TOWN OF ST. ALBANS, VERMONT

Lake Road Sewer and Water Feasibility Study

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SECTION 1

EXECUTIVE SUMMARY

SECTION 1: EXECUTIVE SUMMARY

The Town of St. Albans retained Aldrich + Elliott to perform a sewer collection system and water distribution system feasibility study for the Lake Road / Georgia Shore Road area (aka the Bay area). Limited areas of the Town are currently served through interconnections with the City of St. Albans municipal wastewater and water systems. Sewer and water extensions to the Bay area will require connecting to the City of St. Albans municipal water and wastewater systems. Based on this fact, it is critical that the Town conduct negotiations with the City and coordinate efforts before moving forward with this project.

Topography was evaluated within the Study area as well as current and projected zoning and land use conditions, primary agricultural soils and locations of possible wetlands. Based on the topography between the Bay area and the City's municipal sewer and water infrastructure, the Study area was separated into four (4) new service areas, two (2) of which are evaluated in detail in this report. The two main service areas investigated are the Initial Bay and the Initial Upper Lake Road service areas. These two service areas will require three (3) new wastewater pump stations and two (2) new water pressure reducing valve vaults in order to connect to the City's municipal systems. The following narrative provides a brief description of the recommended sewer and water system improvements as well as construction cost estimates and Total Project cost estimates for the sewer and water projects, separately.

The three wastewater pump stations will be sized and located as follows:

- Town Garage pump station (denoted as PS #1) will be a 120,000 gpd above-ground self-priming facility with two (2) 225 gpm pumps with space available for a third 225 gpm pump for future needs;
- Park pump station (denoted as PS #2) will be a 57,000 gpd above-ground self-priming facility with two (2) 225 gpm pumps;
- Fire Station pump station (denoted as PS #3) will be a 141,000 gpd above-ground self-priming facility with two (2) 225 gpm pumps with space available for a third 225 gpm pump for future needs.

Gravity sewers within the Bay and Upper Lake Road service areas will consist of approximately 10,700 linear feet of 8" diameter and 7,600 linear feet of 10" diameter PVC SDR35 sewermains. Forcemain sewers within the Bay and Upper Lake Road service areas will consist of approximately 10,750 linear feet of dual 6" diameter and 1,350 linear feet of single 6" diameter PVC C900 sewer forcemain lines. The construction cost estimate for the Initial Bay and Upper Lake Road sewer service areas is $4.9M and $2.46M, respectively. The combined Total Project cost for the above projects is $10.1M.

The two new pressure reducing valve vaults for the water transmission main will be located as follows: one at the intersection of Brigham Road and Lake Road, adjacent to the City's existing 16" transmission main; and one approximately 325 feet west of the Lake Road / Kellogg Road intersection. The pressure reducing valve vaults will allow the Town to maintain static water

system pressures within an acceptable range of 40 psi to 120 psi. Transmission and distribution watermains needed to service the Bay area consist of approximately 9,250 linear feet of 12" diameter and 14,800 linear feet of 8" diameter DI CL52 water pipe with miscellaneous waterline appurtenances. The construction cost and Total Project cost estimates for the water system improvements are $4.58M and $6.1M, respectively.

An equivalent user (EU) analysis was done for the four service areas and potential user costs for the sewer system expansion were calculated based on the two main service areas and their corresponding Total Project Cost. Based on the initial year total equivalent user estimate of 223 EUs for the Bay and Upper Lake Road service areas, and using an assumed State of Vermont, Department of Environmental Conservation, Clean Water SRF loan at an interest rate of 2% for 20 years, the annual user rate equates to $2,770 per EU. In order to make this sewer expansion project financially feasible and affordable for its users, a Town-wide sewer assessment fee would likely need to be implemented.

After successfully negotiating with the City of St. Albans for connection to its municipal sewer system, the Town would need to pass a Bond Vote for the estimated total project cost in order to move forward with the proposed sewer expansion project. Given that implementing a Town-wide sewer assessment fee appears to be the only way to make the project financially feasible, it may be difficult to pass the Bond Vote based on the fact that only a small percentage of the Town's residents will directly benefit from this project. Hopefully the indirect benefit of expanding sewer service to the Bay area and possibly to other future areas of Town, in addition to helping protect Lake Champlain, will outweigh the increased costs to residents of the Town as a whole.

SECTION 2

INTRODUCTION

SECTION 2 INTRODUCTION

2.1 PURPOSE AND OBJECTIVES

The Town of St. Albans (Town) retained Aldrich + Elliott, PC (A+E) in September of 2012 to conduct a sewer collection system and water distribution system feasibility study for the Lake Road / Georgia Shore Road area (aka the Bay area). The purpose of this Sewer and Water Feasibility Study is to:

- Define new sewer service areas of interest
- Establish current and future sewer flows for each service area
- Evaluate the water system pressures and needs for extending a distribution main from Brigham Road to Georgia Shore Road
- Prepare preliminary costs (construction, total project, and user costs)
- Indentify possible permits needed and potential funding options

The Town is considering an extension of the wastewater collection system to this area is to improve water quality in Lake Champlain, minimize existing on-site wastewater disposal issues, and support current and future land uses. The Town's interest in extending municipal water to the Bay Area is also to support current and future land uses.

