DRAFT

Wastewater Management Plan

The Old Colony Beach Club Association
Old Lyme, Connecticut

October 2011

Prepared For:

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1. EXECUTIVE SUMMARY

The Old Colony Beach Club Association (OCBCA) is located in the southern coast of Old Lyme, directly on Long Island Sound. The community, which is part of the Town of Old Lyme, operates under a separate charter as The Old Colony Beach Club Association with separate taxing authority. OCBCA includes 217 homes that are generally constructed on lots with average sizes of 0.12 acres. Properties are served by individual subsurface sewage disposal systems and drinking water is provided either by a public water supply system owned and operated by the Connecticut Water Company or by private on-site wells.

In the fall of 2010, the OCBCA property owners voted to conduct a study of the Association's long-term wastewater management needs. The desire for such a study was prompted in part by regulations under consideration by the Town of Old Lyme that would require property owners to upgrade their existing disposal systems to new standards mandated by the town's Water Pollution Control Authority.

The purpose of this wastewater management plan is to evaluate the effectiveness of current wastewater disposal practices within OCBCA and to develop a long-range plan to ensure that, area-wide, wastewater is effectively managed in a way that protects the public health and the quality of ground and surface waters. This study was funded in part with a grant from the Connecticut Department of Energy and Environmental Protection (DEEP).

Based upon field observations, a review of historical and natural resources data and mathematical modeling, it was determined that physical conditions within OCBCA do not allow for adequate wastewater treatment and disposal. In general, the land cannot adequately support the density of development from an on-site wastewater disposal standpoint. Many of the existing septic systems do not meet current public health code standards largely due to either a lack of available space or to adverse on-site conditions (shallow groundwater, rapidly draining soils, etc.). Because of the overall density of

development within OCBCA, the use of conventional on-site wastewater disposal systems (i.e., septic systems and cesspools) is causing the discharge of nitrogen to local ground and surface waters at concentrations significantly higher than those allowed by current regulatory standards. For this reason, it is concluded that continued use of conventional on-site wastewater disposal systems in not a technically feasible, long-term option for OCBCA.

Based on the findings of the study, several alternatives were screened for technical feasibility, regulatory and public acceptance, and cost effectiveness. The basic alternatives considered for OCBCA include the following:

1. Alternative/innovative and higher-technology treatment and subsurface sewage disposal systems on individual lots;

2. Collection and treatment of wastewater from OCBCA at a community sewage treatment and subsurface disposal system located at a site outside of OCBCA ;

3. Collection of wastewater from OCBCA and discharge to the existing sanitary sewer system in East Lyme (either by direct connection or by connection to the Point O'Woods sewer system) for conveyance to and treatment at the New London regional sewage treatment facility.

In the end, connecting to Point O'Woods existing sanitary sewer system was determined to be the most cost-effective and technically viable alternative. While there are risks associated with each alternative, this alternative requires the least amount of construction. It benefits considerably by avoiding the need to construct, operate, and maintain a new treatment facility. In addition, it enjoys the benefit of being the least costly of all alternatives considered. It also will not require the acquisition of private property and will not involve construction within local roads. The alternative will require the successful negotiation of separate agreements with both Point O'Woods and the Town of East Lyme for capacity and use of their respective collection systems.

The recommended plan is to serve the entire OCBCA community with a sanitary sewer system with the following principal components:

- a network of gravity sewers to collect sewage from each property within OCBCA
- A central sewage pumping station located on association-owned property on Gorton Avenue with associated force main and gravity sewers installed along Route 156 to convey sewage to the existing Point O'Woods sewage collection system.

The estimated capital cost for the recommended project is $6,408,078. This figure includes costs for design and construction of the recommended facilities, the purchase of capacity in the East Lyme and Point O'Woods sewage collection systems, and associated engineering, legal, and administrated services. It also includes short term borrowing costs incurred throughout the entire project period. It is estimated that the Association would be eligible for a grant from the Department of Energy & Environmental protection in the amount of $1,370,902. The net local share of the project anticipated to be borrowed from is $5,037,176. All costs are in year-of-construction dollars.

It is assumed that the local share of capital costs of the proposed system will be paid for entirely by the users of the system by means of a sanitary sewer benefit assessment. The estimated average benefit assessment per household is $23,213 which can be paid over a 20-year period. This equates to an annual cost of $1,442 over 20 years at an annual interest rate of 2%, assuming semi-annual payments. Annual operation and maintenance expenses for the system are estimated to be $311 and will be paid for under a separate sewer use fee.

It is important to note that this document recommends a long-term wastewater management solution to the residents of Old Colony Beach. No consideration was made for the possible inclusion of flows from any properties outside of Old Colony Beach. The DEEP has indicated that it may require Old Colony Beach to merge its project with their neighboring beach association, Old Lyme Shores. If this occurs, it is strongly recommended that an engineering study be undertaken to re-evaluate the

recommendations of this study in light of the higher wastewater flow that would result from such a merge. In addition, project costs and finances should be reviewed and revised to reflect changes made to the assumptions used in this study.

2. INTRODUCTION

2.1 Background

The Old Colony Beach Club Association (OCBCA) is a private beach community located on the central coast of the Town of Old Lyme. It differs from many Connecticut beach communities in that it operates under a separate charter, granted by the state legislature in 1935 that enables it to bond money for community improvements and levy taxes upon its members.

OCBCA is comprised of 199 cottages, 18 condominium units, a rooming house, and one house of worship. Cottages, condominium units and the boarding house are predominantly seasonal in use although there are some year-round residents. For the most part, properties are very small, in many cases less than one tenth of an acre in size. The average residential lot size is 0.12 acres. Most properties are served by a public water supply system that is owned and operated by the Connecticut Water Company (CWC). The community predates the public water system and, as a result, a number of the properties also have on-site wells. Many/most wells are shallow, dug wells, some of which are used for drinking water supply. All properties currently rely upon on-site treatment systems (e.g., septic systems, cesspools, etc.) for wastewater treatment and disposal.

In 2010, the Town of Old Lyme Water Pollution Control Authority (OLWPCA) announced its intention to seek an ordinance requiring all properties within the town to upgrade their septic system to meet standards that it believed would avoid the need for future sanitary sewers. The proposed standards, which primarily consisted of a minimum capacity for septic tanks, the elimination of cesspools, and the reconstruction of leaching fields in areas of shallow groundwater to meet minimum separation distances, were announced at a series of public meetings held by the OLWPCA. The residents of

OCBCA expressed concern over the proposed ordinance, particularly because no scientific basis was given for the need for or effectiveness of the mandated improvements, and property owners feared that they would incur significant costs to comply with the ordinance with no guarantee of any benefit. In September of 2010, OCBCA members appropriated funds to hire an engineering company to conduct a study of conditions within the Association and to prepare a wastewater management plan that presented a recommended plan for long-range wastewater management within the beach community.

2.2 Purpose and Scope

This plan evaluates wastewater management alternatives for the Old Colony Beach Club community over a 25-year planning period. The scope of this study is limited to the OCBCA community; no attempt has been made to evaluate the needs of other areas within the Town of Old Lyme beyond the geographic boundaries of OCBCA.

The purpose of this wastewater management plan is to:

- obtain comprehensive field data that quantify surface water and groundwater quality, and evaluate the performance and conditions of existing on-site disposal systems through empirical analyses;
- estimate current and projected future wastewater flows;
- identify and evaluate alternatives for conveyance and disposal of wastewater;
- develop cost-effective collection system alternatives where off-site treatment is found to be necessary;
- prepare preliminary cost estimates of alternative and recommended facilities;
- perform a financial analysis that identifies funding alternatives and determines estimated costs to users;
- prepare an Environmental Assessment for the proposed wastewater management plan;
- prepare a summary report; and

- assist the Old Colony Beach Club Association with a public participation program whereby the conclusions and recommendations of the Wastewater Management Plan are presented to the public in an effort to promote public understanding and support for the study and its recommendations.

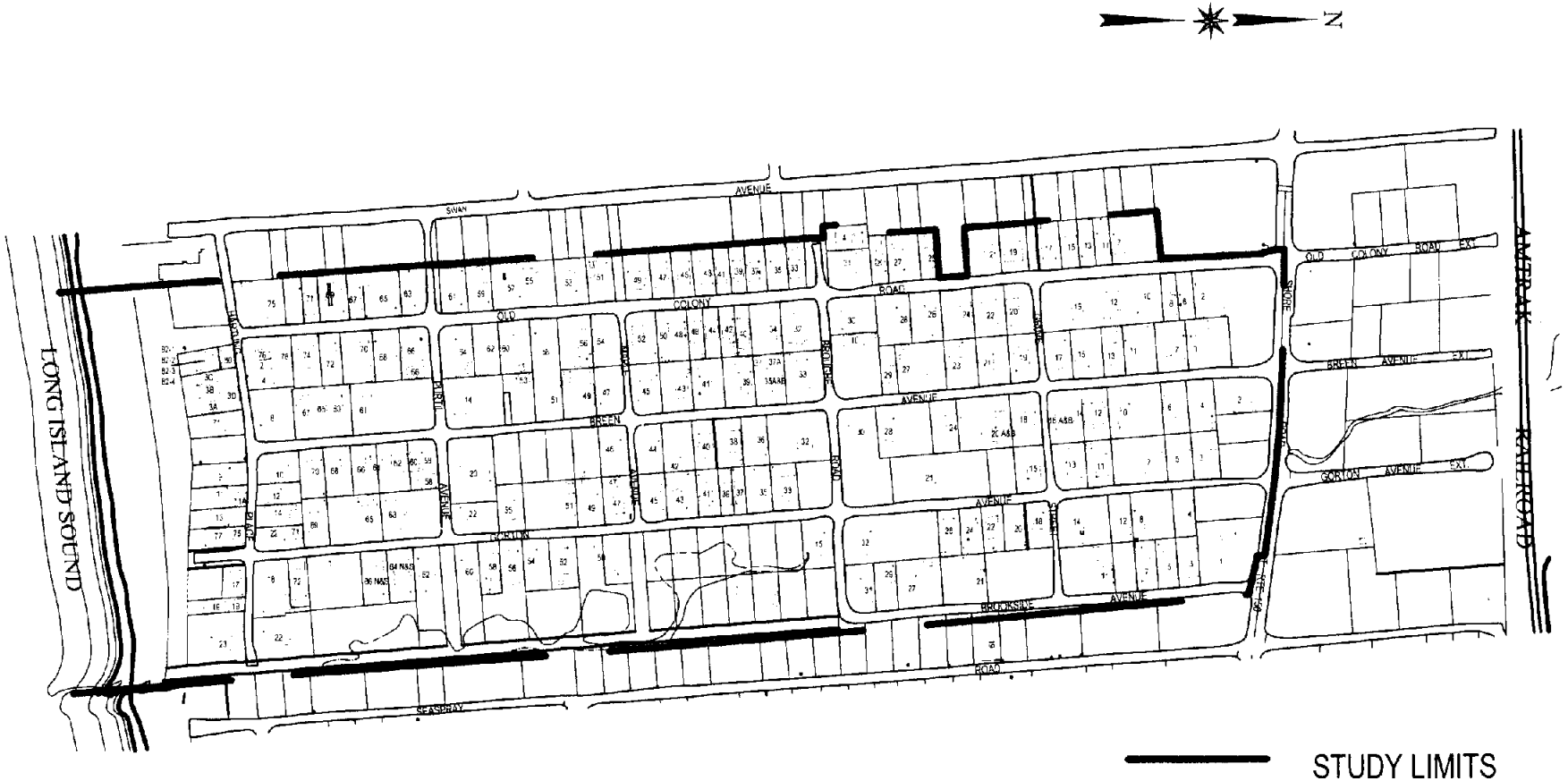
2.3 Planning Area

The planning area consists of the Old Colony Beach Club Association as shown on Figure 2.3.1. The limits of the Association are defined by Brookside Avenue to the east, Long Island Sound to the south, Old Colony Road to the west, and the Shore Road (Route 156) to the north.

The planning study area consists of the residential area defined by the Association that includes the following streets:

Planning Study Area

Breen Avenue
Brookside Avenue
Broughel Avenue
Gorton Avenue
Grove Street
Hartung Place
Maple Avenue
Old Colony Road
Purtil Avenue



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focus & perspective

STUDY AREA

The Old Colony Beach Club Association
P.O. Box 10 Old Lyme, CT

Date:	7/6/11
Scale:	1" = 300'
Drawn By:	RFP
Checked By:	RFP
Project No.:	2011.01

2.3.1

FIGURE NO.

3. WATER QUALITY CLASSIFICATIONS AND EFFLUENT LIMITATIONS

3.1 General

Surface and ground water quality standards have been adopted by the Connecticut Department of Energy & Environmental Protection (DEEP) to preserve and enhance the use of the State's waters for water supply, fish and wildlife propagation, recreation, and other activities. The standards for particular bodies of water and aquifers have been set to maintain or restore the water quality to a level commensurate with its use. The DEEP has classified each body of water according to its highest use, and applies the corresponding standards. The effluent limitations that apply to any existing or future wastewater discharges (either to surface or ground waters) have been developed by the DEEP to protect the existing or desired quality of the receiving waters.

Descriptions of the various water quality classifications and their corresponding standards are presented in Appendix A.

3.2 Water Quality Classifications

The Old Colony Beach Club Association is bounded on south by Long Island Sound. A small, unnamed watercourse originates north of the Amtrak ROW and flows in a southerly direction through OCBCA, and discharges to Long Island Sound at the eastern end of OCBCA. Long Island Sound along the OCBCA shoreline is classified by the Connecticut DEEP as a Class SA coastal and marine surface water and the unnamed watercourse is classified as a Class A inland surface water. For both water bodies, the "A" classification prohibits the discharge of treated municipal or industrial effluent.

For the purpose of this study, it should be noted that OCBCA is located east of the confluence of the Connecticut River with Long Island Sound. The Connecticut River is classified as Class SB and this classification partially extends into Long Island Sound at the point of confluence. Thus, the SB classification extends along the Old Lyme coast to a point approximately 2.5 miles from the centerline of the river (roughly coincident with the western end of the Hawkes Nest Beach neighborhood). This is significant because the DEEP permits the discharge of treated effluent to surface waters with a Class SB designation. Thus, any discharge of treated effluent to a surface water would be restricted to this location or westward.

Groundwater within the entire OCBCA community is classified by the DEEP as "Class GA, GAA - May not meet current standards". Both GA and GAA designations indicate that the water is presumed to be suitable for drinking or other domestic uses without treatment; however the notation "may not meet current standards" reflects the high density of development within the neighborhood and its possible impact on ground water quality. In general, GA areas may be suitable to receive subsurface discharges of domestic sewage, provided that the resulting ground water from the aquifer can comply with Drinking Water Standards without the need for treatment.

3.3 Effluent Limitations

There are no plans for effluent discharges from the project area to surface waters.

4. EXISTING CONDITIONS

4.1 Topography and Watersheds

The project area is characterized by gently sloping relief with elevations varying between 0 and 35 feet above mean sea level as shown in Figure 4.1.1.

The general drainage patterns in the study area are toward Long Island Sound and the brook that flows in a southerly direction through the central/eastern part of the neighborhood. The entire project area is in the Southeast Coast watershed.

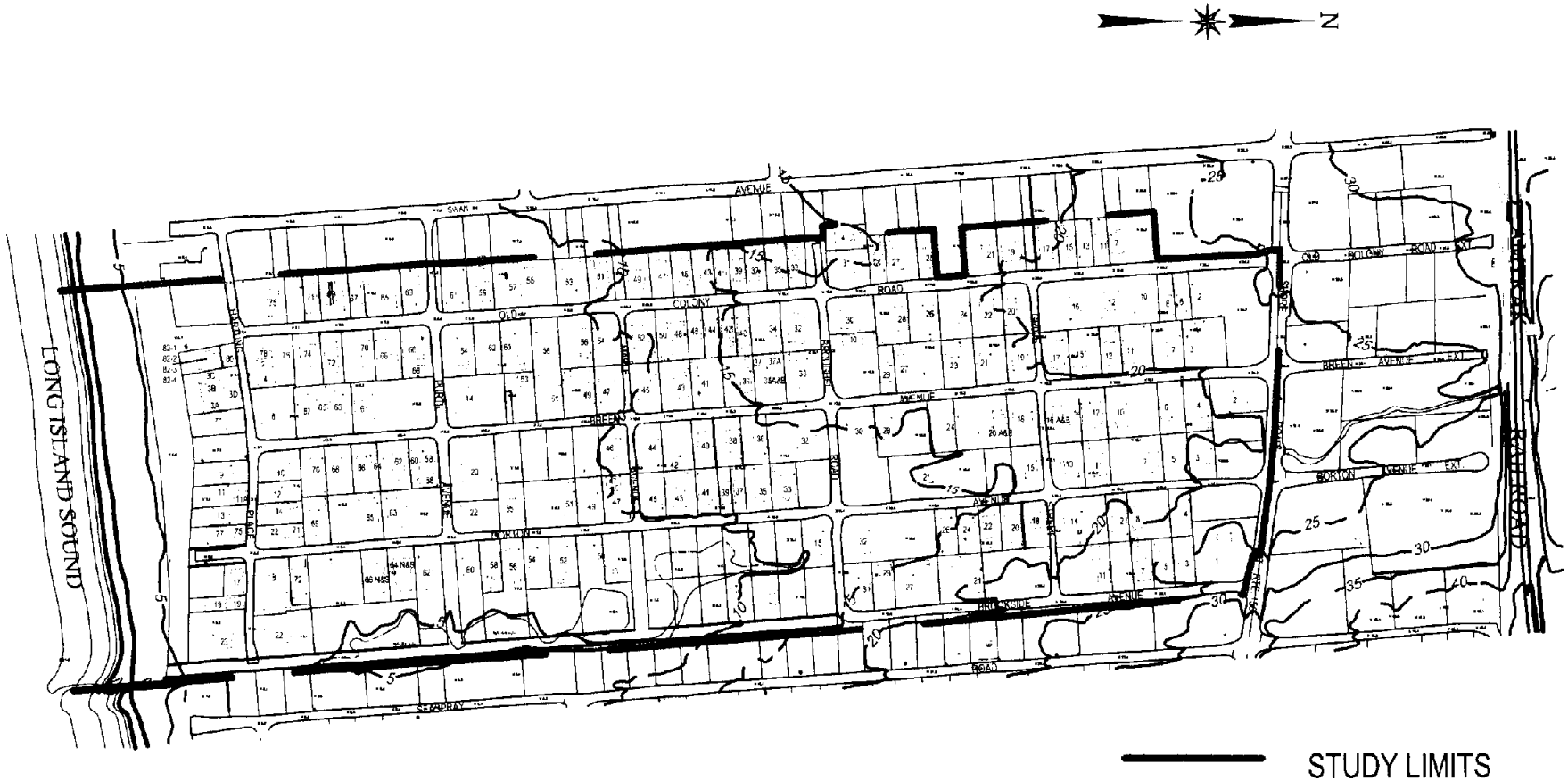
4.2 Surficial Geology and Soils

The U.S. Department of Agriculture Soil Conservation Service (SCS) has prepared mapping of soils in the region, including those found in the project area. Figure 4.2.1 depicts the soil types as within OCBCA mapped by the SCS and as shown in the Soils Survey of New London County, CT (1979).

According to the Soil Survey of New London County[1], the Old Colony Beach Club Association Property is predominately underlain by the following soil Series:

> **Haven Silt Loam (HcB).** This series consists of well-drained soils formed in sandy glacial outwash. They are gently-sloping soils on outwash plains, terraces and other glaciofluvial landforms. Slope typically ranges from 3 to 8 percent. Permeability is described as moderate in the surface horizon and subsoil (i.e., the A & B-horizons) and very rapid in the substratum. Typically, these soils have a dark brown silt loam surface horizon 7-inches thick. This horizon is commonly underlain by yellowish-brown silt loam subsoil extending approximately 20 to 36-

[1] Crouch, M.H. 1983. Soil Survey of New London County, Connecticut. U.S. Department of Agriculture, Soil Conservation Service in cooperation with the Connecticut Agricultural Experiment Station and the Storrs Agricultural Experiment Station. Sheet 90.



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EXISTING TOPOGRAPHY

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Date:	7/6/11
Scale:	1" = 300'
Drawn By:	RFP
Checked By:	RFP
Project No.:	2011.01

4.1.1

FIGURE NO.

Figure 4.1.2

inches below surface grade, and a yellowish-brown very gravelly sand to 60-inches and deeper.

The soils adjacent to the southerly flowing watercourse located in the southeastern section of the Old Colony Beach Club Association Property are identified as:

Tisbury Silt Loam (Ts). This series consists of moderately-well-drained soils formed in sandy glacial outwash. They are gently-sloping soils on outwash plains, terraces and other glaciofluvial landforms. Slope typically ranges from 3 to 8 percent. Permeability is described as moderate in the subsoil and very rapid in the substratum. Typically, these soils have a very-dark grayish brown silt loam surface horizon 8-inches thick. This horizon is commonly underlain by yellowish-brown "mottled" silt loam subsoil extending approximately 24 to 36-inches below surface grade, and a grayish-brown very gravelly sand to 60-inches and deeper. The Tisbury Silt Loam soil series typically exhibits a seasonal-high water table approximately 18-inches below surface grade.

Groundwater is relatively shallow throughout the study area. A total of 4 borings were advanced throughout the study area by hand auger to evaluate soil conditions and to determine seasonal groundwater elevations. Boring logs are presented in Appendix B.

4.3 Land Use and Zoning

Zoning for the study area is Residence R-10 District. This zoning district is a residential use district that requires a minimum lot size of 10,000 square feet, which is approximately 0.23 acres. Construction of most of the properties within Old Colony Beach Club Association predates zoning regulations and a very large majority of the properties do not conform to the minimum lot size.

The primary land usage within the study area is as seasonal single-family residential with the following exceptions:

- a synagogue
- rooming house
- multi-family structures
- condominium units
- the OCBCA beach

Data collected from the town assessor's office indicate that the average lot size for the properties within OCBCA is 5,227 square feet or 0.12 acres. Many lots measure only 0.06 acres (2,614 square feet). The standard deviation is 0.06 acre which indicates that property sizes are fairly uniform throughout the neighborhood. The database summary presented in Appendix C, which was compiled from a review of Old Lyme Health Department files, includes a listing of the lot size for each property as well as other pertinent data.

4.4 Water Supply and Quality

The entire study area is served by a public water supply system owned and operated by the Connecticut Water Company (CWC), which is available to all properties within the study area. Not all properties are customers of the public water system, however, and a small number continue to rely upon on-site wells for water supply. The water system provides water to customers on either a year-round or seasonal basis, depending upon the property's usage classification. Under an agreement between the Town of Old Lyme and CWC, the water company provides water to properties that are classified as "seasonal" only from between April 15st until November 15th. Individual services are turned off by the water company during the off season to prevent damage to equipment and services that are not frost protected. Customers with properties that are approved by the town for year-round occupancy are provided with water year-round. CWC's well fields that supply water to the distribution are located outside of the study area.

Recent water quality results from the public water supply serving Old Colony Beach Club Association have satisfactorily met the standards set by the Connecticut Public Health Code, Section 19-13-B102 (e), for bacteriological, physical, inorganic, organic, and radiological parameters.

On-site wells used for water supply are not subject to regular testing and it is incumbent upon each property owner to arrange for sampling and testing of their well. Aside from four wells that were tested as part of this study's water quality testing program (discussed later in this chapter), no recent analytical results of private well water quality were available for review.

4.5 Existing Wastewater Conveyance and Treatment Facilities

There are currently no wastewater conveyance or treatment facilities within the immediate project area. The nearest sanitary sewers exist in Point O'Woods, a private beach association located in Old Lyme approximately 1 mile east of OCBCA along Route 156. Sewers were installed in Point O'Woods in 2010 as part of a separate project funded in part by the DEEP. The Point O'Woods sewer system conveys wastewater to the existing sanitary sewers located in the Town of East Lyme. Sewers in East Lyme are part of a regional sewer system that serves the towns of East Lyme and Waterford and the city of New London. All sewage collected by the regional system is treated at the Piacenti wastewater treatment facility located in New London, which discharges treated effluent to the Thames River near its confluence with Long Island Sound.

4.6 Existing Wastewater Management

All of the properties within the project area are currently served by on-site sewage disposal systems. Systems are either septic tank with some form of leaching system or

cesspools. The Town of Old Lyme Health Department and the State of Connecticut Public Health Code presently govern the use of on-site systems. Due to site constraints and small lot sizes, systems in many cases are "shoehorned" into the only available space on the lot and most of the on-site systems do not maintain the required separation distances from adjacent water supply wells, watercourses, property lines and groundwater. In addition, leaching fields associated with most of the systems have less than the required amount of effective leaching area-. Given the small lot sizes, system repairs are often a case of "what can be squeezed in" as opposed to "what is required".

Subsurface disposal systems rely upon the soil to renovate the septic tank effluent before it reaches the groundwater. In the case of a conventional septic system consisting of a septic tank and some form of leaching trench, solids and floatable material are removed by a series of baffles in the septic tank and the liquid wastewater is discharged to the leaching system for renovation and disposal. As the septic system is used, a "biomat" (sometimes referred to as the "slime zone") forms at the bottom of the leaching trench where the septic tank effluent is introduced into the soil that consists of naturally occurring bacteria. These bacteria "digest" the nutrients in the wastewater (with the exception of nitrogen) to purify the wastewater as it percolates down through the biomat and soil. In addition, chemical reactions between some of the constituents in the wastewater and minerals in the soils also occur to polish the wastewater. It is important that there be sufficient distance between the bottom of the trench and the surface of the groundwater table to provide enough time for the biologic activity to fully renovate the wastewater. Once it reaches the groundwater table, biological activity essentially ceases and any untreated nutrients remain and are transported by the groundwater. For most soil conditions, the Connecticut Public Health Code requires that there be a minimum separation distance of 18 inches between the bottom of the leaching trench and the seasonal high water table. In cases where soils are extremely porous (percolation rates faster than 1 minute/inch) the separation distance is increased to 24 inches.

Cesspools are a cruder form of wastewater disposal. By contrast to septic systems, cesspools usually do not have leaching systems associated with them and, therefore, require much less space than a conventional septic system. A typical cesspool consists of a vault dug into the ground with a cover set flush with grade. The cesspool can be of any volume, but most of the units in use at Old Colony Beach range in volume from 500 - 1,000 gallons. Similar to a septic tank, the house plumbing is connected directly to the cesspool. The walls (and sometimes the bottom) of the cesspool have openings that are small enough to retain solids while allowing liquids to seep through into the adjoining soils. The simplest cesspools are often built from common rocks which, when stacked to form the walls, provide the openings needed to pass the liquids. As with the leaching trench system described earlier, a biomat forms at the soil/wastewater interface and the effluent is renovated by bacteria in the soil. Cesspools are typically installed deeper than leaching trenches since they provide both solid retention and leaching functions simultaneously and require enough volume to operate properly.

Cesspools are not allowed under the current public health code, however installations that predate the health code are considered to be grandfathered until they either fail or a health hazard occurs. Given the small lot sizes in Old Colony Beach, it is not surprising to find that a number of properties still use this form of wastewater disposal. Their continued presence also is indicative of the age of the systems in the neighborhood.

The soil types located within Old Colony Beach are highly transmissive from a hydraulic standpoint and are capable of passing large volumes of wastewater from on-site disposal systems but not likely to exhibit a percolation rate faster than one minute/inch. Due to the presence of shallow groundwater throughout much of the neighborhood, however, many systems are installed without the requisite separation distance between the disposal system and groundwater and, as a result, incomplete renovation occurs.

In general, the existing septic systems serving the dwellings within Old Colony Beach are considered to be antiquated and do not meet the minimum requirements established by the State Public Health Code. These minimum requirements are intended to protect public health and provide adequate treatment of sanitary wastewater. A development of this size and density, relying on septic systems, would not be allowed today.

4.7 Sanitary Survey Results

Sanitary surveys were conducted in the August of 2011 on all properties within Old Colony Beach. A sanitary survey is an inspection of a property to determine the existing physical conditions of the property and the apparent operating status of the on-site disposal system.

A typical survey consists of first obtaining property owner information, such as the number of occupants, the age of house and disposal system, the location of any water supply wells, the frequency of septic tank pumping, etc. The inspector then walks the property to observe and note any physical conditions that may indicate that the disposal system is stressed or malfunctioning such as pervasive odor, lush growth in the area of the disposal field, or water rising to the surface of the ground. In addition, limiting physical conditions that could interfere with the operation, repair or replacement of the disposal system are also noted. These may include such features as steep slopes, shallow or outcropping bedrock, shallow ground water, close proximity to water bodies or wetland areas, and limited available area. Each surveyed property is then classified as either Failing, Marginal, Suspect, or No Problem Detected.

A malfunctioning or "Failing" septic system is indicated by the notation of any of the following individual or combined observed or reported phenomena:

- Overflow to the ground surface

- Discharge to storm drain or watercourse
- Plumbing backup or problems reported
- Greywater (laundry) discharge to the ground
- Characteristic color and/or odor

"Suspect" septic systems are those that exhibit symptoms of imminent failure and are important to the sanitary survey analysis. A "Suspect" system is one that exhibits features indicating that it has either failed in the past or is on the verge of failing. The symptoms of a suspect system include:

- Saturated leaching area
- Heavy green growth
- Past failure indicated
- Odor in disposal area or catch basin
- Suspicious discharge piping
- Frequent pumping reported.

It is important to note that both the "Failing" and "Suspect" designations rely entirely upon characteristics observable from the ground surface or reported hydraulic problems. They do not consider the subsurface operational characteristics of the systems. Therefore, systems may be still failing or suspected of failing even without overt symptoms.

A "Marginal" lot is a property with an on-site system that is operating properly and is not exhibiting signs of operational stress; however, the property possesses physical constraints that could potentially limit the ability to repair or replace the system in accordance with the Public Health Code requirements. These physical constraints would include such phenomena as small available area; shallow ground water table (less than 3' below grade); extensive bedrock outcropping; steep slopes; adjacent wetlands, watercourse or ponded water less than 25' from the property line; adjacent well less than 75' from the property line; or an underdrain or sump pump discharge.

Systems classified as "No Problem Detected" are those systems that do not possess any of the characteristics of the three preceding classifications. There is adequate

room on the site for the system, it is properly sited and apparently functioning satisfactorily under the prevailing conditions without significant limitations.

Each property surveyed receives only one of the preceding four assessment designations, despite the total number of comment characteristics noted. The most severe characteristic noted on a given property dictates the overall assessment. Thus, properties that receive a "Failing" assessment may also exhibit "Suspect" or "Marginal" features as well. By contrast, properties classified as "No Problem Detected" do not exhibit any limiting comment characteristics.

Sanitary surveys were conducted in the field from August 1-12, 2011. The sanitary surveys included inspection of all but two of the properties located throughout the entire Old Colony Beach area (the two properties not surveyed were occupied by renters at the time of the survey and the occupants were not comfortable allowing access to the property without specific permission from the property owner). For each property inspected, questionnaires were completed if an occupant was present and a site sketch was prepared showing the layout of the lot including any restrictions for on-site septic systems. Data were recorded concerning the characteristics of each property such as lot size, slopes, presence of ledge-rock, and any evidence of failing on-site sewage disposal systems.

None of the properties surveyed were identified as "Failing" and only two properties were deemed to be "Suspect". Absent information about local soil conditions, these results would be considered to be lower than expected. Generally, one would expect to observe a "Failure" rate of between 3%-5% of properties in an older neighborhood such as this and a "Suspect" rate of up to 15%-20% of all properties. However, given the hydraulic conductivity of the local soils, this lower-than-expected incidence of observable failing and suspect systems is believed to be the result of the ability of the soils to accept wastewater at an uninhibited rate that does not cause a

backup or a breakout to the ground surface. As a result, system do not exhibit observable problems and appear to be working well.

It is also important to note that the vast majority of the properties have little or no available area for future repairs to on-site sewage disposal systems. A significant number of lots have been developed with more than one cottage on the property and of those properties with only one dwelling unit, the footprint of the building itself often occupies most of the lot leaving little room for the subsurface disposal system.

Sanitary surveys were conducted between 9AM and 4PM on Mondays through Fridays (weather permitting, no weekends). Notably, in the majority of cases, occupants were not present at the house at the time the property was surveyed. While in some cases, the occupants were possibly away on errands or at the community's beach, a large number of the properties did not appear to be occupied at all during the week. This was confirmed by the president of the Association who indicated that a large number of property owners only occupy their properties on weekends and holidays. This type of usage would obviously reduce the quantity of sewage generated community-wide and, as such, minimize pressure placed on existing on-site systems.

The results of the sanitary surveys are summarized and presented in Table 4.7.1. More detailed sanitary survey results for each property inspected in the field are presented in the database summary contained in Appendix C. A sample sanitary survey inspection form is also included in Appendix C.

The sanitary survey results indicate that of the 217 properties surveyed, none were classified as "Failure". Additionally, only 1% were classified as "Suspect", 93 % were classified as "Marginal", and 6% were classified as "No Problem Detected".

Table 4.7.1

Old Colony Beach Club Association
RESULTS OF 2011 SANITARY SURVEY

FAILURE					SUSPECT							MARGINAL							NPD	
Breakout	Disch. To CB	Disch. To Watercourse/CB	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted
							2					144	75		11	28	8		2	10

OVERALL SUMMARY

CLASSIFICATION	NUMBER	PERCENT
FAILURE	0	0
SUSPECT	2	1
MARGINAL	159	93
NO PROBLEM DETECTED	10	6

When evaluating sanitary survey data, two criteria are generally used to determine if existing conditions indicate that a problem exists with the use of on-site septic systems. These criteria are as follows:

if the number of failing properties ≥ 5% **or**

if the number of suspect properties ≥ 20%

As shown on Table 4.7.1, the data collected for the properties surveyed in Old Colony Beach indicate that the criterion for failing properties and the criterion for suspect properties were not exceeded. Thus, data obtained from the sanitary surveys were not indicative of widespread problems with on-site septic systems in Old Colony Beach. This finding may be attributed to reduced water usage associated with a seasonal cottage lifestyle. Most of the properties surveyed had outside showers and evidence suggests that the showers are used regularly. In addition, most people surveyed indicated that laundry was not done on the premises. The general sense from interviews with occupants is that water usage is rigorously restricted to minimize problems associated with on-site septic system.

Field observations and interviews with property owners also indicate that many and perhaps most of the subsurface disposal systems are what were originally installed when the cottage was built on the property. These systems predate the public health code and were constructed without any standards. Their longevity is largely attributed to the hydraulic conductivity of the soils in the area.

Finally, the Town of Old Lyme implemented a mandatory septic tank pumpout program several years ago and, with few exceptions, properties within Old Colony Beach have been complying with program requirements. This required maintenance is regarded as beneficial to the operation of disposal systems at Old Colony Beach.

4.8 Water Quality Sampling

A water quality sampling program was conducted in August of 2011 to evaluate impacts of existing wastewater disposal systems on existing ground and surface waters. The program involved the collection of water samples from surface waters, private wells, catch basins and a groundwater sump pump throughout the neighborhood and laboratory analysis of the samples for parameters that would indicate the presence of partially treated sewage. Figure 4.8.1 presents a map showing the sampling locations.

