDU	\$25,200	\$16,500	\$8,700	\$25,200		
Annual Capital Cost per EDU (20-yr. Term, 2% for eligible costs only)		\$1,009	\$598	\$1,607	\$265	\$1,872

**TABLE 3-5B ALTERNATIVE #1 OPINION OF PROBABLE COSTS – OLSBA**

<b>I. Treatment &amp; Disposal Off OLSBCA property - initially Driving Range Property</b>	<b>Est. Cost</b>	<b>Subtotal</b>
<b>Procure Agreements for Recommended Plan</b>		
1. Technical Services to Procure Stakeholder Agreements	\$12,000	
2. Legal and Administrative Services to Procure Stakeholder Agreements	\$20,000	
<b>3. Total - Procure Agreements for Recommended Plan (rounded)</b>		<b>\$32,000</b>
<b>Project Construction</b>		
4. Construction Cost - Gravity Sewer w/Central Pump Station	\$1,898,000	
5. Construction Cost - Force Main Along Route 156 to Driving Range	\$434,000	
5a. Construction Cost - House Connections	\$57,600	
6. Treatment System	\$1,718,000	
7. Dispersal System - includes Site Work & Land Cost see Table 3-3	\$192,000	
Land	\$150,000	
8. Technical Services - Design, Permitting & Construction Administration	\$860,000	
9. Legal & Administrative	\$215,000	
<b>10. Total - Project Construction Costs (Rounded)</b>		<b>\$5,525,000</b>
<b>DEEP CWF Eligible Design &amp; Construction Costs</b>		
11. Procure Agreements for Recommended Plan (excluding Legal & Admin)	\$12,000	
12. Project Construction Costs (Excluding Legal & Admin)	\$5,252,400	
<b>13. Total - DEEP CWF Loan Eligible Costs (Rounded)</b>		<b>\$5,264,000</b>
<b>DEEP Ineligible Costs</b>		
14. Short Term Financing at 1.5%	\$0	
15a. Legal and Administrative Fees (Table Line Items #2, #9 & House to ST Costs)	\$235,000	
15b. House Connection to Septic Tank	\$57,600	
<b>16. Total - DEEP Ineligible Costs (Rounded)</b>		<b>\$293,000</b>
<b>Estimated Local Share</b>		
17. DEEP CWF Loan Eligible Costs	\$5,264,000	
18. DEEP Ineligible Costs	\$293,000	
<b>19. Estimated Local Cost Share (Total Capital Cost)</b>		<b>\$5,557,000</b>
<b>20. DEEP CWF 25% Design &amp; Construction (Small Community) Grant</b>		<b>\$1,316,100</b>
	<b>Grand Total</b>	<b>\$4,240,900</b>

<b>II. Additional Association Improvements:</b>		
<b>Additional Association Improvements (Ineligible Costs)</b>		
21. Storm Drainage Improvements	\$235,000	
22. Extensive Road Reconstruction	\$794,000	
23. Fire Hydrants	\$160,000	
24. Drinking Water System Improvements	\$474,500	
25. Technical Services - Design, Permitting & Construction Administration	\$332,700	
<b>26. Total - Additional Association Improvements</b>		<b>\$1,996,200</b>

<b>II. Alternative #1 w/Grant and Association Improvements</b>	<b>Capital Costs</b>	<b>3.25%, 20 Years on Ineligible Costs</b>			<b>O&amp;M</b>	<b>Total</b>
		<b>Eligible</b>	<b>Ineligible</b>	<b>Total</b>		
<b>Project Costs - With Association Improvements, With CT DEEP Grant</b>	<b>\$6,237,100</b>	<b>\$3,947,900</b>	<b>\$2,289,200</b>	<b>\$6,237,100</b>	<b>\$56,500</b>	
<b>Gross Cost per EDU</b>	<b>\$32,500</b>	<b>\$20,600</b>	<b>\$11,900</b>	<b>\$32,500</b>	<b>\$294</b>	
<b>Annual Capital Cost per EDU (20-yr. Term, 2% for eligible costs only)</b>		<b>\$1,260</b>	<b>\$818</b>	<b>\$2,078</b>	<b>\$294</b>	<b>\$2,372</b>