2.2 EXISTING INFORMATION

The Town of St. Albans is located within Franklin County, Vermont on the eastern shores of Lake Champlain. It borders the Town of Swanton to the north, the Town of Fairfield to the east, and the Town of Georgia on the south, as shown in Figure No. 1 in Appendix A. A small portion of the Town is on City water and sewer based on previous agreements made between the City and the Town. The majority of Town residents are on private on-site septic and water well systems.

The closest municipal sewer collection system infrastructure that this Study considers connecting to is located along Lake Road, just east of Walnut Street. There are gravity sewermains slightly closer to the Study area on Lake Road, however, these sewermain pipe sizes are not ideal for the additional capacity needed to sewer the Bay area. This Study will investigate sewering the St. Albans Bay area as well as the Hathaway Point Road area and the lower Georgia Shore Road area.

The closest City-owned water distribution main is located at the intersection of Brigham Road and Lake Road. This Study will investigate the potential for extending a water transmission main from this intersection west along Lake Road / Vermont Route 36 to the intersection of Georgia Shore Road. The current static system pressures at the Brigham Road / Lake Road intersection are approximately 155 psi. An analysis will be performed to determine the number and location of potential pressure reducing valve vaults that will be necessary to maintain adequate system pressures along this proposed alignment.

2.3 SCOPE OF STUDY

The scope of this report is to present the findings of the Lake Road Sewer and Water Feasibility Study and will include the following:

- Gather and review existing information
- Delineate possible sewer service areas based on topography and current land use
- Estimate wastewater flows for existing and future conditions
- Develop preliminary sewer collection system infrastructure, including locations of necessary pump stations
- Delineate possible water system pressure zone boundaries using topography and system pressure information
- Develop a preliminary design for the water transmission main on Lake Road / Vermont Route 36 and within the Bay area and identify possible locations for pressure reducing valve vaults
- Prepare preliminary costs including construction and total project costs
- Identify potential funding options
- Identify permits and regulatory requirements
- Develop a list of next steps

SECTION 3

SEWER AND WATER SERVICE AREAS / PRESSURE ZONE BOUNDARIES

SECTION 3 SEWER AND WATER SERVICE AREAS / PRESSURE ZONE BOUNDARIES

3.1 GENERAL

This Section will define possible sewer service areas within the Lake Road / Georgia Shore Road study area and will present site information about these areas. The site information will be used to develop a preliminary design and will assist in determining which of the proposed sewer service areas are most economically feasible to construct.

3.2 SITE INFORMATION

3.2.1 General

The site information addressed here includes:

- Topography
- Zoning and Land Use
- Primary Agricultural Soils
- Wetlands Mapping

3.2.2 Topography

The ground topography between the City's wastewater collection system infrastructure and the Bay area is rather significant, with elevations ranging from roughly 370 feet above mean sea level near Walnut Street to roughly 100 feet above mean sea level near Georgia Shore Road. In order to utilize as much gravity sewer design as possible, the Study area was divided into multiple sewer service areas based on the relative topography and existing land use.

Similarly, the ground topography between the City's water distribution system and the Bay area ranges from 328 feet to 105 feet above mean sea level. In order to maintain adequate system pressures, pressure reducing valves vaults will be considered based on the change in topography along the proposed water transmission main route.

3.2.3 Zoning and Land Use

The Town Zoning Map, dated October 19, 2005 was reviewed as part of the Study. The areas evaluated in this report have a zoning designation of Residential, Commercial, Commercial/Residential, or Lakeshore, as shown in Figure No. 8 of Appendix A. The 2012 Town Plan was also reviewed to better understand current and future growth needs. The Town Plan identifies a proposed zoning district called the St. Albans Bay Area District. The purpose of this new District is to allow for new residential and commercial development within the St. Albans Bay Area that maintains the historic village character of this area. Providing this area with municipal water and sewer is essential for future growth in addition to improving the water quality of Lake Champlain.

3.2.4 Primary Agricultural Soils

The State of Vermont Land Use and Development Law, Act 250, defines Primary Agricultural Soils as those soils with a combination of physical and chemical characteristics that have a potential for growing food, feed, and forage crops. They also have sufficient moisture and drainage, plant nutrients or responsiveness to fertilizers, few limitations for cultivation, and an average land slope not exceeding 15 percent. Any soils having an Agricultural Value Group rating of 1 through 7 are considered Primary Agricultural Soils. Based on the Vermont Agency of Natural Resources, Environmental Interest Locator (see Figure 7 in Appendix A), Prime Ag. Soils can be found in various locations along Lake Road (Vermont Route 36). These soils are concentrated mostly between Kellogg Road and Brigham Road, and around the intersection of Lake Road and Georgia Shore Road.