Ground water samples were analyzed for the following parameters: nitrate, nitrite, TKN, ammonia, total nitrogen, and the presence of bacteria (E. coli, and total coliform). Exceedence of the listed threshold values for these parameters can be indicative of wastewater from on-site septic systems entering the shallow ground water table without complete renovation. Analytical results are presented in Table 4.8.1

Well samples were collected in one of two methods. If the well was active, a sample was collected via an outside faucet. If the well was inactive, a grab sample was collected by lowering a collection device into the well. With the exception of sample OCB-W3, detectable concentrations of one or more test parameters were found in all but one of the five well samples collected. Nitrite was below laboratory detection limits in all wells sampled. All samples with the exception of OCB-W3 contained one or more test parameter that exceeded threshold values and indicative of impacts from human activities. Only one of the wells (OCB-W5) is currently being used for potable water supply.

Surface water samples were collected from the brook that runs through Old Colony Beach at three different locations. Sample OCB-S1 was collected at a point along the south side of Shore Road where the brook enters the culvert before entering Old Colony Beach. The second sample was collected at the point on the south side of

TABLE 4.8.1

WATER QUALITY MONITORING RESULTS
OLD COLONY BEACH CLUB ASSOCIATION
OLD LYME, CONNECTICUT

August 2011

PRIVATE WELLS

Parameter Units	Nitrate mg/L	Nitrite mg/L	TKN mg/L	Ammonia mg/L	E.Coli #/100mL	Total Coliform #/100mL
Threshold Value	**3.5**	**0.5**	**0.5**	**0.5**	**1.0**	**1.0**
OCB W-1						
8/18/2011	3.5	<0.01	**6.1**	**5.8**	**>1,000**	**>2,000**
OCB-W2						
8/22/2011	**7.1**	<0.01	**1**	0.04	<10	**40**
OCB-W3						
8/22/2011	<0.05	<0.01	0.18	0.06	<10	<10
OCB-W4						
8/22/2011	**4.5**	<0.01	0.4	<0.02	<10	**50**
OCB-W5						
8/22/2011	1.6	<0.01	**2.1**	0.32	**>60**	**>2,000**

GROUNDWATER SUMP PUMP DISCHARGE

Parameter Units	Nitrate mg/L	Nitrite mg/L	TKN mg/L	Ammonia mg/L	E.Coli #/100mL	Total Coliform #/100mL
Threshold Value	**3.5**	**0.5**	**0.5**	**0.5**	**1.0**	**1.0**
OCB GW-1						
8/18/2011	**7.6**	0.04	**1.8**	0.47	**20**	**610**

SURFACE WATER

Parameter Units	Nitrate mg/L	Nitrite mg/L	TKN mg/L	Ammonia mg/L	E.Coli #/100mL	Total Coliform #/100mL
Threshold Value	**3.5**	**0.5**	**0.5**	**0.5**	**1.0**	**1.0**
OCB S-1						
8/18/2011	0.79	<0.01	**0.65**	0.04	**520**	**>2,000**
OCB S-2						
8/18/2011	1.8	<0.01	**0.69**	0.17	**300**	**>2,000**
OCB S3						
8/18/2011	2.4	<0.01	**0.82**	0.1	**30**	>2000

CATCH BASINS

Parameter Units	Nitrate mg/L	Nitrite mg/L	TKN mg/L	Ammonia mg/L	E.Coli #/100mL	Total Coliform #/100mL
Threshold Value	**3.5**	**0.5**	**0.5**	**0.5**	**1.0**	**1.0**
OCB CB-1						
8/18/2011	3.5	0.02	**3.3**	0.44	**30**	**>2,000**
OCB-CB2						
8/18/2011	<0.05	<0.01	**2.8**	**1.5**	**70**	**>2,000**
OCB-CB3						
8/18/2011	3.1	<0.01	**5.3**	**3.1**	**>1000**	**>2000**
OCB-CB4						
8/18/2011	0.41	0.03	**4.2**	**3.4**	**110**	**>2,000**
OCB-CB5						
8/22/2011	1.6	<0.01	**2.1**	0.32	**>60**	**>2,000**

2.1 Result above "Threshold Value". Considered high relative to expected background levels and indicative of impacts due to human activity.

Broughel Road where the culvert discharges to the surface. The third sample was collected from the brook at the end of Purtil Avenue, upstream of the point where storm drains discharge to the brook.

The surface water samples were analyzed for the following parameters: nitrate, nitrite, TKN, ammonia, total nitrogen, and the presence of bacteria (E. coli, and total coliform). Exceedence of the listed threshold values for these parameters can be indicative of wastewater from on-site septic systems entering the surface water body without complete renovation. Analytical results are presented in Table 4.8.1. Note that surface water quality testing is seldom used as a stand-alone test to determine the existence of a pollution problem from on-site systems.

Other factors, such as animal waste (in particular from geese and other waterfowl) and storm drainage runoff, can affect testing results. These factors can have a significant impact on readings for indicator bacteria such as fecal coliform, fecal streptococcus and fecal enterococcus. The surface water quality testing was conducted in conjunction with the ground water quality testing and the sanitary surveys in an effort to obtain an overall picture of existing conditions.

Elevated levels of nitrogen compounds including nitrate, ammonia, and TKN were found in all three samples collected as well as high concentrations of E. Coli and total coliforms. The concentration of TKN exceed the threshold value in all three surface water samples and was found in progressively increasing concentrations in downstream samples, suggesting impacts from activities in Old Colony Beach. This similar trend was also noted with nitrate concentrations. Sample OCB-S1, which is considered to reflect background conditions of the stream as it enters Old Colony Beach, indicates that water quality is impacted prior to entering the neighborhood.

Because of shallow groundwater levels, many of the storm drains contained flowing water at the time that samples were collected despite the absence of a recent storm event. Water levels in storm drains in the vicinity of Purtil Avenue varied and reflected tidal activity. A total of five grab samples were collected of water flowing through various catch basins throughout the neighborhood and were analyzed for nitrate, nitrite, TKN, ammonia, total nitrogen, and the presence of bacteria (E. coli, and total coliform). Concentrations of one or more of the test parameters exceeded threshold values in each of the samples collected and bacteria levels were high in all samples. The total nitrogen concentrations were elevated in all samples collected and ammonia exceeded threshold values in three of the samples (OCB-CB2, OCB-CB3, and OCB-CB4). Sample OCB-CB3 was collected from a catch basin that was also receiving groundwater from a sump pump discharge. A sample of the discharge from the sump pump was sampled separately as sample OCB-GW1 and the analytic results are shown in Table 4.9.1.

In conclusion, the results of the water quality sampling program indicate the presence of incomplete wastewater treatment throughout the study area.

4.9 Pollutant Renovation Analysis

As part of the evaluation of existing conditions within the Old Colony Beach area, RFP Engineering performed a pollutant renovation analysis of a typical, individual property within the study area and of the Association property as a whole. The main purposes of these analyses are to evaluate the ability of on-site systems to fully treat nitrogen, one of the primary pollutants found in wastewater, and achieve pathogen die-off under prevailing site and soil conditions. The pollutant renovation analysis consisted of computing the concentration of nitrogen discharged to Long Island Sound from the community as a whole, the concentration of nitrogen discharged from a typical lot within the study area, the minimum lot size required to ensure that nitrogen is diluted to below

the drinking water standard of 10.0 mg/l prior to crossing the property line, and the minimum required distance down-gradient from a typical property to ensure adequate pathogen die-off.

Nitrogen, a primary constituent found in septic tank/cesspool effluent at a concentration of approximately 35 mg/l, is not treated by a conventional subsurface disposal system. Consequently, dissolved nitrogen passes through the soil interface and into the groundwater with little to no reduction in concentration. The public health code requires, however, that nitrogen be reduced to less than 10 mg/l, which is the maximum concentration allowed under the state's drinking water standards before it leaves a property. In order for this to occur, it must be diluted by rainfall to reduce its overall concentration. As properties diminish in size, the amount of rainfall available for dilution also diminishes which raises the overall concentration of nitrogen in the discharge.

To compute the concentration of nitrogen discharged to Long Island Sound from the community as a whole, a similar calculation is performed. This computation is based upon the design wastewater flow for the entire study area, the rainfall available for dilution, and the mass loading of nitrogen from the wastewater based upon flow from the entire neighborhood. The analysis determined that the concentration of nitrogen being discharged to Long Island Sound is 14.1 mg/l. This is well above both the state drinking water standard of 10.0 mg/l and the maximum surface water background concentration, which is less than 1.0 mg/l. Nitrogen is the main nutrient of concern affecting Long Island Sound water quality. These computations are presented in Appendix E.

The concentration of nitrogen discharged from a typical lot within the study area was also calculated. A representative lot within the study area was used for this analysis with an area equal to the average lot size within OCBCA (0.12 acre) property. The wastewater flow generated from the dwelling on this property was assumed to be equal to the average daily flow from a single dwelling unit, 244 gallons per day. As in the preceding computation, using the design wastewater flow for the property, the rainfall

available for dilution on the property, and the mass loading of nitrogen from the wastewater, the concentration of nitrogen discharged from the property is computed to be 19.1 mg/l. Again, this is well above the state drinking water standard of 10.0 mg/l. These computations are presented in Appendix E.

The minimum lot size needed to dilute the concentration of nitrogen from wastewater from an on-site septic system to below the drinking water standard of 10.0 mg/l was also computed. An allowable nitrogen concentration of 9.9 mg/l was used for this analysis as well as a wastewater flow of 244 gpd, which is the average daily flow generated from a typical dwelling in the study area. Using the design wastewater flow, the mass loading of nitrogen from the wastewater, and the average annual rainfall for the area, the minimum required lot size was computed to be 0.24 acres. By way of example, the computed lot size is 2 times larger than the average lot found in Old Colony Beach. Stated differently, 92% of the properties in Old Colony Beach do not meet this criterion. This computation is shown in Appendix E.

The minimum required distance down gradient from a typical property needed to provide adequate pathogen die-off was also computed. This analysis looked at the distance required to achieve the minimum 21-day bacteria travel time from a leachfield to the closest property line. A representative lot within the study area was used for this analysis. A typical lot measuring 50' x 100' was used for this calculation and an average hydraulic gradient of 0.01 ft/ft (equal to the average gradient of the land). Using the design wastewater flow for a single dwelling, the porosity of the soils in the area, the assumed hydraulic gradient of the ground water table and the hydraulic conductivity of the soil in the area, the ground water velocity was computed. Based on this ground water velocity, the minimum distance required to provide 21-day travel time was calculated to be 70 feet. To satisfy the above requirement for pathogen die-off, a minimum lot size of 0.25 acres would be required for this lot configuration. This computation is shown in Appendix E.

This pollutant renovation analysis shows, among other things, that due to the density of development in the study area, maximum allowable nitrogen concentrations are currently exceeded and pathogenic bacteria die-off criteria are not being met. This is contributing to surface and ground water degradation in the Old Colony Beach area. The excessive nitrogen loading to Long Island Sound is a contributing factor in the eutrophication of this water body.

4.10 Existing Conditions: Summary and Conclusions

The study area was evaluated for its ability to adequately support on-site wastewater disposal. Data from the sanitary surveys, previous studies, water quality sampling, Assessor's records, Health Department records, and the *New London County Soil Survey* were collected and analyzed. The data and analyses indicate that the study area cannot adequately support on-site wastewater disposal as a long-term viable method of wastewater management.

In general, physical conditions within Old Colony Beach do not allow for adequate wastewater treatment and disposal within the study area. Such conditions include soil type and characteristics, shallow depth to ground water, small lot sizes, small available area for repairing or replacing septic systems and cesspools, the inability to satisfy the minimum setback from water supply wells and property lines as required by the Public Health Code, and the proximity of Old Colony Beach to Long Island Sound. Of significant concern are the numerous instances where on-site wells are in close proximity to septic systems and the resulting inability for on-site systems to fully renovate wastewater.

The results of the pollutant renovation analysis performed for Old Colony Beach as a whole and for a typical lot within it indicate that the discharges from existing septic systems are currently causing the discharge of nitrogen to local groundwaters and Long

Island Sound and at a rate far greater than that which is allowed by state water quality standards.

5. SCREENING AND EVALUATION OF WASTEWATER MANAGEMENT ALTERNATIVES

5.1 Overview

The results of the evaluation of existing wastewater management methods and concerns within the Old Colony Beach Club Association boundaries are presented in Chapter 4. It was determined that the entire Old Colony community is an area of concern relative to the impact of existing wastewater management practices on the water resources in the area.

As discussed earlier, the setting in the Old Colony community consists of 217 dwellings (primarily seasonal and year-round cottages and condominiums) on parcels with an average lot size of approximately 0.12 acres, or 52% of the minimum land area required by existing zoning regulations and only 36% of the DEP's minimum criteria of one-half acre for properties with on-site disposal. The majority of the properties are served by a public water supply system owned and operated by the Connecticut Water Company (CWC). Under an agreement with the Town of Old Lyme, CWC provides water on a year-round basis only to those properties that have been approved by the Town for year round provided that the building's plumbing meets with CWC's requirements. All other customers are provided water on a seasonal basis (April 15th through November 15th) to properties deemed to be "seasonal" by the Town. Approximately 53 properties have a private water supply well although most of these wells are no longer in use and the properties are now connected to the public water system. Plumbing for properties of CWC customers with active wells are fitted with a backflow prevention device, which are regularly inspected by CWC to eliminate possible cross-contamination.

The topography varies from flat to gently sloping, generally from north to south towards Long Island Sound. A small brook, a portion of which has been encased in a

RCP culvert, traverses the neighborhood from north to south. Groundwater is generally shallow across the entire neighborhood and becomes increasingly shallow towards the brook and Long Island Sound. Shallow groundwater hampers many on-site wastewater disposal systems' ability to fully renovate wastewater. The very small lot sizes together with the natural resource features within Old Colony Beach are not conducive for the proper operation of conventional, code conforming, on-site sewage disposal systems.

A groundwater and surface water sampling and analysis program was conducted at various monitoring points within the community and at various surrounding surface water locations. The laboratory results indicated high levels of bacteriological contamination at several of the sampling points and traces of nutrients that are indicative of incomplete wastewater treatment.

In addition to the physical surveys, sampling and laboratory analysis, an analytical renovation analysis was performed to determine the fate of bacteria and nitrogen compounds discharged from the existing individual on-site sewage disposal systems. This analysis shows that, for the majority of properties, the required criteria for bacteria die-off and nitrogen dilution required by the state water quality standards cannot be achieved in the existing Old Colony Beach setting.

Sanitary surveys were conducted on all of the Old Colony Beach properties. While the surveys did not reveal overt failures of existing on-site sewage disposal systems, it has been determined that the nitrogen and bacterial constituents of the wastewaters are not being managed in accordance with the standards of the Department of Environmental Protection.

Because of these findings, a number of strategies, alternative technologies and management practices have been screened for technical feasibility, regulatory and public acceptance, and cost effectiveness. Alternatives evaluated for Old Colony Beach include the following:

1. No further action, and continued reliance on existing subsurface disposal systems for wastewater treatment and disposal.

2. Upgrading or reconstruction of existing, individual on-site subsurface sewage disposal systems on individual lots;

3. Upgrading to alternative, innovative and higher technology treatment and subsurface sewage disposal systems on individual lots;

4. Providing a community sewage collection system within Old Colony Beach to convey the wastewater to a sewage treatment plant located on a remote site outside the boundaries of the Association for treatment and subsurface disposal of the treated effluent;

5. Providing a community sewage collection system within Old Colony Beach and a conveyance system to a connection point in the existing East Lyme sanitary sewer system that conveys sewage through the Waterford and New London systems for treatment at the New London regional sewage treatment facility.

5.2 Collection and Treatment Alternatives

5.2.1 No Action Taken

The comparatively low incidence of failing and suspect on-site wastewater disposal systems observed within Old Colony Beach during the sanitary surveys conducted in the summer of 2011 gives the appearance that the current method of wastewater disposal is satisfying the needs of the community. However, as demonstrated in Chapter 4, the lack of observable problems belies the true condition, which is that partially treated wastewater from the 217 homes in the community results in the discharge of excessive amounts of nutrients to Long Island Sound and the brook. It is likely that factors such as favorable soils, water conservation measures practiced by occupants, the intermittent (weekend)

and seasonal use of many properties, together with the comparatively low per household occupancy rate probably contribute to the lower-than-expected rate of failing septic systems.

If allowed to continue, there is little reason to expect that conditions would improve. Many/most of the subsurface systems have already surpassed their expected life and local health officials face extreme difficulties trying to effect repairs on the majority of the small lots. Repairs that are made usually must compromise the amount of leaching structures that can be installed, thereby constricting the hydraulic capacity of the system. Most of the residents interviewed during the sanitary survey acknowledge the need to practice some form of water conservation and forego the use of water consuming devices such as dishwashers and washing machines. Virtually every property surveyed has some form of outdoor shower that is not connected to the subsurface disposal system, and many of them were clearly being used as the primary showering device for the cottage.

It is important to note that the Nitrogen Loading Analysis performed for Old Colony Beach (see Chapter 4 for discussion) indicates that the community as a whole discharges nitrogen at a concentration of 14.1 mg/l to both the brook and Long Island Sound. This is greater than the maximum concentration of nitrogen allowed to be discharged to surface waters by current standards. Furthermore, the analysis also demonstrated that a typical property within the association can only reduce the concentration of nitrogen in groundwater to 19.1 mg/l at the point where it leaves the property. Because the quantity of nitrogen that is discharged from the area is a direct function of the density of development, the continued use of septic systems in the area will only serve to perpetuate and exacerbate these discharges.

5.2.2 On-Site Alternatives

5.2.2.1 Conventional Septic Systems

A great deal of work has been done over the years to evaluate and improve the existing on-site disposal systems in an effort to maintain these individual systems as a viable wastewater management program for the community. Recently, the Town of Old Lyme Water Pollution Control Authority announced its intent to establish a new ordinance that would require all subsurface disposal systems within Old Lyme to be upgraded to meet certain minimum standards, including the elimination of cesspools. Such an ordinance was of particular concern to the residents of Old Colony Beach because no study had been conducted to determine the cost or feasibility of such upgrades or even if they were technically feasible in high-density beach neighborhoods.

As mentioned previously, the average lot size in Old Colony Beach is 0.12 acres. It is not possible to upgrade or reconstruct systems on this size of a lot to meet all of the criteria of the Public Health Code or the State Water Quality Standards as they are currently written. For example, typical properties within Old Colony Beach measure only 50'x100'. In a neighborhood with a cluster of lots this size, it is impossible to install wells that respect the public health code's required minimum separation distance of 75' between it and the nearest septic system. In most cases, system repairs would require waivers for property boundary and building setbacks and leachfield system sizing. Most of the existing on-site sewage disposal systems in Old Colony Beach were constructed for use with a seasonal cottage and are considered substandard today.

For seasonal cottages, the leachfield is "rested" for a good portion of the year which causes the restrictive biomat - the biological growth that is established at the bottom of the leaching trench - to break down during the off-season. This breakdown allows the mat to accept septic tank effluent at a higher-than-normal rate during the spring and early summer, as compared with systems that are used on a year-round basis, until the bio-mat is fully re-established. This, together with highly conductive soils, may explain why many of the undersized systems in Old Colony Beach continue to function hydraulically. It is likely that if a significant number of homes in the Old Colony Beach area were converted from seasonal to year-round usage, system problems would increase.

The Connecticut Public Health Code includes certain design criteria for household subsurface sewage disposal systems that are intended to ensure that systems function properly and provide a high degree of water quality protection. The most important of these criteria, in terms of water quality protection, include the requirements that the base of a leachfield system be situated at least 18 inches above the average seasonal high groundwater table and at least 4 feet above bedrock. These minimum separation distances are required since it is the soil, in an aerobic (oxygen rich) environment with the presence of beneficial bacterial types, that provides the bulk of septic tank effluent renovation. The Health Code also requires that the soils surrounding a subsurface sewage disposal system have adequate hydraulic capacity to accept the quantity of wastewater discharged, so that premature surfacing or breakout of effluent does not occur. It is well documented in the literature and from field investigations that groundwater pollution by bacteria, virus and ammonia compounds occurs when leachfield systems are set on bedrock or in close proximity to, or within groundwater.

Another type of groundwater pollution can occur even when systems are constructed in favorable soils and situated well above the groundwater table. This type of pollution is caused by excessive concentrations of nitrogen compounds. The drinking water standard for combined nitrate and nitrite forms of nitrogen (aerobic oxidized forms of nitrogen in highly treated wastewater) is 10 milligrams per liter (mg/l). Typical domestic sewage contains approximately 40 mg/l of nitrogen. Small percentages of nitrogen are removed by the combined actions of the septic tank and leachfield system. The balance of the nitrogen is discharged into the groundwater and is reduced in concentration primarily by dilution from infiltrating rainfall. Groundwater nitrogen concentrations must meet the nitrogen standard before the groundwater is intercepted by a water supply well, crosses the property line or is discharged to a surface water. In the end, the concentration of nitrogen in groundwater is dependent upon the overall density of housing, the amount of dilution area available for infiltrating rainfall, the quantity of waste discharged and the duration during the year in which wastewater is discharged.

The effluent from conventional septic systems on the very small, existing lots cannot be renovated adequately to meet established nitrogen reduction and bacterial die-off standards. On lots as small as those found in Old Colony Beach, nitrogen concentrations in the groundwater flowing from a typical lot can be shown to be in excess of 10 mg/l. Insufficient bacteria die-off also occurs on these small lots. Both of these effluent parameters violate the standards of the DEP.

Conventional on-site systems are therefore not considered to be feasible as a long-term method of wastewater management in the Old Colony Beach community.

5.2.2.2 Innovative/Alternative Treatment Systems

There are many wastewater treatment systems on the market that are designed to offer innovative and alternative ways to improve effluent quality emanating from individual houses or groups of houses. Typically the objective of these systems is to improve the water quality being discharged in order to reduce leaching system requirements. In many cases this objective is met and properties that are otherwise undevelopable are able to be approved for development, and existing lots that are experiencing problems are improved to meet regulatory requirements. The following technologies were evaluated for possible use within Old Colony Beach:

- Recirculating Sand Filter
- Amphidrome Treatment Process
- Bioclere Treatment System
- Cromaglass System
- RUCK Sand Filter System
- FAST System
- Waterloo Biofilter System
- Peat Moss Treatment System
- Orenco Trickling Filter

Table 5.2.2.1 summarizes the attributes of each technology along with brief comments about their applicability. All have similar characteristics as outlined below when evaluating them for application in the Old Colony Beach community:

- These systems produce a higher quality effluent than a conventional septic system. However, unless effluent disinfection is provided (typically not an option with some systems), the reduction of bacteria provided does not eliminate the presence of pathogens in the effluent. In general the systems accomplish nitrification and denitrification of effluent producing total nitrogen levels that are typically diluted to less than 10 mg/l by the time the effluent crosses the downgradient property line.

TABLE 5.2.2.1
COMPARISON OF INDIVIDUAL ON-SITE SEWAGE DISPOSAL SYSTEM TECHNOLOGIES
OLD COLONY BEACH WASTEWATER MANAGEMENT STUDY
OLD LYME, CT

OCTOBER 2011

Technology/ Proprietary Name	BOD_5 Reduction (2)	Pathogen Reduction	Nitrogen Reduction	TSS Reduction	Requires Backup Power Supply	Suitable for Seasonal Operation	Winterization Required	O & M Reqmts. (4)	Capital Cost (5)	Annual O & M Cost (6)
1. Holding Tank	Yes	Yes	Yes	Yes	If Pump Station Installed	Yes	If Pump Station Installed	High	$ 4,000 - $6,000	$500
2. Conventional Septic System	Minor	Minor	Minor	Yes	If Pump Station Installed	No (3)	If Pump Station Installed	Low	$ 5,000 - $20,000	$55
3. Recirculating Sand Filter (1)	Yes	Yes	Yes	Yes	Yes	No (3)	Yes	Average	$10,000 - $20,000	$500
4. Amphidrome Treatment Process (1)	Yes	Yes	Yes	Yes	Yes	No (3)	Yes	High	$10,000 - $20,000	$1,000
5. Bioclere Treatment System (1)	Yes	Yes	Yes	Yes	Yes	No (3)	Yes	High	$10,000 - $20,000	$850
6. Cromaglass System (1)	Yes	Yes	Yes	Yes	Yes	No (3)	Yes	High	$10,000 - $20,000	$800
7. RUCK Sand Filter System (1)	Yes	Yes	Yes	Yes	Yes	No (3)	Yes	Average	$15,000 - $20,000	$450
8. FAST System (1)	Yes	Yes	Minor	Yes	Yes	No (3)	Yes	High	$10,000 - $20,000	$800
9. Waterloo Biofilter System (1)	Yes	Yes	Minor	Yes	Yes	No (3)	Yes	Average	$10,000 - $20,000	$500
10. Peat Moss Treatment System (1)	Yes	Yes	Minor	Yes	Yes	No (3)	Yes	Average	$10,000 - $20,000	$500
11. Orenco Trickling Filter (1)	Yes	Yes	Minor	Yes	Yes	No (3)	Yes	Average	$8,000 - $101,000	$650

NOTES:

1. Use of this system is currently evaluated on a site-specific basis by the CTDEEP. A Discharge Permit from CTDEEP is required for operation.
2. 5-Day Biochemical Oxygen Demand
3. Requires 4 - 8 weeks for development of biological treatment process
4. Low, Average, or High
5. Capital Cost Includes Installation of Treatment System and Leaching System. Does Not Include System Design, Permitting or Contingency.
6. Annual Operation & Maintenance Cost Includes: Electricity, Service Contract, Maintenance, Periodic Pump-Out of Sludge and Periodic Effluent Monitoring.
   O&M costs based on seasonal use of the sewage disposal system.

TSS: Total Suspended Solids

- The systems require a backup power supply to operate continuously during public power supply interruptions if a public water supply exists as is the case in Old Colony Beach.

- Each system utilizes a biological process wherein microscopic organisms consume the organics in the wastewater. This type of system is not suitable for seasonal operation in a community like Old Colony Beach because it takes 4 to 8 weeks from initial or seasonal startup for the system to develop the biological environment and equilibrium required in the treatment process to be effective. This means that during approximately the first one third of the "beach season", these types of systems would not be providing adequate treatment.

- The systems require winterization prior to deactivation for the winter shut down period. If merely shut down, the wastewater contained within the treatment systems would become corrosive and, depending upon the depth of the installation, may be subject to freezing.

- Operation and maintenance costs of these types of systems are generally high compared to "conventional" septic systems or public sewerage systems due to power and maintenance associated with the various mechanical/electrical system components.

- Despite their ability to reduce the amount of nutrients discharged to the groundwater, none of the systems provide pathogen destruction as part of the treatment scheme. While disinfection may be an option on some of the systems, it would require the installation of additional equipment and, depending on the method of disinfection employed, may require the use of chemicals for treatment.

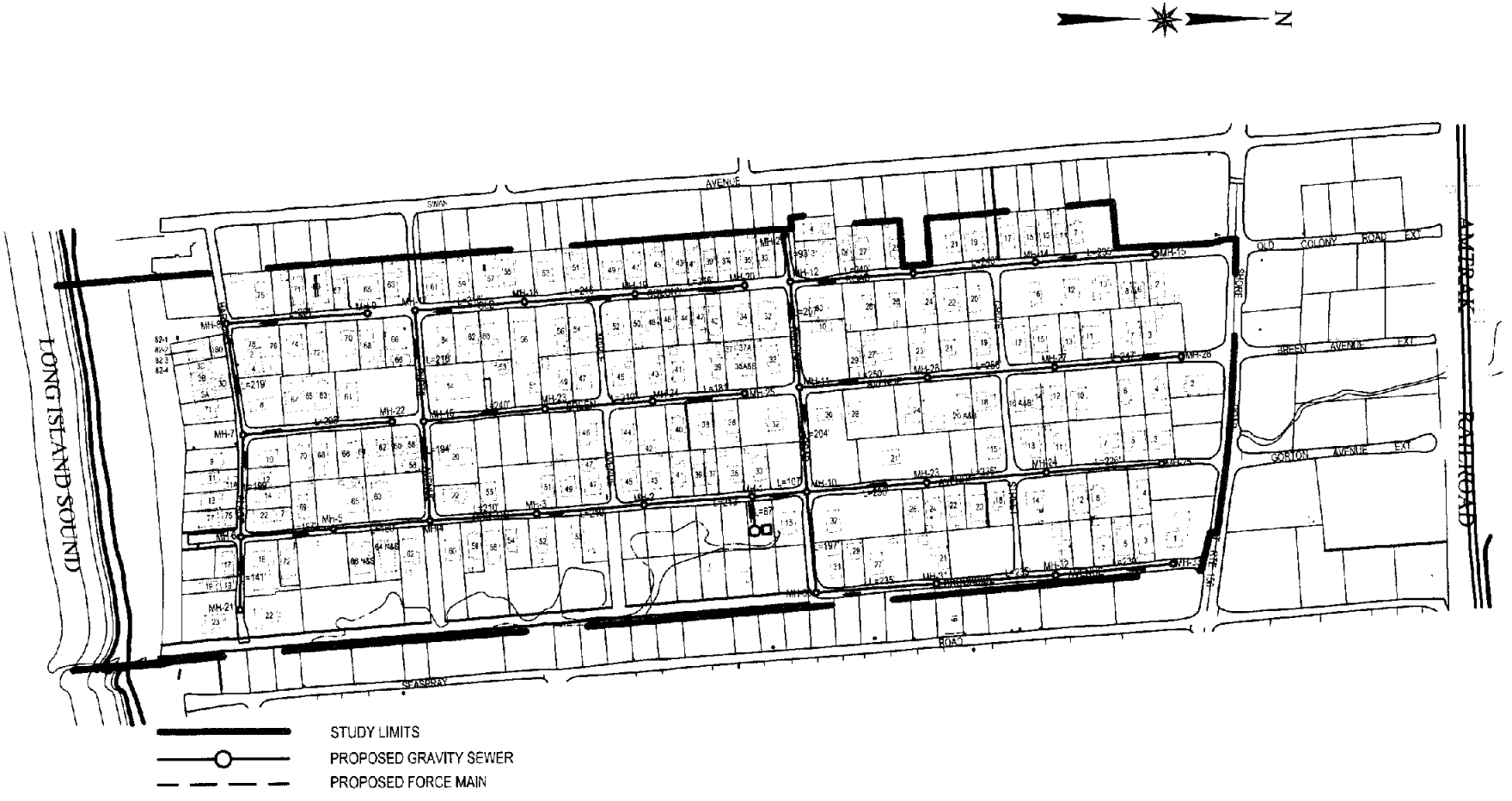
- None of the technologies evaluated reduced the required "footprint area" needed for treatment system components. All technologies required a leaching field for ultimate disposal of the treated effluent and, in some cases, the area occupied by the treatment system component exceeds the area of a conventional septic system. In Old Colony Beach where space is at a premium, it is doubtful that these systems could even be physically installed on many of the properties.

For these reasons, these technologies are not considered to be a suitable remedy for the proper and comprehensive management of wastewaters within the Old Colony Beach community.

5.2.3 Community Wastewater Treatment

Community wastewater treatment, for the purpose of this study, is defined as collection of wastewater from the entire Old Colony Beach community and conveyance and treatment at a centralized facility with a discharge to the ground. Under this alternative, sewage would be collected from each property within Old Colony Beach via a conventional sewer system and conveyed to a community treatment system located at a site outside of the Old Colony Beach neighborhood. Only sites located outside of the Old Colony Beach Club Association limits were considered due to the lack of available space within the Association's limits. The site would contain a wastewater treatment facility sized to handle the design flow from the entire Old Colony Beach community that discharged to a network of subsurface leaching facilities.

As stated above, all off-site community treatment alternatives will require the construction of a wastewater collection system within Old Colony Beach to collect wastewater from each property. Under the proposed plan, sewage would be collected by a network of gravity sewers installed within the rights-of-way within Old Colony Beach. It appears that grinder pumps will not be needed to serve any of the properties; however, a final determination can only be made during the design phase when precise topographic mapping is available. The gravity sewers would then convey wastewater to a pumping station to be constructed on a vacant lot on the east side of Gorton Avenue, adjacent to 15 Broughel Road. This lot is approximately one-half acre in size and is situated above the 500-year flood plain. A plan showing the proposed collection system within Old Colony Beach is presented in Figure 5.2.3.1.



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focus & perspective

PROPOSED OCBCA COLLECTION SYSTEM

The Old Colony Beach Club Association
P.O. Box 10 Old Lyme, CT

Date:	7/6/11
Scale:	1" = 300'
Drawn By:	RFP
Checked By:	RFP
Project No.:	2011.01

5.2.3.1

FIGURE NO.

For wastewater treatment, several types of treatment technologies were considered for both community treatment system sites, including oxidation ditch, rotating biological contactors (RBC), and sequencing batch reactors (SBR). In the end, the SBR technology was pursued as the most appropriate and cost effective technology, primarily due to the ability of this type of system to provide treatment for the wide range of flows expected from Old Colony Beach due to seasonal occupancy. Tertiary treatment for the removal of nitrogen was not considered in order to minimize costs; therefore sites must be of adequate size to attenuate nitrogen.

Under this alternative, it would be necessary to construct and operate a sewage treatment plant on a remote site.