**TABLE 3-7: ALTERNATIVE #2 OPINION OF PROBABLE COSTS – OCBCA ONLY**

I. Alternative # 2 - Treatment-Disposal within OCBCA Area	Est. Cost	Subtotal
<b>Procure Agreements for Recommended Plan</b>		
1. Technical Services to Procure Stakeholder Agreements	\$10,000	
2. Legal and Administrative Services to Procure Stakeholder Agreements	\$10,000	
<b>3. Total - Procure Agreements for Recommended Plan (rounded)</b>		<b>\$20,000</b>
<b>Project Construction</b>		
4. Construction Cost - Gravity Sewer w/Central Pump Station	\$1,364,000	
5. Construction Cost - Force Main to Treatment and Dispersal Sites (common trench as se	\$160,000	
6. Treatment System	\$1,862,590	
7. Dispersal System - includes Site Work & Land Cost see Table 3-3	\$498,474	
8. Technical Services - Design, Permitting & Construction Administration	\$778,000	
9. Legal & Administrative	\$117,000	
<b>10. Total - Project Construction Costs (Rounded)</b>		<b>\$4,780,000</b>
<b>DEEP CWF Eligible Design &amp; Construction Costs</b>		
11. Procure Agreements for Recommended Plan (excluding Legal & Admin)	\$10,000	
12. Project Construction Costs (Excluding Legal & Admin)	\$4,663,000	
<b>13. Total - DEEP CWF Loan Eligible Costs (Rounded)</b>		<b>\$4,673,000</b>
<b>DEEP Ineligible Costs</b>		
14. Short Term Financing at 1.5%	\$0	
15a. Legal and Administrative Fees (Table Line Items #2, #9)	\$127,000	
<b>16. Total - DEEP Ineligible Costs (Rounded)</b>		<b>\$127,000</b>
<b>Estimated Local Share</b>		
17. DEEP CWF Loan Eligible Costs	\$4,673,000	
18. DEEP Ineligible Costs	\$127,000	
<b>19. Estimated Local Cost Share (Total Capital Cost)</b>		<b>\$4,800,000</b>
<b>20. DEEP CWF 25% Design &amp; Construction (Small Community) Grant Amount</b>		<b>\$1,168,250</b>
<b>Grand Total</b>		<b>\$3,631,750</b>

II. Additional Association Improvements:		
<b>Additional Association Improvements (Ineligible Costs)</b>		
21. Storm Drainage Improvements	\$235,000	
22. Extensive Road Reconstruction	\$1,030,000	
23. Fire Hydrants	\$0	
24. Drinking Water System Improvements	\$0	
25. Technical Services - Design, Permitting & Construction Administration	\$253,000	
<b>26. Total - Additional Association Improvements</b>		<b>\$1,518,000</b>

I. - Alternative #2 w/Grant	Capital	O&M	Total
Project Costs - With CT DEEP Grant, No Association Improvements, No Cost Sharing	\$3,632,000	n/a	\$3,632,000
Gross Cost per EDU (213)	\$17,100		
Annual Capital Cost per EDU (20-yr. Term, 2%)	\$1,000	\$399	\$1,399

II. - Alternative #2 w/Grant and Association Improvements	Capital Costs	4.5%, 20 Years on Ineligible Costs			O&M	Total
		Eligible	Ineligible	Total		
Project Costs - With Association Improvements, With CT DEEP Grant, No Cost Sharing	\$5,149,750	\$3,504,750	\$1,645,000	\$5,149,750	\$85,000	
Gross Cost per EDU (213)	\$24,200	\$16,500	\$7,700	\$24,200	\$399	
Annual Capital Cost per EDU (20-yr. Term, 2% for eligible costs only)		\$1,000	\$590	\$1,590	\$399	\$1,989

III. - Alternative #2 w/Grant, Association Improvements and Cost Sharing	Capital Costs	4.5%, 20 Years on Ineligible Costs			O&M	Total
		Eligible	Ineligible	Total		
Project Costs - With Association Improvements, With CT DEEP Grant, With Cost Sharing	\$5,149,750	\$3,504,750	\$1,645,000	\$5,149,750	\$0	
Gross Cost per EDU (213)	\$24,200	\$16,500	\$7,700	\$24,200	\$399	
Annual Capital Cost per EDU (20-yr. Term, 2% for eligible costs only)		\$1,000	\$590	\$1,590	\$399	\$1,989