The installation of gravity sewers in rural areas can create growth impacts. Act 250 has historically prohibited the installation of gravity sewers in areas with Prime Ag. Soils in order to maintain the agricultural nature of those areas. Given the Prime Ag. Soils and rural character of the area between the Upper Lake Road Sewer Service Area and the Bay Sewer Service Area, gravity sewers are not recommended along this section of Lake Road. The Prime Ag. Soils, lack of density, and current zoning regulations do not support the need for gravity sewers in this area.

3.2.5 Wetlands

Several Class II Wetlands are located along Lake Road, concentrated between Church Road and Little County Road, as shown on the Vermont Agency of Natural Resources, Environmental Interest Locator (see Figure 6 in Appendix A). Class II Wetlands are wetlands that are shown on the National Wetlands Inventory Map and are significant and thus merit protection under the Vermont Wetland Rules. Construction within these designated wetlands is only allowed after obtaining a State of Vermont, Conditional Use Determination and a U.S. Army Corps of Engineers Permit. A Conditional Use Determination is also required when construction occurs within 50 feet of the wetland boundary.

This Study will take the Wetland boundaries into account when evaluating the feasibility of construction, however, additional wetlands delineation activities will need to be performed during Final Design to determine the exact impact on these areas.

3.3 SEWER SERVICE AREAS

Based on the site information evaluated within the Study area, four (4) different sewer service areas were defined. These service areas are described in Table 3.1 and on Figure No. 2 in Appendix A.

Table No. 3.1
Proposed Sewer Service Areas

Service Area Name	Locations Included within Service Area
Initial Bay	Lake Road, Georgia Shore Road, McGinn Drive, Cherry Street, Chubb Street, Little County Road, Mechanic Street, Church Road, and Patten Crosby Road
Initial Upper Lake Road	Lake Road, Brigham Road, Bronson Road, Jewell Street
Future Western	Hathaway Point Road
Future Southern	Georgia Shore Road

The main focus of the Study area is the Initial Bay Service Area and the Initial Upper Lake Road Service Area, due to their relative proximity to existing municipal infrastructure, density of residential and commercial properties, and current zoning. The remaining two (2) Service Areas, denoted as Future Western and Future Southern will be briefly evaluated as possible future expansions based on their more distant proximity to the central Bay area.

3.4 WATER SERVICE AREAS / PRESSURE ZONES BOUNDARIES

Based on the existing water system pressures at the proposed interconnection area of Brigham Road and Lake Road, and the site topography within the Study area, two (2) different pressure zones were identified as being necessary to provide water service to the Initial Bay Service Area and the Initial Upper Lake Road Service Area. Pressure reducing valve vaults will be used at these boundaries in order to achieve the desired system pressures. The pressure zone boundaries were determined using the analysis shown below.

The existing water system pressure at the intersection of Brigham Road and Lake Road is 155 psi. The Vermont Water Supply Rules recommend that minimum working pressures in a distribution system should be no less than 35 psi and have a normal working pressure of approximately 60 to 80 psi. The Rules further state that when the static pressures in a distribution system exceed 100 psi, pressure reducing devices should be provided. Given that the typical working pressure in the City of St. Albans is approximately 120 psi, this Study used a design pressure range goal between 40 psi and 120 psi. Based on the existing water system pressure of 155 psi at the Brigham Road / Lake Road intersection, a pressure reducing valve vault would be necessary at this location to reduce the system pressure to 40 psi.

Water pressure is directly related to elevation change by a factor of 2.31 vertical feet per 1 psi of pressure change. In order to maintain pressures within the desired range of 40 psi to 120 psi, the allowable change in elevation is calculated as follows:

$$(120\ psi - 40\ psi)\ x\ 2.31 \frac{ft}{psi} = 184.8\ ft$$

This means that based on the elevation of the proposed pressure reducing valve vault near Brigham Road, the proposed transmission main would require a second pressure reducing vault when the ground elevation is 185 feet lower than the Brigham Road valve vault. The proposed

Brigham Road valve vault elevation is approximately 328 feet above mean sea level, therefore, the next pressure reducing valve vault would need to be located on Lake Road near an elevation of 143 feet above mean sea level. This location is roughly 325 feet south of Kellogg Road.