The criteria used to identify potential sites are as follows:

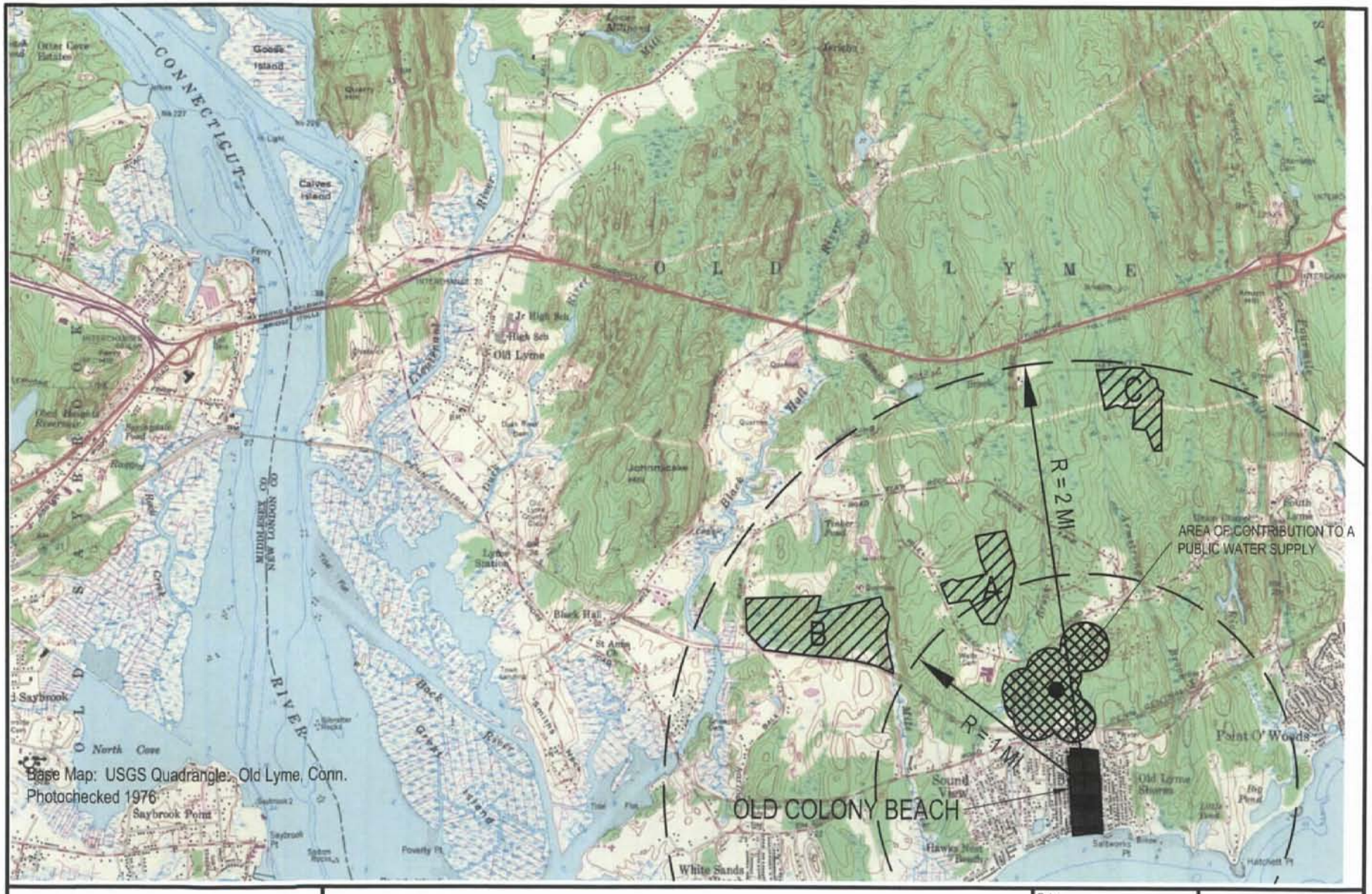
- Sites must be currently vacant;
- Sites must have a net available area with a hydraulic capacity sufficient to accommodate wastewater from the entire Old Colony Beach community. "Net available area" is defined as area within the site that is free of inland or coastal wetlands, shallow bedrock, excessive slopes, and shallow groundwater, or other features that would restrict subsurface wastewater discharge; and
- Surficial soils at the sites must be mapped as being compatible for on-site wastewater disposal

The goal was to identify one or more candidate sites within a one-mile radius of Old Colony Beach. This is the approximate distance to the nearest public sewer (located in Point O' Woods) and was thought to be the distance that conveyance facilities could be constructed while remaining cost effective. This search produced only one site that met the criteria: a 44-acre lot located at 182 Mile Creek Road (Site A or "the Mile Creek Road site"). This site is privately owned.

The search then expanded to a 2-mile radius and two additional candidate sites were identified. The first site is a vacant lot located at 71 Button Ball Road immediately north of the Amtrak railroad tracks (Site B or "the Buttonball Road site"). This site is 107 acres of which, approximately 30 are deemed to be usable for subsurface disposal. This site is presently owned by the Town of Old Lyme and signs along Buttonball Road indicate that the parcel is designated as open space.

The second site is located at 29-1 Hatchetts Hill Road, approximately 1,800 feet east of the intersection with Hill Road (Site C or the "Hatchetts Hill Road site"). This site has a total area of 45 acres with no significant restrictions for use as subsurface disposal. This site is privately owned. The three sites are shown on Figure 5.2.3.2.

Using published soil mapping, an analysis was then performed to determine the theoretical hydraulic capacity of each site in order to evaluate each site's ability to accept treated effluent from Old Colony Beach. It is emphasized that because these sites are not owned by the Old Colony Beach Club Association, access to them was not available and no on-site testing (test holes, soil borings, etc.) was performed to verify the accuracy of existing soil mapping. Consequently, rigorous site testing would be needed if this alternative was to be pursued. A copy of the results of this analysis is presented in Appendix F. Based upon this analysis, it was determined that each site was capable of accepting treated effluent from the study area. The facilities necessary to convey sewage from Old Colony Beach to each site are described below.



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POTENTIAL COMMUNITY TREATMENT SITES

The Old Colony Beach Club Association
P.O. Box 10 Old Lyme, CT

Date:	07/12/11
Scale:	1" = 3,000'
Drawn By:	RFP
Checked By:	RFP
Project No.:	2011.01

5.2.3.2

FIGURE NO.

5.2.3.1 Site A: Mile Creek Road Site

Of the three sites, the Mile Creek Road site is the closest site to Old Colony Beach. It is located approximately 5,000 feet in a straight line from the entrance to Old Colony Beach. The site measures 44 acres and is located on the east side of Mile Creek Road, approximately 2,400 feet northwest of the intersection of Cross Road and Mile Creek Road. While this site appears to have adequate soils for a subsurface discharge of treated effluent, it does not have adequate area to attenuate nitrogen during peak wastewater flow events. The site is also situated close to and hydraulically upgradient of a public water supply well field. Because of these two factors, the site was eliminated from further consideration.

5.2.3.2 Site B: Button Ball Road Site

The Button Ball Road site is located approximately 6,500 feet radially from the entrance to Old Colony Beach. However, access to the site using existing roadway rights-of-way would require constructing more than 15,500 linear feet of pipeline and three wastewater pump stations to transport sewage from the entrance to Old Colony Beach to the site proposed treatment facility. From a site suitability standpoint, only approximately 30 of the 107 acres are considered to be usable for subsurface disposal. The usable space is located on the eastern end of the site and is furthest away from the Buttonball Road entrance. The remainder of the site contains significant wetlands that would need to be crossed to access the usable portion of the site.

The conveyance system to transport sewage to the site is described as follows. Starting at the proposed pump station on Gorton Avenue, approximately 1,200 l.f. of 4-inch forcemain would be constructed along

Broughel Road and Breen Avenue to the intersection with Shore Road (Rte. 156). From there, the pipe would turn west along Shore Road and run another 4,100 feet to a pumping station located at the Mile Creek crossing. From there, a force main would continue 4,100 west along Shore Road then turn north and run approximately 1,400 feet along Buttonball Road to a second pump station located along Buttonball Road. Sewage would then be pumped from this station approximately 3,300 linear feet to a third pump station located at the entrance to the site. A portion of this pipeline would cross under the Amtrak railroad tracks requiring the need for pipe jacking or directional drilling. The third pump station would pump the sewage via a 4-inch force main easterly across the lot under a newly constructed roadway to the new treatment system located approximately 1,900 feet east of the entrance to the site.

A considerable amount of site development would be needed to construct the treatment facility. A new roadway would need to be constructed to provide access to the site and to provide a corridor for such utilities as 3-phase power and telecommunication conduits. It is estimated that the treatment system itself would occupy approximately 2 acres of land, including parking, treatment structures and various buildings and structures. Treated sewage from the treatment facility would discharge to a series of leaching galleries for ultimate disposal to the ground. The required footprint area of the gallery system is approximately 3 acres. A summary of the disposal system requirements is presented in Appendix F. Note that the DEEP may require that a suitable portion of the site with an area equal to the disposal area be held in reserve in the event that the system required replacement.

5.2.3.3 Site C: Hatchetts Hill Road Site

The entrance to the Hatchetts Hill Road site is located approximately 8,600 l.f. radially from the entrance to Old Colony Beach. However, as with the Buttonball Road site, there is no direct route to the property and a significant conveyance system with over 3.2 miles of pipeline and 3 pump stations would be required to transport sewage from Old Colony Beach to the site.

Although this site appears to have sufficient area to site a subsurface disposal system, as with the Mile Creek Road site, this site does not have the requisite area to attenuate nitrogen from peak wastewater discharges. Because of this, the site was removed from further consideration.

5.2.4 Connection to the East Lyme Sanitary Sewer System With Treatment at the New London Regional Treatment Facility

Under this alternative, sewage would be collected from properties within Old Colony Beach and conveyed to the existing sewer system located in Route 156 in East Lyme. From there, it would be conveyed through the towns of East Lyme, Waterford, and the City of New London to the Piacenti Regional Treatment Facility located along the Thames River. There are two sub-alternatives that were considered: connection to the Point O'Woods collection system and discharge directly to the existing sewers in East Lyme. Each alternative is discussed below.

5.2.4.1 Connection to the Point O'Woods Wastewater Collection System

Under this alternative, sewers would be constructed from Old Colony Beach to the central wastewater pump station located on Connecticut Road,

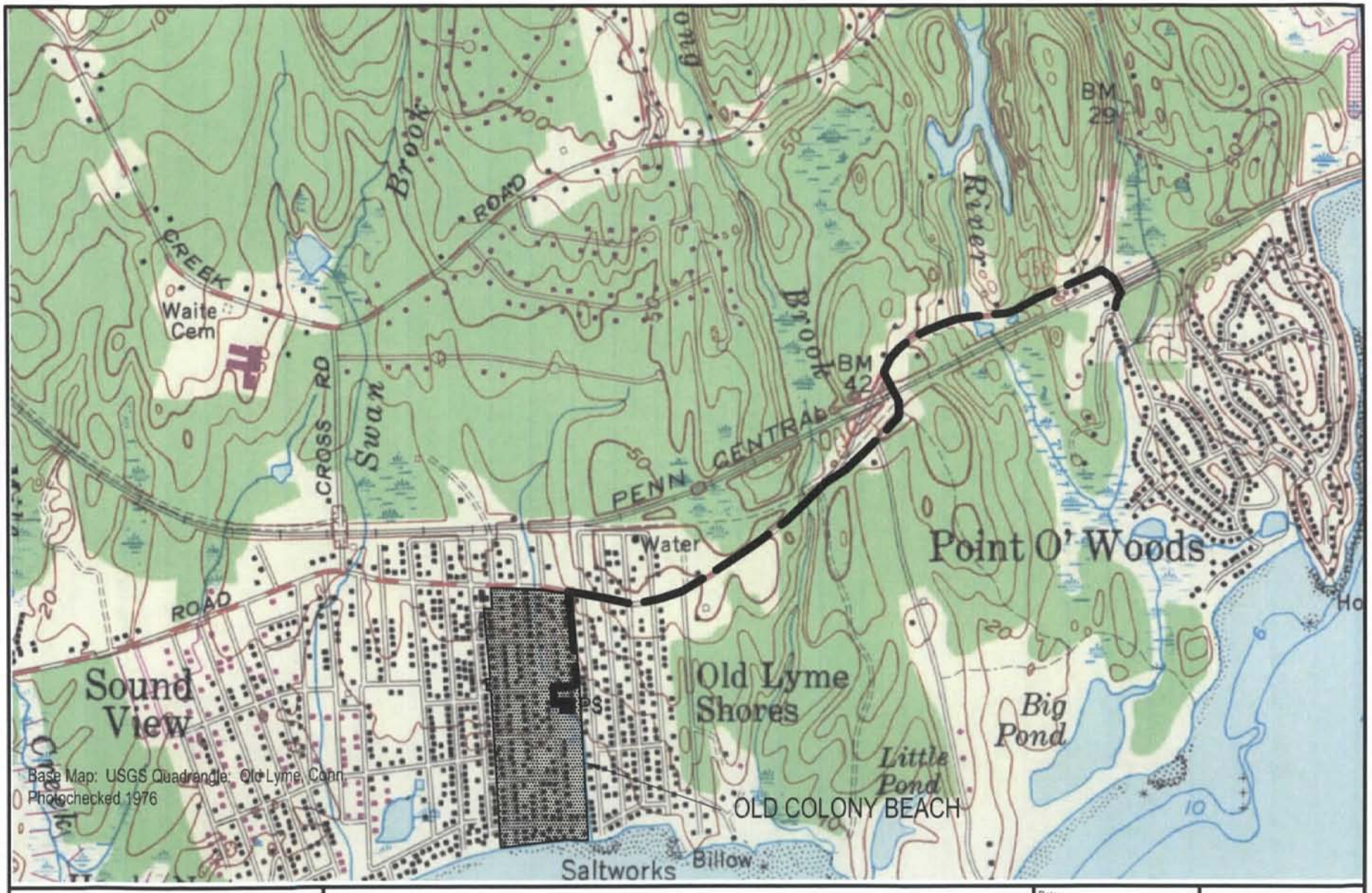
near the entrance into Point O'Woods. This would involve the installation of approximately 5,200 l.f. of 4" diameter force main in Shore Road to the entrance to Point O'Woods. A portion of this force main would pass under the existing Amtrak railroad right-of-way which would require either pipe jacking or directional drilling. At the entrance to Point O'Woods, the force main would turn south, into Point O'Woods, pass under the Amtrak railroad underpass, and discharge to an existing manhole located 350' away at the intersection of Connecticut Road and North Road. The sewage would then be conveyed by gravity to the existing pump station where it would be pumped via the existing 6" force main to East Lyme's wastewater collection and conveyance system. A map of this alternative is presented in Figure 5.2.4.1.

Construction of the existing Point O'Woods collection and conveyance system was completed in 2010. The design of the central wastewater pump station and force main was based on flow from Point O'Woods only and additional capacity for properties outside of Point O'Woods was not provided. The central wastewater pump station is a duplex, submersible station with a 6" diameter force main.

Connection to the Point O'Woods collection system will require one of two approaches:

- Modify of the existing wastewater pump station to provide enough capacity to handle the combined flow from both communities; or
- Storage of wastewater from Old Colony Beach during peak periods with off-peak pumping to the Point O'Woods system

Under either approach, it would be necessary for Old Colony Beach Club Association to enter into an agreement with The Point O'Woods Association, Incorporated to define the terms and conditions under which



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SEWER ALTERNATIVE 1: DISCHARGE TO POINT O' WOODS

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Checked By:	RFP
Project No.:	2011.01

5.2.4.1

FIGURE NO.

the two communities would share common conveyance facilities. Among other things, the agreement would need to address:

- The amount of flow that Old Colony Beach could discharge into the Point O'Woods sewer system.
- The amount to be paid to Point O'Woods by Old Colony Beach to reimburse it for its proportional share of the cost to construct the portion of the Point O'Woods' system that it will be using.
- The amount and method of payment by Old Colony Beach to Point O'Woods for its share of the cost to operate and maintain the portion of Point O'Woods system that it utilizes.

5.2.4.1.1 Modify Existing Wastewater Pump Station to Increase Capacity

Under this alternative, the existing wastewater pumps would be replaced with larger pumps capable of handling the combined peak wastewater flows from both neighborhoods (280 gpm + 156 gpm = 436 gpm). This could be accomplished a couple of ways. One way would be to replace the existing submersible pumps with larger pumps capable of delivering the combined flow from both neighborhoods. The larger pumps would necessitate replacing existing electrical components (e.g., starters and controls). Both the existing wetwell and the emergency generator would need to be evaluated to determine if they could accommodate the changes to the station. The advantage of this approach is that the upgraded station would have the capacity to pass the peak flow from both neighborhoods. The disadvantage of this approach is that the pumps would be "oversized" for flow conditions during most of the year, especially during winter months utilizing more power than necessary.

Another possibility would be to add jockey pumps to the existing pumps and force main to add additional capacity during peak flow periods. Under this scenario, each pump would be fitted with a jockey pump that would energize during peak flow periods to increase the pump rate of each

primary pump. Existing wastewater controls and motor starters would need to be modified to effect such a change. The existing wetwell and standby generator would need to be evaluated to see if they could accommodate the combined flows and larger electrical loads. The advantage of this approach is that the modified system would have greater flexibility to accommodate the range of flows received at the station. The primary disadvantage of this alternative is that it would increase the complexity of the operation of the station, possibly making it more susceptible to operational problems.

5.2.4.1.2 Storage and Off-Peak Pumping

Presently, both Old Colony Beach and Point O'Woods share a similar wastewater flow profile over the course of a typical year. Peak flow periods correspond to the summer months (Memorial Day weekend through Labor Day weekend) when children are out of school and families can stay at the beach full time. Flows are higher on weekends when cottage occupancy rates typically peak. Wastewater flows are at a minimum during winter months when only about ten percent of the homes are occupied. In the springtime, as water services are activated to seasonal properties, homeowners typically spend weekends at their properties preparing them for the coming summer season. Similarly, after Labor Day, occupancy typically drops off to weekend usage until water services are shut off for the winter season.

The central pump station at Point O'Woods is sized to pass the peak flow generated when all properties are fully occupied – typically a 4th of July weekend. As occupancy decreases, available capacity in the station increases. The significance of the two associations' flow patterns is that that with the exception of peak periods when the majority of properties are

fully occupied (holidays and summer weekends), the existing wastewater pump station in Point O'Woods has capacity available to handle combined flows from both communities. Therefore, the time periods when flows from Old Colony Beach would need to be stored for off-peak (i.e., nighttime) discharge would be minimized.

Under this alternative, the wetwell for the Old Colony Beach pump station would be oversized to enable it to store wastewater generated during daytime (peak) hours, when the Point O'Woods station is being fully utilized to handle Point O'Woods wastewater flows. During nighttime hours (midnight to 5 AM), the Old Colony Beach station would pump its contents to the Point O'Woods station which, in turn, would pump it to East Lyme. Additional instrumentation would be needed at the Point O'Woods station to enable the two stations to operate in a synchronized manner.

The primary advantages of this approach is that the existing station at Point O'Woods would require only minimal modification (primarily additional controls) and that flows in the existing forcemain would not exceed additional design conditions. The primary disadvantage of this approach is that it would require a higher degree of complexity for control systems at both pump stations.

5.2.4.2 Direct Connection to the East Lyme Wastewater Collection System

Under this alternative, a new pipeline would be constructed to convey sewage from Old Colony Beach directly to the nearest gravity sewer located in East Lyme. This would involve the installation of approximately 6,500 l.f. of 4-inch diameter force main to a new pump station located near the intersection of Shore Road and Oakridge Drive. This pipeline would need to pass under the

existing Amtrak right-of-way and the Threemile River. From there, an additional 5,900 l.f. of forcemain would be installed to convey the sewage to the terminus of the gravity sewer located at the top of the hill on Shore Road as you enter East Lyme. This pipeline would cross the Fourmile River, which forms the boundary between Old Lyme and East Lyme.

5.3 Technical Feasibility Summary

Of the alternatives considered, only the following are considered to be technically feasible:

- Community wastewater treatment with subsurface discharge outside of Old Colony Beach at the Buttonball Road site.
- Connection to the Point O'Woods sanitary sewer system with treatment at the New London Regional Treatment Facility.
- Connection to the East Lyme sanitary sewer system with treatment at the New London Regional Treatment Facility

Table 5.3.1.1. presents a summary of the significant elements of each of the technically feasible wastewater management alternatives. A discussion of the advantages and disadvantages of each alternative is presented in the following sections.

5.3.1 Community Wastewater Treatment with Subsurface Discharge

This alternative will require the collection of wastewater from Old Colony Beach for treatment and disposal at the Buttonball Road site. In addition to the collection system in Old Colony Beach, it will require the construction of three pump stations, approximately 13,000 l.f. of pipeline, a stream crossing (Mile Creek), and a railroad crossing. Sitework for the proposed treatment facility would be extensive and would include the construction of a 2,000' access road through inland wetlands and disturbance

Table 5.3.1.1 - Wastewater Management Alternative Comparison[1]

Alternative	Treatment Plant	Number of Pumping Stations	4" Force Main (Linear Feet)	RR Crossing	Stream/ River Crossing	Requires Acquisition of Private Property?
Community Treatment - Button Ball Road Site	1	4	12,700	1	1	Yes
Connection to Point O'Woods Sewer System	0	1	6,600	2	1	No
Connection to East Lyme Sewer System	0	2	13,400	1	2	Yes

[1] Does not include collection system piping within Old Colony Beach

of over 5 acres of land. As with the siting of any new treatment facility, significant public opposition can be anticipated.

Once outside of Old Colony Beach, construction would occur in state and local rights-of-way. It would be necessary to purchase property for the construction of three wastewater pump stations as well as the treatment/disposal facility. Old Colony Beach does not have the power of eminent domain outside of its borders making site acquisition extremely uncertain. The treatment site itself is town-owned and is currently designated as open space; a lengthy public approval process is anticipated with no guarantees that the site would be able to be purchased.

Considerable site testing will be required to confirm the ability of the site to support the required disposal system with no guarantee that the site will meet the criteria. In addition to detailed soil mapping, this site testing will involve extensive, multi-season, ground water monitoring to accurately chart seasonal fluctuations. This testing will require considerable time to complete and final design of the treatment system cannot begin until it has been completed and the data are fully evaluated.

If constructed, the subsurface disposal system would be among the largest such systems in the state; consequently DEEP approval of the system is expected to be difficult and time consuming with no guarantee of success. Construction costs associated with treatment and disposal systems will be high because of site constraints, including the need to construct a lengthy access road through inland wetlands. In addition to DEEP approval for the treatment system, considerable state, local and federal permits would be required for construction of the transmission system as well as the treatment facility.

Finally, personnel would be needed to operate and maintain the collection system and treatment facility. This would necessitate either the creation of a new department that would fall under the purview of the Association or require the Association to contract for this service with an outside entity.

Table 5.3.1.2 summarizes the significant pros and cons associated with this alternative.

Table 5.3.1.2 – Advantage/Disadvantage Matrix – Community Treatment System

Community Wastewater Treatment with Subsurface Discharge	
Advantages	**Disadvantages**
1. Concentrates the treatment and disposal of wastewaters in one central location rather than individuals operating and maintaining 217 individual subsurface systems in a high-density area. 2. Provides for uniform operation and maintenance of all wastewater conveyance, treatment and disposal facilities. 3. Does not require the negotiation of intermunicipal agreements with neighboring communities.	1. Further site testing is needed to confirm the viability of this alternative. Results of site testing may eliminate the site from further consideration, resulting in a loss of time and money. 2. Site acquisition costs are likely to be high. Required properties for pump stations and treatment facilities may not be able to be acquired due to the lack of eminent domain powers. 3. Significant local permitting/approval requirements due to possible impacts to wetlands during construction. 4. Recent experience with the Point O'Woods sewer project indicates that local zoning approval will be needed for the construction of the treatment facility. 5. Site development costs will be high due to a lack of site access and site constraints. 6. Residents may object to the location/ presence of treatment plant.

	7. Staff will be required for operation and maintenance of the collection system and treatment facility, resulting in higher annual user fees. 8. If constructed, the community treatment system would be among largest of its kind in the state. Difficulty/ delays obtaining a DEEP permit can be anticipated. 9. The remote distance of treatment facility from Old Colony Beach results in lengthy force mains, which may cause odor problems in the conveyance system and at treatment facility. Extensive odor control equipment is likely to be needed.

5.3.2 Connection to the Point O'Woods Sanitary Sewer System

This alternative will require the conveyance of wastewater from Old Colony Beach to the existing sanitary sewer located inside of Point O'Woods Beach Association. It will not require construction any additional pump stations (other than the central station located in Old Colony Beach) but will require one potentially difficult crossing of the Amtrak railroad right-of-way along Shore Road (Route 156) due to the presence of ledge rock and a second crossing below the underpass into Point O'Woods. Of the three alternatives, this alternative would require construction of the least amount of new facilities.

It is recommended that Old Colony Beach purchase capacity from East Lyme to utilize the regional sewer system. This approach would eliminate the need for Old Colony Beach to pursue separate agreements with Waterford and New London, which would simplify the process. This alternative would also require Old Colony Beach to purchase capacity in both Point O'Woods' sanitary sewer system as well before it could

utilize a portions of its wastewater system. This would entail negotiation of separate intermunicipal agreements with the Town of East Lyme and The Point O'Woods Beach Association, Incorporated. The Old Colony Beach/Point O'Woods agreement would need to provide for the use of central wastewater pump station and pipeline to East Lyme and address shared construction and usage costs. The Old Colony Beach/East Lyme agreement is needed to secure capacity for Old Colony Beach's flow in East Lyme's collection system as well as to address shared construction and usage charges.

Presently capacity is limited in the East Lyme collection system and at the treatment facility in New London. A study is presently underway of the treatment facility to determine long-range capacity needs. Although the final report has not been issued at the time of this writing, an engineer working on the study has indicated that the report will recommend allocation of capacity for some of the beach associations in Old Lyme, including Old Colony Beach.

It should be noted that the downstream sewage conveyance and treatment facilities that Old Colony Beach would utilize (in both East Lyme and Point O'Woods) were constructed in part with funds from the Connecticut Department of Energy and Environmental Protection. The DEEP has indicated that it would represent itself in such negotiations between Old Colony Beach and Point O'Woods and/or East Lyme if conditions warrant. The department provided considerable assistance with the negotiations that occurred between East Lyme and Point O'Woods. Even with this assistance, the agreement between East Lyme and Point O'Woods took over three years to negotiate and finalize. A similar level of effort should be anticipated to secure agreements with East Lyme and Point O'Woods for wastewater flow from Old Colony Beach.

Because this alternative represents the least amount of conveyance facilities, it also would enjoy the least amount of required operation and maintenance. Old Colony Beach would likely contract for O&M services for its collection system rather than create

an internal maintenance department. Once connected to the regional sewerage system, Old Colony Beach would be expected to participate its proportional share of in the cost of any necessary improvements to shared facilities in East Lyme, Waterford, and/or New London.

Table 5.3.2. summarizes the significant pros and cons associated with this alternative.

Table 5.3.2. – Advantage/Disadvantage Matrix – Connection to Point O'Woods

Connection to the Point O'Woods Sanitary Sewer System	
Advantages	**Disadvantages**
1. The need to construct a new treatment facility is eliminated. 2. Does not require the purchase of private property to site wastewater pump stations. 3. Permitting requirements are minimized. 4. Operation & maintenance requirements are minimized. 5. Requires construction of the least amount of new facilities; consequently, construction time will be the shortest. 6. Local permitting requirements are minimized due to least amount of disturbances to wetlands.	1. Requires negotiating separate agreements with East Lyme and Point O'Woods for the purchase of capacity in their respective collection systems. This may require extensive time to accomplish and Old Colony Beach will likely incur significant legal and engineering costs during this process. 2. The Association will be expected to participate in the cost of future improvements to shared facilities in Point O'Woods, East Lyme, Waterford, and New London.

5.3.3 Connection to the East Lyme Sanitary Sewer System

This alternative will require the conveyance of wastewater from Old Colony Beach directly to the existing sanitary sewer located in Route 156 in East Lyme. It will require construction of one pumping station and two pipeline stream/river crossings. It will also require the installation of a pipeline under the Amtrak right-of-way.

As with the previous alternative, this alternative would require Old Colony Beach to purchase capacity in East Lyme's sanitary sewer system but would eliminate the need to enter into a separate agreement with Point O'Woods. All of the previously identified issues pertaining to negotiating an agreement with East Lyme would also apply to this alternative.

This alternative would require construction within Old Lyme and East Lyme and would require securing wetlands permits from both communities. This alternative would also require acquiring private property for a wastewater pump station along Shore Road. There is some flexibility as to where the station could be sited, but the Old Colony Beach Club Association has no condemnation powers outside of its territorial limits, which would place it at a disadvantage during negotiations for the purchase of private property.

Table 5.3.3 summarizes the significant pros and cons associated with this alternative.

Table 5.3.3 – Advantage/Disadvantage Matrix – Connection to East Lyme

Connection to the East Lyme Sanitary Sewer System	
Advantages	**Disadvantages**
1. The need to construct, operate and maintain a new wastewater treatment facility is eliminated.	1. Requires negotiating an agreement with East Lyme for the purchase of capacity in its

2. Permitting requirements are moderate. 3. Pipelines would be constructed entirely within Connecticut DOT rights-of-ways.	collection system. This may require extensive time with no guarantee of success. Legal costs are expected to be high. 2. Requires the acquisition of private property for the construction of a wastewater pump station. 3. The Association will be expected to participate in the cost of future improvements to shared facilities in East Lyme, Waterford, and New London.

5.4 Cost Comparison

Capital costs have been estimated for each of the technically viable alternatives. Detailed breakdowns of these estimates are presented in Appendix G. A summary of these costs is presented in Table 5.4.1. Note that an estimated cost of $1,919,627 for construction of collection facilities within Old Colony Beach is included as a common component in the estimated cost for each alternative.

As indicated in the table, connection to the existing sewer system Point O'Woods is the least-cost alternative with a total estimated present day cost of $5,700,000.

5.5 Recommended Plan

Based upon the foregoing discussion, connection to the Town of East Lyme's existing sanitary sewer system is the recommended alternative. While there are risks associated with each alternative, this alternative is by far the most straightforward and least complicated. It benefits considerably from its lack of a need to construct and operate a new treatment facility and associated discharge. In addition, it enjoys the benefit of being the least-cost of all alternatives considered. A more detailed discussion of this alternative is presented in Chapter 6.

TABLE 5.4.1
PRELIMINARY OPINION OF CAPITAL COSTS FOR TECHNICALLY FEASIBLE ALTERNATIVES
OLD COLONY BEACH CLUB ASSOCIATION
OLD LYME, CT

OCTOBER, 2011

Alternative	Capital Cost [1]	DEP Grants	Net Cost	No. of EDU's Served [2]	Net Cost Per EDU	Annual Cost Per EDU [3]
1. Community Treatment System at Buttonball Road Site	$10,700,000	$2,500,000	$8,200,000	217	$37,788	$2,300
2. Connection to Point O'Woods Sewer System	$5,700,000	$1,300,000	$4,400,000	217	$20,276	$1,235
3. Connection to East Lyme Sewer System	$6,200,000	$1,400,000	$4,800,000	217	$22,120	$1,347

NOTES:

1. All Costs are rounded and are in 2011 Dollars. Costs for comparison purposes only.
2. EDU = Equivalent Dwelling Unit
3. Annual Net Cost Per EDU at 2% Interest for 20 Years

6. RECOMMENDED PLAN

6.1 General

Individual on-site wastewater disposal systems have been found not to be a reliable, long-term method of wastewater management for the majority of properties at Old Colony Beach. The recommended plan is to serve the entire Old Colony Beach area with a sanitary sewer collection system that consists of a network of gravity sewers that convey sewage to a central pump station located near the intersection of Gorton Avenue and Broughel Avenue. The pump station would then discharge wastewater via a 4-inch diameter force main that exits the beach area along Brookside Avenue to Shore Road (CT Route 156). The force main would continue east along Route 156, crossing under the Amtrak railroad tracks east of the intersection with Hatchett Road. It would then continue east along Shore Road and turn south into the entrance road into Point O'Woods, pass under the railroad underpass, and discharge to a gravity sewer at the intersection of Connecticut Road and North Road. The sewage would then be conveyed by the existing collection system to Point O'Woods' central wastewater pump station where it would be pumped through the existing 6-inch along Route 156 to East Lyme. A map showing the recommended alternative is shown in Figure 5.2.4.1.

6.2 Service Area

The limits of the sewer service area conform to the limits of the study area, which encompasses all of the Old Colony Beach area. A total of 217 dwellings are currently contained within the Old Colony Beach boundaries. The proposed sanitary sewer collection system is shown in Figure 5.2.3.1.

6.3 Estimated Sewage Flows

6.3.1 Initial Wastewater Flows:

The initial (2011) average daily wastewater flow is estimated as follows:

Assume:

1 single family cottage = 1 equivalent dwelling unit (EDU)
1 EDU = 3.5 persons/EDU x 70 gallon/person/day = 244 gpd
1 multi-family unit = 1.5 x EDU = 366 gpd
1 condominium unit = 0.75 x EDU = 183 gpd
1 boarding room = 75 gpd

Using the preceding assumptions, the initial (2011) average daily sewage flow is computed as follows:

Table 6.3.1.1 – Initial Average Daily Flow

Flow Source	Number	Unit Rate (Gal/Day)	Total (Gal/Day)
Single Family	196	244	47,824
Multi-family	5	366	1,830
Condominium	18	183	3,294
Boarding Room	22	75	1,650
			Q_{Avg} = 54,598

6.3.2 Future Wastewater Flows:

There are presently 20 vacant lots scattered throughout Old Colony Beach. Of these, five contain a significant amount of freshwater wetlands but the remaining ten lots are considered to be developable. For the purpose of this study, a 25-year planning period was selected. This period reflects a reasonable time frame within which to project future conditions and provides the Old Colony Beach Association with upwards of 5 years to implement the recommendations of the study while providing 20-years of design life for the recommended facilities. It is assumed that the 15 developable lots will become developed as single-family

houses over the course of the 25-year planning period, which represents a 7% overall growth rate. Therefore, the future flow rate is estimated as follows:

Assume:

1 single family cottage = 1 equivalent dwelling unit (EDU)
1 EDU = 3.5 persons/EDU x 70 gallon/person/day = 244 gpd
1 multi-family unit = 1.5 x EDU = 366 gpd
1 condominium unit = 0.75 x EDU = 183 gpd
1 boarding room = 75 gpd

Using the preceding assumptions, the future (2036) average daily sewage flow is computed as follows:

Table 6.3.2.1 – Future Average Daily Flow

Flow Source	Number	Unit Rate (Gal/Day)	Total (Gal/Day)
Single Family	211	244	51,484
Multi-family	5	366	1,830
Condominium	18	183	3,294
Boarding Room	22	75	1,650
			Q_{Avg} = 58,258

A peaking factor is then applied to the average daily wastewater flow and an allowance for infiltration/inflow is added to determine the future peak hourly flow for this system. The future peak hourly flow figure is used for sizing the pumping stations and the sanitary sewer pipelines associated with the proposed sewer system.

$$\text{Peaking Factor} = \frac{14}{4+\sqrt{P}} + 1$$

where P = population in thousands

The service population is estimated as follows:

Population = 211 houses x 3.5 people/house + 5 multi-family units x 1.5 x 3.5 people/unit + 18 condominium units x 0.75 x 3.5 x people/unit + 22 boarding rooms x 1 person /room

Population = 834 pepole

834 people/1,000 ➡ P = 0.83

$$\text{Peaking Factor} = 3.9 + \sqrt{\frac{14}{0.83}} + 1$$

Peak hourly wastewater flow = 58,258 gpd x 3.9

= 227,206 gpd

= 158 gal/min

The design flow used for sizing sewer collection system piping and pumping stations based on the future flow is equal to the peak hourly flow plus an allowance for infiltration and inflow (I/I) into the system. I/I is only computed for gravity sewer lines and not for force mains. The proposed sewer system would have an estimated I/I flow figure of 1,774 gallons per day based on the following calculation:

I/I = 100 gal/day per diameter of pipeline in inches per mile of pipeline

I/I = (100 gpd)(10")(.13 mi.)+(100 gpd)(8")(1.2 mi.)+
(100 gpd)(6)(1.14mi) = 1,774 gpd

Therefore, the design flow used for sizing sewer collection system piping and pump stations, based on the projected future flow, is as follows:

Q_{Design} = 227,206 gpd + 1,774 gpd = 228,980 gpd

Q_{Design} = 159 gpm

7. FINANCIAL ANALYSIS

7.1 Overview

The methods used for financing the costs of design, construction and operation and maintenance (O&M) of the recommended sewer system are discussed below. It is assumed that design and construction costs will be eligible for funding through the Department of Energy and Environmental Protection's Clean Water Fund (CWF). This fund was established to assist municipalities with the funding of large wastewater projects by offering a combination of grants and low-interest loans. In addition, it is anticipated that Old Colony Beach would qualify as a "small community" under this program, which would offer two advantages. First, it would allow Old Colony Beach to be eligible to receive up to 25% of qualified design and construction costs in the form of a grant (non-small community projects only qualify for a maximum grant of 20%) and to borrow the remainder of eligible expenses at an annual interest rate of 2%. Second, the DEEP has created a separate fund for small community projects such as this to help them to qualify for funding. Thus, it would place the project in a smaller pool of projects competing for a separate pool of funds, which raises the likelihood that funds will be available.