### 3.4 Alternative #3 Costs

Based upon Lombardo Associates, Inc. experience, Table 3-8 presents LAI's opinion of minimum capital and annual O&M costs for representative individual and cluster systems that achieve TN < 10 mg/l. As can be seen from a comparison of the Table 3-8 Alternative # 3 costs to the per EDU costs of Alternatives # 1 and # 2 on Table 3-9, there is no economic incentive to pursue Alternative # 3.

**TABLE 3-8: ALTERNATIVE #3 OPINION OF PROBABLE COSTS PER EDU**

<b>OCBCA - Individual and Cluster Systems Alternative</b>		
	<b>Capital Costs</b>	<b>Annual O&amp;M Costs</b>
<b>Individual On-Site System</b>	<b>\$ 28,000</b>	<b>\$ 800</b>
<b>Small Cluster System</b>	<b>\$ 27,000</b>	<b>\$ 600</b>
<b>Large Cluster System</b>	<b>\$ 27,000</b>	<b>\$ 800</b>
Annual O&M Costs significantly influenced by site conditions and CT DEEP requirements		

### 3.5 Cost Comparison

Table 3-9 presents a Summary of the Project Capital Costs of the Proposed Plan and Alternative # 1.

**TABLE 3-9: SUMMARY OF PROBABLE PROJECT COSTS**

Alternative # 1 - Local Area Wastewater Treatment & Disposal/Reuse System						
Number Properties	213	192	405			
Major System Component	Proposed Plan			STE Collection, Off-Site Disposal (Cherrystones)		
	OCBCA	OLSBCA	Total	OCBCA	OLSBCA	Total
<b>1. Project Capital Costs</b>						
Collection System Cost	\$2,980,400	\$3,613,024	\$6,593,424	\$1,931,000	\$2,459,600	\$4,390,600
Transmission Costs	\$1,709,300	\$1,709,300	\$3,418,600	\$546,000	\$546,000	\$1,092,000
Treatment Costs	\$891,800	\$891,078	\$1,782,878	\$2,162,000	\$2,162,000	\$4,324,000
Disposal/Reuse System Costs	\$0	\$0	\$0	\$242,000	\$242,000	\$484,000
Unaccounted for Costs	\$412,500	\$412,500	\$825,000	\$0	\$0	\$0
Land Cost	\$0	\$0	\$0	\$150,000	\$150,000	\$300,000
<b>Total Cost</b>	<b>\$5,994,000</b>	<b>\$6,625,902</b>	<b>\$12,619,902</b>	<b>\$5,031,000</b>	<b>\$5,559,600</b>	<b>\$10,590,600</b>
Cost Savings vs Proposed Plan						\$2,029,302
% Cost Savings vs Proposed Plan						16%

<b>2. Net Capital Costs</b>						
	Proposed Plan			STE Collection, Off-Site Disposal (Cherrystones)		
	OCBCA	OLSBCA	Total	OCBCA	OLSBCA	Total
Additional Improvements	\$1,518,000	\$1,996,200	\$3,514,200	\$1,518,000	\$1,996,200	\$3,514,200
Projected CT DEEP Grant	(\$1,317,500)	(\$1,493,900)	(\$2,811,400)	(\$1,172,300)	(\$1,316,100)	(\$2,488,400)
<b>Net Cost w/Grant</b>	<b>\$6,195,000</b>	<b>\$7,129,000</b>	<b>\$13,323,000</b>	<b>\$5,377,000</b>	<b>\$6,240,000</b>	<b>\$11,617,000</b>
Cost Savings vs Proposed Plan						\$1,706,000
% Cost Savings vs Proposed Plan						13%
Cost Savings to DEEP Grant programs Proposed Plan						\$323,000