A pressure reducing valve vault located roughly 325 feet south of Kellogg Road would reduce the system pressure in the proposed transmission main from 120 psi down to 40 psi. A reduced system pressure of 40 psi in this area would increase as the transmission main travels west, down to the Initial Bay Area. The ground elevation at the intersection of Lake Road and Georgia Shore Road is 105 feet above mean sea level which this translates into a system pressure at this location of 56 psi as calculated below:

$$40\ psi + \frac{143\ ft - 105\ ft}{2.31\frac{ft}{psi}} = 56\ psi$$

System pressures of 56 psi in the Initial Bay Service Area are reasonable; therefore, in order to extend municipal service from Brigham Road to the Initial Bay Service Area, the creation of two (2) pressure zones with a corresponding pressure reducing valve vault at each boundary, is necessary. The approximate locations of the proposed PRV vaults are shown on Figure No. 2 in Appendix A.

SECTION 4

SEWER COLLECTION SYSTEM

SECTION 4 SEWER COLLECTION SYSTEM

4.1 WASTEWATER FLOWS

4.1.1 General

Property information was researched using Google Earth mapping software to make visually-based assumptions regarding land use and to develop anticipated wastewater flows for sizing the various collection system components. This information was sorted and compiled for each sewer service area. The basis for the wastewater generation rates is described in greater detail in the following narrative. Detailed wastewater flow values and calculations for each subarea are presented in Appendix B.

4.1.2 Residential Wastewater Flow Estimates

Residential wastewater generation rates were developed using the Environmental Protection Rules (EPR) recommended flow quantity of 210 gallons per day (gpd) per single family unit. Initial year residential unit numbers were developed using Google Earth, as described above, to tally up those properties which were assumed to be single family residential. Design year residential unit numbers were developed using predicted residential growth within the entire sewer service area.

4.1.3 Commercial and Industrial Wastewater Generation Rates

Determination of estimated wastewater rates for the commercial and industrial properties depends on the type of establishment (i.e. retail store, restaurant, manufacturing, etc.) on the property. For these businesses, wastewater flows were estimated using Flow Tables from the EPRs. Several structures weren't easily identifiable; for those properties an industry-standard allowance of 68 gpd per 1,000 square feet was used for commercial properties and 30 gpd per 1,000 square feet was used for industrial properties.

4.1.4 Municipal and Institutional Wastewater Generation Rates

Determinations of estimated wastewater rates for the municipal and institutional uses depend on the type of user (i.e. school, church, municipal building, etc.). The flow quantities were developed based on recommended values using Flow Tables from the EPR's. School population figures were obtained from the School District. Other municipal and institutional unit data was developed from general observations.

4.1.5 Infiltration Allowance

Infiltration allowance is estimated using the EPR recommended flow quantity of 300 gallons per day per inch-mile of pipe.

4.1.6 Sewer Flows Estimates by Service Area

The following Table 4.1 represents the Average Daily Flow and Peak Daily Flow, in gallons per minute, for the Initial Year and the Design Year. The Peak Daily Flow is calculated by applying a

peaking factor of 4.0 to the Average Daily Flow.

Table 4.1
Initial Year and Design Year Sewer Flow Estimates

Sewer Service Area	Initial Year (2013)			Design Year (2033)		
	Average Daily Flow		Peak Daily Flow	Ave. Daily Flow		Peak Daily Flow
	(gpd)	(gpm)	(gpm)	(gpd)	(gpm)	(gpm)
Initial Bay	36,100	25	100	51,250	36	144
Initial Upper Lake Road	17,350	12	48	20,500	14	56
Future Western	--	--	--	39,650	28	112
Future Southern	--	--	--	29,660	21	84

Notes:
(1) Wastewater flows were estimated using flow tables from the EPRs (refer to Appendix B).

Initial and design year Peak Daily Flow estimates will be taken into consideration in Section 4.3 below, to size the pump station sewage pumps, forcemain pipe, and the gravity sewer lines. Several of the sewer flows for the sewer service areas shown in Table 4.1 will be combined based on which service areas gravity flow to which pump stations.

4.2 EQUIVALENT USERS

The number of equivalent users (EUs) will be used in Section 6 for the user cost analysis. For residential users, an equivalent user is defined as one (1) house, apartment or mobile home, etc. For non-residential uses, one (1) equivalent user equals 210 gpd based on the establishment's flow basis as discussed above in Section 4.1. The minimum equivalent user for all accounts is 1.0 equivalent user. The following table shows the number of residential, commercial, municipal and institutional EUs by Sewer Service Area.

Table 4.2
Equivalent Users by Service Area

Sewer Service Area	Initial Year (2013)			Design Year (2033)		
	Residential EUs	Commercial EUs (1)	Total EUs	Residential EUs	Commercial EUs (1)	Total EUs
Initial Bay	123	26	149	188	33	221
Initial Upper Lake Road	40	34	74	55	34	89
Future Western	--	--	--	165	0	165
Future Southern	--	--	--	125	0	125
TOTAL	**163**	**60**	**223**	**533**	**67**	**600**

Notes:
(1) This column includes commercial, municipal, and institutional EUs. For simplicity, it's labeled as "Commercial".