It is recommended that Old Colony Beach Club Association apply for design and construction funding from the Clean Water Fund. Using this funding source, the DEEP would act as banker and would advance funds to Old Colony Beach for eligible expenses thereby eliminating the need for the community to secure financing on the open market in the form of selling bonds. For a small community such as Old Colony Beach, this offers significant cost savings. Old Colony Beach would have the opportunity to repay the state for borrowed funds over a 20-year period at the very favorable annual rate of rate of 2%.

7.2 Project Costs

7.2.1 Capital Costs:

Capital costs for the Old Colony Beach sanitary sewer system include costs for the following principal items:

- construction of sanitary sewers in roadways and off-road areas;
- construction of a central pump station;
- acquisition of pump station sites and sewer easements (if needed);
- negotiation of an intermunicipal agreement with Point O'Woods and the Town of East Lyme;
- costs associated with modifying the Point O'Woods wastewater pump station;
- payments to Point O'Woods for Old Colony Beach's proportional share of the capital cost of shared facilities;
- costs (if any) to upgrade downstream facilities in East Lyme to accommodate Old Colony Beach's wastewater flow;
- costs for engineering, legal, and administrative services; and
- short-term borrowing costs during design and construction

The estimated capital cost for the recommended project is $6,408,078. This figure includes costs for all items enumerated above. It is estimated that the Association would be eligible for a grant from the Department of Environmental protection in the amount of $1,370,902. The net local share of the project, then, is $5,037,176. All costs are in year-of-construction dollars.

The cost of the project will be financed by a combination of state grants and low-interest loans. The debt will be paid by benefit assessments levied against properties within the project area. A detailed breakdown of these project costs is presented in Table 7.2.1.1 – Preliminary Opinion of Capital Costs and summarized below. The costs in Table 7.2.1.1 assume that 100% of the project will be paid for by the residents of Old Colony Beach and that no other sources of funding are available. An itemized breakdown of the estimated costs for the recommended plan in 2011 dollars is summarized in Appendix E.

TABLE 7.2.1.1

PRELIMINARY OPINION OF CAPITAL COSTS [1]

SANITARY SEWERS WITH DISCHARGE TO POINT O'WOODS
The Old Colony Beach Club Association
Old Lyme, CT
October 19, 2011

	November 2011 Costs	January 2016 Costs
Construction Cost - Sewer [2]	$3,856,113	$4,257,461
15% Contingency [3]	$578,417	$638,619
Technical Services - Design & Construction[4]	$771,223	$851,492
Legal & Administrative[5]	$192,806	$212,873
Short Term Interest[6]	$330,435	$364,827
Technical Services During Negotiations	$25,000	$27,602
Legal and Administrative Services During Negotiations (5%)	$50,000	$55,204
TOTAL DESIGN & CONSTRUCTION COST:	**$5,803,994**	**$6,408,078**
DEP Grant	**($1,301,438)**	**($1,370,902)**
ESTIMATED NET LOCAL SHARE - SEWER:	**$4,502,555**	**$5,037,176**
Number of EDU's Served	217	217
NET COST PER EDU - SEWER:	**$20,749**	**$23,213**
ANNUAL COST PER EDU - SEWER[7]:	**$1,290**	**$1,442**

NOTES:

(1) All costs developed in 2011 dollars and indexed to year of construction dollars at an annual rate of 2%.

(2) Does not include cost of gravity service connections from building to sewer in street (this cost to be paid by homeowner).
Average connection cost estimated to be $2,500- $5,00 per recent experience in POW.

(3) 15% Contingency used for 2011 estimate. Contingency to be reduced to 10% following design, and 5% following bid opening.

(4) Technical Services During Design and Construction estimated @ 20% of construction for planning purposes. Services include engineering design, topographic survey, test borings, bid & award services, contract administration and resident inspection services

(5) Legal and Administrative Costs estimated @ 5% of construction cost. Services include Bond Counsel costs and miscellaneous legal and administrative costs during design and construction of the project.

(6) Short term interest calculated at 2% per year by assuming borrowing half of the total amount over the entire project duration (6 years)

(7) Annual cost per EDU is over a 20-year period at an annual interest rate of 2%.

7.2.2 Operation and Maintenance Costs:

For projects that receive funds under the state DEEP CWF, state regulations require that the costs for operation and maintenance (O&M) of these facilities be allocated to and paid for by the sewer system users. A user charge system is developed to distribute the cost of O&M of sewage collection and treatment works to each user or user class typically in proportion to the user's contribution to the total wastewater loading. Factors such as sewage strength, volume and delivery flow rate may be considered and included as the basis for the user's contribution to insure a proportional distribution of O&M cost to each user. In the case of Old Colony Beach, all sewage is anticipated to be generated from household waste.

For the Old Colony Beach sewer system, it is recommended that the cost of O&M of the facilities be apportioned on the basis of an equivalent dwelling unit (single-family house) since virtually all users would discharge wastewater of normal domestic strength. Under this approach, there would be no variable in the cost-allocation formula to account for the strength of the wastewater, and discharge volume would be the only parameter used to apportion costs. The formula should differentiate between type of use (i.e., single family, multi-family, etc.) This method of apportionment would satisfy state and federal regulations and would provide the Association with the most equitable and simplest cost-allocation formula. User fees for sources other than single family use would be based on flow rates as a multiple of the flow contribution from a residential unit, and surcharges could be established for higher strength wastewaters, if any are found to originate within the project area. The Association may wish to incorporate a factor to account for seasonal vs. year round occupancy in the formula that it applies to individual properties. The final user fee policy must be crafted and adopted before properties are allowed to connect to the system, and is typically formulated during construction phase of the project.

Old Colony Beach's user fee should be comprised of four elements:

- The fees charged by East Lyme to discharge to its wastewater collection system;
- The fees charged by Point O'Woods to utilize a portion of its wastewater collection system;
- The day-to-day costs incurred by Old Colony Beach to operate and maintain its wastewater collection system; and
- A sinking fund to establish a reserve to pay for the cost to replace equipment.

As a point of reference, Point O'Woods presently charges it's users a flat fee of $200/year for O&M of its wastewater collection system. This fee includes charges it receives from the Town of East Lyme to discharge to its collection system as well as costs to operate, maintain, and administer its own collection system. It should be noted, however, that Point O'Woods system has only been in operation since June of 2010 and they do not yet have a solid handle on their operating costs; consequently, the figure cited above is likely to change (either up or down) as time goes by and more cost data becomes known. Regardless, because Old Colony Beach would be a user of Point O' Woods' system, which in turn is a user of East Lyme's system, Old Colony Beach should anticipate that its fee should be equal to the fee charged by Point O'Woods plus the cost to operate and maintain Old Colony Beach's system. Terms and conditions for the payment of O&M fees to both Point O'Woods and East Lyme would be spelled out in the respective intermunicipal agreements with Old Colony Beach. The estimated costs for O&M of the Old Colony Beach sewer system are given in Table 7.2.2.1. Under the recommended alternative, the cost per equivalent dwelling unit (EDU) is estimated to be $311 annually for O&M costs.

TABLE 7.2.2.1

ESTIMATE OF O&M COSTS FOR SEWER USERS CONNECTING TO THE POINT O' WOODS SEWER SYSTEM[1]

(Recommended Alternative)

Old Colony Beach Club Association
Old Lyme, Connecticut

October 2011

Item	Annual Cost
1. Existing Point O'Woods Sewer User Fee	$200
2. New Sewer User Fee [2] (Old Colony Beach O&M Only Costs)	$111
Total Annual Cost per EDU [3]:	**$311**

Notes:

1. All costs in 2011 dollars.
2. Includes costs for O&M Contractor, Power, Techical, Admin. and sinking fund as indicated below exclusive to Old Colony Beach Club Association.
3. Based on 217 EDU's. This figure reflects the estimated number of initial units to be served by the proposed sewer system.

Item	
O&M Contractor	$10,000
Power & Chemicals	$5,000
Technical	$2,500
Sinking Fund	$2,500
Admin	$2,000
Misc.	$2,000
Total	$24,000
Cost Per Building Served	$111

7.3 Cost Allocation Methodology

7.3.1 State Grants and Loans:

As stated earlier, the state's design and construction grants program is administered through the DEEP's Clean Water Fund (CWF). In general, this fund provides grants for up to 25 percent of eligible project costs and a low-interest loan (2 percent per annum interest rate) for the remainder of the eligible costs.

The DEP's CWF would provide a grant for up to 25 percent of *eligible* project costs. The DEEP classifies project-relate costs into three different eligibility classifications as follows:

- costs that are eligible for both grant and loan;
- costs that are eligible for loan only; and
- costs that are not eligible for either grant or loan funds under the CWF programs and must be paid directly by the community.

Table 7.3.1 provides a general classification of typical project-related costs. Because not all project-related expenses (particularly legal expenses) are eligible for grants, the net effect is to lower the overall percentage of project-related costs that are eligible for grants. Therefore, despite the availability of grants for up to 25% of eligible project related expenses, the net effect on total project-related expenses is somewhat less. In Old Colony Beach's case, it is anticipated that the net grant will be approximately 21.4% of total project costs.

Table 7.3.1 – Eligibility of Project-Related Expenses

Type of Expense	DEEP Classification
Planning	Eligible for a 55% planning grant. No low-interest loan funds available.
Engineering (design and construction related expenses)	Grant and low interest loan eligible.
Construction	Generally grant and low interest loan eligible *provided* that the expense is directly related to the elimination of pollution.
Land acquisition	Low interest loan only. Not eligible for grants.
Legal (bond counsel & general counsel)	Low interest loan only. Not eligible for grants.
Administrative	Low interest Loan only. Not eligible for grants.
Short-term borrowing (interest)	Low interest Loan only. Not eligible for grants.
Non pollution abatement related expenses	Local funds only; not eligible for grant or low interest loan funds

7.3.2 Local Share:

The local share of the project costs represents the difference between the total project cost and the amount of grants that will be received. This is the amount that must be paid back to the state by the Old Colony Beach community. As shown in Table 7.2.1.1, the estimated total cost for the recommended plan (including short-term interest) is $6,408,078. Subtracting $1,370,902 from this figure (the assumed DEEP grant) yields a net capital cost of $5,037,176. *All costs are in year-of-construction dollars.* This is the amount that must be repaid to the state by the beneficiaries of the Old Colony Beach collection system.

7.3.3 Average Benefit Assessment:

For the purpose of this analysis, it is assumed that benefit assessments will be levied against properties within the project area to repay funds borrowed from the DEEP for construction of the project, although the Association may employ other methods to collect funds. It is further assumed that The Old Colony Beach Club Association will finance the full cost of the project without receiving contributions from the Town of Old Lyme or any other sources.

For projects such as this, communities develop and adopt what is called a benefit assessment formula to recover all project-related costs that are incurred. Ideally, this formula is derived in such a manner as to equitably distribute the local share of project-related expenses over the property owners who derive a benefit from the system. Each community's formula tends to be somewhat unique and reflects attributes that are perceived to be of particular concern to the community (e.g., lot size, front footage, etc.). The benefit assessment formula is typically developed and adopted during the design and construction phases of the project but must be adopted before the system is activated.

The actual assessment formula will not be adopted for several years to come. However, ***for illustrative purposes only*** and to provide a residents with a sense of the magnitude of the costs that users will pay, the average cost per building has been computed. It is expected that the final benefit assessment policy that is adopted by the Association will allocate costs of the Old Colony Beach collection system in a manner that differentiates between single-family dwelling units, multi-family dwelling units, condominium units, etc. and property owners should take their particular situation into consideration when trying to estimate what their particular assessment may be. The Association will develop the final benefit assessment policy during the construction phase of the project and may elect to include factors such as lot size or street frontage in the computation of each property's assessment. Under the average assessment formula, individual assessments are estimated as follows:

Given that there are 217 buildings within the service area, the average net capital cost per building is $5,037,176/217 = $23,213. Amortizing this average cost over a 20-year period at an annual interest rate of 2% yields requires annual payments of $1,442 per building. Note that all costs are in year of construction dollars.

7.4 Projected User Charges

As discussed in Section 7.2.2 above the principal components of the Old Colony Beach sewer system's O&M costs are user fees paid to Point O'Woods East Lyme and the cost of maintaining the proposed facilities serving Old Colony Beach. The current user fee charged by Point O'Woods for a single-family residence is $200 per year.

The estimated costs for O&M of the Old Colony Beach sewer system are given in Table 7.2.2.1. O&M costs for the Old Colony Beach sewer system include electrical

power for the proposed pump station, costs for fuel and chemicals that are expended, and contracted services for system O&M,. The annual O&M cost associated solely with the Old Colony Beach sewer system is estimated to be $110 per building. Note that these charges are estimated in 2011 dollars and may differ somewhat from future costs.

It is projected that each single-family house will pay a total of $310 annually for O&M costs.

7.5 Average Connection Cost

Properties would be required to pay the cost of connecting their house to the lateral sewer in the street. The projected average cost of a building connection has been estimated at $2,500 to $5,000 per connection per recent experience in Point O'Woods. The actual cost would vary and depend on such factors as the presence of bedrock, high groundwater, extensive landscaping, etc.

7.6 Summary of Local Costs

The average annual sewer assessment (capital costs) is estimated to be $1,442 per building served. The average annual user fee (O&M costs) is estimated to be $310 per building served. Adding these costs results in a total estimated average annual cost for a single-family dwelling unit of $1,752.

7.7 Financial Capability

Old Colony Beach should consult its charter to determine if there are any limits on the amount that it may borrow. To qualify for Clean Water Funds, Old Colony Beach

will be required to pledge its full faith and credit and the Association will have to demonstrate its creditworthiness to the satisfaction of the State Treasurer and may be required to amend its charter. In consideration of the complexities involved, it is highly recommended that The Old Colony Beach Association, Inc. seek the advice of bond counsel at an early stage to assist with identifying and resolving any borrowing-related issues.

8. PLAN IMPLEMENTATION

Implementation of the recommended plan will require a significant effort on behalf of the Old Colony Beach Association over a long period of time and will require the expenditure of considerable funds. There are myriad tasks to be performed and, because it is a predominantly seasonal community, it is strongly recommended that Old Colony Beach appoint personnel to oversee this project that are committed to it and are available year-round.

Old Lyme Shores Beach Association (OLS), which abuts the project area to the east, is presently undertaking a similar study of its long-range wastewater management needs. As of this writing, a report has not been issued. That project is also funded by the DEEP and the DEEP has indicated that if both plans recommend the same or similar solutions, it will require the two associations to merge their projects into a single design and construction project which the DEEP would fund through the Clean Water Fund. If this occurs, it will be necessary to perform an interim engineering evaluation to assess the impacts of combining the two projects. For example, this report, which addresses only Old Colony Beach's wastewater management needs, recommends construction of a new sewer system that discharges to the existing sewers in Point O'Woods. If Old Colony Beach joins with Old Lyme Shore, the combined wastewater is likely to be twice as much as the projected flow from Old Colony Beach only. This larger flow may be too large to convey through Point O'Woods' collection system and it would be necessary to determine a cost-effective method to covey the combined flow to East Lyme's sewer system.

Consolidation of the two projects will require the creation of a joint committee to oversee and manage the project presumably with membership from both beach associations. The logistics of creating this entity is beyond the scope of this study; however, it is recommended that advice of legal counsel be sought early on to assist with its establishment since this entity would be responsible for the expenditure of public

funds. In fact, among the first order of business of this joint committee would be the hiring of an engineering firm as discussed in the preceding paragraph.

For purposes of this study, however, it is assumed that Old Colony Beach will be proceeding on its own with the implementation of the recommended plan. The following sections discuss the steps required to implement the plan. If Old Colony Beach and Old Lyme Shores merge their respective projects into a single project, the recommended implementation steps should be reviewed and adjusted to reflect this change.

8.1 Implementation Steps and Schedule

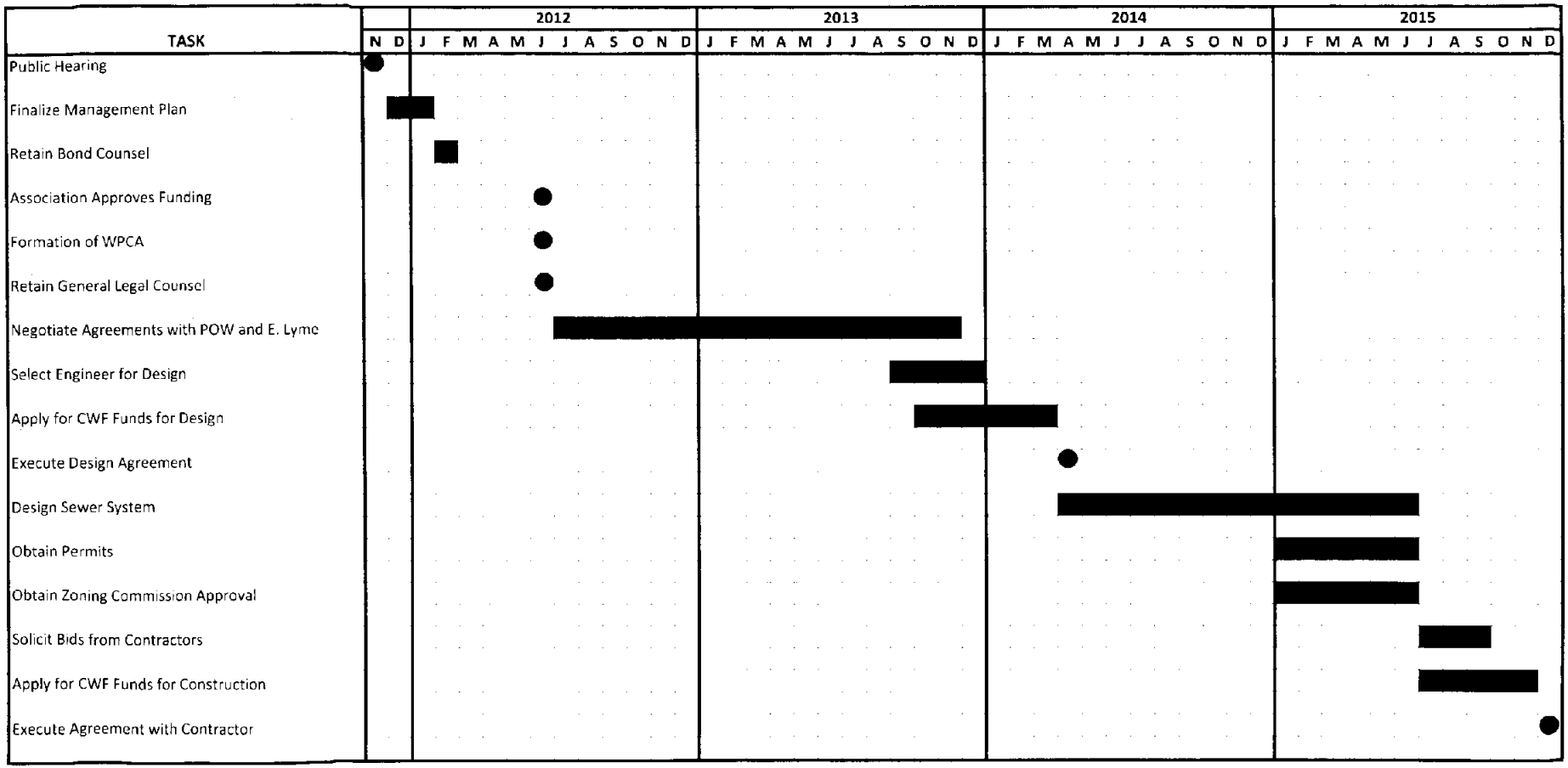
A summary of the major steps needed to implement the recommended plan is shown in Table 8.1.1. Again, the implementation steps are based on the assumption that Old Colony Beach Club Association is proceeding on its own and not as a joint project with Old Lyme Shores, although most of the steps are common to either approach. The steps also assume that the project is funded by the DEEP through the Clean Water Fund. Bond counsel should be consulted when establishing a detailed sequence for implementation of the recommended plan.

Figure 8.1.1 places the implementation schedule through project design on a calendar. It is projected that project design can be completed within 15 months and construction of the project will require a minimum of 18 months to complete. The overall schedule calls for completion of construction and system start-up during July of 2017. Note that the negotiation of agreements with East Lyme and Point O' Woods are critical path elements and are beyond the control of Old Colony Beach. For purposes of advancement, it is assumed that these tasks can be accomplished by the end of 2013 but there is no guarantee that these tasks can be completed by the assumed date. It is strongly recommended that The Old Colony Beach Club Association not enter into agreement with its selected designer until capacity has been secured and agreements with Point O'Woods and East Lyme are in place.

Table 8.1.1 – Project Implementation Steps

1. Board of Governors conducts a Public Hearing to solicit comments on the draft wastewater management plan.
2. RFP Engineering finalizes the wastewater management plan and issues a final report.
3. Board of Governors retains the services of bond counsel to assist with the preparation of a motion(s) to be voted on by the association authorizing the funding of the project.
4. Association adopts recommendations of the plan and votes to authorize funds for design and construction of the project.
5. Board of Governors authorizes the formation of a Water Pollution Control Authority.
6. WPCA retains the service of general legal counsel to assist with negotiations of intermunicipal agreements.
7. WPCA forms a subcommittee to meet with DEEP and Old Lyme Shores to discuss consolidation of the two projects.
8. OCBCA and Old Lyme Shores engage an engineer to evaluate the impacts of a combined project.
9. Negotiate agreements with Town of East Lyme and Point O'Woods for capacity and use of facilities.
10. Select and negotiate an agreement with a qualified engineering firm for design of the project
11. Apply to the DEEP for Clean Water Funds for design of the project
12. Execute a design agreement with engineering firm
13. Design system
14. Obtain permits from local, state and federal agencies
15. Obtain local zoning commission approval of the project
16. Solicit bids from contractors
17. Apply to the DEEP for funds for construction of the project
18. Execute agreement with lowest qualified bidder
19. Construct project
20. Develop a sewer use ordinance and connection policy
21. Develop and adopt benefit assessment policy
22. Develop and adopt user fee system
23. Enter into an agreement with a qualified firm for system operation and maintenance
24. Allow users to connect
25. Implement user fee system and collect charges from customers
26. Levy benefit assessments on properties and collect assessments
27. Begin repayment of CWF loan funds

FIGURE 8.2.1 - IMPLEMENTATION SCHEDULE THROUGH PROJECT DESIGN



It is anticipated that the residents of Old Colony Beach will vote on appropriating project funds at the June 2012 Association meeting. Residents will be required to vote on appropriating the entire cost of the project (design and construction costs) and would not be allowed to vote to fund only design funds.

8.2 Administrative Resources

It is recommended that the Point O' Woods Association seek the advice of bond counsel at an early stage to assist with the financing of the project. It is also recommended that the Association anticipate a significant involvement of its staff during project design and construction. Technical involvement by staff during the early stages of the project will enable a better understanding of design decisions and system operating requirements.

The Association should anticipate considerable activity once capacity has been secured and intermunicipal agreements are in place. Bookkeeping duties will be light to moderate throughout design and construction phases. However, the Association should expect that following construction, administrative and bookkeeping demands will increase sharply as benefit assessments are levied and collected, user fees are billed and collected, and payments are made to the Clean Water Fund.

For system maintenance, the Association should anticipate entering into a maintenance contract with a qualified company that can provide routine and emergency maintenance of the central pump station as well as the limited O&M that will be necessary for pipelines. Because of the limited O&M requirements, it is not expected to be cost-effective for Old Colony Beach to hire its own staff to provide this service.

9. ENVIRONMENTAL ASSESSMENT

9.1 Project Description

The planning area consists of the Old Colony Beach Association as shown on Figure 2.3.1. The limits of the Association are defined by Long Island Sound to the south, Old Colony Road to the west Shore Road to the north, and Brookside Avenue to the east.

The planning study area consists of the residential area defined by the Association boundaries which includes the following streets:

List of Streets in Planning Study Area

Breen Avenue
Brookside Avenue
Broughel Road
Gorton Avenue
Grove Street
Hartung Place
Maple Avenue
Old Colony Road
Purtil Avenue

The wastewater management program planned for the Old Colony Beach area is designed to alleviate public health and environmental problems. These problems include contamination of groundwater and drinking water wells (some of which are in shallow groundwater regimes and in close proximity to septic systems), and impacts to Long Island Sound and the brook, both in terms of bacterial loading and contribution to eutrophication from nutrients in wastewater. The environmental impacts of this recommended plan are described in detail below.

9.2 Discussion of Alternatives

Although several alternatives were considered as part of the Old Colony Beach wastewater management plan, the four general types of wastewater management alternatives are evaluated herein. The four general types are:

1.) No Action
2.) Resolve with On-site Alternatives
3.) Resolve with Community Wastewater Treatment, and
4.) Resolve with Conventional Wastewater Collection and Treatment.

The first alternative is to take no action and continue to allow properties to rely on individual subsurface wastewater disposal systems. This approach has been found to be creating a source of pollution and is not considered to be a feasible alternative. The "take no action" alternative would for the continued degradation of groundwater and surface water quality and the potential for a future public health hazard.

The second possible alternative is to resolve problems with existing on-site systems by repairing and/or reconstructing the septic systems. This alternative would require significant variances to the Public Health Code requirements. Furthermore, because the density of development has been found to be a factor, the continued use of existing on-site systems, even if functioning properly, will still allow for the continued degradation of ground and surface water quality and the potential for a future public health hazard.

The third possible alternative is to construct a community wastewater treatment system outside of Old Colony Beach with the discharge of treated effluent to a subsurface disposal system. Various community system sites were considered and evaluated. However, construction costs were found to be high due to high site development costs and the distance of the sites from the project area. The recommended sanitary sewer system was selected as the most technically feasible and cost effective solution.

9.3 Existing Environmental Conditions

The project area is characterized by gentle relief with elevations varying between 0 and 30 feet above mean sea level (a.m.s.l.) as shown in Figure 4.1.1.

The general drainage pattern in the study area is toward Long Island Sound. The project area is contained in the Lower Connecticut River Regional Basin. Old Colony Beach is bordered on the south by Long Island Sound. The area is bordered by Shore Road (CT Rte. 156) to the north.

The project area is densely developed with little vacant land remaining. The project area is comprised of 217 seasonal and year round dwellings (mostly cottages). Water quality sampling has detected impacts to local groundwater due to partially untreated wastewater being discharged by onsite wastewater disposal systems. The association maintains a private beach for use by association members and their guests which provides direct access to Long Island Sound for recreational purposes. The quality of air in Old Colony Beach is good, due to few sources of excessive or unusual pollution in the town and the proximity of the area to Long Island Sound.

9.4 Impacts

9.4.1 On Land Use:

Land use in the project area is predominantly residential with the exception of a synagogue. The character of the project area in terms of its residential use will be maintained and will not be subject to change due to the proposed project.

9.4.2 Traffic and Circulation Impacts:

Short-term impacts on traffic would result from construction activities. Traffic may be temporarily detoured or single-lane traffic may be required on the streets in the project area during construction. Traffic could also be slightly delayed at times while construction equipment is moving in the streets. Such impacts are typical and unavoidable in construction projects; however, they can be minimized by careful planning, scheduling and implementation measures.

9.4.3 Visual Impacts:

Short-term visual impacts would occur during construction of the project. Such impacts are inevitable and can be minimized by careful inspection during construction to ensure appropriate construction techniques are employed.

Long-term impacts from the project would be minimal. Once the work is complete, roadways and vegetation would be restored to its pre-construction condition or improved. Appropriate landscaping and buffering will be employed to minimize any visual impact from the proposed wastewater pump station.

9.4.4 Groundwater Impacts:

Both short-term and long-term impacts on groundwater quality would be positive. The construction activities will not affect groundwater quality. The implementation of the project will eliminate on-site wastewater discharges as usage malfunctioning septic systems and cesspools cease and properties are connected to the sewer, thus directly improving groundwater quality.

9.4.5 Surface Water Impacts:

Adverse short-term water quality impacts would be limited to potential siltation of surface water adjacent to construction activity. This impact will be mitigated by rigorous implementation of erosion control measures such as hay bales, sedimentation basins, silt fencing and mulching and seeding of exposed areas immediately after construction. The long-term impacts on surface water quality will be positive by eliminating the nutrient loading associated with on-site septic systems. Soil erosion and sedimentation control measures employed during construction will mitigate any potential surface water pollution.

9.4.6 Air Quality Impacts:

Short-term air quality impacts may occur during construction caused by exhaust and dust generated by construction related activities. Equipment exhaust will be negligible when compared with those produced by normal traffic flow. The dust will be controlled by wetting or application of calcium chloride.

Limiting contractor activities to prescribed working hours, as needed, will mitigate noise impacts. Also, routine inspection and maintenance of all mechanized construction equipment will be enforced.

This project is not in conflict with the Connecticut State Air Quality Implementation Plan.

9.4.7 Socio-economic Impacts:

Various socioeconomic impacts will result from the project. The Old Colony Beach Association would benefit as a whole by implementing the recommended plan. Property values will increase following sewer construction in the area. Groundwater and surface water quality will be maintained or improved

by eliminating inadequately treated wastewater discharges. Furthermore, Old Colony Beach, one of the town's natural resources, will be improved by implementation of the recommended plan.

A concern that has been expressed throughout the completion of this study is the increased burden on town services (such as fire fighting, police patrols and response, emergency response, and schools) that would be caused by the construction of sewers in the Old Colony Beach area. The general thought is that after the area is sewered, the seasonal dwellings will be converted to year-round use, thereby increasing the burden on town services. The issue of dwelling conversion should be resolved as a zoning issue. There will not be an increase in required town services associated simply with the sewering of the Old Colony Beach area.

9.4.8 Induced Growth:

For the purposes of designing the recommended sewer collection system and pump station, 7% growth was accounted for during the 25-year planning period considered for this study. This growth figure is equal to an additional 15 dwellings being constructed in the Old Colony Beach area.

9.4.9 Environmentally Sensitive Areas:

9.4.9.1 Wetlands

Any construction in wetland areas or crossings of streams or rivers will have an impact on the environment.

A preliminary review of the existing conditions and possible construction scenarios associated with the recommended sewer plan indicates that no wetlands or watercourses will be involved during

construction in the Old Colony Beach area. Construction of the sewer line to East Lyme along Route 156 will entail crossing the Three Mile River with a buried 4-inch diameter force main. All available best management practices will be used during construction to minimize environmental impacts to the river.

During design of the sanitary sewer system, a detailed evaluation of the project area will be conducted by a certified soil scientist to definitively determine the existence and location of wetlands, both fresh water and tidal. Any construction related activities that could result in impacts to wetlands or watercourses would be subject to regulation, review and approval by the local Conservation Commission and if necessary the CT Department of Environmental Protection and the U.S. Army Corps of Engineers. Due to its proximity to Long Island Sound, the project is subject to DEEP Coastal Area Management review and approval.

Contract documents and specifications will require soil erosion and sedimentation controls such as riprap, hay bales, sedimentation basins and silt fencing to be used in the appropriate areas. Caution will be exercised to preserve trees and minimize disturbance of environmentally sensitive areas. No equipment or material storage will be allowed in wetland areas. Vegetative clearing would be minimized to the extent practicable and vegetative cover would be restored as soon as possible after construction.

9.4.9.2 Endangered and Threatened Species

The DEEP Natural Diversity Data Base map for Old Lyme indicates the possible presence of listed species in the proposed project area. Measures will be incorporated into the design of the project to ensure that any construction activities related impacts will be minimized.

Construction activities must be closely monitored, and implementation of appropriate sedimentation and erosion control measures is an absolute requirement to protect Long Island Sound and the Three Mile River from any adverse impacts. It is expected that the proposed sewer system will improve water quality in Long Island Sound as on-site wastewater treatment and disposal will be eliminated from the project area.

9.4.9.3 Archaeological Needs

According to the Connecticut Historical Commission, there are no known historical resources in the project area that could be affected by the proposed project. The intensity of development that has occurred within the project area is likely to have disturbed any artifacts that may have been present.

9.4.10 Mitigation of Adverse Impacts:

9.4.10.1 On Land Use

Virtually all of the area to be served by the proposed sanitary sewer system is presently developed. The Town of Old Lyme rigorously enforces its zoning regulations to prevent intensification of development. Some of the lots in the proposed service area that are not developed may experience some increased pressure to develop; however, enforcement of current zoning regulations should adequately control any induced growth.

9.4.10.2 Traffic and Circulation Impacts

Impacts on traffic will be temporary and can be mitigated with appropriate timing of construction, selected detours, and police direction of traffic during heavy travel times and in difficult areas of construction.

9.4.10.3 Visual Impacts

Visual impacts will be minor and can be mitigated with the incorporation of careful construction practices so as not to deteriorate existing conditions. Appropriate landscaping and buffering of the pumping facilities will be an integral component of the design and construction of the sewer system.

9.4.10.4 Groundwater Impacts

No adverse impact on groundwater is anticipated.

9.4.10.5 Surface Water Impacts

Using erosion and sedimentation control measures will mitigate potential adverse impacts on surface water.

9.4.10.6 Air Quality Impacts

Adverse impacts on air quality will not be significant. Dust produced during construction will be controlled with calcium chloride and watering as necessary. Construction vehicles and equipment will be required to abide by prevailing regulations regarding emissions. Limiting the hours for construction as necessary and proper maintenance of construction equipment will mitigate noise impacts.

9.4.10.7 Socio-economic Impacts

The only adverse socio-economic impact is the cost of the project. The users of the system will pay for the entire local share of project costs. This impact is unavoidable; however, it would be offset by the benefit the users will realize by eliminating existing and future pollution problems and by enhancing the value of their property.

9.4.10.8 Environmentally Sensitive Areas

Adverse impacts on environmentally sensitive areas will be mitigated through the use of soil erosion and sedimentation control measures and through other means required by the regulatory agencies having jurisdiction over construction activities in the Old Colony Beach area.