	<b>3. Capital Cost Per EDU</b>				<b>Savings/EDU</b>	
	Proposed Plan		Alternative # 1		Savings	
	OCBCA	OLSBCA	OCBCA	OLSBCA	OCBCA	OLSBCA
Gross Sewer Only Cost / EDU	\$28,141	\$34,510	\$23,620	\$28,956	\$4,521	\$5,554
Gross Sewer w/improve Cost / EDU	\$35,268	\$44,907	\$30,746	\$39,353	\$4,521	\$5,554
<b>Net Cost w/improve &amp; grant / EDU</b>	<b>\$29,100</b>	<b>\$37,130</b>	<b>\$25,200</b>	<b>\$32,500</b>	<b>\$3,900</b>	<b>\$4,600</b>

<b>4. Annual O&amp;M Costs</b>										
	Proposed Plan			Alternative # 1			Savings			
	OCBCA	OLSBCA	Total	OCBCA	OLSBCA	Total	OCBCA	OLSBCA	Total	%
<b>Total</b>	<b>\$83,100</b>	<b>\$83,100</b>	<b>\$166,200</b>	<b>\$56,500</b>	<b>\$56,500</b>	<b>\$113,000</b>	<b>\$26,600</b>	<b>\$26,600</b>	<b>\$53,200</b>	<b>32.0%</b>
<b>Cost /EDU</b>	<b>\$390</b>	<b>\$433</b>	<b>\$410</b>	<b>\$265</b>	<b>\$294</b>	<b>\$279</b>	<b>\$125</b>	<b>\$139</b>	<b>\$131</b>	<b>32.0%</b>

<b>5. Annual Capital Amortization &amp; O&amp;M Costs</b>								
	Proposed Plan		Alternative # 1		Savings		% Savings	
	OCBCA	OLSBCA	OCBCA	OLSBCA	OCBCA	OLSBCA	OCBCA	OLSBCA
<b>Total Annual</b>	<b>\$2,315</b>	<b>\$2,909</b>	<b>\$1,872</b>	<b>\$2,372</b>	<b>\$443</b>	<b>\$537</b>	<b>23.6%</b>	<b>22.6%</b>

## 4. CONSIDERATION OF SHORELINE AREAWIDE SYSTEM & TOWN FUNDING

### 4.1 Shoreline Areawide System

It is understood that there are approximately 1,100 properties in addition to the 400 +/- properties in OCBCA and OLSBCA that potentially could be part of Shoreline Areawide Wastewater System. The Shoreline area is illustrated on Figure 4-1. A wastewater system serving 1,500 properties would need to be designed for a wastewater flow of 300,000 gpd.

FIGURE 4-1: OLD LYME SHORELINE AREA



Based upon a visual analysis, it is estimated that there are 500 – 600 properties between OCBCA and the proposed treatment/disposal at the Driving Range-Golf Course.

The cost savings with inclusion of these properties is estimated at:

- ✓ \$ 2 +/- million in collection system savings using a septic tank effluent collection system versus conventional sewers
- ✓ \$0.5+/- million in transmission system cost savings to OCBCA and OLSBCA as the proposed transmission system with a capital cost of \$1.092 million would be

shared by 2+ times the number of users. LAI is of the opinion that the pipe size increase cost with the additional flow is inconsequential.

- ✓ The additional transmission cost for the additional areas would be very low as the pipeline traverses the developments. This would result in \$0.5 million cost savings for the expanded service areas.
- ✓ Treatment and disposal system cost savings associated with economies of scale are expected to be 10% - 20% of those costs, which is \$1 to \$2 million

These savings add up to \$ 4 – 5 +/- million.

### **Farm Lane & White Sands Beach Area**

The Farm Lane area will require its own transmission line, albeit it should be short, so cost savings there will be primarily with collection system savings and treatment plant economies of scale, which given the small area, we would expect to be \$200,000 +/-.

The White Sands Beach area will also require a transmission line to solely serve that developed area. Consequently savings will be primarily with collection system savings and treatment plant economies of scale. It may be more cost effective for the White Sands Beach area to have its own treatment-disposal system on lands adjacent to the developed area. As this would avoid the transmission system costs. This option should be evaluated in any subsequent studies. Savings of \$0.5 - \$1.0+ million are projected.