The total initial year equivalent users for the Bay and Upper Lake Road sewer service areas are 223 EUs. This is made up of 163 residential EUs and 60 commercial / municipal / institutional EUs. The total design year equivalent users for the Bay Service Area, Upper Lake Road Service Area, Western Bay Service Area and Southern Bay Services Area is 600 equivalent users. This is made up of 533 residential EUs and 67 commercial / municipal / institutional EUs.

4.3 SEWER SYSTEM INFRASTRUCTURE

4.3.1 Description

The following narrative discusses the proposed collection system infrastructure including gravity sewer lines, sewer pump stations, and sewer forcemains, necessary to sewer the study area. Design considerations include topography (as discussed in Section 3), sewer service areas (as discussed earlier in this Section), and proximity to the City's existing infrastructure on Lake Road.

4.3.2 Gravity Collection System

Two factors that were considered when sizing the gravity sewer lines were pipe capacity relative to estimated flows, and available slope. Since the wastewater flows within the study area are relatively low on a gallons per minute basis (even under peak flow conditions), the critical factor of these two is available slope.

The Initial Bay Sewer Service Area will utilize both 8" and 10" gravity sewermains and will require two (2) new wastewater pump stations. The layout of the proposed sewer system is shown on Figure No. 4 in Appendix A.

The Initial Upper Lake Road Sewer Service Area will require 10" gravity sewermains based on the relatively flat topography, and one (1) new wastewater pump station at the Town's Fire Station. The pump stations are discussed in detail below. The layout of the proposed sewer system is shown on Figure No. 5 in Appendix A.

4.3.3 Pump Stations and Forcemain System

Design considerations that were taken into account for the following wastewater pump stations and forcemain pipe networks include choosing pumps with pump rates that maintain a minimum flow velocity of 2.5 feet per second in the forcemain, pump run times, dose volumes, and dose volume fill times. The following narrative provides information on each of the three (3) required pump stations.

<u>Town Garage Pump Station (PS #1)</u>

Wastewater flows generated along the following roads will gravity flow in an 8" diameter sewermain to a new 120,000 gpd above ground pump station located at the Town Garage:

- Georgia Shore Road (from #48 Georgia Shore Road southeast to Seminary Hill Road)
- Chubb Street
- Little County Road
- Mechanic Street
- Church Road (from Patten Crosby Road south Georgia Shore Road)
- Patten Crosby Road.

Additionally, Bay area flows from the Park pump station (aka PS #2, discussed below) will also flow through the Town Garage pump station. Based on the initial and future sewer flow estimates flowing through this pump station, a dual 6" forcemain line (i.e. (2) 6" forcemains in one trench) will be necessary. The initial year flow estimates range from an average daily flow of 25 gpm to a peak flow of 100 gpm. This will require a total of two (2) 225 gpm sewage pumps, with only one running at a time and the other used as a backup pump. Wastewater will be pumped through one of the two 6" diameter forcemains up Church Road and Lake Road, approximately 6,600 linear feet to the proposed Fire Station pump station.

Based on possible future sewer system expansions to the Southern Bay and Western Bay Sewer Service Areas, the anticipated flows at this facility could increase up to 84 gpm for an average daily flow and up to 335 gpm for a peak flow. This would require the use of a second 6" diameter forcemain pipe and the addition of a third sewage pump at this location, allowing two (2) 225 gpm pumps to run concurrently, each pumping flow through the dual 6" diameter forcemains, and the third 225 gpm pump to be used as a backup pump. Wastewater would be pumped through the dual 6" diameter forcemain pipes up Church Road and Lake Road to the Fire Station pump station.

The reason that two (2) 6" diameter forcemain pipes is ideal in this scenario, as opposed to one 8" diameter forcemain pipe, is because it gives the Town the flexibility of using a single forcemain during the initial lower flow condition which will help maintain the needed minimum forcemain velocity of 2.5 feet per second. Then during the future high flow condition, the Town could utilize both forcemain pipes.

Since it is unknown at this time when sewer service will be expanded to the Future Southern and Future Western Service Areas, it makes economic sense to construct the dual forcemain during initial construction, and wait to purchase the third pump until the increase in demand warrants it. The above-ground pump station, which will be housed in a small building, should include adequate room for the addition of a third pump.

<u>Park Pump Station (PS #2)</u>

Wastewater flows generated along the following roads will gravity flow in an 8" diameter sewermain to a new 57,000 gpd above-ground pump station located near the Town's Park on Lake Road.