9.4.11 For All Adverse Impacts:

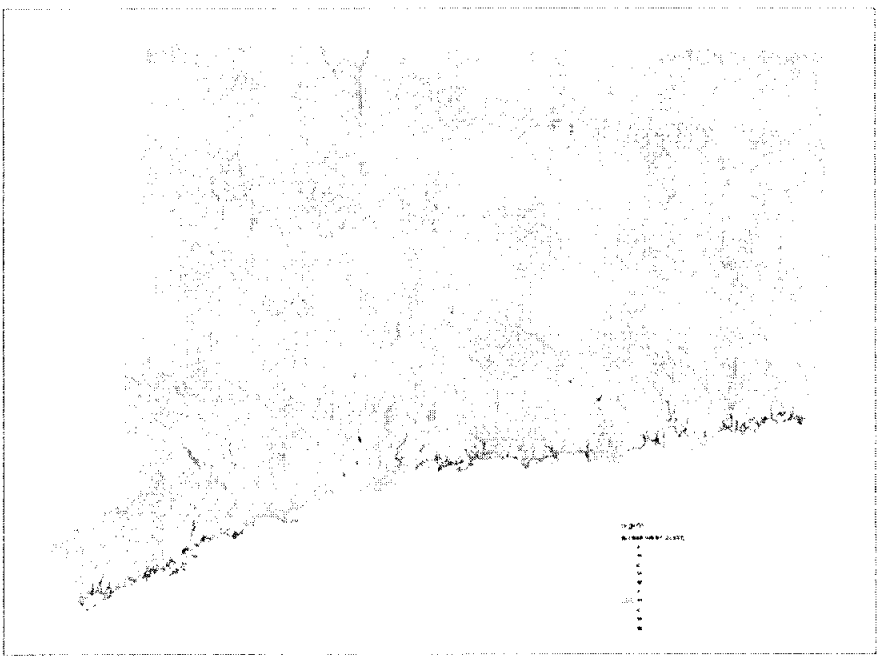
Any and all adverse impacts will be eliminated or minimized during the design, permitting and construction phases of the project.

Appendix A

Descriptions of Water Quality Classifications

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

WATER QUALITY STANDARDS



Bureau of Water Protection and Land Reuse
Planning and Standards Division

Surface Water Quality Standards	**Effective**	**February 25, 2011**
Groundwater Quality Standards	**Effective**	**April 12, 1996**

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CONNECTICUT WATER QUALITY STANDARDS

PREFACE

The Water Quality Standards (WQS) set forth in this publication are an important element in Connecticut's clean water program. The WQS set an overall policy for management of water quality in accordance with the directive of Section 22a-426 of the Connecticut General Statutes. In simple terms the policies can be summarized by saying that the Department of Environmental Protection shall:

- Protect surface and ground waters from degradation.
- Segregate waters used for drinking from those that play a role in waste assimilation.
- Restore surface waters that have been used for waste assimilation to conditions suitable for fishing and swimming.
- Restore degraded ground water to protect existing and designated uses.
- Provide a framework for establishing priorities for pollution abatement and State funding for clean up.
- Adopt standards that promote the State's economy in harmony with the environment.

There are three elements that make up the WQS. The first of these is the Standards themselves. The Standards comprise the policy statements that discuss issues such as: classification of different water resources according to the desirable use: antidegradation; allowable types of discharges; fundamental principles of waste assimilation; and a variety of other subjects. The second element, also contained in this document, is the Criteria. The Criteria are descriptive and numerical standards that describe the allowable parameters and goals for the various water quality classifications. The final element is the Classification Maps that show the Class assigned to each surface and groundwater resource throughout the State. These maps identify the relationship between designated uses and the applicable Standards and Criteria for each class of surface and ground water.

These three elements, Standards, Criteria and Classification Maps, comprise the WQS and are adopted using the public participation procedures contained in Section 22a-426 of the Connecticut General Statutes. The Standards, Criteria and Classification Maps are required to be reviewed and revised on a triennial basis. Any change is considered a revision requiring public participation. The public participation process consists of public meetings, notification of all chief elected officials, notice in the Connecticut Law Journal and a public hearing. The Classification Maps may be the subject of separate public hearings that are held for the adoption of the map covering each major drainage basin in the State.

As with any complex program, it is always difficult to anticipate the questions that the public may have about either proposed or adopted standards. The staff of the Planning and Standards Division of the Bureau of Water Protection and Land Reuse are the best source of information about these WQS and are always willing to provide answers to your questions. They may be contacted by writing to:

Director
Planning and Standards Division
Bureau of Water Protection and Land Reuse
Department of Environmental Protection
79 Elm Street
Hartford, Connecticut 06106-5127

The WQS do not stand alone; rather, they are one critical element in Connecticut's program to protect and improve water quality. The WQS are written in response to, and in concert with, the principles of Connecticut's Clean Water Act, which is in Chapter 446k of the Connecticut General Statutes (CGS). The Statutes set the broad outline and legal framework for Connecticut's entire program. They establish the authorities and procedures for the WQS, for permitting discharges to the waters of the State and for the abatement of pollution. Within the framework of the Statutes, the WQS establish broad policy and objectives to meet the statutory goals. These objectives are then carried out by means of specific procedures and requirements of statutory sections and even more detailed regulations. These include Statutes and Regulations for the permitting of discharges to the waters of the State, hazardous materials management, solid waste management, water diversions, structures, dredging, wetlands and others.

The Water Quality Standards provide policy guidance in many different areas, all of which are subject to detailed statutory and regulatory requirements. Some examples are as follows:

- Decisions on the acceptability of a type of discharge to a specific water resource.
- Any decision on the siting of a landfill.
- Decisions on the type of remediation and priority for the cleanup of hazardous waste sites.
- Decisions on the priority assigned to improvements of municipal sewerage systems and the priority for funding such projects.
- Decisions on Water Quality Certification pursuant to Section 401 of the Federal Clean Water Act.

INTRODUCTION

Section 22a-426 of the Connecticut General Statutes requires that the Commissioner of Environmental Protection adopt standards of water quality consistent with the federal Clean Water Act. The WQS establish a goal of restoring and maintaining the chemical, physical, and biological integrity of Connecticut surface waters and, wherever attainable, providing for the protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water. The purpose of these WQS is to provide clear and objective statements for existing and projected water quality and the general program to improve Connecticut's water resources. They also serve to qualify the State and its municipalities for available federal grants for water pollution control. Section 22a-426 of the Connecticut General Statutes mandates these WQS shall:

- Apply to interstate waters or portions thereof within the State.
- Apply to such other waters within the State as the Commissioner may determine is necessary.
- Protect the public health and welfare and promote the economic development of the State.
- Preserve and enhance the quality of State waters for present and prospective future use for public water supplies, propagation of fish and aquatic life and wildlife, recreational purposes and agricultural, industrial and other legitimate uses.
- Be consistent with the health standards as established by the Department of Public Health.

Water Quality Classifications, based on the adopted WQS, establish designated uses for surface and ground waters and identify the criteria necessary to support those uses. The designated use and criteria applicable to each water body or identified segment serve to focus the Department's water quality management activities, including establishment of water quality based treatment controls and strategies required by the federal Clean Water Act.

Section 303 of the federal Clean Water Act requires state adoption of surface WQS and their review and, if warranted, modification at least once every three years. Connecticut first adopted Water Quality Standards in 1967. Federal law defines WQS as the identification of water quality goals for each water resource through the assignment of designated uses to be made of the water and by setting criteria necessary to protect the uses.

Federal regulations specify that WQS should, wherever attainable, provide water quality for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water, taking into consideration their use and value for public water supplies, propagation of fish, shellfish and wildlife, recreation in and on the water and agricultural, industrial and other purposes including navigation.

Although federal law requires adoption of Water Quality Standards for surface waters, WQS for ground waters are not subject to federal review and approval. Connecticut's WQS recognize that surface and ground waters are interrelated and address the issue of competing use of ground waters for drinking and for wastewater assimilation. These Standards specifically identify ground water quality goals, designated uses and those measures necessary for protection of public and private drinking water supplies, which are the principal uses of Connecticut ground waters.

SURFACE WATER QUALITY STANDARDS

1. It is the State's goal to restore or maintain the chemical, physical, and biological integrity of surface waters. Where attainable, the level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water shall be achieved.

2. Existing and designated uses such as propagation of fish, shellfish and wildlife, recreation, public water supply, and agriculture, industrial use and navigation, and the water quality necessary for their protection is to be maintained and protected.

3. Surface waters with an existing quality better than the criteria established in these WQS shall be maintained at their existing high quality, unless the Commissioner finds, after adequate opportunity for intergovernmental review and public participation, that allowing lower water quality is necessary to accommodate overriding economic or social benefits to the State and to the area in which the surface water is located, and that existing and designated uses will be fully protected. The implementation procedures for the antidegradation provisions of these WQS are provided in full in Appendix E.

4. For all new and existing discharges to high quality surface waters the Commissioner shall, at a minimum, require applicants to meet the highest applicable standards of performance promulgated pursuant to the Federal Clean Water Act and the Connecticut General Statutes, and may require additional treatment measures if deemed necessary to prevent pollution and maintain high water quality. The Commissioner shall also require the use of appropriate Best Management Practices for control of discharges and activities to high quality surface waters.

5. If the Commissioner designates a high quality surface water as an Outstanding National Resource Water pursuant to federal regulations at 40 CFR 131.12(a) the high water quality shall be maintained and protected. The lowering of water quality is prohibited for such surface waters except where activities limited in time and scope will result in only temporary and insignificant changes in water quality and the activities will not result in water quality less than necessary to protect existing and designated uses.

6. Standard 1 shall be met except where (1) a use attainability analysis prepared pursuant to federal regulation at 40 CFR 131.10(g) and (j) demonstrates that the surface water has been irreparably altered to the extent that certain designated uses have been permanently lost; and (2) quality criteria necessary to protect all other existing, and designated uses of the surface water have been adopted by the Commissioner as a revision to these WQS in accordance with Section 22a-426 of the Connecticut General Statutes. Periodic re-examination of such designated use decisions shall be performed as required by federal regulations (40 CFR 131.20).

7. Any person or municipality requesting a change in Water Quality Classification shall demonstrate to the Commissioner that the proposed new Classification is consistent with all existing or designated uses made of, or presently possible in, such surface waters. Any such change in a Water Quality Classification shall be considered a revision of these WQS and subject to the public participation requirements of Section 22a-426 of the Connecticut General Statutes. The Commissioner will not approve a reclassification which is not consistent with Standards 3 or 4 of these WQS.

8. Water Quality Criteria do not apply to environmental conditions brought about by natural causes or conditions.

9. Discharges to surface waters shall be limited as follows:

   (A) Class AA, A and SA surface waters: discharges may be permitted by the Commissioner from public or private drinking water treatment systems, dredging activity and dredge material dewatering operations, including the discharge of dredged or fill material and clean water discharges. In Class AA surface waters such discharges shall be subject to the approval of the Commissioner of Public Health. The Commissioner may authorize other discharges to surface waters with a Classification of SA, A or AA provided the Commissioner finds such discharge will be of short duration and is necessary to remediate surface water or ground water pollution. Any such discharge shall be treated or controlled to a level which in the judgment of the Commissioner, protects aquatic life and public health.

   The Commissioner may authorize certain treated domestic sewage discharges to surface waters with a Classification of A or SA provided the Commissioner finds that: 1) such discharge is deemed necessary by the Commissioner to abate ground water or surface water pollution from a domestic sewage disposal system that was in use prior to February 28, 2011; 2) such discharge is treated or controlled to the maximum extent practicable in the subsurface and in all cases to a level that in the judgment of the Commissioner, in consultation with the Commissioner of Public Health, protects the environment, public health, safety and welfare; 3) such discharge does not constitute a community pollution problem as defined in Section 22a-423 of the Connecticut General Statutes; 4) a demonstration has been made to the satisfaction of the Commissioner that no technically and economically feasible alternative exists for such discharge; and 5) such discharge is not being sought in connection with a new source, new or expanded building or development, or a change to the design or use of an existing building or development, which change results in, or as designed may result in, an increase in (i) the occupancy of such building or development or (ii) the discharge from such building or development. Nothing in this standard shall preclude the Commissioner from requiring such discharge to be eliminated should future conditions provide a technically or economically feasible alternative to authorizing such discharge.

   (B) Class B and SB surface waters: discharges may be permitted for all those allowed in Class AA, A and SA surface waters, cooling water discharges, discharges from municipal and industrial wastewater treatment systems and other discharges subject to the provisions of Section 22a-430 of the Connecticut General Statutes.

(C) Class B* surface waters: discharges may be permitted for all those allowed in Class AA, A and SA surface waters. No direct wastewater discharges are allowed other than those consistent with Class AA, A and SA surface waters.

10. The Commissioner may, on a case-by-case basis, establish zones of influence when authorizing discharges to surface waters under Sections 22a-430 and 22a-133(k) of the Connecticut General Statutes in order to allocate a portion of the receiving surface waters for mixing and assimilation of the discharge. Unless otherwise indicated in these WQS, the applicable Water Quality Criteria apply outside the zone of influence for a discharge. Establishment of a zone of influence shall not preclude attainment of any existing or designated uses of the receiving surface waters. The area and/or volume of receiving water allocated to zones of influence shall be determined based on the unique physical, chemical and biological characteristics of the receiving surface water body. The Commissioner may require applicants to provide information on receiving surface water and wastewater characteristics including the volume of flow and area required for mixing and assimilation of waste. The zone of influence shall be limited to the maximum extent possible. As a guideline, the zone of influence for assimilation of a thermal discharge shall be no greater than 25% of the cross-sectional area or volume of flow of the receiving water. In establishing a zone of influence the Commissioner shall consider without limitation:

(A) the characteristics of the discharge, such as its volume, strength, temperature and the persistence of any substances in the discharge, potential bioaccumulation or bioconcentration of these substances in aquatic organisms, and the potential for any substances, either singly or in combination with other substances present in the discharge or receiving surface water body to result in an unacceptable risk to human health or the environment.

(B) an allowance for a continuous zone of passage for free swimming and drifting organisms.

(C) the effect of the discharge on spawning grounds or nursery areas of sensitive aquatic organisms or areas utilized by aquatic organisms for shelter and living space.

(D) the effect of the discharge on the aesthetic quality of the receiving water including but not limited to the potential to cause objectionable deposits, floating debris, oil, scum, and other materials that form nuisances or produce objectionable color, odor, taste, or turbidity, or that may attract undesirable aquatic life or wildlife, or result in the dominance of nuisance species.

(E) the location of other discharges in the receiving surface water body to insure that the cumulative effect of adjacent zones of influence will not significantly reduce the environmental value or preclude any existing or designated uses of the receiving surface water.

Assessment of environmental value will be based on the characteristics of the receiving surface water including but not limited to: type of water body, velocity, depth, number and type of aquatic habitats, migration patterns, nature of the food chain, level of productivity, water temperature, condition of associated biological communities, ability of tributaries to provide biological recruitment, presence of endangered species and value

to human uses (aesthetic, commercial, sport fishing and recreational uses).

11. The 7Q10 is the minimum flow to which these Water Quality Standards for surface waters apply, except when a surface water is regulated by dams or water withdrawals sanctioned by law to result in flows below that level. In such cases these Water Quality Standards apply to that low flow determined by the Department's Minimum Flow Regulations as amended (Section 26-141a-1, et seq. of the Regulations of Connecticut State Agencies); the Department's Diversion Permit Program (Section 22a-365 through 22a-378 of the Regulations of Connecticut State Agencies); or the Federal Energy Regulatory Commission's hydropower licensing process (Federal Power Act 16 USCS SEC 791a et seq). Maintaining a long-term flow of 7Q10 or less may result in significant stress on the physical and biological quality of surface waters. In those surface waters at, near or below the naturally occurring 7Q10 flow, more stringent Water Quality Criteria may be required to achieve and maintain existing and designated uses. The Commissioner may approve discharge limitations based on minimum average daily flow in excess of 7Q10 conditions, provided the Commissioner is satisfied that special measures will be implemented during low flow conditions which provide protection to the environment at least as effective as that protection which would pertain if limitations were based solely on 7Q10 conditions. Surface waters which are influenced by tidal forces or which experience short-term variation in flow due to periodic or irregular water release from upstream diversions or other causes may require special consideration by the Commissioner when establishing a zone of influence or issuing discharge permits under the provisions of Section 22a-430 of the Connecticut General Statutes in order to protect existing and designated uses, including consideration of the minimum flow to which these Water Quality Standards apply. Low flow in a tidal water body shall be evaluated under low tide conditions unless another low flow regime is demonstrated to the Commissioner's satisfaction to be protective of water quality and aquatic resources.

12. The Commissioner, pursuant to Chapter 446k of the Connecticut General Statutes and regulations adopted there under, will regulate discharges to the surface waters to assure that such discharges do not cause acute or chronic toxicity to freshwater and marine aquatic life and wildlife, do not impair the biological integrity of freshwater and marine ecosystems and do not create an unacceptable risk to human health.

    (A) In making a determination under Chapter 446k of the Connecticut General Statutes as to whether a discharge will or can reasonably be expected to cause pollution of surface waters, the Commissioner shall consider the numeric criteria for the chemical constituents listed in Appendix D;

    (B) The Commissioner may amend the numeric criteria for the chemical constituents listed in Appendix D of these WQS in accordance with the procedures specified in Section 22a-426 of the Connecticut General Statutes on his or her own initiative, or upon request of any person or municipality that site-specific water quality criteria be adopted or amended, provided such request is supported by sound scientific and technical evidence demonstrating the following:

        1. Conditions at the specific site differ significantly from those used in establishing the statewide criteria.

        2. The proposed site-specific criteria are sufficiently stringent to protect all existing and designated uses of the water body.

3. The proposed site-specific criteria are derived in a manner consistent with sound scientific and technical principles, giving consideration to all applicable federal guidance.

13. The Commissioner may adopt or amend criteria for any surface water or class of water, in accordance with the procedures specified in the Connecticut General Statutes (Section 22a-426) and in paragraphs (1), (2), and (3) of Standard 12(B) of these WQS, provided such change is supported by sound scientific and technical evidence, and existing and designated uses are fully protected.

14. Surface waters and sediments shall be free from chemical constituents in concentrations or combinations which will or can reasonably be expected to result in acute or chronic toxicity to aquatic organisms or otherwise impair the biological integrity of aquatic or marine ecosystems outside of any dredged material disposal area or areas designated by the Commissioner for disposal or placement of fill materials or any zone of influence allowed by the Commissioner, or bioconcentrate or bioaccumulate in tissues of fish, shellfish and other aquatic organisms at levels which will impair the health of aquatic organisms or wildlife or result in unacceptable tastes, odors or health risks to human consumers of aquatic organisms or wildlife unless such sediments are capped with material suitable for unconfined, open water disposal as an appropriate means of ensuring consistency with this standard as approved by the Commissioner in writing. In determining consistency with this Standard, the Commissioner shall at a minimum consider the numeric criteria listed in Appendix D and any other information the Commissioner deems relevant.

15. Except within dredged material disposal areas or areas designated by the Commissioner for disposal or placement of fill materials, surface waters and bottom sediments shall be substantially free of pollutants that: a) unduly affect the composition of bottom fauna; b) unduly affect the physical or chemical nature of the bottom; or c) interfere with the propagation or habitats of shellfish, finfish and wildlife. Dredged materials disposed of at a dredged material disposal area shall not result in: a) floating residues of any sort; b) release of any substance which may result in long-term or permanent degradation of water quality in surface waters overlying or adjacent to the disposal areas; c) dispersal of contaminated sediments outside a dredged material disposal area other than that occurring as a transient plume during disposal operations; or d) biological mobilization and subsequent transport of toxic substances to food chains. The Commissioner may consider Best Management Practices including but not limited to capping the dredged material with material suitable for unconfined open water disposal as appropriate means of ensuring consistency with this standard.

16. Biological Condition criteria may be utilized where appropriate for assessment of the biological integrity of surface waters.

17. The discharge of radioactive materials to a surface water in concentrations or combinations which would be harmful to human, animal or aquatic life shall not be allowed. The applicable criteria can be found in Title 10, Part 20 of the Code of Federal Regulations.

18. Best Management Practices for control of non-point source pollutants may be required by the Commissioner on a case-by-case basis.

19. The Commissioner shall require Best Management Practices, including imposition of discharge limitations or other reasonable controls on a case-by-case basis as necessary for point and nonpoint sources of phosphorus and nitrogen, including sources of atmospheric deposition, which have the potential to contribute to the impairment of any surface water, to ensure maintenance and attainment of existing and designated uses, restore impaired waters, and prevent excessive anthropogenic inputs of nutrients or impairment of downstream waters.

20. Use of Best Management Practices and other reasonable controls on nonpoint sources of nutrients and sediment are preferable to the use of biocides to address a trophic state that has been altered due to excessive anthropogenic inputs.

21. Surface waters identified as potential drinking water supplies in the Long Range Plan for Management of Water Resources prepared and adopted pursuant to Section 22a-352 of the Connecticut General Statutes shall be designated Class AA. The Commissioner may, with the concurrence of the Commissioner of the Department of Public Health, designate other surface waters as Class AA including surface waters that (1) have been designated a proposed drinking water supply in Connecticut's Conservation and Development Policies Plan, (2) have been recommended for future use as a drinking water supply in the current approved water supply plan submitted and approved pursuant to Section 25-32d of the Connecticut General Statutes, (3) the Commissioner has issued a Diversion Permit authorizing use as a drinking water supply, or (4) have been identified in a request from a municipality for designation as a drinking water supply at a public hearing concerning water quality classifications.

22. Section 22a-417 of the Connecticut General Statutes imposes an absolute restriction on the discharge of sewage to Class AA reservoirs and their tributaries. The existence of a discharge to a surface water which occurs outside the State that then flows into the State shall not be considered a valid reason for either relaxing the restriction in Connecticut or changing the Class AA designation. It is a policy of the State to pursue the adoption of compatible WQS in neighboring states to assure the protection of Connecticut drinking water supplies.

23. Disinfection shall be required for all treated sewage discharges to surface waters. The period of disinfection shall vary depending on the characteristics of the receiving surface water as described below:

    (A) Continuous disinfection shall be required at all sewage treatment plants located south of Interstate Highway 95 (I-95) to protect shellfish resources.

    (B) Disinfection shall be required from May 1 to October 1 at all sewage treatment plants located north of I-95. Seasonal disinfection is intended to protect the sanitary quality of bathing waters, and minimize adverse impacts to aquatic life associated with disinfection. An alternative schedule, including continuous disinfection, may be required if found necessary by the Commissioner to protect existing or designated uses.

    (C) For those Class B surface waters located north of Interstate Highway 95 (I-95) and downstream of a sewage treatment plant providing seasonal disinfection as

authorized by the Commissioner, criteria for indicator bacteria do not apply during periods when disinfection is not required.

24. The discharge of sewage from any vessel to any water is prohibited.

25. Indicator bacteria are used to detect the potential presence of contamination by human or animal wastes. Due to the inherent uncertainty involved in sampling and analytically determining bacteria levels, exceedences of water quality criteria does not always indicate a water quality problem and therefore should be investigated by means of a sanitary survey or other appropriate means to determine sources of elevated indicator bacteria levels. (see also Appendix B).

26. Physical obstructions such as dams, which prevent fish migration for spawning and growth, shall not be considered a valid reason for failure to achieve and maintain water quality conditions necessary to support all designated uses of a surface water unless the Commissioner has approved a Use Attainability Analysis documenting that a designated use is not attainable for such surface water.

27. The allowable temperature increase resulting from discharges in the estuarine segments of the Housatonic, Connecticut and Thames Rivers shall be consistent with the criteria for the non-tidal segments.

28. Surface water quality monitoring methods shall be consistent with Title 40 Part 30 of the Code of Federal Regulations or other equivalent monitoring methods approved in writing by the Commissioner.

29. Surface waters which are not specifically classified shall be considered as Class A or Class SA.

30. Watercourses which are contained in drainage conduits or pipes and which are not assigned a specific class are considered to be the class of the water body segment into which they discharge.

31. Revisions to the WQS, including but not limited to the following, shall be subject to the public participation process provided for in Section 22a-426 of the Connecticut General Statutes:

    (A) The adoption of a map which depicts the Water Quality Classifications assigned to any water resource.

    (B) Any decisions regarding the lowering of water quality in existing high quality surface waters or a change in the Water Quality Classification of any surface water.

    (C) The adoption of any Use Attainability Analysis.

    (D) The adoption or amendment of site-specific water quality criteria.

32. These WQS shall apply to all surface waters. Evaluation of a discharge or discharge of dredged or fill material to wetlands shall include consideration of the manner in which

such wetlands support existing and designated uses and protect and maintain downstream water quality.

SURFACE WATER CLASSIFICATIONS AND CRITERIA

CLASS AA DESIGNATED USES AND CRITERIA

Designated Uses- These surface waters are designated for: existing or proposed drinking water supplies; habitat for fish and other aquatic life and wildlife; recreation; and water supply for industry and agriculture.

Parameter	Criteria
Aesthetics	Uniformly excellent.
Dissolved oxygen	Not less than 5 mg/L at any time.
Sludge deposits-solid refuse-floating solids-oils and grease-scum	None other than of natural origin.
Color	None other than of natural origin.
Suspended and settleable solids	None in concentrations or combinations which would impair designated uses; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of the bottom; none which would adversely impact aquatic organisms living in or on the bottom substrate.
Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity or dredging activity or discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained.
Turbidity	Shall not exceed 5 NTU over ambient levels and none exceeding levels necessary to protect and maintain all designated uses. All reasonable controls or Best Management Practices are to be used to control turbidity.
Indicator bacteria	See Appendix B.
Taste and odor	None other than of natural origin.
pH	As naturally occurs.
Allowable Temperature Increase	There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and in no case exceed 85 °F, or in any case raise the temperature of surface water more than 4 °F.
Chemical constituents	None in concentrations or combinations which would be harmful to designated uses. Refer to Standards numbers 10, 11, 12, 13, 14, 17 and 19.
Nutrients	The loading of nutrients, principally phosphorus and nitrogen, to any surface water body shall not exceed that which supports maintenance or attainment of designated uses.
Sodium	Not to exceed 20 mg/L.
Biological Condition	Sustainable, diverse biological communities of indigenous taxa shall be present. Moderate changes, from natural conditions, in the structure of the biological communities, and minimal changes in ecosystem function may be

evident; however, water quality shall be sufficient to sustain a biological condition within the range of Connecticut Biological Condition Gradient Tiers 1-4 as assessed along a 6 tier stressor gradient of Biological Condition Gradient (See Appendix G).

CLASS A DESIGNATED USES AND CRITERIA

Designated Uses - These surface waters are designated for: habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture.

Parameter	Criteria
Aesthetics	Uniformly excellent.
Dissolved oxygen	Not less than 5 mg/L at any time.
Sludge deposits-solid refuse-floating solids-oils and grease-scum	None other than of natural origin.
Color	None other than of natural origin.
Suspended and settleable solids	None in concentrations or combinations which would impair designated uses; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of the bottom; none which would adversely impact aquatic organisms living in or on the bottom substrate.
Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, dredging activity or the discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained.
Turbidity	Shall not exceed 5 NTU over ambient levels and none exceeding levels necessary to protect and maintain all designated uses. All reasonable controls or Best Management Practices are to be used to control turbidity.
Indicator bacteria	See Appendix B.
Taste and odor	None other than of natural origin.
pH	As naturally occurs.
Allowable Temperature Increase	There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 85 °F, or in any case raise the temperature of surface water more than 4 °F.
Chemical constituents	None in concentrations or combinations which would be harmful to designated uses. Refer to Standards numbers 10, 11, 12, 13, 14, 17, and 19.
Nutrients	The loading of nutrients, principally phosphorus and nitrogen, to any surface water body shall not exceed that which supports maintenance or attainment of designated uses.
Sodium	None other than of natural origin.
Biological Condition	Sustainable, diverse biological communities of indigenous taxa shall be present. Moderate changes, from natural conditions, in the structure of the biological communities, and minimal changes in ecosystem function may be evident; however, water quality shall be sufficient to sustain a biological condition within the range of Connecticut Biological Condition Gradient Tiers 1-4 as assessed along a 6 tier stressor gradient of Biological Condition Gradient (See Appendix G).

CLASS B DESIGNATED USES AND CRITERIA

Designated Uses - These surface waters are designated for: habitat for fish and other aquatic life and wildlife; recreation; navigation; and industrial and agricultural water supply.

Parameter	Criteria
Aesthetics	Good to excellent.
Dissolved oxygen	Not less than 5 mg/L at any time.
Sludge deposits-solid refuse floating solids-oils and grease-scum	None except for small amounts that may result from the discharge from a permitted waste treatment facility and none exceeding levels necessary to protect and maintain all designated uses.
Color	None which causes visible discoloration of the surface water outside of any designated zone of influence.
Suspended and settleable solids	None in concentrations or combinations which would impair the most sensitive designated use; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of the bottom; and none which would adversely impact aquatic organisms living in or on the bottom sediments; shall not exceed 10 mg/L over ambient concentrations.
Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, dredging activity or discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained.
Turbidity	Shall not exceed 5 NTU over ambient levels and none exceeding levels necessary to protect and maintain all designated uses. All reasonable controls or Best Management Practices are to be used to control turbidity.
Indicator bacteria	Refer to Appendix B
Taste and odor	None that would impair any uses specifically assigned to this Class.
pH	6.5 – 8.0
Allowable Temperature Increase	There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 85 °F, or in any case raise the temperature of surface water more than 4 °F.
Chemical constituents	None in concentrations or combinations which would be harmful to designated uses. Refer to Standards numbers 10, 11, 12, 13, 14, 17, and 19.
Nutrients	The loading of nutrients, principally phosphorus and nitrogen, to any surface water body shall not exceed that which supports maintenance or attainment of designated uses.

Biological Condition	Sustainable, diverse biological communities of indigenous taxa shall be present. Moderate changes, from natural conditions, in the structure of the biological communities, and minimal changes in ecosystem function may be evident; however, water quality shall be sufficient to sustain a biological condition within the range of Connecticut Biological Condition Gradient Tiers 1-4 as assessed along a 6 tier stressor gradient of Biological Condition Gradient (See Appendix G).

Note: Class B* surface water, applicable to Candlewood Lake, is a subset of Class B waters and is identical in all ways to the designated uses, criteria and standards for Class B waters except for the restriction on direct discharges stated in Water Quality Standard 9.

CLASS SA DESIGNATED USES AND CRITERIA

Designated Uses - These surface waters are designated for: habitat for marine fish, other aquatic life and wildlife; shellfish harvesting for direct human consumption; recreation; industrial water supply; and navigation.

Parameter	Criteria
Aesthetics	Uniformly excellent.
Dissolved oxygen	Acute: Not less than 3.0 mg/L. Chronic: Not less than 4.8 mg/L with cumulative periods of dissolved oxygen in the 3.0– 4.8 mg/L range as detailed in Appendix C.
Sludge deposits-solid refuse-floating solids-oils and grease-scum	None other than of natural origin.
Color	None other than of natural origin.
Suspended and settleable solids	None other than of natural origin.
Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, dredging activity or the discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained.
Turbidity	None other than of natural origin except as may result from normal agricultural, road maintenance, or construction activity, dredging activity or discharge of dredged or fill materials provided all reasonable controls and Best Management Practices are used to control turbidity and none exceeding levels necessary to protect and maintain all designated uses.
Indicator bacteria	See Appendix B
Taste and odor	As naturally occurs.
pH	6.8 – 8.5
Allowable Temperature Increase	There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 83 °F. or in any case raise the temperature of the receiving water more than 4 °F. During the period including July, August and September, the temperature of the receiving water shall not be raised more than 1.5 °F unless it can be shown that spawning and growth of indigenous organism will not be significantly affected.
Chemical constituents	None in concentrations or combinations which would be harmful to designated uses. Refer to Standards numbers 10, 11, 12, 13, 14, 17, and 19.

Nutrients	The loading of nutrients, principally phosphorus and nitrogen, to any surface water body shall not exceed that which supports maintenance or attainment of designated uses.
Biological Condition	Sustainable, diverse biological communities of indigenous taxa shall be present. Moderate changes, from natural conditions, in the structure of the biological communities, and minimal changes in ecosystem function may be evident; however, water quality shall be sufficient to sustain a healthy, diverse biological community

CLASS SB DESIGNATED USES AND CRITERIA

Designated Uses - These waters are designated for: habitat for marine fish, other aquatic life and wildlife; commercial shellfish harvesting; recreation; industrial water supply; and navigation.

Parameter	Criteria
Aesthetics	Good to excellent.
Dissolved oxygen	Acute: Not less than 3.0 mg/L. Chronic: Not less than 4.8 mg/L with cumulative periods of dissolved oxygen in the 3.0– 4.8 mg/L range as detailed in Appendix C.
Sludge deposits-solid refuse-floating solids-oils and grease-scum	None except for small amounts that may result from the discharge from a grease waste treatment facility providing appropriate treatment and none exceeding levels necessary to protect and maintain all designated uses.
Color	None resulting in obvious discoloration of the surface water outside of any designated zone of influence.
Suspended and settleable solids	None in concentrations or combinations which would impair the designated uses; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of bottom sediments; none which would adversely impact organisms living in or on the bottom sediment.
Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, dredging activity or discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained.
Turbidity	None other than of natural origin except as may result from normal agricultural, road maintenance, or construction activity, or discharge from a waste treatment facility providing appropriate treatment, dredging activity or discharge of dredged or fill materials provided all reasonable controls and Best Management Practices are used to control turbidity and none exceeding levels necessary to protect and maintain all designated uses.
Indicator bacteria	See Appendix B.
Taste and odor	As naturally occurs. None that would impair any uses specifically assigned to this Class.
pH	6.8 – 8.5
Allowable Temperature Increase	There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 83 °F, or in any case raise the temperature of the receiving water more than 4°F. During the period including July, August and September, the temperature of the receiving water shall not be raised more than 1.5 °F unless it can be shown that spawning and growth of indigenous organisms will not be significantly affected.
Chemical constituents	None in concentrations or combinations which would be harmful to designated uses. Refer to Standards numbers 10, 11, 12, 13, 14, 17, and 19.

Nutrients	The loading of nutrients, principally phosphorus and nitrogen, to any surface water body shall not exceed that which supports maintenance or attainment of designated uses
Biological Condition	Sustainable, diverse biological communities of indigenous taxa shall be present. Moderate changes, from natural conditions, in the structure of the biological communities, and minimal changes in ecosystem function may be evident; however, water quality shall be sufficient to sustain a healthy, diverse biological community

LAKE TROPHIC CATEGORIES

The ranges of Total Phosphorus, Total Nitrogen, Chlorophyll-a, and Secchi Disk Transparency appearing in Table 1 below are assessed collectively to determine the trophic state of a lake. In addition to water column data, the trophic state of a lake is determined by the percentage of the surface area covered by macrophytes in accordance with Table 2 below. For the purpose of determining consistency with the WQS, the natural trophic state of a lake is compared with the current trophic state to determine if the trophic state of the lake has been altered due to excessive anthropogenic inputs. Lakes in advanced trophic states which exceed their natural trophic state due to anthropogenic sources are considered to be inconsistent with WQS.