Therefore it is not unreasonable to expect ~\$5 million of savings as compared to a conventional sewerage system and would be comparable to the 22+% savings estimated for OCBCA and OLSBCA.

### **4.2 Town Assumption of Land Costs**

Should the Town assume the cost of the land for the treatment and disposal facilities, estimated at \$300,000, the **annual** savings per property in OCBCA and OLSBCA would be reduced by \$35+/-.

Based upon LAI's understanding there are some Town owned lands that could be used for treatment and/or disposal however it is understood that the largest parcel is across from the police station. It is insufficient for all of the needs of the Shoreline communities but should be evaluated in the recommended subsequent studies to reduce overall project costs.

## 5. RESPONSE TO QUESTIONS ON DRAFT REPORT

Following are questions/comments submitted to Lombardo Associates, Inc. (LAI) by the Town. LAI Response is provided in a different font after the question/comment.

1. The LAI report shows a need to get easements for each individual property for install, maintenance and cleanouts of the STEG system. This entails getting 213 easements which is a very lengthy and costly process. **Is the cost of getting the easements included in the LAI report? if so where was it listed?**

**Blanket easements are used (no metes and bounds are necessary) and provision of the easement is a condition of the project paying for connecting the property to the sewer and for the project to receive grants for this cost. If a property does not provide the easement, they incur the connection cost entirely on their own.**

2. LAI states they are eliminating the connection fee how is the system being connected to each house? **where is the expense for connection in the LAI report?**

**Please review Tables 3-1A and 3-1B of this Report which provides the costs for house connection to septic tank and connection from septic tank to street sewer.**

3. The cost for the East Lyme studies have been submitted at a cost of <\$40,000.00 not \$125,000 as stated in the Lai report.

**No cost was provided for this item in the F&O July 2012 report. A copy of the submission should be provided for an objective analysis and to understand the exact cost rather than solely < \$40,000.**

**At the end of this section, we calculate the impact of this change and others as presented below.**

4. The pump station upgrade has been researched and the cost is much lower than the \$200,000.00 and would be eligible to be rolled into the grant from DEEP.

**The pump station upgrade cost estimate needs to be provided so that it can be objectively assessed and any change to the analysis contained herein calculated. As no cost for this item was in the July 2012 F&O Report, it will be helpful to the review for whatever the cost is, to be presented along with basis.**

5. Unknown where the additional \$500,000.00 cost comes from for capacity as we have a preliminary agreement from East Lyme, Waterford & New London for capacity and flow that would be less than the \$1,000,000.00 that was budgeted.

**The Preliminary Agreement should have been appended to July 2012 report. It was just recently developed it should be provided for a transparent analysis. LAI noted that it was odd that fee was same for only one or both communities.**

6. Capacity is being obtained from New London and not East Lyme. East Lyme/Waterford will be a flow through system and there is no impact on the East Lyme capacity so the statement of not being able to obtain capacity is false and has no merit.

**The issue raised in this Report is the capacity of the East Lyme/Waterford collection and pumping systems, in addition to New London transmission system and treatment plant. The significant question is whether and to what degree the East Lyme/Waterford collection and pumping systems need to be upgraded with the flow from OLSBCA and OCBCA, as well as potentially from other beach**

7. Alternate #2 shows many private properties that would have small cluster systems installed on these properties. **How does LAI intend to secure these properties; purchase? take by eminent domain?**

**Alternative # 2 was developed as a conceptual option and has been dismissed. Should there be interest in implementing Alternative #2, easements would need to be obtained. LAI acknowledged the complexities of implementing Alternatives # 2 and # 3 and recommended Alternative #1.**

8. Major road repairs and storm water drainage issues plague both associations and is a major part of this project. To remove the road repair and storm drain upgrades to this project is not the course the members of OCBCA want to take. NOTE: 3-2 minimize road repair/restoration costs.

**Road repair and storm drain upgrades were not removed. The Report states the road repair associated solely with sewer line work would be minimized.**

9. If you take the total cost of the LAI project at \$5,183,000.00 and include another \$500,000.00 (½ of the true cost of the land) you will have a final package at \$5,683,000.00 which comes out to \$26,680.00 per EDU. The total project proposed by RFP/Fuss & O'Neill is at a midpoint of \$5,513,000.00 which comes out to \$25,882.00 per EDU or \$800.00 less than the proposed LAI system.