- Lake Road (from #552 Lake Road southwest to the Park)
- McGinn Drive
- Cherry Street
- Georgia Shore Road (from #29 Georgia Shore Road west to Lake Road)

Based on the initial and future sewer flow estimates flowing through this pump station, a single 6" diameter forcemain will be adequate. The initial year flow estimates range from 9 gpm of average daily flow to 35 gpm of peak flow. This will require a single 225 gpm pump to be running at a time, with one 225 gpm pump as a backup. Based on future sewer system expansions to the Western Bay Service Area, flows to the Park pump station could increase to 40 gpm of average daily flow and up to 160 gpm at peak flow. Given that a single 225 gpm pump can adequately handle a peak

flow of 160 gpm, a single 225 gpm pump pumping through a single 6" diameter sewer forcemain is adequate for this high future flow condition.

Fire Station Pump Station (PS #3)

Based on the proximity of the Upper Lake Road Sewer Service area to the City's existing infrastructure on Lake Road, wastewater flows from the Town Garage pump station (which includes flow from the Park pump station) would need to be pumped up Lake Road to the Fire Station pump station. The Fire Station pump station will be located at the Town's Fire Station on Lake Road and will receive forcemain flow from the Town Garage pump station (PS #1 discussed earlier), as well as gravity sewer flows through new 8" diameter and 10" diameter gravity sewer lines from the following nearby roads:

- Lake Road (from #1050 Lake Road west to the Town Fire Station)
- Brigham Road (from Pearl Street south to Lake Road)
- Jewell Street (from #16 Jewell Street north to Lake Road)
- Bronson Road (from #2359 Bronson Road north to Lake Road)

The Fire Station pump station will be a 141,000 gpd above-ground pump station. Based on the initial and future sewer flow estimates, the anticipated flows at this facility could range from 37 gpm of average daily flows to 148 gpm for peak flows based on initial year conditions and 98 gpm of average daily flow up to 392 gpm for peak flows based on future conditions. This variation in flow will require the use of a dual 6" diameter forcemain and two (2) 225 gpm pumps running concurrently, with one spare pump as a backup, similar to the Town Garage pump station. The dual forcemain will allow the Town to use a single sewer forcemain for initial lower flow conditions, and two (2) 6" diameter forcemains during the future higher flow conditions. During the initial condition, a single 225 gpm wastewater pump will operate at any one time, and during the future high flow condition, two (2) 225 gpm pumps will operate concurrently.

It is unknown at this time when sewer service would be expanded to the Future Southern and Future Western Service Areas, so while it makes economic sense to construct the dual forcemain during initial construction, the Town should consider waiting to purchase the third pump until the increase in demand warrants it. The above-ground pump station, which will be housed in a small building, should include adequate room for the addition of a third pump.

SECTION 5

COORDINATION WITH THE CITY OF ST. ALBANS

SECTION 5 COORDINATION WITH THE CITY OF ST. ALBANS

5.1 GENERAL

This Section provides an initial review of the existing City of St. Albans sewer and water infrastructure with which this Study proposes connecting to. Future coordination between the Town and the City will be necessary in order to evaluate the City's wastewater system and water system capacities.

5.2 GRAVTIY SEWER COLLECTION SYSTEM INFRASTRUCTURE

The City of St. Albans currently owns and maintains a gravity sewer collection system that extends on Lake Road as far west as Beauregard Drive. The gravity sewer main at this end is 4" diameter and increases to 15" diameter just east of Walnut Street. In an effort to minimize the impact of the existing gravity sewer main capacity, the preliminary design included in this Study looks into connecting the Initial Bay and Upper Lake Road Service Areas sewers to the 15" diameter sewer main just east of Walnut Street that discharges into the main truck sewer to the City's Wastewater Treatment Facility (WWTF).

It is important to note that the City is currently under a 1272 Order for CSO discharge and it is possible that a new pump station discharge could worsen this condition. In addition a new Lake Champlain Phosphorus Total Maximum Daily Load (TMDL) is currently being established and may require upgrades to the City's WWTF. It is likely that the City will require the Town to participate in the cost of compliance with the TMDL. Lastly, the City will require the Town to purchase allocation so the Town will need to identify any allocation and connection fees.

5.3 WATER DISTRIBUTION SYSTEM INFRASTRUCTURE

The City of St. Albans currently owns and maintains a 16" diameter and 12" diameter high pressure watermain on Brigham Road and Jewell Street, respectively. These existing high pressure watermains are currently the closest water system infrastructure to the Study areas. As discussed in Section 3 of this Study, the system pressure at the junction of these two watermains, located at the intersection of Brigham Road and Jewell Street, is 155 psi. The relatively large pipe size and high pressures of these two existing watermains will provide adequate water supply to service the Upper Lake Road and Initial Bay Service Areas, without significantly impacting the existing service to nearby connected properties. Due to the significant elevation change between this existing infrastructure and the proposed service areas, two pressure reducing water valve vaults will be necessary in order to provide working pressures within acceptable ranges. These pressure reducing valve vaults were discussed previously in Section 3 of this report.