Table 1: Parameters and Defining Ranges for Trophic State of Lakes in Connecticut			
Trophic State Based on Water Column Data	**Description**	**Parameters**	**Defining Range**
Oligotrophic	May be Class AA, Class A, or Class B water. Low in plant nutrients. Low biological productivity characterized by the absence of macrophyte beds. High potential for water contact recreation.	Total Phosphorus	0-10 ug/l spring and summer
		Total Nitrogen	0-200 ug/l spring and summer
		Chlorophyll-a	0-2 ug/l mid-summer
		Secchi Disk Transparency	6 + meters mid-summer
Mesotrophic	May be Class AA, Class A, or Class B water. Moderately enriched with plant nutrients. Moderate biological productivity characterized by intermittent blooms of algae and/or small areas of macrophyte beds. Good potential for water contact recreation.	Total Phosphorus	10-30 ug/l spring and summer
		Total Nitrogen	200-600 ug/l spring and summer
		Chlorophyll-a	2-15 ug/l mid-summer
		Secchi Disk Transparency	2-6 meters mid-summer
Eutrophic	May be Class AA, Class A, or Class B water. Highly enriched with plant nutrients. High biological productivity characterized by occasional blooms of algae and/or extensive areas of dense macrophyte beds. Water contact recreation opportunities may be limited.	Total Phosphorus	30-50 ug/l spring and summer
		Total Nitrogen	600-1000 ug/l spring and summer
		Chlorophyll-a	15-30- ug/l mid-summer
		Secchi Disk Transparency	1-2 meters mid-summer
Highly Eutrophic	May be Class AA, Class A, or Class B water. Excessive enrichment with plant nutrients. High biological productivity, characterized by severe blooms of algae and/or extensive areas of dense macrophyte beds. Water contact recreation may be extremely limited.	Total Phosphorus	50 + ug/l spring and summer
		Total Nitrogen	1000 + ug/l spring and summer
		Chlorophyll-a	30 + ug/L mid-summer
		Secchi Disk Transparency	0-1 meters mid-summer

AQUATIC MACROPHYTES

Macrophytes are aquatic plants large enough to be seen without magnification. Macrophyte distribution and abundance data are reviewed in conjunction with the water column data to determine the trophic states of lakes or ponds. If macrophyte growth is very extensive (75 - 100% of water body area) and dense, the trophic state of a lake or pond is "highly eutrophic" regardless of the water column data. If macrophyte growth is extensive (30 - 75% of water body area) and dense, the trophic state is "mesotrophic" when the water column indication is oligotrophic, and the trophic state is "eutrophic" when the water column indication is mesotrophic or eutrophic.

Table 2 Percent of Macrophyte Coverage Used to Determine Trophic State of Lakes

Trophic State Based on Water Column Data	% Water Body Area of Lake Affected by Macrophytes	Lake Trophic State
Oligotrophic	<30	Oligotrophic
	30-75	Mesotrophic
	>75	Highly Eutrophic
Mesotrophic	<30	Mesotrophic
	30-75	Eutrophic
	>75	Highly Eutrophic
Eutrophic	<30	Eutrophic
	30-75	Eutrophic
	>75	Highly Eutrophic

GROUND WATER QUALITY STANDARDS

GW1. The policy of the Department in areas that are classified as GAA, GAA, or GA is to maintain or restore all ground water in such areas to its natural quality.

GW2. If the Commissioner determines that, with respect to a particular pollutant, restoring or maintaining natural quality at a GAA, GAAs, or GA level is not technically practicable, the Department's policy is to:

(A) maintain or restore quality such that the ground water is suitable for drinking and other domestic uses without treatment, and

(B) maintain or restore quality such that the ground water will not adversely affect surface water quality or prevent the maintenance or attainment of any designated uses of surface waters to which that ground water discharges, and

(C) eliminate sources of pollution to such ground water to the extent that the Commissioner determines to be technically practicable, and regulate discharges to such groundwater so as to prevent pollution.

GW3. Ground water is deemed suitable for drinking and other domestic uses without treatment when no pollutant in such groundwater:

(A) exceeds a level which the Commissioner of Public Health has determined, pursuant to Section 22a-471 of the General Statues, creates or reasonably can be expected to create an unacceptable risk of injury to the health or safety of persons using such ground water for drinking or other personal or domestic use,

(B) is a carcinogen present at a concentration associated with a 1-x-10^{-6} excess cancer risk,

(C) is a non-carcinogen present at a level exceeding that to which the human population, including sensitive subgroups, can be exposed on a daily basis without appreciable risk of adverse health effects during a lifetime, or

(D) exceeds a level which the Commissioner determines, in consultation with the Commissioner of Public Health, renders the ground water so aesthetically impaired that a person cannot reasonably be expected to consume or otherwise use it.

GW4. The policy of the Department in areas classified as GB is:

(A) to eliminate or reduce in the ground water any pollutant which presents a hazard of fire, explosion, or toxic or hazardous emission to the environment or otherwise poses a threat to public safety or an unacceptable risk to public health, and

(B) to maintain the ground water at a quality that will not adversely affect the quality of surface waters to which such ground water discharges or

prevent the maintenance or attainment of any designated or existing uses in such surface waters, and

(C) to maintain a quality consistent with all designated and existing uses of the ground water, including its use for drinking without treatment if such ground water has, prior to the adoption of these WQS, been utilized for, and continues to be utilized, for drinking water, and

(D) to regulate discharges to the ground water in order to prevent further degradation of ground water quality.

GW5. The policy of the Department in areas classified as GC is:

(A) to eliminate or reduce in the ground water any pollutant which presents a hazard of fire, explosion, or toxic or hazardous emission to the air or otherwise poses a threat to public safety or an unacceptable threat to public health, and

(B) to maintain the ground water at a quality that will not adversely affect the quality of surface waters to which such ground water discharges or prevent the maintenance or attainment of any designated or existing uses in such surface waters, and

(C) to limit the impacts of waste discharges on ground water quality to those which, despite the use of treatment technology, cannot be avoided and which result from a discharge which is authorized by a permit under Section 22a-430 of the General Statutes.

GW6. With respect to ground water whose quality is actually higher than that reflected by the assigned classification, the Department's policy is that such ground water should be maintained at its existing high quality. To maintain such quality, the Commissioner may require that:

(A) a new, increased, or otherwise modified discharge to such ground water shall be given treatment such that, notwithstanding such classification, the actual higher quality is maintained.

(B) if after the adoption of these WQS there is an unpermitted release of pollutants to ground water which is classified GB but whose quality is actually GA or GAA, such groundwater shall be remediated to the standards for Class GA or GAA.

GW7. The Commissioner may raise the ground water classification of any area if he finds that such ground water meets the standards for the higher classification.

GW8 (A) The Commissioner may consider an application to lower a ground water Classification to GB. Such application shall be subject to the public participation requirements of Section 22a-426 of the General Statutes and shall:

(i) describe the nature and extent and date of commencement of pollution of the ground water proposed to be reclassified,

(ii) identify all sources of drinking water in the area whose ground water is proposed to be reclassified and identify all existing uses of ground water within and down gradient of such area,

(iii) assess the potential of the subject area to produce ground water in an amount suitable for a public water supply,

(iv) describe all past and present land uses in the subject area with dates, and

(v) provide such other information the Commissioner may reasonably require to determine the most appropriate ground water classification.

(B) A ground water classification shall not be lowered to GB unless the applicant has satisfactorily demonstrated that; any person within or down gradient of the area to be reclassified and extending to an area previously classified as GB or to a surface water body to which the groundwater discharges will be provided with an adequate public water supply, and that lowering of a ground water classification will not prevent attainment of adjacent surface water quality goals or present unacceptable health risks, and

(i) that the ground water to be reclassified is polluted as a result of intense urban, commercial, or industrial development which occurred prior to 1981, and the hydrologic conditions of the subject area are not suitable for the development of a significant public water supply, or

(ii) the ground water proposed to be reclassified is polluted and remediation of such ground water to a quality suitable for drinking without treatment is not technically practicable, or

(iii) there is an overriding social or economic justification for reclassifying the ground water to GB and the proposed reclassification is supported by the affected municipality or municipalities, as affirmed, in writing, by the chief executive officer(s) of the municipality or municipalities. For the purpose of this Standard an "affected municipality" is one in which ground water classifications are to be altered, "social justification" means a specific social need of the affected municipality or the state and "economic justification" means avoidance of an economic impact that would substantially impair or otherwise detrimentally affect the economy of the community or the state. The applicant must also demonstrate that the purposes for the reclassification will not result in development that is inconsistent with the State Policies Plan for Conservation and Development as adopted pursuant to Section 16a-30 of the General Statutes.

GW9. The Commissioner may consider an application to lower a ground water classification to GC. Any such application shall be subject to the public participation requirements of Section 22a-426 of the General Statutes and:

(A) Such application shall be accompanied by a completed application under Section 22a-430 of the General Statutes for a permit to discharge leachate from a solid waste land disposal facility to the subject ground water.

(B) A ground water classification shall not be lowered to GC unless the applicant has satisfactorily demonstrated that:

(i) there is an overriding social or economic justification for reclassifying the ground water to GC and the affected municipality or municipalities have been notified of the proposed reclassification; and

(ii) the ground water proposed to be reclassified is not suitable for development of a significant public water supply and is suitable for waste treatment; and

(iii) the subject area is adjacent to and hydraulically connected with a surface water body classified B or SB; and

(iv) in a Section 22a-430 permit application the applicant has delineated the zone of influence (see standard GW10) of the ground water proposed to be reclassified as extending from the proposed solid waste land disposal facility to the receiving surface water body, and the applicant owns the land overlying such zone of influence, or has an easement with respect to such land which easement is properly recorded and provides protections, as described in subsection D(1) and D(2) of Standard GW10, or otherwise controls the zone of influence to the satisfaction of the Commissioner.

GW10. Zones of influence. The Commissioner may establish zones of influence when, in the course of permitting discharges to the ground water under Section 22a-430 of the General Statutes, he allocates ground water and soil resources for the treatment of pollutants. Within that zone of influence the Section 22a-430 permittee will be allowed to degrade the ground water such that it may not meet the standards for the assigned classification or be suitable for uses designated by these Water Quality Standards for such classification.

(A) For a subsurface sewage disposal system permitted under authority delegated pursuant to Section 22a 430- 1 of the Regulations of Connecticut State Agencies to the Commissioner of Health and Addiction Services, the zone of influence shall be that area required by the minimum separating distances established in Section 19- 13-B 103d of the Regulations of Connecticut State Agencies.

(B) For discharges to ground water of treated domestic sewage other than discharges of domestic sewage identified in subparagraph GW10(A),

agricultural wastes, and storm water, the zone of influence shall be the area in which such discharge causes the ground water to be 1) altered in quality from its natural condition, or 2) lowered in quality from that which is suitable for drinking and other domestic uses without treatment. The Commissioner may require the applicant for a permit under Section 22a-430 of the General Statutes to submit for the Commissioner's approval an engineering plan showing the areal extent of any such zone of influence.

(C) The applicant for a permit under Section 22a-430 of the General Statutes authorizing a discharge other than a discharge of treated domestic sewage, agricultural waste, or storm water shall delineate the zone of influence associated with the proposed discharge. Such zone of influence shall include all areas beneath which the ground water which is or may be affected in quality by such discharge. The Commissioner may require that such zone of influence extend to a receiving water body with a classification of B or SB.

(D) The Commissioner may require the applicant for a permit under Section 22a-430 of the General Statutes to demonstrate that he has acquired rights to the zone of influence of the proposed discharge. Acquisition of such rights means that the applicant owns the land overlying such zone, has obtained an easement with respect to such land and has recorded such easement in the applicable Town Clerk's office, or otherwise controls such zone to the Commissioner's satisfaction. Any such easement or G other control mechanism shall: 1) provide the applicant with the exclusive right to use the ground water in such zone and such right to enter the land overlying such zone as the Commissioner deems necessary to accommodate monitoring or remediation, and 2) assure that the ground water within such zone will not be used for potable water supply.

(E) The delineation by a Section 22a-430 permit applicant of the zone of influence of a proposed waste discharge indicates that the underlying ground water may not be suitable for human consumption or other uses. Installation of a withdrawal well in or near such a zone of influence may result in an induced flow of polluted ground water to such well. When reviewing an application to withdraw groundwater pursuant to Connecticut's Water Diversion Policy Act, General Statutes Sections 22a-365 et seq., the Commissioner considers the potential impacts on water quality attributable to induced flow of polluted water from a zone of influence associated with a waste discharge.

GW11. The Department's classification of ground water, whether as GB, GC, or otherwise, conveys no right to degrade that ground water or to utilize less effective treatment measures than those utilized for discharges to groundwater designated for use as potable water. Domestic sewage shall be given the same treatment regardless of the classification of the groundwater to which such sewage is discharged.

GW12. The Commissioner applies the following policies in reviewing applications under Section 22a-430 of the General Statutes to discharge waste to ground water:

(A) Class GAA Ground Waters: The Commissioner does not issue permits authorizing a discharge to class GAA ground water unless such discharge is of treated domestic sewage as defined in Section 22a-430-1 of the Regulations of Connecticut State Agencies, waste generated by certain agricultural practices, certain water treatment waste waters from public water supply treatment systems, or certain minor cooling waters or clean waters. If a GAA area is within an Aquifer Protection Area designated in accordance with Section 22a-354 of the General Statutes, the Commissioner does not issue permits authorizing a groundwater discharge that conflicts with any regulation adopted pursuant to Section 22a-354(i) of the General Statutes

(B) Class GAAs Ground Waters: The Commissioner does not issue permits authorizing a discharge to class GAA ground water unless such discharge is of treated domestic sewage as defined in Section 22a-430-1 of the Regulations of Connecticut State Agencies, waste generated by certain agricultural practices, certain water treatment waste waters from public water supply treatment systems, or certain minor cooling waters or clean waters. If a GAAs area is within an Aquifer Protection Area designated in accordance with Section 22a-354 of the General Statutes, the Commissioner does not issue permits authorizing a groundwater discharge that conflicts with any regulation adopted pursuant to Section 22a 354(i) of the General Statutes.

(C) Class GA Ground Waters: The Commissioner does not issue permits authorizing a discharge to class GA ground water unless such discharge is allowed under subparagraph (A) of this standard or is a Discharge from a septage treatment system or of other wastes that are predominantly human, plant, or animal in origin so long as any such wastes are of natural origin, easily biodegradable and, if properly managed, pose no threat of pollution to the ground water. The ground water plume generated by a discharge of septage treatment system must terminate in a stream with classification of B or SB unless the permittee treats the discharge in a manner which the Commissioner determines is adequate to maintain class A water in the receiving stream.

(D) Class GB Ground Waters: The Commissioner may issue permits authorizing a waste discharge to class GB ground water if such discharge would be allowable in a GA area under subparagraph (C) of this standard or if such discharge meets all of the following criteria:

(i) the Commissioner has determined that such waste is generated by a source which is unlikely to produce persistent pollutants or pollutants that do not biodegrade in soil.

(ii) the waste will be treated as necessary to render it amenable to attenuation by the receiving soil so that the groundwater will not be impaired.

(iii) such discharge otherwise conforms with all applicable legal requirements and standards.

Appendix B

Test Boring Logs

SOIL INVESTIGATION FIELD NOTES **William Jackson**

TEST PIT # TP-1

JOB NO. JE 11-08	CLIENT: RFP Engineering, LLC	
SITE LOCATION: Old Colony Beach Club Association, Old Lyme, Connecticut, Broughel Road, West of Old Colony Road Ground Surface Elevation: Approx. 14-feet		
DATE: June 15, 2011	TIME: AM	WEATHER: clear, warm, approx. 80 deg.
LAND USE: Residential	LAND FORM: outwash plain	SLOPE: 0 to 3%
SOIL MAP UNIT: N/R		DEPTH TO GRNDWTR: 43-inches
SOIL CLASSIFICATION: N/R		DEPTH TO BEDROCK: Not Encountered
PARENT MATERIAL: glaciofluvial stratified sand and gravel		DEPTH TO COMPACT SOIL: Not Observed

		SOIL PROFILE DESCRIPTION					
SOIL HORIZON	DEPTH (IN.)	SOIL TEXTURE	MATRIX COLOR DRY/MOIST	SOIL REDOX COLORS DRY/MOIST	STRUCTURE	CONSISTENCY DRY/MOIST/WET	NOTES
A	0 to 8	fine sandy loam	10YR 4/3	not observed	granular	friable	common roots
C1	8 to 42	sandy loam	10YR 5/6	not observed	granular	friable	significant gravel and cobbles
C2	42 to 44	sandy loam	10YR 5/6	10YR 5/2 c,c,d 7.5YR 4/6 m,c,p	granular	friable	significant gravel and cobbles

NOTE: N/R = Not Reported
Evidence for Seasonal High Ground Water 42-inches below surface grade
End boring 44-inches below surface grade due to coarse gravel and cobbles

SOIL INVESTIGATION FIELD NOTES **William Jackson**

TEST PIT # TP-2

JOB NO. JE 11-08	CLIENT: RFP Engineering, LLC	
SITE LOCATION: Old Colony Beach Club Association, Old Lyme, Connecticut, Gorton Ave and Purtil Ave Ground Surface Elevation: Approx. 6-feet		
DATE: June 15, 2011	TIME: AM	WEATHER: clear, warm, approx. 80 deg.
LAND USE: Residential	LAND FORM: outwash plain	SLOPE: 0 to 3%
SOIL MAP UNIT: N/R		DEPTH TO GRNDWTR: 22-inches
SOIL CLASSIFICATION: N/R		DEPTH TO BEDROCK: Not Encountered
PARENT MATERIAL: glaciofluvial stratified sand		DEPTH TO COMPACT SOIL: Not Observed

		SOIL PROFILE DESCRIPTION					
SOIL HORIZON	DEPTH (IN.)	SOIL TEXTURE	MATRIX COLOR DRY/MOIST	SOIL REDOX COLORS DRY/MOIST	STRUCTURE	CONSISTENCY DRY/MOIST/WET	NOTES
A	0 to 8	silt loam	10YR 3/3	not observed	granular	friable	common roots
B	8 to 20	fine sandy loam	10YR 5/6	7.5YR 4/6 f,f,d	c subang blky	friable	
C1	20 to 23	fine loamy sand	10YR 5/6	2.5Y 5/2 m,c,p	granular	friable	
C2	23 to 36	fine sand	2.5YR 4/2	2.5Y 5/1 c,m,f	single grain	friable	

NOTE: N/R = Not Reported
Evidence for Seasonal High Ground Water 20-inches below surface grade

SOIL INVESTIGATION FIELD NOTES **William Jackson**

TEST PIT # TP-3

JOB NO. JE 11-08	CLIENT: RFP Engineering, LLC		
SITE LOCATION: Old Colony Beach Club Association, Old Lyme, Connecticut, Breen Ave and Grove Ave Ground Surface Elevation: Approx. 18-feet			
DATE: June 15, 2011	TIME: AM	WEATHER: clear, warm, approx. 80 deg.	
LAND USE: Residential	LAND FORM: outwash plain	SLOPE: 0 to 3%	
SOIL MAP UNIT: N/R		DEPTH TO GRNDWTR: 43-inches	
SOIL CLASSIFICATION: N/R		DEPTH TO BEDROCK: Not Encountered	
PARENT MATERIAL: glaciofluvial stratified sand and gravel		DEPTH TO COMPACT SOIL: Not Observed	

		SOIL PROFILE DESCRIPTION					
SOIL HORIZON	DEPTH (IN.)	SOIL TEXTURE	MATRIX COLOR DRY/MOIST	SOIL REDOX COLORS DRY/MOIST	STRUCTURE	CONSISTENCY DRY/MOIST/WET	NOTES
A	0 to 8	fine sandy loam	10YR 3/3	not observed	granular	friable	common roots
B	8 to 19	fine sandy loam	10YR 4/3	not observed	granular	friable	few roots
C1	19 to 33	fine sandy loam	10YR 4/6	not observed	granular	friable	
C2	42 to 44	sand	10YR 4/8	7.5 4/3 c,m,p	single grain	friable	

NOTE: N/R = Not Reported
Evidence for Seasonal High Ground Water 33-inches below surface grade

SOIL INVESTIGATION FIELD NOTES **William Jackson**

TEST PIT # TP-4

JOB NO. JE 11-08	CLIENT: RFP Engineering, LLC						
SITE LOCATION: Old Colony Beach Club Association, Old Lyme, Connecticut, Breen Ave and Maple Ave Ground Surface Elevation: Approx. 11-feet							
DATE: June 15, 2011	TIME: AM					WEATHER: clear, warm, approx. 80 deg.	
LAND USE: Residential	LAND FORM: outwash plain					SLOPE: 0 to 3%	
SOIL MAP UNIT: N/R						DEPTH TO GRNDWTR: Not Observed	
SOIL CLASSIFICATION: N/R						DEPTH TO BEDROCK: Not Encountered	
PARENT MATERIAL: glaciofluvial stratified sand and gravel						DEPTH TO COMPACT SOIL: Not Observed	
		SOIL PROFILE DESCRIPTION					
SOIL HORIZON	DEPTH (IN.)	SOIL TEXTURE	MATRIX COLOR DRY/MOIST	SOIL REDOX COLORS DRY/MOIST	STRUCTURE	CONSISTENCY DRY/MOIST/WET	NOTES
A	0 to 8	fine sandy loam	10YR 3/3	not observed	granular	friable	common roots
B	8 to 29	fine sandy loam	10YR 4/6	not observed	granular	friable	significant gravel
C2	29 to 34	f - c sand	10YR 4/3	not observed	single grain	friable	significant gravel and cobbles

NOTE: N/R = Not Reported
Ground Water observed approx. 42-inches below top of fame in adjacent catch basin
End boring 34-inches below surface grade due to coarse gravel and cobbles

Appendix C

Database of Sanitary Survey Results

Old Colony Beach Club
Property Database and Sanitary Survey Results

BREEN AVENUE

						FAILURE					SUSPECT							MARGINAL							NPD									
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse/CB	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
2	Breen Ave.	3	1		1													1									√	√				84	71	0.12
3	Breen Ave.	3	1																						1							84	70	0.15
4	Breen Ave.	3	1	√	1													1	1								√					84	72	0.10
6	Breen Ave.	3	1															1	1													84	73	0.10
7	Breen Ave.	3	1	√														1										√				84	69	0.11
10	Breen Ave.	3	1	√	1								1					1	1			1	1									84	74	0.29
11	Breen Ave.	3	1															1														84	68	0.11
12	Breen Ave.	3	1	√	1													1	1				1					√				84	75	0.10
13	Breen Ave.	3	1															1									√			1		84	67	0.08
14	Breen Ave.	3	1	√	1													1	1				1											
15	Breen Ave.	3	1	√														1					1					√				84	66	0.11
16	Breen Ave.	8	2	√	1													1	1									√√				84	76	0.11
17	Breen Ave.	4	1		1													1	1				1							1		84	65	0.10
18	Breen Ave.	2	1	√	1													1									√		√			84	77	0.10
19	Breen Ave.	4	1		1													1														84	64	0.10
20	Breen Ave.	3	1	√	1													1									√	√	√			84	78	0.10
21	Breen Ave.	2	1	√	1													1														84	63	0.11
23	Breen Ave	2	1															1									√			1		84	62	0.11
24	Breen Ave.	3	1	√	1													1									√		√			84	79	0.19
27	Breen Ave.	4	1															1														84	61	0.17
28	Breen Ave.	3	1		1														1												1		84	80	0.19
29	Breen Ave.	2	1															1									√					84	60	0.06
30	Breen Ave.	4	1																1								√			1		84	81	0.32
32	Breen Ave.	5	1	√	1													1									√	√				80	128	0.27
33	Breen Ave.	4	2 Family	√	1													1									√	√				80	92	0.11
35	Breen Ave.	9	3		1													1									√	√				80	91	0.11
36 A&B	Breen Ave.	4	2 Family															1									√	√				80	129	0.09
38	Breen Ave.	4	1		1													1									√	√				80	130	0.09
39	Breen Ave.	3	1										1					1										√				80	90	0.11
40	Breen Ave.	3	1		1													1									√			1		80	131	0.09

BREEN AVENUE

						FAILURE					SUSPECT							MARGINAL						NPD									
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse/CB	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
41	Breen Ave.	3	2 Family	√														1	1				1				√	√				80	89	0.11
42	Breen Ave.	3	1	√																								√				80	132	0.09
43	Breen Ave.	4	1	√							1	1	1					1	1				1				√	√				80	88	0.04
44	Breen Ave.	4	2 Houses	√	1													1										√				80	133	0.09
45	Breen Ave.	4	1															1	1								√			1		80	87	0.09
46	Breen Ave.	5	2 Family															1									√			1		80	117	0.18
47	Breen Ave.	4	1		1			1										1					1				√	√√	√			80	103	0.09
49	Breen Ave.	4	1															1	1								√			1		80	102	0.11
50	Breen Ave.		Vacant																													80	119	0.09
51	Breen Ave.	4	1															1	1								√	√				80	101	0.08
52	Breen Ave.		Vacant																													80	120	0.09
53	Breen Ave.	2	1																1								√	√				80	100	0.10
54	Breen Ave.		Vacant																													80	121	0.09
58 1	Breen Ave.	1	Condo		1													1	1								√			1		80	110/1	0.09
58	Breen Ave.	2	Condo															1	1											1		80	110/2	0.09
60	Breen Ave.	2	Condo															1	1								√	√				80	110	0.09
61	Breen Ave.	6	1	√																												80	109	0.29
62	Breen Ave.	2	Condo															1	1								√	√				80	111	0.09
62-1	Breen Ave.	1	Condo															1	1								√	√				80	111/1	0.09
63	Breen Ave.	4	Condo																								√	√				80	108	0.21
64	Breen Ave.	2	Condo		1													1	1								√	√				80	112/1	0.09
65	Breen Ave.	6	Condo																								√	√				80	108/1	0.21
66	Breen Ave.	4	Condo															1	1								√	√				80	112	0.09
67	Breen Ave.	6	Condo																								√	√				80	108/2	0.21
68	Breen Ave.	7	2															1	1								√					80	113	0.09
70	Breen Ave.	2	1															1	1								√			1		75	26	0.10
71	Breen Ave.	4	1															1	1								√					76	50	0.11
81	Breen Ave.	17	1	√																														
83, 85, 87	Breen Ave.		3															1	1															

Old Colony Beach Club
Property Database and Sanitary Survey Results

BROOKSIDE AVENUE

						FAILURE					SUSPECT						MARGINAL						NPD								
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
1	Brookside Ave	5	2 Fam	√	1													1									√				84	112	0.23
3	Brookside Ave	3	1	√														1	1				1				√			1		84	111	0.08
5	Brookside Ave	3	1	√	1													1				1					√			1		84	110	0.08
7	Brookside Ave	5	1		1													1				1										84	109	0.08
17	Brookside Ave	4	1		1																	1					√	√				84	107	0.20
19	Brookside Ave		Vacant																													84	106	0.24
21	Brookside Ave	3	1																							1				1		84	105	0.16
27	Brookside Ave	3	1																							1	√			1		84	104	0.16
29	Brookside Ave	5	1															1														84	103	0.08
31	Brookside Ave	3	1															1	1								√	√				84	102	0.08
51	Brookside Ave		Vacant																													80	150	0.20
69	Brookside Ave		Vacant																													80	156/1	0.10

BREEN AVENUE

						FAILURE					SUSPECT							MARGINAL							NPD									
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
4	Broughel Rd	6	2															1									√			1		80	77	0.09
10	Broughel Rd	4	1		1																					1		√		1		84	59	0.20
15	Broughel Rd	3	1	√	1													1	1		1	1										80	142/1	0.29

Old Colony Beach Club
Property Database and Sanitary Survey Results

GORTON AVENUE

						FAILURE					SUSPECT							MARGINAL						NPD									
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
1	Gorton Ave.		Vacant																												84	90	0.10
2	Gorton Ave.		Vacant																												84	91	0.14
3	Gorton Ave.	3	1		1																				1	√	√				84	89	0.10
5	Gorton Ave.	4	2 Family															1								√					84	88	0.10
4	Gorton Ave.	3	1	√	1													1	1			1				√	√√				84	92	0.08
7	Gorton Ave.	3	1															1	1							√	√				84	87	0.10
8	Gorton Ave.	3	1		1													1								√	√				84	93	0.16
10	Gorton Ave.		1																														
11	Gorton Ave.	4	1															1	1										1		84	89	0.10
12	Gorton Ave.	3	1															1	1			1				√					84	94	0.16
13	Gorton Ave.	3	1															1	1			1			1	√					84	85	0.11
14	Gorton Ave.	4	1	√	1													1	1			1									84	95	0.20
15	Gorton Ave.	3	1															1	1							√					84	84	0.10
17	Gorton Ave.		Vacant																												84	83	0.10
18	Gorton Ave.	2	1															1								√			1		84	96	0.08
20	Gorton Ave.	4	Multi Family																1	1						√					84	97	0.08
21	Gorton Ave.	3	1	√	1														1								√				84	82	0.34
22	Gorton Ave.	4	1										1					1	1							√	√				84	98	0.08
24	Gorton Ave.	3	1															1	1								√				84	99	0.08
26	Gorton Ave.	4	1															1	1							√			1		84	100	0.08
32	Gorton Ave.	0	Synagogue																1										1		84	101	0.32
33	Gorton Ave.	3	1	√														1	1							√			1		80	140	0.09
35	Gorton Ave.	3	1															1	1										1		80	139	0.09
37	Gorton Ave.	5	1															1	1							√			1		80	138	0.05
38	Gorton Ave.		Vacant																												80	142/2	0.49
39	Gorton Ave.	5	1															1	1							√			1		80	137	0.05
41	Gorton Ave.	3	1	√	1													1	1							√					80	136	0.05
43	Gorton Ave.	2	1		1													1	1							√	√				80	135	0.09
44	Gorton Ave.		Vacant																												80	142/3	0.58
45	Gorton Ave.	4	1	√	1													1	1										1		80	134	0.09
47	Gorton Ave.	4	2															1	1							√	√				80	127	0.09
48	Gorton Ave.		Vacant																												80	143	0.10
49	Gorton Ave.	4	1															1	1										1		80	126	0.09
50	Gorton Ave.	4	1	√	1													1	1		1	1			1		√				80	144	0.30
51	Gorton Ave.	6	1															1	1							√			1		80	125	0.10
52	Gorton Ave.	4	1															1	1												80	145	0.10
53	Gorton Ave.		Vacant																												80	125/1	0.10
54	Gorton Ave.	7	1															1	1							√	√				80	146	0.10
55	Gorton Ave.	3	1															1	1							√	√				80	124	0.09
56	Gorton Ave.	5	2 Family		1														1		1										80	127	0.24
58	Gorton Ave.	4	1															1	1										1		80	148	0.08

Old Colony Beach Club
Property Database and Sanitary Survey Results

GORTON AVENUE

						FAILURE					SUSPECT							MARGINAL							NPD								
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
60	Gorton Ave.	4	1																1								√	√				80	149	0.24
62	Gorton Ave.	2	1															1	1				1				√	√√				80	151	0.23
63	Gorton Ave.	8	Multi Family															1	1											1		80	116	0.18
64	Gorton Ave.	6	4 Family																1								√	√				80	152	0.20
65	Gorton Ave.	6	2 Family																							1				1		80	115	0.18
66	Gorton Ave.	4	4 Units															1	1								√					80	153	0.20
68	Gorton Ave.		Vacant																													80	154	0.20
69	Gorton Ave.	4	1	√														1	X								√	√				80	114	0.10
70	Gorton Ave.		Vacant																													80	155	0.10
71	Gorton Ave.	1	1		1													1	X											1		76	30/1	0.00
72	Gorton Ave.	4	2 Family															1	X													76	31	0.06
75 & 77	Gorton Ave.	11	2															1	X									√√				76	46	0.10
78	Gorton Ave.		Vacant																													76	45	0.09

Old Colony Beach Club
Property Database and Sanitary Survey Results

HARTUNG PLACE

						FAILURE					SUSPECT							MARGINAL							NPD									
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
3A	Hartung Place	3	Condo		1													1	1		1	1					√	√				71	51/A	0.18
3B	Hartung Place	3	Condo		1													1	1		1	1					√	√				71	51/B	0.18
3C	Hartung Place	3	Condo		1													1	1		1	1					√	√				71	51/C	0.18
3D	Hartung Place	3	Condo		1													1	1		1	1					√	√				71	51/D	0.18
8	Hartung Place	3	2 Family	√	1													1	1			1					√	√	√			76	28	0.17
9	Hartung Place	4	2 Family															1	1		1						√					76	49	0.11
10	Hartung Place	4	1		1													1	1			1								1		76	27	0.09
11 & 11A	Hartung Place	8	2															1	1		1						√			1		76	48	0.09
12	Hartung Place	4	1															1	1											1		76	28	0.08
13	Hartung Place	5	1	√														1	1		1						√	√				76	47	0.08
14	Hartung Place	6	2 Family															1	1								√	√				76	29	0.08
16	Hartung Place	7	1																									√				76	30	0.08
17	Hartung Place	3	1		1													1	1								√			1		76	44	0.04
18	Hartung Place	8	2															1	1											1		76	32	0.16
19 & 19-1	Hartung Place	7	2															1												1		76	43	0.07
22	Hartung Place	4	2 Family															1	1									√		1		76	33	0.22
23	Hartung Place	3	1	√	1													1	1									√	√			76	42	0.18

OLD COLONY ROAD

						FAILURE					SUSPECT							MARGINAL							NPD									
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
2	Old Colony Road	3	1	√	1																				1				1		84	47	0.25
6	Old Colony Road	2	1															1									√			1		84	48	0.06
7	Old Colony Road	2	1																								√	√				84	46	0.17
8	Old Colony Road	2	1															1												1		84	49	0.06
10	Old Colony Road	4	1		1													1				1						√				84	50	0.11
11	Old Colony Road	5	1															1									√			1		84	45	0.06
12	Old Colony Road	3	1																1								√	√				84	51	0.17
13	Old Colony Road	4	1															1												1		84	44	0.06
15	Old Colony Road	3	1															1												1		84	43	0.07
16	Old Colony Road	2	1															1	1											1		84	52	0.15
17	Old Colony Road	3	1															1														84	42	0.10
19	Old Colony Road	5	1	√	1													1				1					√	√				84	41	0.11
20	Old Colony Road	4	1															1												1		84	53	0.10
21	Old Colony Road	4	1		1													1									√			1		84	40	0.11
22	Old Colony Road	4	1																								√			1		84	54	0.11
24	Old Colony Road	3	Multi Fam															1									√	√√				84	55	0.11
25	Old Colony Road	2	1															1									√	√				84	39	0.06
26	Old Colony Road	5	1															1									√					84	56	0.11
27	Old Colony Road	5	1	√	1													1									√	√		1		84	38	0.11
28	Old Colony Road	3	1		1													1									√	√				84	57	0.11
29	Old Colony Road	5	1		1													1				1					√			1		84	37	0.06
30	Old Colony Road	7	1		1													1												1		84	58	0.10
31	Old Colony Road	6	1															1												1		80	78	0.11
32	Old Colony Road	6	2 Family	√	1													1				1							√			80	79	0.11
33	Old Colony Road	4	2															1										√	√			80	75	0.08
34	Old Colony Road	3	1																						1					1		80	80	0.11
35	Old Colony Road	3	1															1									√			1		80	74	0.08
37	Old Colony Road	4	1															1									√			1		80	73	0.08
39	Old Colony Road	4	1															1										√				80	72	0.06
40	Old Colony Road	2	1															1												1		80	81	0.06
41	Old Colony Road	6	2															1									√	√?		1		80	71	0.06
42	Old Colony Road	2	1															1									√	√				80	82	0.06
43	Old Colony Road	3	1															1												1		80	70	0.08
44	Old Colony Road	3	1															1												1		80	83	0.06
45	Old Colony Road	3	1															1														80	69	0.08
46	Old Colony Road	3	1															1									√			1		80	84	0.06