**Please see Table 3-9 as \$5,031,000 is latest estimate for OCBCA and includes \$150,000 for land costs. F&O system cost is \$5,994,000 for OCBCA. The suggested not completely defined adjustments are less than the cost**

difference. Consequently, the local option will be less costly, or at least comparable, on a capital cost basis. We note that there are significant uncertainties with negotiating intermunicipal agreements. One major objective of the LAI Report was to identify local alternatives that were technically viable and cost competitive. The LAI identified local solutions were not identified by previous engineering studies.

Most importantly, the local solution annual O&M costs are estimated to be 32% lower than connection to New London. Consequently the life cycle cost of the local option would be less costly than the New London connection. The State funding program is required to fund the least costly option.

## 6. CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Conclusions

Based upon the analysis presented herein, the following conclusions can be drawn.

1. Pending site suitability determinations, which based upon a preliminary analysis appear favorable, a local Town of Old Lyme wastewater system for OCBCA & OLSBCA is technically viable, with available technically viable lands nearby, and cost-competitive with the proposed Plan on connection to the New London WWTF.
2. With value engineering efforts, additional cost savings are anticipated for an OCBCA & OLSBCA wastewater system.
3. The local Town of Old Lyme alternatives identified herein can be easily configured to address all of the wastewater issues in the remaining 1,100 +/- properties in the Old Lyme beach- shoreline communities. Sufficient lands are available for treatment. The nearby golf course has expressed an interest in receiving effluent for irrigation and candidate lands for disposal appear to have the needed capacity. Site capacity studies are needed to determine exact capacities.
4. The proposed Plan for connection to New London has many implementation challenges and unaccounted for costs that could significantly impede its implementation and increase its cost. As an example agreements will be needed with East Lyme, Waterford and New London. A previous F&O study states that there is no current capacity for Old Lyme for connection to the New London wastewater system – which includes the East Lyme and Waterford pump stations and transmission systems. We understand that unused/unallocated capacity at the New London WWTF may be available.
5. Realization of the cost savings and environmental benefits described in this Report will require the Town of Old Lyme deciding and making a commitment to be the lead for establishment of a wastewater management district to serve the OCBCA and OLSBCA, and others as desired/needed.
  - a. Such a district would be financially self-sufficient with all capital and annual O&M costs paid by the users – i.e. district participants. The Town may wish to fund components of the project such as land and other components.
  - b. The Town can achieve economies of scale and provide financing for ineligible costs at a lower rate than the individual beach associations.
  - c. The Town can readily acquire needed lands and easements. The legal ability of OCBCA & OLSBCA to obtain easements from an unwilling property owner is questionable and needs to be determined.
  - d. Given the Consent Order described in Section 1, the Town will need to commit to taking a lead role on the Consent Order's compliance and enter into discussions with CT DEEP regarding the Town replacing OCBCA as the responsible party for the Consent Order. Given the strict deadline requirements of the Consent Order,

time is of the essence. It is LAI's opinion that the Consent Order's overall schedule for an operational wastewater system serving OCBCA by June 30, 2016 is readily achievable with a Town wastewater solution.

## 6.2 Recommendations

The following recommendations are submitted by Lombardo Associates, Inc. for the Town of Old Lyme's consideration.

### a. Decision on Pursuit of Old Lyme Beaches-Shoreline Wastewater District

Town leaders reach consensus/decision to pursue establishment of an Old Lyme Beaches-Shoreline Wastewater District to serve potentially the OCBCA and OLSBCA and the other Shoreline areas. In addition to the various Town Boards reviewing and opining on the proposed District, a public information program should be performed as soon as possible to inform the public of the issues and to solicit public feedback.