It should be noted that the City is currently evaluating their storage needs and there may be a need for additional storage to service the study area. In addition, the State of Vermont Water Supply Division will need to be contacted to confirm if the Town will need to have their own

storage in the separate pressure zones. Lastly, the City will require the Town to purchase allocation so the Town will need to identify any allocation and connection fees.

SECTION 6

RECOMMENDED PLAN

SECTION 6 RECOMMENDED PLAN

6.1 GENERAL

Based on the Town's current water and sewer needs and the potential water and sewer construction costs within the Study area, neither the Lake Road waterline extension or the Initial Bay and Initial Upper Lake Road sewer collection system expansions appear to be financially feasible at this time. The relatively high costs and the low number of potential new users on the respective systems make these projects difficult to justify financially. If it is determined in the future that the needs in these areas outweigh the cost, then further coordination will need to be made with the City, and additional waterline and sewer system design engineering will need to be done.

Assuming that the Initial Bay and Initial Upper Lake Road areas have a high demand for water and sewer infrastructure in the future, the following narrative provides recommendations for water and sewer infrastructure.

6.2 WATERLINE EXPANSION

6.2.1 Description

Construction of approximately 9,300 linear feet of new 12" diameter Ductile Iron, Class 52 transmission watermain on Lake Road, from Brigham Road to George Shore Road, to service the Bay area. Also included are two (2) new pressure reducing valve vaults, one at Brigham Road and one near Kellogg Road, to create two new pressure zones within the system. In addition to the transmission main, construction of approximately 14,500 linear feet of new 8" diameter Ductile Iron, Class 52 watermains on Little County Road, Georgia Shore Road, Patten Crosby Road, Church Road, McGinn Drive, Cherry Street, Mechanic Street, Seminary Hill Road, Chubb Street, Bouthilete Circle, and Ouellet Drive, is necessary to service the properties within the Bay area. The proposed water system layout is shown on Figures 2 and 6 in Appendix A.

6.2.2 Cost Estimates

Construction of the new 12" diameter transmission main, 8" diameter watermains, new fire hydrants and mainline gate valves, two new pressure reducing valve vaults, and water service stubs to the Right-of-Way, results in an estimated December 2012 (ENR 9410) construction cost of $4.58M. A Total Project Cost estimate was calculated for the waterline expansion and includes construction costs, 10% construction contingency, preliminary engineering, final design engineering, construction engineering, a construction engineering contingency of 5%, and other administrative, fiscal, legal, and short term interest costs. The Total Project Cost estimate for the proposed water system is roughly $6.1M. It is important to note that the Total Project Cost estimate excludes any connection and allocation fees that will likely be assessed by the City, as well as any costs for land purchases and/or easements. Refer to Appendix C for detailed breakdowns of the construction cost estimates and the Total Project Cost estimate.

6.3 SEWER SYSTEM EXPANSION

6.3.1 Collection System

Construction of approximately 10,700 linear feet of 8" diameter and 7,600 linear feet of 10" diameter PVC SDR35 gravity sewer lines, 10,750 linear feet of dual 6" diameter PVC C900 forcemain lines, 1,350 linear feet of single 6" diameter PVC C900 forcemain lines, and three (3) new above ground wastewater pump stations, as discussed in Section 4 of this report. The proposed layout for the sewer collection system is shown on Figures 2, 4, and 5 in Appendix A.

6.3.2 Cost Estimates

Construction cost estimates were done for the Initial Bay Sewer Service Area and the Initial Upper Lake Road Sewer Service Area. The construction cost estimate, in December 2012 dollar values (ENR 9410), for the Initial Bay and the Initial Upper Lake Road Sewer Service Areas is $4.9M and $2.5M, respectively. A Total Project Cost estimate was calculated for the Initial Bay and Initial Upper Lake Road Sewer Service Areas, and includes construction costs, 10% construction contingency, preliminary engineering, final design engineering, construction engineering, a construction engineering contingency of 5%, and other administrative, fiscal, legal, and short term interest costs. The Total Project Cost estimate for the initial project is roughly $10.1M. It is important to note that the Total Project Cost estimate excludes any connection and allocation fees that will likely be assessed by the City, as well as any costs for land purchases and/or easements. Refer to Appendix D for detailed breakdowns of the construction cost estimates and the Total Project Cost estimate.

6.4 USER COST ANALYSIS

Based on the equivalent user evaluation from Section 4 of this report, the debt service for the Total Project Cost discussed above could either be paid for through increased user rates for the new equivalent users, or spread throughout the Town through a Town-wide debt service tax assessment. If the Total Project Cost for the initial sewer project is $10.1M and it's divided evenly amongst 223 equivalent users, assuming a CWSRF loan at 2% for 20 years, this would equate to an annual debt service payment of $2,770 per equivalent user. If the costs were spread throughout the Town, the annual debt service payment of $617,716 could decrease the cost burden on the connected users. The debt service costs presented do not include operation and maintenance (O&M) and discharge fees to the City of St. Albans. Given the substantial debt service costs, the O&M and discharge costs have not been estimated at this time.