OLD COLONY ROAD

						FAILURE					SUSPECT								MARGINAL						NPD								
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
47	Old Colony Road	6	1		1													1				1				√					80	68	0.08
48 &50	Old Colony Road	6	2		1													1				1									80	85	0.11
49	Old Colony Road	5	1		1													1				1							1		80	67	0.11
51	Old Colony Road	7	1		1													1				1							1		80	60	0.11
52	Old Colony Road	9	2 Family		1													1	1		1	1							1		80	86	0.09
53	Old Colony Road	6	1															1													80	59	0.11
54	Old Colony Road	7	1															1	1										1		80	93	0.09
55	Old Colony Road	3	1		1													1											1		80	58	0.11
56	Old Colony Road	2	1		1																				1	√					80	94	0.11
57	Old Colony Road	3	1		1													1											1		80	57	0.11
58	Old Colony Road	4	1															1								√	√				80	85	0.13
59	Old Colony Road	4	1															1									Fail		1		80	56	0.09
60	Old Colony Road	5	1		1													1	1							√	√		1		80	96	0.10
61	Old Colony Road	6	1		1													1								√					80	55	0.09
62	Old Colony Road	7	2		1													1	1										1		80	97	0.09
63	Old Colony Road	9	1		1													1				1				√	√		1		80	47	0.09
64	Old Colony Road	5	2 Family	√														1	1							√	√√	√			80	98	0.11
65	Old Colony Road	6	2 Family		1													1				1							1		80	46	0.09
66	Old Colony Road	11	2		1													1								√	√		1		80	104	0.10
67	Old Colony Road	4	2		1													1				1				√			1		80	45	0.09
68	Old Colony Road	8	1		1													1											1		80	105	0.10
69	Old Colony Road	6	1																												80	44	0.09
70	Old Colony Road	2	1		1																				1		√	√			80	106	0.12
71	Old Colony Road	4	1															1											1		76	22	0.06
72	Old Colony Road	3	1															1											1		80	107	0.08
73	Old Colony Road		Vacant																												76	21	0.06
74	Old Colony Road	6	1	√	1													1											1		76	23	0.11
75	Old Colony Road	3	1																								√		1		76	20	0.16
76	Old Colony Road	17	5	√														1									√	√			76	24	0.19
80	Old Colony Road	4	1																								√√				76	106	0.12
82 4	Old Colony Road	2	Condo															1								√					76	53	0.09
82-2	Old Colony Road	2	Condo															1								√					76	53/1	0.09
82-3	Old Colony Road	2	Condo															1								√					76	53/2	0.09
82-1	Old Colony Road	2	Condo															1								√	√				76	53/3	0.09
--	Old Colony Road		Vacant																												76	63	2.39

OLD COLONY ROAD

Name	Address	City/State/Zip
GOLD BEATRICE W	2 OLD COLONY RD	OLD LYME, CT 06371
MOTTA PAUL J JR & LYNN K W/S	116 BAY AVE	NEW BRITAIN, CT 06053
KRAIMER LEO TR	4045-D NW 3RD ST	DELRAY BEACH, FL 33445
STRAZDAS VICTOR	43 BIRCHWOOD DR	NEW BRITAIN, CT 06052-1541
SAPIA JOSEPH R + SHIRLEY R	10 OLD COLONY RD	OLD LYME, CT 06371
CALITRO RICHARD A & YOLANDA C	11 OLD COLONY RD	OLD LYME, CT 06371
KINGSTON KAREN M & RICHARD J JR	12 OLD COLONY RD	OLD LYME , CT 06371
TUCKER MILDRED R	115 NORTHBROOK DR	WEST HARTFORD, CT 06117
GAVENS SEYMOUR TRUSTEE	22 BERWYN RD	WEST HARTFORD, CT 06107
WESNAK LISA M	3 BAYBERRY DR	AMHERST, NH 030312513
BALDUCCI GEORGE & DAVID &	17 OLD COLONY RD	OLD LYME, CT 06371
LAPILA LAWRENCE J & HEIDI B (Q/C)	192 WATCH HILL RD	BERLIN, CT 06037
VACCO REALTY MANAGEMENT LLC Q/C	28 MAXWELL DR	WETHERSFIELD, CT 06109
MENDES HELENA*+ LOURA NAZARE & GALO IZABEL	51 LONG HILL DR	GLASTONBURY, CT 060331180
VACON PAUL J	22 DOROTHY ST	ENFIELD, CT 06082
LIVINGSTON STANLEY M&ADELINE M TRUSTEES (Q/C)	11 HICKORY HILL	VERNON, CT 06066
OLD COLONY EXCHANGE LLC	60 SALTAIRE DR	OLD LYME, CT 06371
LIVINGSTON, MARIE A	11 HICKORY HILL	VERNON, CT 06066
WOJTASZEK MIECZYSLAW ET AL Q/C	34 HAWTHORNE ST	NEW BRITAIN, CT 06051
BROCKI JERRY R & DONNA W/S	23 STACY CATE DR	SOUTHINGTON, CT 06489
LABROT ANDREW G JR (Q/C)	539 BILLINGS RD	SOMERS, CT 06071-2045
FAZIO ANTHONY R ET AL CARE OF: CATHY DAMATO	34 OLD WOOD RD	BERLIN, CT 06037
SIGNOR ALYCE C	125 FOXCROFT RD	WEST HARTFORD, CT 06119
BARNES MARK K (W)	POB 102	SOUTH LYME, CT 06376
MEUCCI JOSEPH P & CARLA L Q/C	15 WINDY KNOLL DR	BERLIN, CT 06037
DEFRANCESCO JAMES D & FRANK & ROBERT	29 NORTHFIELD LA	BERLIN, CT 06037
FRAP INVEST CO LLC*& RISLEY PHYLLIS R	117 HARTFORD AVE	WETHERSFIELD, CT 06109
CANNATA MINNIE ET AL c/o ANNE VECCHITTO	23 FERRY ST	MIDDLETOWN, CT 06457
WHALEN JEFFREY T & NANCY	97 CORAM RD	SHELTON, CT 06484
KASTNER SANDRA Q/C	115 RESERVOIR RIDGE	SOUTHINGTON, CT 06489
WHALEN DOUGLAS P & MARIE A Q/C	285 MAIN ST APT A-2	FARMINGTON, CT 06032
MCFALL MONTE R & DEBORAH L S	40 BIDWELL ST	GLASTONBURY, CT 06033
JACOBS MARTIN P (Q/C)	213 COLONIAL LA	DAYTON, OH 45429
COLANTONIO GASTONE & HOLLY	16 MORRISON AVE	WETHERSFIELD, CT 06109
SPIESMAN RICHARD C & JUDITH E	4 SLEEPY HOLLOW LA	DIX HILLS, NY 11746
NEMIROW JAY & BARBARA & NEMIROW DAVID TR	14 KING EDWARD RD	WEST HARTFORD, CT 06117

OLD COLONY ROAD

Name	Address	City/State/Zip
POWERS	200 FISHER AVE	AVON, CT 06001
SINGER BETTY R TRUSTEE	1 CHATFIELD DR	WEST HARTFORD, CT 06110
BOURKE RUTH Q	127 GROVE ST	WINDSOR LOCKS, CT 06096
PACE PROPERTIES LLC	103 SOUTH MILL DR	SO GLASTONBURY, CT 06073
COHEN MICHAEL J	65 MOHEGAN DR	WEST HARTFORD , CT 06117
DIGREGORIO NINO A ET AL	26 SAXON RD	WETHERSFIELD, CT 06109
TIROLETTO JOHN & JOSEPH J	7 GLENWOOD ST	ENFIELD, CT 06082-2714
DIEFENBACHER BETTY ETAL	BEAR PAWS RANCH PO BOX 7410	CAVE CREEK, AZ 853277410
MALTESE INNOCENZO F & RACHALA A	5 GRAPEVINE LA	KENSINGTON, CT 06037
PLAUT ROBERTA W WALLET MAURICE-LIFE USE	57 OLD COLONY RD	OLD LYME, CT 06371
ORFIELLI GERALD (SIC) & ORFITELLI MARIE	88 CORTLAND WAY	SOUTHINGTON, CT 06489-2460
BORDONARO PAUL T + NATALIE M	29 CLIFFORD DR	WEST HARTFORD, CT 06107
FAZIO LORENZO	47 THORNILEY ST	NEW BRITAIN, CT 06051
NEWMAN DOROTHY A & DURSO VIRGINIA C	2 TICON CT	HUNTINGTON, CT 06484
MCLELLAN URSULA & ROBERT (FIDY- 1/2 INT)	485 NORTON RD	KENSINGTON, CT 06037
GLANTZ DAYNA & HOWARD QC	7608 WEST AVE	ELKINS PARK, PA 19027
SYMOLON ROBERT J TRUSTEE & KAREN	64 OLD COLONY RD	OLD LYME, CT 06371
MORELLO ENTERPRISES (Q/C)	20 IRONGATE LA	CROMWELL, CT 06416
GUARNACCIA SALVATORE P & SALVATORE C W/	190 NEW LONDON RD	COLCHESTER, CT 06415
CLAYNER LLC c/o MILTON BAYER	1322 LUCINDA PALM COURT APT. A	DELRAY BEACH FL 33484
SEMEL SCOTT N Q/C	82 DARTMOUTH ST	BOSTON, MA 02116
DIPINTO PATRICK N JR & FORGIONE BARBARA	105 REUSSNER RD	SOUTHINGTON, CT 06489
SEMEL SCOTT N Q/C	82 DARTMOUTH ST	BOSTON, MA 02116
ASAL ROBERT L & MARILYN	58 OLD FARMS PL	KENSINGTON, CT 06037
BICHUNSKY MRYNA (Q/C)	6 HALLMARK DR	WALLINGFORD, CT 06492
LOMBARD ANDREW P JR ET AL C/O ANDREA LOMBARD	8 HARTUNG PL	OLD LYME, CT 06371
LOMBARD CARL C JR ET AL	74 OLD COLONY RD	OLD LYME, CT 06371
DIPINTO PATRICK N JR W	960 FARMINTON DR	BERLIN, CT 06037
LOMBARD ANDREW P JR ET AL C/O ANDREA LOMBARD	8 HARTUNG PL	OLD LYME, CT 06371
SEMEL SCOTT N Q/C	82 DARTMOUTH ST	BOSTON, MA 02116
GOUVEIA BILL L & MARIA J	45 GAYLORD DR	MONROE, CT 06468
NELIGON THOMAS J	POB 696	WESTBROOK, CT 06498
PETERSON DENNIS R & MARC C	POB 4106	OLD LYME, CT 06371
KLAGES MARLENE V W	HC62 BX 5	TYLER HILL PA 10469
OLD COLONY BEACH ASSOCIATION	PO BOX 10	OLD LYME, CT 06371

Old Colony Beach Club
Property Database and Sanitary Survey Results

PURTILE AVENUE

						FAILURE					SUSPECT							MARGINAL							NPD								
No.	Street	Number of Bdrms	Usage	Year Round Usage	Well	Breakout	Disch. To CB	Disch. To Watercourse	Plumb. Backup	Laundry Disch.	Saturated Leaching Area	Heavy Green Growth	Past Failure Indicated	Odor in Disposal Area	Odor in Adjacent CB	Frequent Pumping Reported	Suspicious Discharge Piping	Small Area	Shallow Groundwater	Extensive Bedrock	<25' From Wetland	<75' From Well	Soil Drain/Sump Pump	Slope >25%	Recent Repair Evident/Noted	No Problems Noted	Discharge Permit	Repair	Variance	Cesspool	No Records Avail.	Map	Lot	Area
14	Purtill Ave	20	Rmng hse															1	1								√	√				80	99	0.21
20	Purtill Ave	7	1																1				1				√	√				80	122	0.20
22	Purtill Ave	5	2 Family															1	1								√	√				80	123	0.10

PURTILE AVENUE

Name	Address	City/State/Zip
TOLCHINSKY DMITRY & ADEL	286 SHORE RD	OLD LYME, CT 06371
NICOTERA FRANK & MARILYN W/S	246 TWO ROD HIGHWAY	WETHERSFIELD, CT 06019
RICHALL MORRIS P TRUSTEES ET AL&	64 LAVENDER AVE	ROCKY HILL, CT 06067

OLD COLONY BEACH CLUB ASSOCIATION

SANITARY SURVEY INSPECTION FORM

Date: _____ Time: _____

Weather: _____

Address: _____

Owner: _____

Source: □ Owner □ Renter □ Other: _____
□ Owned since: _____

Well: □ Yes □ No In use? □ Yes □ No CWC customer: □ Yes □ No

Usage: □ Seasonal □ Year Round Age of House: _____
□ Single Family □ Multi-Family No. Occupants: _____

No. Bedrooms: _____ Washer? □ Yes □ No
Disposal? □ Yes □ No

Type of Septic System:

□ Cesspool □ Leaching Trench
□ Septic Tank □ Drywell/Leaching Pit
□ Unknown □ Separate Laundry Drywell
□ Other: _____

Age of System: _____ Repairs: _____

Reported Problems:

□ Frequent Pumping Required
□ Backup of Fixtures
□ Odor
□ Breakout to Ground

Observations:

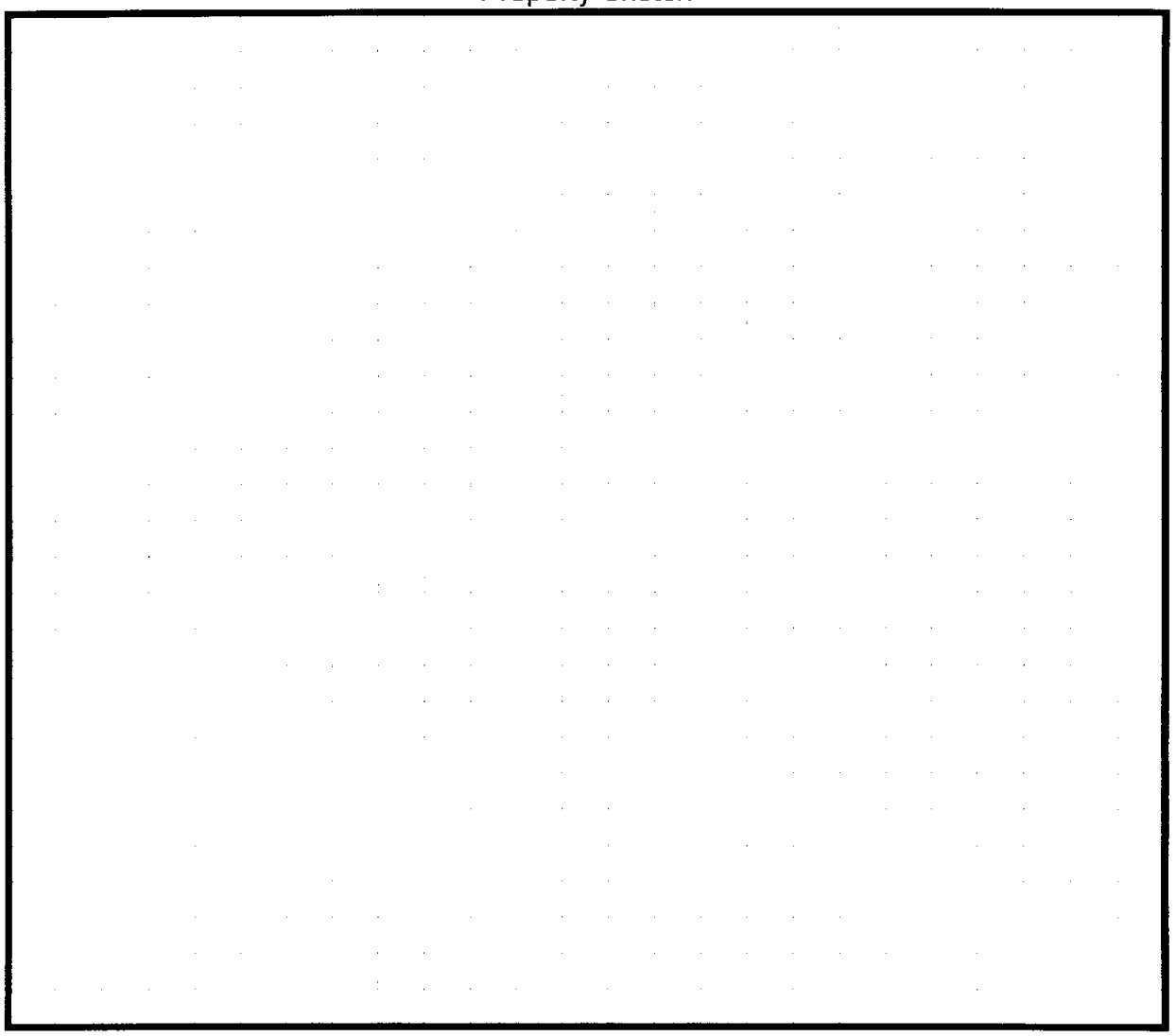
F
□ Breakout to Ground Surface
□ Discharge to storm drain/CB
□ Discharge to watercourse
□ Plumbing backup/problem reported
□ Laundry discharge to ground

M
□ Small available area
□ Shallow groundwater <3'
□ Extensive bedrock outcropping
□ < 25' from wetlands/surface water
□ < 75 feet from adjacent well
□ Soil drain/sump pump discharge
□ Extreme slope >25%

S
□ Saturated leaching area
□ Heavy green growth
□ Past failure indicated
□ Odor in disposal area
□ Odor in adjacent storm drain
□ Frequent pumping reported
□ Suspicious discharge piping

NPD
□ Recent repair evident or reported
□ No problems noted

Property Sketch



Field Notes:

Appendix D

Water Quality Sampling Results

PHOENIX
Environmental Laboratories, Inc.

Friday, August 26, 2011

RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Project ID: OCBCA
Sample ID#s: BA66176 - BA66184

This laboratory is in compliance with the QA/QC procedures outlined in EPA 600/4-79-019, Handbook for Analytical Quality in Water and Waste Water, March 1979, SW846 QA/QC and NELAC requirements of procedures used.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext. 200.

Sincerely yours,

Phyllis Shiller

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #MA-CT-007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		08/18/11	10:50
Location Code:	SPECIAL2 | S	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66176

Project ID: OCBCA
Client ID: S-1

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	520	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	0.04	0.02	mg/L	08/24/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/19/11	5:48	BS/EG	300.0
Nitrate as Nitrogen	0.79	0.05	mg/L	08/19/11	5:48	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	0.55	0.1	mg/L	08/24/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		08/18/11	11:40
Location Code:	SPECIAL2 | S	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66177

Project ID: OCBCA
Client ID: S-2

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	300	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	0.17	0.02	mg/L	08/24/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/19/11	5:58	BS/EG	300.0
Nitrate as Nitrogen	1.8	0.05	mg/L	08/19/11	5:58	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	0.69	0.1	mg/L	08/24/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		08/18/11	11:35
Location Code:	SPECIAL2 | S	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66178

Project ID: OCBCA
Client ID: S-3

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	340	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	0.1	0.02	mg/L	08/24/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/19/11	6:08	BS/EG	300.0
Nitrate as Nitrogen	2.4	0.05	mg/L	08/19/11	6:08	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	0.82	0.1	mg/L	08/24/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		08/18/11	11:45
Location Code:	SPECIAL2 | CB	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66179

Project ID: OCBCA
Client ID: CB-1

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	30	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	0.44	0.02	mg/L	08/24/11		WM	E350.1
Nitrite as Nitrogen	0.02	0.01	mg/L	08/19/11	6:18	BS/EG	300.0
Nitrate as Nitrogen	3.5	0.05	mg/L	08/19/11	6:18	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	3.3	0.1	mg/L	08/24/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		08/18/11	13:20
Location Code:	SPECIAL2 | CB	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66180

Project ID: OCBCA
Client ID: CB-2

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	70	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	1.5	0.02	mg/L	08/24/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/19/11	6:28	BS/EG	300.0
Nitrate as Nitrogen	< 0.05	0.05	mg/L	08/19/11	6:28	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	2.8	0.1	mg/L	08/24/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		08/18/11	13:35
Location Code:	SPECIAL2 | CB	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66181

Project ID: OCBCA
Client ID: CB-3

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	>1000	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	3.1	0.02	mg/L	08/24/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/19/11	6:38	BS/EG	300.0
Nitrate as Nitrogen	3.1	0.05	mg/L	08/19/11	6:38	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	5.3	0.1	mg/L	08/24/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	GROUND WATER	Collected by:		08/18/11	13:35
Location Code:	SPECIAL2 | GW1	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66182

Project ID: OCBCA
Client ID: GW-1

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	20	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	610	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	0.47	0.02	mg/L	08/25/11		WM	E350.1
Nitrite as Nitrogen	0.04	0.01	mg/L	08/19/11	6:48	BS/EG	300.0
Nitrate as Nitrogen	7.5	0.25	mg/L	08/23/11	0:13	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	1.8	0.1	mg/L	08/25/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	GROUND WATER	Collected by:		08/18/11	14:20
Location Code:	SPECIAL2 | W	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66183

Project ID: OCBCA
Client ID: W-1

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	>1000	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	5.8	0.04	mg/L	08/25/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/19/11	6:59	BS/EG	300.0
Nitrate as Nitrogen	< 0.05	0.05	mg/L	08/19/11	6:59	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	8.1	0.2	mg/L	08/25/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		08/18/11	14:40
Location Code:	SPECIAL2 | CB	Received by:	LB	08/18/11	16:06
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA66176
Phoenix ID: BA66184

Project ID: OCBCA
Client ID: CB-4

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	110	10	/100 mls	08/18/11	16:50	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/18/11	16:50	K/R	SM 9222B
Ammonia as Nitrogen	3.4	0.02	mg/L	08/25/11		WM	E350.1
Nitrite as Nitrogen	0.03	0.01	mg/L	08/19/11	7:59	BS/EG	300.0
Nitrate as Nitrogen	0.41	0.05	mg/L	08/19/11	7:59	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	4.2	0.1	mg/L	08/25/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

QA/QC Report

August 29, 2011

QA/QC Data

SDG I.D.: GBA66176

Parameter	Blank	Dup RPD	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD	% Rec Limits	% RPD Limits
QA/QC Batch 183211, QC Sample No: BA66049 (BA66176, BA66177, BA66178, BA66179, BA66180, BA66181)										
Ammonia as Nitrogen	BDL	0	102			109			85 - 115	20
Nitrogen Tot Kjeldahl	BDL	13.3	108			103			85 - 115	20
QA/QC Batch 183096, QC Sample No: BA66179 (BA66176, BA66177, BA66178, BA66179, BA66180, BA66181, BA66182, BA66183)										
Nitrate as Nitrogen	BDL	0	102			101			85 - 115	20
Nitrite as Nitrogen	BDL	NC	108			99.7			85 - 115	20
QA/QC Batch 183097, QC Sample No: BA66195 (BA66184)										
Nitrate as Nitrogen	BDL	0	101			104			85 - 115	20
Nitrite as Nitrogen	BDL	NC	106			90.7			85 - 115	20
QA/QC Batch 183307, QC Sample No: BA66685 (BA66182, BA66183, BA66184)										
Ammonia as Nitrogen	BDL	0	106			101			85 - 115	20
Nitrogen Tot Kjeldahl	BDL	1.10	111			100			85 - 115	20
QA/QC Batch 183260, QC Sample No: BA67033 (BA66182)										
Nitrate as Nitrogen	BDL	NC	99.8			97.3			85 - 115	20
Nitrite as Nitrogen	BDL	NC	102			104			85 - 115	20

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria

Phyllis Shiller, Laboratory Director
August 29, 2011

Sample Criteria Exceedences Report

Requested Criteria: GWP, SWP

GBA66176

SampNo	LocCode	Acode	Phoenix Analyte	Criteria Units	ST	State Category	Criteria Name	Result	RL	Factored Criteria	Factored RL Criteria	Analysis Units
BA66176	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	0.04	0.02	0.003	0.003	mg/L
BA66177	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	0.17	0.02	0.003	0.003	mg/L
BA66178	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	0.1	0.02	0.003	0.003	mg/L
BA66179	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	0.44	0.02	0.003	0.003	mg/L
BA66180	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	GWPC (µg/L)	1.5	0.02	0.5	0.5	mg/L
BA66180	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	1.5	0.02	0.003	0.003	mg/L
BA66181	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	GWPC (µg/L)	3.1	0.02	0.5	0.5	mg/L
BA66181	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	3.1	0.02	0.003	0.003	mg/L
BA66182	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	0.47	0.02	0.003	0.003	mg/L
BA66183	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	GWPC (µg/L)	5.8	0.04	0.5	0.5	mg/L
BA66183	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	5.8	0.04	0.003	0.003	mg/L
BA66184	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	GWPC (µg/L)	3.4	0.02	0.5	0.5	mg/L
BA66184	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	3.4	0.02	0.003	0.003	mg/L

CHAIN OF CUSTODY RECORD

PHOENIX Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: info@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-8726

Temp 5 Pg of

Data Delivery:
☐ Fax #:
☒ Email: eprylo@rfpengineering.com

Customer: RFP ENGINEERING, LLC
Address: 188 N. MAIN ST.
SOUTHINGTON, CT 06489

Project: OCB CA
Report to: RFP
Invoice to: RFP

Project P.O:
Phone #: 860 276-9923
Fax #:

Client Sample - Information - Identification

Sampler's Signature _____ Date: _____

Matrix Code:
DW=Drinking Water GW=Ground Water SW=Surface Water WW=Waste Water
SE=Sediment SL=Sludge S=Soil/Solid W=Wipe O=Other

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	BACTERIA	NITRATE	AMMONIA	TKN	Soil VOA Vials [ ] methanol [ ] H2O	GL Soil container ( ) oz	GL Soil container ( ) oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] H2SO4	PL As is	PL H2SO4 250ml	PL HNO3 250ml	PL NaOH 250ml	Bacteria Bottle
606176	OCB S-1	SW	8/18/11	1050	X	X	X							1	1		1	
606177	OCB S-2	SW	8/18/11	1140	X	X	X							1	1		1	
606178	OCB S-3	SW	8/18/11	1135	X	X	X							1	1		1	
606179	OCB CB-1	SW	8/18/11	1145	X	X	X							1	1		1	
606180	OCB CB-2	SW	8/18/11	1320	X	X	X							1	1		1	
606181	OCB CB-3	SW	8/18/11	1335	X	X	X							1	1		1	
606182	OCB GW-1	GW	8/18/11	1335	X	X	X							1	1		1	
606183	OCB W-1	GW	8/18/11	1420	X	X	X							1	1		1	
606184	OCB CB-4	SW	8/18/11	1440	X	X	X							1	1		1	

Relinquished by:	Accepted by:	Date:	Time:
	Arnold	8/19	10:34

Comments, Special Requirements or Regulations:

Turnaround:
☐ 1 Day*
☐ 2 Days*
☐ 3 Days*
☒ Standard
☐ Other
* SURCHARGE APPLIES

RI
☐ Direct Exposure (Residential)
☐ GW
☐ Other

CT
☐ RCP Cert
☒ GW Protection
☐ SW Protection
☐ GA Mobility
☐ GB Mobility
☐ Residential DEC
☐ I/C DEC
☐ Other

MA
☐ MCP Certification
☐ GW-1
☐ GW-2
☐ GW-3
☐ S-1
☐ S-2
☐ S-3
☐ MWRA eSMART
☐ Other

Data Format
☒ Excel
☐ PDF
☐ GIS/Key
☐ EQuIS
☐ Other

Data Package
☐ Tier II Checklist
☐ Full Data Package*
☒ Phoenix Std Report
☐ Other
* SURCHARGE APPLIES

State where samples were collected: CT

PHOENIX
Environmental Laboratories, Inc.

Friday, August 26, 2011

RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Project ID: OCBCA
Sample ID#s: BA67027 - BA67030

This laboratory is in compliance with the QA/QC procedures outlined in EPA 600/4-79-019, Handbook for Analytical Quality in Water and Waste Water, March 1979, SW846 QA/QC and NELAC requirements of procedures used.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext. 200.

Sincerely yours,

Phyllis Shiller

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #MA-CT-007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	GROUND WATER	Collected by:		08/22/11	11:15
Location Code:	SPECIAL2 | OCB W	Received by:	LDF	08/22/11	13:57
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA67027
Phoenix ID: BA67027

Project ID: OCBCA
Client ID: OCB-W2

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	<10	10	/100 mls	08/22/11	17:00	K/R	SM9222G
Total Coliform	40	10	/100 mls	08/22/11	17:00	K/R	SM 9222B
Ammonia as Nitrogen	0.04	0.02	mg/L	08/26/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/23/11	0:45	BS/EG	300.0
Nitrate as Nitrogen	7.1	0.05	mg/L	08/23/11	0:45	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	1	0.1	mg/L	08/26/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	GROUND WATER	Collected by:		08/22/11	11:40
Location Code:	SPECIAL2 | OCB W	Received by:	LDF	08/22/11	13:57
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA67027
Phoenix ID: BA67028

Project ID: OCBCA
Client ID: OCB-W3

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	<10	10	/100 mls	08/22/11	17:00	K/R	SM9222G
Total Coliform	<10	10	/100 mls	08/22/11	17:00	K/R	SM 9222B
Ammonia as Nitrogen	0.06	0.02	mg/L	08/26/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/23/11	1:05	BS/EG	300.0
Nitrate as Nitrogen	< 0.05	0.05	mg/L	08/23/11	1:05	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	0.18	0.1	mg/L	08/26/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

Ver 1

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	GROUND WATER	Collected by:		08/22/11	11:55
Location Code:	SPECIAL2 | OCB W	Received by:	LDF	08/22/11	13:57
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA67027
Phoenix ID: BA67029

Project ID: OCBCA
Client ID: OCB-W4

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	<10	10	/100 mls	08/22/11	17:00	K/R	SM9222G
Total Coliform	50	10	/100 mls	08/22/11	17:00	K/R	SM 9222B
Ammonia as Nitrogen	< 0.02	0.02	mg/L	08/26/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/23/11	1:16	BS/EG	300.0
Nitrate as Nitrogen	4.5	0.05	mg/L	08/23/11	1:16	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	0.4	0.1	mg/L	08/26/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

August 26, 2011

FOR: RFP Engineering, LLC
188 N. Main St.
Southington, CT 06489

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		08/22/11	12:10
Location Code:	SPECIAL2 | OCB CB	Received by:	LDF	08/22/11	13:57
Rush Request:		Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBA67027
Phoenix ID: BA67030

Project ID: OCBCA
Client ID: OCB-CB5

Parameter	Result	RL	Units	Date	Time	By	Reference
Escherichia Coli	>60	10	/100 mls	08/22/11	17:00	K/R	SM9222G
Total Coliform	>2000	10	/100 mls	08/22/11	17:00	K/R	SM 9222B
Ammonia as Nitrogen	0.32	0.02	mg/L	08/26/11		WM	E350.1
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/23/11	1:26	BS/EG	300.0
Nitrate as Nitrogen	1.6	0.05	mg/L	08/23/11	1:26	BS/EG	300.0/9056
Nitrogen Tot Kjeldahl	2.1	0.1	mg/L	08/26/11		WM	E351.1

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

Phyllis Shiller, Laboratory Director
August 29, 2011

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

QA/QC Report

August 29, 2011

QA/QC Data

SDG I.D.: GBA67027

Parameter	Blank	Dup RPD	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD	% Rec Limits	% RPD Limits
QA/QC Batch 183376, QC Sample No: BA66987 (BA67027, BA67028, BA67029, BA67030)										
Ammonia as Nitrogen	BDL	0	106			98.5			85 - 115	20
Nitrogen Tot Kjeldahl	BDL	60.4	114			113			85 - 115	20
QA/QC Batch 183260, QC Sample No: BA67033 (BA67027, BA67028, BA67029, BA67030)										
Nitrate as Nitrogen	BDL	NC	99.8			97.3			85 - 115	20
Nitrite as Nitrogen	BDL	NC	102			104			85 - 115	20

r = This parameter is outside laboratory rpd specified recovery limits.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria

Phyllis Shiller, Laboratory Director
August 29, 2011

Sample Criteria Exceedences Report

Requested Criteria: GWP, SWP

GBA67027

SampNo	LocCode	Acode	Phoenix Analyte	Criteria Units	ST	State Category	Criteria Name	Result	RL	Factored Criteria	Factored RL Criteria	Analysis Units
BA67027	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	0.04	0.02	0.003	0.003	mg/L
BA67028	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	0.06	0.02	0.003	0.003	mg/L
BA67029	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	BDL	0.02	0.003	0.003	mg/L
BA67030	SPECIAL2	NH3-WM	Ammonia as Nitrogen	ug/L	CT	Inorganic Substances	SWPC (µg/L)	0.32	0.02	0.003	0.003	mg/L

CHAIN OF CUSTODY RECORD

Temp 4° Pg of

PHOENIX Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: info@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-8726

Data Delivery:
[ ] Fax #:
[X] Email: rpry@loerfpengineering.com

Customer: RFP ENGINEERING, LLC
Address: 188 N. MAIN ST. SOUTH WINDSOR, CT 06489

Project: OCBCA
Report to: RFP
Invoice to: RFP

Project P.O:
Phone #: 860/628-7279
Fax #:

Client Sample Information - Identification

Sampler's Signature: Date: 8/25/11

Matrix Code:
DW=Drinking Water GW=Ground Water SW=Surface Water WW=Waste Water
SE=Sediment SL=Sludge S=Soil/Solid W=Wipe O=Other

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	BACTERIA	NITRATE / NITRITE	AMMONIA / TKN	Soil VOA Vials [ ] methanol [ ] H2O	GL Soil container ( ) oz	GL Soil container ( ) oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] HCl	PL As is [X] 250ml [ ] 500ml [ ] 1000ml	PL H2SO4 [X] 250ml [ ] 500ml [ ] 1000ml	PL HNO3 250ml	PL NaOH 250ml	Bacteria Bottle
670027	OCB-W2	GW	8/22/11	1115	X	X	X						1	1			1
670028	OCB-W3	GW	8/22/11	1140	X	X	X						1	1			1
670029	OCB-W4	GW	8/22/11	1155	X	X	X						1	1			1
670030	OCB-CB5	SW	8/22/11	1210	X	X	X						1	1			1

Relinquished by: Accepted by: Date: 8/22 Time: 1357

Comments, Special Requirements or Regulations:

Turnaround:
[ ] 1 Day*
[ ] 2 Days*
[ ] 3 Days*
[ ] Standard
[ ] Other
* SURCHARGE APPLIES

RI
[ ] Direct Exposure (Residential)
[ ] GW
[ ] Other

CT
[ ] RCP Cert
[X] GW Protection
[ ] SW Protection
[ ] GA Mobility
[ ] GB Mobility
[ ] Residential DEC
[ ] I/C DEC
[ ] Other

MA
[ ] MCP Certification
[ ] GW-1
[ ] GW-2
[ ] GW-3
[ ] S-1
[ ] S-2
[ ] S-3
[ ] MWRA eSMART
[ ] Other

State where samples were collected: CT

Data Format
[X] Excel
[ ] PDF
[ ] GIS/Key
[ ] EQuIS
[ ] Other

Data Package
[ ] Tier II Checklist
[ ] Full Data Package*
[X] Phoenix Std Report
[ ] Other