**The Town should request a Stay until mid-February 2013 of the OCBCA Consent Order that requires that by October 13, 2012, OCBCA retain one or more qualified consultants, acceptable to the CT DEEP Commissioner, to prepare the documents and implement or oversee the actions required by the Order. This Stay will enable the Town to develop an alternative and would not materially affect the ability of OCBCA to achieve the Consent Order requirement to have an operational system by June 30, 2016.**

### b. OCBCA – CT DEEP Consent Order – Assumption by Town

Once the Town has decided to pursue implementation of a Beaches Wastewater District, the Town should meet with Old Colony Beach Club Association and CT DEEP to discuss the Town being responsible for the actions required by the Consent Order with a revised Wastewater Management Plan. This document with updates, including CT DEEP requirements, would be the revised Wastewater Management Plan for the Consent Order.

### c. Treatment & Disposal Site(s) Testing & Procurement

Concurrent with the above activities, the Town should initiate discussions with property owner(s) for acquisition of lands that would be used for treatment and disposal/reuse. The Cherrystone's Driving range property and Black Hall Golf Club should be approached as the top priority properties. It is understood that 15+/- soil borings on the Driving Range indicated sand and gravel soils and groundwater deeper than 100 inches. Upon its review and preliminary hydrogeologic mounding analysis and fate/transport analysis for buildout wastewater flows, this data may be sufficient for site suitability/capacity determination. Additional site testing/analysis will be necessary to confirm site suitability. Data on the Black Hall Golf Club property needs to be acquired. The Golf Course has indicated a willingness to provide the results of borings on its property.

**d. Town Meeting Action**

A Plan should be prepared and submitted for Town meeting action in October to fund the efforts for pursuit and implementation of a Shoreline Wastewater System, which would need to be adopted by the Town by the end of January. The recommended Stay in the Consent Order (see a. above) would provide the Town the needed time to perform the needed studies and have public review/discussion.

Table 5-1 is a Gantt chart of an initial listing of the required activities for the Town of Old Lyme to decide to pursue and implement an Old Lyme Beaches Wastewater District and assumption of the OCBCA Consent Order consistent with the above recommendations.

**TABLE 5-1: RECOMMENDED ACTIVITIES & SCHEDULE FOR PURSUIT AND IMPLEMENTATION OF OLD LYME BEACHES WASTEWATER DISTRICT**

Old Colony Beach Club Association Wastewater Issues - Decision on and Establishment of Prospective Old Lyme Beaches Wastewater District (OLBWD)																							
Activities and Schedule as of August 28, 2012																							
Week of	August	September				October				November				December			January						
	27-Aug	3-Sep	10-Sep	17-Sep	24-Sep	1-Oct	8-Oct	15-Oct	22-Oct	29-Oct	5-Nov	12-Nov	19-Nov	26-Nov	3-Dec	10-Dec	17-Dec	24-Dec	31-Dec	7-Jan	14-Jan	21-Jan	28-Jan
<b>1</b>	<b>Decision on Pursuit of Old Lyme Beaches Wastewater District</b>																						
a	Meeting with Board of Selectmen - Presentation of Plan																						
b	Meetings with Other Town Officials - Legal, Budget/Financial, etc.																						
c	Decision by Town Officials to Pursue OLBWD - pending public input																						
d	Engineering Refinement of Plan - based upon Town feedback of Executive Plan																						
	Public Information Program																						
e	Preparation of Public Information Documents																						
f	Distribution of PID - mailers																						
g	Web site - use Town web site and/or new site																						
h	Public Meetings - assume 3 - 5																						
	<b>Legal</b>																						
i	Develop District Formation Plan & Schedule																						
j	Engineering Plan for District-OCBCA; OLSBCA & Others																						
k	Town Board actions and Public Hearings																						
<b>2</b>	<b>OCBCA – CT DEEP Consent Order – Assumption by Town</b>																						
a	Meetings with OCBCA & CT DEEP																						
b	Draft revisions to Consent Order																						
c	Revised Consent Order																						
d	Signing of Revised Consent Order																						
<b>3</b>	<b>Treatment &amp; Disposal Site(s) Testing &amp; Procurement</b>																						
a	Determination if Town sites are sufficient																						
b	Meetings - Negotiations with property Owners																						
c	Site(s) Testing - if needed																						
<b>4</b>	<b>Town Meeting Authorization for Project Funding</b>																						
<b>5</b>	<b>Town Meeting Authorization of District Formation</b>																						
	Black Hall Golf Club members meeting Sept. 25, 2012																						