* SURCHARGE APPLIES

Appendix E

Pollutant Renovation Analysis

focus & perspective
RFP Engineering, LLC
188 North Main Street
Southington, CT 06489
Tel. (860) 276-9923
Fax. (860) 426-9211

Project: OCBCA Wastewater Management Plan
Job No.: 2011.01
Sheet No ____ of ____
Prepared By: RFP Date: 10/4/11
Checked by: ____ Date: ____

NITROGEN ATTENUATION – ENTIRE ASSOCIATION

ASSUME:

TOTAL AREA OF OCBCA = 36.382 AC = 1,584,800 Ft^2
AVG. DAILY FLOW = 54,544 GPD (2010)
AVG. ANNUAL RAINFALL FOR CT = 50 "/YR
NITROGEN CONCENTRATION IN EFFLUENT = 35 MG/L

$$\text{NITROGEN CONCENTRATION} = \frac{\text{TOTAL NITROGEN}}{\text{TOTAL RAINFALL}}$$

$$\text{TOTAL NITROGEN} = 54{,}544 \text{ GPD} \times 3.785 \text{ L/GAL} \times 35 \text{ MG/L}$$

$$N = 7{,}225{,}716 \text{ MG/DAY}$$

$$\text{TOTAL RAINFALL} = \frac{50 \text{ "/YR}}{365 \text{ DAYS/YR}} \times \frac{1 \text{ Ft}}{12 \text{ "}} \times 36{,}382 \text{ AC} \times 43{,}560 \text{ Ft}^2/\text{AC} \times \frac{1 \text{ L}}{0.0353 \text{ Ft}^3}$$

$$\text{TOTAL RAINFALL} = 512{,}502 \text{ L/DAY}$$

$$\text{NITROGEN CONCENTRATION} = \frac{7{,}225{,}716 \text{ MG/DAY}}{512{,}502 \text{ L/DAY}}$$

$$\text{NITROGEN CONCENTRATION} = 14.1 \text{ MG/L}$$

focus & perspective
RFP Engineering, LLC
188 North Main Street
Southington, CT 06489
Tel. (860) 276-9923
Fax. (860) 426-9211

Project:	OCBCA Wastewater Management Plan		
Job No.:	2011.01		
Sheet No		of	
Prepared By:	RFP	Date:	10/4/11
Checked by:		Date:	

INDIVIDUAL PROPERTY POLLUTION REMOVATION ANALYSIS

ASSUME:

3 BEDROOM COTTAGE w/ AVERAGE DAILY FLOW = 244 GPD
NITROGEN CONCENTRATION OF EFFLUENT = 35 MG/L
AVERAGE ANNUAL RAINFALL IN CT = 50"/YR
AVERAGE LOT SIZE = 0.12 AC = 5,227 FT^2

$$\text{NITROGEN CONCENTRATION} = \frac{\text{TOTAL MASS OF N}}{\text{TOTAL RAINFALL}}$$

TOTAL N = 244 GPD x 3.785 L/GAL

N = ~~923.4~~ 923.5 L/DAY

N = 923.5 L/DAY x 35 MG/L

N = 32,324 MG/DAY

$$\text{TOTAL RAIN} = \frac{50"/YR}{365\ DAYS/YR} \times \frac{1\ FT}{12\ IN} \times 5,227\ FT^2 \times \frac{1\ L}{0.0353\ FT^3}$$

TOTAL RAIN = 1,690 L/DAY

$$\text{NITROGEN CONCENTRATION} = \frac{32,324\ MG/DAY}{1,690\ L/DAY} = 19.1\ MG/L$$

focus & perspective
RFP Engineering, LLC
188 North Main Street
Southington, CT 06489
Tel. (860) 276-9923
Fax. (860) 426-9211

Project:	OCBCA Wastewater Management Plan		
Job No.:	2011.01		
Sheet No	of		
Prepared By:	RFP	Date:	10/4/11
Checked by:		Date:	

CALCULATION OF MINIMUM LOT SIZE FOR NITROGEN ATTENUATION

ASSUME

3 BEDROOM COTTAGE WITH AVG. DAILY FLOW = 244 GPD
AVERAGE RAINFALL IN CONNECTICUT = 50 "/YR
NITROGEN CONCENTRATION IN EFFLUENT = 35 MG/L
MAX NITROGEN CONCENTRATION AT PROPERTY LINE = 9.9 MG/L

$$\text{NITROGEN CONCENTRATION } (C_N) = \frac{\text{TOTAL NITROGEN}}{\text{TOTAL RAINFALL}}$$

$$C_N = \frac{\text{TOTAL NITROGEN}}{\text{RAINFALL RATE} \times \text{AREA}}$$

$$\text{AREA} = \frac{\text{TOTAL NITROGEN}}{\text{RAINFALL RATE} \times C_N}$$

$$\text{AREA} = \frac{35\ \text{MG/L} \times 244\ \text{G/D} \times 3.875\ \text{L/G}}{50\ \text{"/YR} \times 1\ \text{YR}/365\ \text{D} \times 1\ \text{FT}/12\ \text{"} \times 9.9\ \text{MG/L} \times 1\ \text{L}/0.0353\ \text{FT}^3}$$

$$\text{AREA} = 10{,}336\ \text{FT}^2 = 0.24\ \text{ACRES}$$

Appendix F

Community Subsurface Sewage Disposal System Analysis

JACKSON ENGINEERING, LLC

- Environmental and Soil Consultants -

289 High Road, Kensington, Connecticut 06037
Phone: 860-224-4063 Fax: 860-224-4372

July 29, 2011

Mr. Robert F. Prybylo, P.E.
RFP Engineering, LLC
188 North Main Street
Southington, Connecticut 06489

Feasibility Assessment for Potential Off-Site Subsurface Sewage Disposal
Old Colony Beach Club Association, Old Lyme, Connecticut
JE Project No. 11-08

Dear Mr. Prybylo;

Per your request, Jackson Engineering, LLC has completed an assessment of potential locations for off-site subsurface disposal of residential sewage within an approximately two-mile radius of the Old Colony Beach Club Association, Old Lyme, Connecticut.

Project Overview

Jackson Engineering, LLC met with RFP Engineering, LLC on June 8, 2011 to review the location of the Old Colony Beach Club Association (the "Association") property and to define an approximate two-mile radius from Route 156, located at the northern property boundary for the Association. On June 15th, William Jackson conducted a windshield survey within the circular area defined by the two-mile radius.

There are approximately 220 seasonal homes within the Association. RFP Engineering, LLC calculated a present average daily sewage flow equal to 54,244 gallon-per-day ("gpd"). This value was later increased to 60,000 gpd to account for possible development and to represent a future average daily sewage flow.

Potential Parcels for Subsurface Sewage Disposal

Jackson Engineering, LLC assumed that the potential dilution of the total nitrogen concentration within the average daily sewage flow would be a significant limiting factor and estimated a minimum of 45-acres of land area would be required to attenuate a 37 mg/liter concentration of total nitrogen (as nitrate) within the average daily sewage flow. This concentration of nitrogen is typical of post-septic tank residential effluent that has undergone further mineralization within the subsurface leaching process.

Jackson Engineering, LLC searched for properties within the circular area defined by the two-mile radius that exhibited the following characteristics:

- A vacant, un-developed, parcel greater than 45-acres in area;
- Favorable upland soils without significant limitations (e.g., shallow ground water, shallow rock, compact till, steep slopes) based on information contained in the Soil Survey of New London County[1]: and,
- Sufficient off-set distances from existing municipal water supply wells located in the Town of Old Lyme.

Jackson Engineering, LLC identified seven potential suitable parcels for on-site sewage disposal based on a review of available Town GIS mapping, topography maps, aerial photographs, and the Soil Survey. The seven parcels are identified on the attached Figure 1. Parcels #1 through #4 are located within the two-mile radius. Parcels #5, #6 and #7 are located just beyond the two-mile radius and were later deemed too distant to be considered further.

Parcels #1 and #3 are each approximately 45 acres in area. These two parcels met the minimum land area required for initial consideration; however, due to limiting conditions, including the existence of watercourses, and associated wetlands, the parcels were removed from further consideration.

Parcels #2 and #4 appeared to be potentially suitable for a community subsurface sewage disposal system and were selected for further consideration.

Feasibility of Selected Parcels

Jackson Engineering, LLC reviewed the following parcels where potential development of a community subsurface sewage disposal leaching system for a 60,000 gpd future average daily design flow warranted further consideration.

1 #71 Buttonball Road. Old Lyme, Connecticut. (Parcel #2 shown in Figure 1).

The potential suitable off-site parcel identified within the two-mile radius was the 107-acre, #71 Buttonball Road parcel. This parcel is located approximately 1.0-miles northwest of the Association. The parcel is bounded by Buttonball Road to the west, Mile Creek to the east, and the Northeast Corridor Railroad to the south. According to Sheet No. 85 of the New London County Soil Survey, an approximately 23-acre sub-area of forested land in the eastern section of the larger parcel is underlain by the "Hinckley gravelly sandy loam, 3 to 15% slopes". This is a deep, excessively drained, soil derived from stratified sand and gravel parent materials. The permeability for this soil is described in the Soil Survey as "very rapid"

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[1] Crouch, M.H. 1983. Soil Survey of New London County, Connecticut. U.S. Department of Agriculture, Soil Conservation Service in cooperation with the Connecticut Agricultural Experiment Station and the Storrs Agricultural Experiment Station Sheet 85.

A conceptual subsurface sewage disposal leaching system, identified based on information contained in Table 6 of the Connecticut Public Health Code-Regulations and Technical Standards[2], assuming a typical septic tank effluent quality, a < 10 min. per inch soil percolation rate, and specification of 4' by 4' leaching galleries, would entail approximately 7,174 linear feet of leaching system. A conceptual system configuration might include six rows of leaching galleries, and each row composed of twelve 100-foot sections of leaching galleries. The footprint for such a leaching system configuration would extend approximately 1,250 linear feet in length and encompass a minimum of three-acres of land.

Note: the above conceptual subsurface sewage disposal leaching system description is not based on any prior evaluation of existing soils or subsurface conditions to determine potential limiting conditions. Comprehensive site evaluation and testing would be required to collect the necessary information to support an actual design for a community subsurface sewage disposal leaching system on this parcel.

2. #130-1 Whippoorwill Road, Old Lyme, Connecticut, (Parcel #4 shown in Figure 1).

A second potential suitable, off-site parcel identified was the 87-acre, #130-1 Whippoorwill Road parcel. This parcel is located approximately 1.8-miles north-northwest of the Association on the north side of Interstate I-95. The parcel is located east of Whippoorwill Road and is bounded by Interstate I-95 to the south. The southeastern corner of the parcel apparently abuts Flat Rock Road and includes a section of Sawmill Brook. The parcel can be subdivided into three general sections based on information from Sheet No. 85 of the Soil Survey of New London County:

- The western section of the parcel contains a north-south watercourse and an associated expanse of poorly drained to very-poorly-drained wetland soils. This section of the parcel is unsuitable for subsurface sewage disposal.

- The central section of the parcel contains a north-south-orientated forested ridge. The "Charlton-Hollis fine sandy loams, very rocky, 15 to 45% slopes" soil map unit identified by the Soil Survey indicates glacial till parent materials that exhibit significant slopes and shallow depths to bedrock. This section of the parcel is also unsuitable for subsurface sewage disposal.

- The soils in the eastern section of the parcel are mapped as "Paxton and Montauk fine sandy loams, 3 to 8% slopes". These are soils derived from glacial till parent materials that exhibit a dense "hard-pan" restrictive horizon located approximately 30-inches below surface grade. The permeability for the hard-pan horizon is described as "slow" to "very slow".

[2] Connecticut Public Health Code, Regulations and Technical Standards for Subsurface Sewage Disposal Systems. January 2010. State of Connecticut, Department of Public Health, Environmental Engineering Program

The land area, which could potentially be used for subsurface disposal, within this parcel is approximately 24 acres. However, the shallow glacial-till soils in this area present severe hydraulic limitations in the design of a system of this magnitude; these soils would not likely have the capacity to accommodate the daily design flow within the subsurface. Therefore, Jackson Engineering, LLC does not recommend further consideration of this parcel.

If you have any questions or comments regarding the information contained in this report, please contact us at (860) 224-4063.

Sincerely,
JACKSON ENGINEERING, LLC

William A. Jackson, R.S., L.E.P.
Registered Soil Scientist

Potential Suitable Parcels

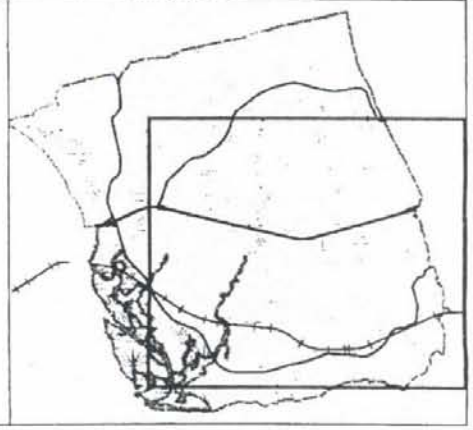
Figure 1

1 – 182 Mile Creek Rd.
44 acres, 4500 ft away
2 – 71 Buttonball Rd.
107 acres, 1 mile away
3 – 29-1 Hatchetts Hill Rd.
45 acres, 1.7 miles away
4 – 130-1 Whippoorwill Rd.
87 acres, 1.8 miles away
5 – 20 Short Hills Rd.
195 acres, 2.1 miles away
6 – 64 Whippoorwill Rd.
186 acres, 2.2 miles away
7 – 245 Whippoorwill Rd.
204 acres, 2.3 miles away

OLD LYME CONNECTICUT

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

This data set/map is for planning purposes only and should not be used for larger scale analysis. The Town of Old Lyme, CT shall not be held liable for any use of the data or images shown on this map, nor is any warranty of accuracy expressed. All uses of this data set/map are subject to field verification.



JACKSON ENGINEERING, LLC

- Environmental and Soil Consultants -

289 High Road, Kensington, Connecticut 06037
Phone: 860-224-4063 Fax: 860-224-4372

August 3, 2011

Mr. Robert F. Prybylo, P.E.
RFP Engineering, LLC
188 North Main Street
Southington, Connecticut 06489

Feasibility Assessment for Potential Off-Site Subsurface Sewage Disposal
Cost Estimate for a Conceptual Community Subsurface Sewage Disposal Leaching System
Old Colony Beach Club Association, Old Lyme, Connecticut
JE Project No. 11-08

Dear Mr. Prybylo;

Jackson Engineering, LLC outlined a conceptual community subsurface sewage disposal leaching system for the 60,000 gallon-per-day daily sewage flow in our July 29, 2011 letter report. The conceptual design was based on soils characteristics for the eastern section of #71 Buttonball Road, Old Lyme, as identified on Sheet No. 85 of the Soil Survey of New London County.[1]

A conceptual subsurface sewage disposal leaching system will require approximately 7,200 linear feet of 4' by 4' leaching galleries. We have divided the total linear feet of leaching galleries required into twelve units of leaching area. Attached is a sketch of one unit of leaching area. This unit consists of six rows of 4' by 4' by 100 linear feet of leaching chambers, three distribution boxes (i.e., two high-level overflow and one equal elevation) and approximately 55 linear feet of 4" SDR 35 distribution piping. A total of twelve (12) of the above leaching system units will be required to account for the total linear feet of leaching system required.

The attached cross-section of a 4x4 gallery shows 12-inches of stone aggregate around the sides of each leaching gallery, non-woven filter fabric covering, and 6-inches of granular fill cover. These features have been included in the cost estimate as well as 12-inches of stone aggregate at each end.

The estimated cost to construct the above conceptual leaching system is Six Hundred Thirty Thousand ($630,000.00) Dollars. This estimate was prepared for Jackson Engineering, LLC by Mr. Steven M. Romano, Sr., Construction Estimator. A copy of Mr. Romano's cost estimate is attached.

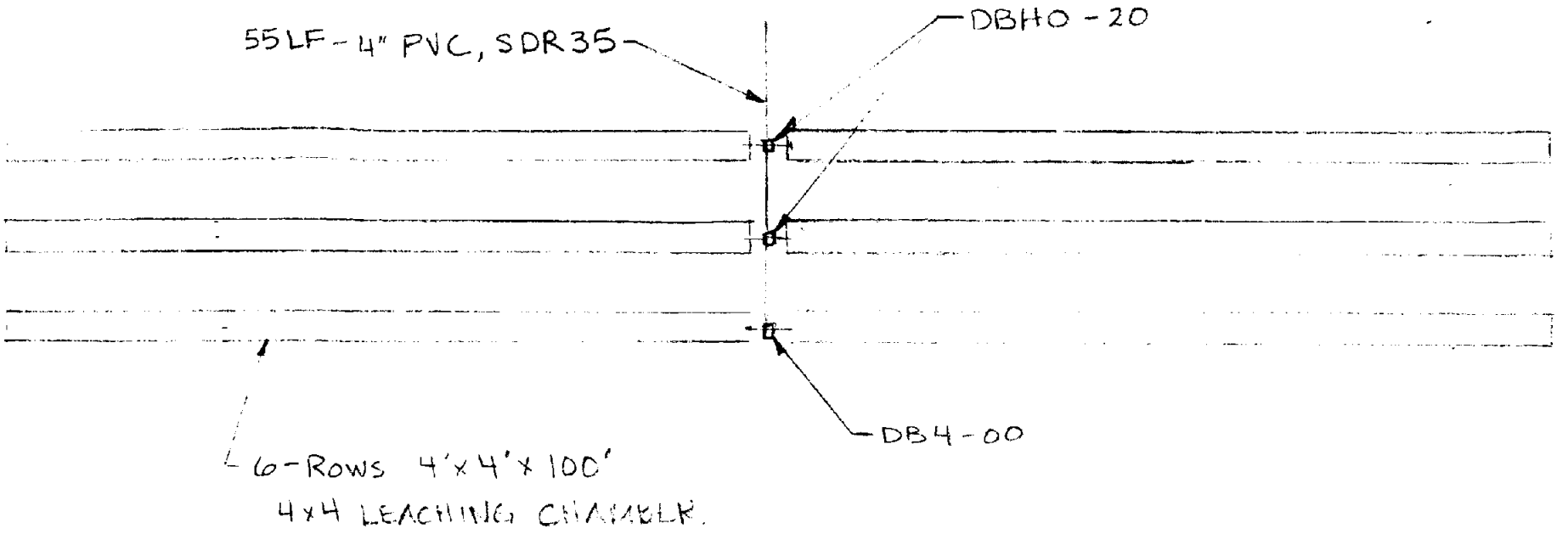
[1] Crouch, M.H. 1983. Soil Survey of New London County, Connecticut. U.S. Department of Agriculture, Soil Conservation Service in cooperation with the Connecticut Agricultural Experiment Station and the Storrs Agricultural Experiment Station. Sheet 85.

Note; the cost estimate does not include specification of pre-treatment (i.e., septic tanks or packaged treatment plants), distribution pumps, force main, or dosing chambers.

Please contact us at (860) 224-4063 with questions or comments regarding the cost estimate.

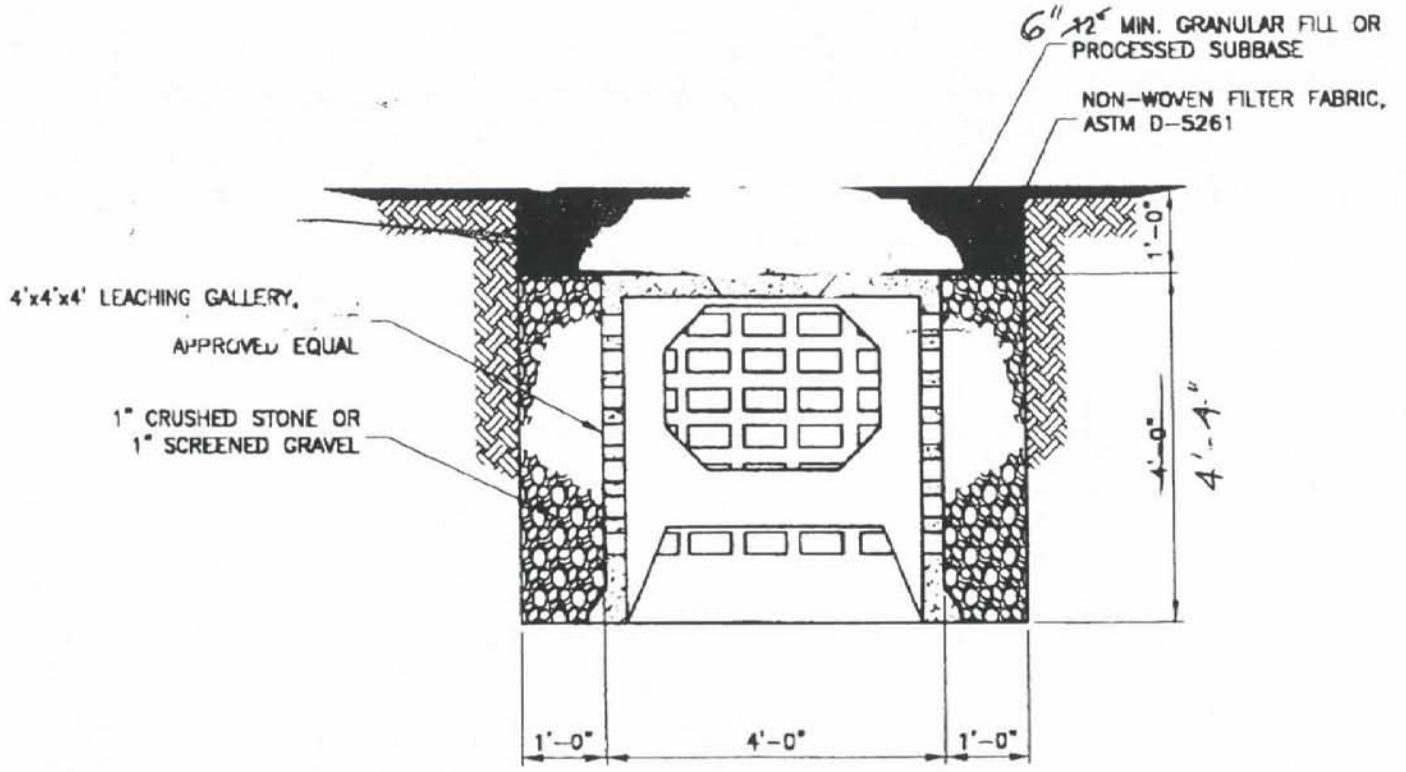
Sincerely,
JACKSON ENGINEERING, LLC

William A. Jackson, R.S., L.E.P.
Registered Soil Scientist



LEACHING UNIT (TYP.)

1" = 2.0'



CONCRETE LEACHING GALLERY CROSS SECTION

N.T.S.

Steven M. Romano, Sr
DBA Romano & Sons Site Work Consulting
375 Beach Street
Goshen, CT 06756-2309
July 30, 2011

William Jackson
Jackson Engineering, LLC
289 High Road
Kensington, CT 06037

Dear Bill:

The following is the cost estimate you requested and is based on the conceptual subsurface disposal leaching system design given to me.

This estimate assumes 7,200 linear feet of 4' x 4' precast concrete leaching galleries divided into 12 units of leaching area each done in sequence until the final unit is complete. Following the drawing and detail you provided each unit will consist of 600' of H-20 rated gallery, three concrete distribution boxes, 4" SDR-35 gasket joint distribution pipe, 3/4" stone aggregate along the sides as well as one foot one either end of the trench, approved granular fill on the top of trench and approved non woven filter fabric covering trench. The trench will be backfilled with excavated material, rough graded, raked and hydro-seeded to restore site. The following is the breakdown of cost:

Materials including a 15% mark up for contractor -	$434,409.24
Machine and labor based on 40 days to complete -	$120,000.00
Tree clearing of approximately 4 acres -	$ 10,000.00
Stump, Grub and removal of stumps off site -	$ 20,000.00
Site restoration (Grade, rake & hydro-seed) -	$ 45,000.00
Total of project completed (12 units) -	$629,409.24

Please remember this is only a cost estimate and in no way reflects the actual cost or costs associated with doing this project and should be interpreted as such and is based on information provided at this time. The following sheet will break down the above costs in detail.

Thank you for the opportunity to help with this project. I look forward in working with you in the future.

Sincerely,

Steven M. Romano

Jackson Engineering, LLC
Community Leaching System

MATERIAL	UNIT	UNIT COST	QUANTITY	EXTENDED COST
SDR-35 ASTM 3034 Gasket Joint Pipe	ln.ft.	$1.05	56	$58.80
Precast Concrete Distribution Box	ea.	$37.00	3	$111.00
4' X 4' X 8' Precast Concrete H-20 Leaching Gallery	ea.	$330.00	72	$23,760.00
4' x 4' x 4' Precast Concrete H-20 Leaching Gallery	ea.	$190.00	6	$1,140.00
Typar Non Woven Filter Fabric 1.5oz (6' x 300')	roll	$79.04	2	$158.08
3/4" Washed Stone/delivered	ton	$17.00	291.95	$4,963.15
Approved Septic Sand/delivered	ton	$18.00	71.55	$1,287.90
MATERIAL COST PER LEACHING UNIT				$31,478.93
CONTRACTOR MARK UP - 15%				$4,721.84
TOTAL PER UNIT				$36,200.77
LEACHING SYSTEM MATERIAL COST	unit	$36,200.77	12	$434,409.24
MACHINE AND LABOR TO INSTALL SYSTEMS	day	$3,000.00	40	$120,000.00
TREE CLEARING	acre	$2,500.00	4	$10,000.00
STUMPING AND GRUBING (INCL DISPOSAL)	acre	$5,000.00	4	$20,000.00
SITE RESTORATION	sq.ft.	$0.25	180,000	$45,000.00
TOTAL FOR JOB				$629,409.24

NOTE: PRECAST GALLERY IS ASSUMED H-20 LOADING.
NOTE: CONTRACTOR MARK UP IS INDUSTRY STANDARD.
NOTE: AGGREGATE PRICING IS BASED ON A QUARRY LOCATED CLOSE TO JOB SITE. ADDITIONAL TRUCKING CHARGES MAY APPLY.
NOTE: STUMPS ARE ASSUMED TO BE REMOVED FROM SITE IN 30 YD CONTAINERS.
NOTE: NO ADDITIONAL TOPSOIL IS TO BE TRUCKED IN FOR RESTORATION. ONSITE MATERIAL IS TO BE USED.

Appendix G

Construction Cost Estimates

CONSTRUCTION COST ESTIMATE

Date: **16-Oct-11**

Project: **Old Colony Beach Waswtewater Management Plan**

Description: **COLLECTION SYSTEM WITHIN OLD COLONY BEACH**

ALL COSTS ARE IN 2011 DOLLARS

ITEM	UNIT	EST. QTY	UNIT PRICE	TOTAL
Gravity Sewer - Local Roads				
6" PVC	LF	6,000	$50	$300,000
8" PVC	LF	6,237	$75	$467,775
10" PVC	LF	700	$85	$59,500
12" PVC	LF		$100	$0
Force Main - Local Roads				
3" DIP	LF		$50	$0
4" DIP	LF		$65	$0
6" DIP	LF		$80	$0
Force Main - State Roads				
3" DIP	LF		$60	$0
4" DIP	LF		$75	$0
6" DIP	LF		$100	$0
Tee/Wye	EA	225	$300	$67,500
Manholes				
Gravity	EA	33	$3,000	$99,000
Force Main	EA		$4,500	$0
Pumping Stations	EA	1	$400,000	$400,000
Site Acquisition	LS			$0
RR Crossings				
Jacking	LS		$150,000	$0
Trenching	LS		$25,000	$0
Stream/River Crossing	LS		$30,000	$0

ITEM	UNIT	EST. QTY	UNIT PRICE	TOTAL
Bituminous Pavement				
State Temp	SY		$20	$0
State Perm	SY		$12	$0
Local Temp	SY	4,518	$9	$40,662
Local Perm	SY	19,567	$12	$234,804
Rock Removal				
Mechanical	CY		$250	$0
Blasting	CY		$125	$0
Maintenance and Protection of Traffic				
	ALLOW	1		$0
			Subtotal:	$1,669,241
			Contingency (@15%):	$250,386
			Total Estimated Cost:	**$1,919,627**

CONSTRUCTION COST ESTIMATE

Date: 16-Oct-11

Project: Old Colony Beach Waswtewater Management Plan

Description: COMMUNITY TREATMENT SYSTEM OPTION

ALL COSTS ARE IN 2011 DOLLARS

ITEM	UNIT	EST. QTY	UNIT PRICE	TOTAL
Gravity Sewer - Local Roads				
6" PVC	LF	6,000	$50	$300,000
8" PVC	LF	6,237	$75	$467,775
10" PVC	LF	700	$85	$59,500
12" PVC	LF		$100	$0
Force Main - Local Roads				
3" DIP	LF		$50	$0
4" DIP	LF	5,910	$65	$384,150
6" DIP	LF		$80	$0
Force Main - State Roads				
3" DIP	LF		$75	$0
4" DIP	LF	6,800	$90	$612,000
6" DIP	LF		$110	$0
Tee/Wye	EA	225	$300	$67,500
Manholes				
Gravity	EA	33	$3,000	$99,000
Force Main	EA	12	$4,500	$54,000
Pumping Stations	EA	4	$400,000	$1,600,000
Site Acquisition	LS	2	$100,000	$200,000
RR Crossings				
Jacking	LS	1	$150,000	$150,000
Trenching	LS		$25,000	$0
Stream/River Crossing	LS	1	$30,000	$30,000

ITEM	UNIT	EST. QTY	UNIT PRICE	TOTAL
Bituminous Pavement				
State Temp	SY	6,044	$20	$120,889
State Perm	SY	18,889	$12	$226,667
Local Temp	SY	7,197	$9	$64,777
Local Perm	SY	31,357	$12	$376,279
Rock Removal				
Mechanical	CY	100	$250	$25,000
Blasting	CY	500	$125	$62,500
Maintenance and Protection of Traffic				
	ALLOW	1	$48,000	$48,000
Community Treatment System				
Property Acquisition	LS	1	$535,000	$535,000
20' Access Road	LS	1	$175,000	$175,000
Sitework/utilities	LS	1	$250,000	$250,000
SBR Treatment System	LS	1	$750,000	$750,000
Disposal System	LS	1	$629,409	$629,409
			Subtotal:	$7,287,445
			Contingency (15%):	$1,093,117
			Technical Services @ 20%:	$1,457,489
			Legal and Administrative @ 3%:	$218,623
			Short Term Interest:	$615,549
			Subtotal:	$10,672,223
			DEP Grant:	-$2,459,513
			Net Local Share:	**$8,212,711**

CONSTRUCTION COST ESTIMATE

Date: 16-Oct-11

Project: Old Colony Beach Waswtewater Management Plan

Description: CONNECTION TO POINT O'WOODS SEWER SYSTEM

ALL COSTS ARE IN 2011 DOLLARS

ITEM	UNIT	EST. QTY	UNIT PRICE	TOTAL
Gravity Sewer - Local Roads				
6" PVC	LF	6,000	$50	$300,000
8" PVC	LF	6,237	$75	$467,775
10" PVC	LF	700	$85	$59,500
12" PVC	LF		$100	$0
Force Main - Local Roads				
3" DIP	LF		$50	$0
4" DIP	LF	1,363	$65	$88,595
6" DIP	LF		$80	$0
Force Main - State Roads				
3" DIP	LF		$60	$0
4" DIP	LF	5,230	$75	$392,250
6" DIP	LF		$100	$0
Tee/Wye	EA	225	$300	$67,500
Manholes				
Gravity	EA	33	$3,000	$99,000
Force Main	EA	5	$4,500	$22,500
Pumping Stations	EA	1	$400,000	$400,000
Site Acquisition	LS			$0
RR Crossings				
Jacking	LS	1	$150,000	$150,000
Trenching	LS	1	$25,000	$25,000
Stream/River Crossing				
	LS	1	$30,000	$30,000

ITEM	UNIT	EST. QTY	UNIT PRICE	TOTAL
Bituminous Pavement				
State Temp	SY	3,672	$20	$73,440
State Perm	SY	11,475	$12	$137,700
Local Temp	SY	5,275	$9	$47,477
Local Perm	SY	22,899	$12	$274,785
Rock Removal				
Mechanical	CY	100	$250	$25,000
Blasting	CY	500	$125	$62,500
Maintenance and Protection of Traffic	ALLOW	1	$24,000	$24,000
Modification of POW Pump Station	LS	1	$200,000	$200,000
Cost of Shared Facilities	LS	1	$909,091	$909,091

Subtotal:	$3,856,113
Contingency (15%):	$578,417
Technical Services During Intermunicipal Negotiations:	$75,000
Technical Services @ 20%:	$771,223
Legal and Administrative @ 3%:	$115,683
Short Term Interest:	$330,305
Subtotal:	$5,726,741
DEP Grant:	-$1,301,438
Net Local Share:	**$4,425,303**

CONSTRUCTION COST ESTIMATE

Date: October 16, 2011

Project: Old Colony Beach Waswtewater Management Plan

Description: CONNECTION TO EAST LYME SEWER SYSTEM

ALL COSTS ARE IN 2011 DOLLARS

ITEM	UNIT	EST. QTY	UNIT PRICE	TOTAL
Gravity Sewer - Local Roads				
6" PVC	LF	6,000	$50	$300,000
8" PVC	LF	6,237	$75	$467,775
10" PVC	LF	700	$85	$59,500
12" PVC	LF		$100	$0
Force Main - Local Roads				
3" DIP	LF		$50	$0
4" DIP	LF	1,000	$65	$65,000
6" DIP	LF		$80	$0
Force Main - State Roads				
3" DIP	LF		$60	$0
4" DIP	LF	12,400	$75	$930,000
6" DIP	LF		$100	$0
Tee/Wye	EA	225	$300	$67,500
Manholes				
Gravity	EA	33	$3,000	$99,000
Force Main	EA	5	$4,500	$22,500
Pumping Stations	EA	2	$400,000	$800,000
Site Acquisition	LS	1	$100,000	$100,000
RR Crossings				
Jacking	LS	1	$150,000	$150,000
Trenching	LS		$25,000	$0
Stream/River Crossing				
	LS	2	$30,000	$60,000

ITEM	UNIT	EST. QTY	UNIT PRICE	TOTAL
Bituminous Pavement				
State Temp	SY	11,022	$20	$220,444
State Perm	SY	34,444	$12	$413,333
Local Temp	SY	4,518	$9	$40,662
Local Perm	SY	19,567	$12	$234,804
Rock Removal				
Mechanical	CY	100	$250	$25,000
Blasting	CY	500	$125	$62,500
Maintenance and Protection of Traffic				
	ALLOW	1	$80,000	$80,000

Subtotal:	$4,198,019
Contingency (15%):	$629,703
Technical Services During Intermunicipal Negotiations:	$75,000
Technical Services @ 20%:	$839,604
Legal and Administrative @ 3%:	$125,941
Short Term Interest:	$359,185
Subtotal:	$6,227,451
DEP Grant:	-$1,416,831
Net Local Share:	**$4,810,619**