Considering the above, it appears that a Town-wide debt service assessment fee is likely required to make the project affordable for its users.

6.5 PERMITS

A preliminary list of potential permit requirements is discussed in the narrative below. Further analysis will need to be done during final design to finalize the list.

State of Vermont Potable Water and Wastewater Disposal Permits

If the sewer expansion project connects any new properties to the municipal sewer system, a separate permit will be required for each property. Any properties that have an existing Water and Wastewater Disposal Permit will be required to amend those permits.

Vermont Agency of Transportation (VTrans), Right-of-Way Permit

VTrans currently has jurisdiction of a portion of Lake Road (aka VT Route 36) from Church Road west to Little County Road. If construction takes place within the Right-of-Way in this area (i.e. waterline or forcemain along Lake Road), a VTrans Right-of-Way permit will be necessary.

State of Vermont Water Supply Permit to Construct

Because the Lake Road waterline expansion project involves constructing more than 500 linear feet of waterline, a Water Supply Permit to Construct is required.

State of Vermont Stormwater Construction General Permit

Because the overall project will disturb more than 1 acre of land area, a Stormwater Construction General Permit will be required. It is anticipated that this project will be considered “low risk” due to its linear nature; however, further analysis will need to be done during final design to confirm this.

Natural Resources Board Act 250 Land Use Permit

Because the water and sewer projects expand existing municipal services to previously un-serviced areas of Town, an Act 250 Land Use Permit will need to be submitted to the State of Vermont District office for this project.

State of Vermont Division of Fire Safety

A building permit from the State of Vermont, Division of Fire Safety will be required for the pump stations.

Conditional Use Determination

A wetlands delineation will need to be conducted in order to identify the limits of existing wetlands within the project area. It is anticipated that all work will be constructed outside of existing wetlands; however, portions of the construction may be located within the 50 foot wetland buffer zone. If this is the case, a Conditional Use Determination from the State of Vermont Water Quality Division and possibly a determination from the U.S. Army Corps, will be required.

Archaeological Resource Assessment

At a minimum, information on the project will need to be submitted to the State of Vermont Division for Historic Preservation for concurrence. Depending on the level of review, a Phase IA investigation with subsequent further phases may be required.

Environmental Information Document

Documentation of compliance with environmental permitting will likely be required by the funding agency if the project utilizes State or Federal funding.

State of Vermont Stream Alteration Permit

A Stream Alteration Permit will be required for all stream crossings.

Local Permits

Permits may be required by the City of St. Albans as well as the Town of St. Albans for connecting to the City's municipal systems, constructing watermains and sewermains within the City limits, and constructing above-ground wastewater pump stations within the Town.

6.6 POTENTIAL FUNDING SOURCES

There are three (3) common funding sources for municipal wastewater and water projects. These sources are summarized below. Further detailed evaluation of the applicability of these sources will need to be made during preliminary engineering.

VT Department of Environmental Conservation – SRF (State Revolving Fund) Loans

The State of Vermont offers low cost financing for wastewater collection and water supply projects through the State Revolving Fund (SRF) loan program. Projects are funded based on a priority point system. Every year the Facilities Engineering Division (Clean Water SRF) and the Drinking Water and Groundwater Protection Division (Drinking Water SRF) update the priority list through a public process.

For the CWSRF program, awards can be made to municipalities for pollution control related work: planning or construction. Planning loans are interest-free but construction loans carry a 2% administration fee. The loans are repaid in equal annual payments over a term of up to 20 years. Planning loans are typically included in the SRF loan for the subsequent project phase. Loan repayments are returned to the revolving fund for subsequent use as new loans.

For the DWSRF program, awards can be made to municipalities for planning or construction. Planning loans are interest-free but construction loans carry anywhere from a -3% to 3% interest fee depending on the community's user costs and median household income (MHI). The loans are repaid in equal annual payments over a term of up to 20 years. Planning loans are typically included in the SRF loan for the subsequent project phase. Loan repayments are returned to the revolving fund for subsequent use as new loans.

The sewer expansion project would apply for eligibility under the CWSRF program, and the waterline extension project would apply for eligibility under the DWSRF program.

VT Department of Environmental Conservation – 35% Grant - Dry Weather Pollution Abatement

Awards may be made to municipalities for the planning and construction of facilities whose purpose is the abatement of dry-weather pollution associated with a documented source (i.e. failed septic system) that is discharging to waters of the State. This may include interceptor and collection sewers, pump stations, sewage treatment facilities, outfall sewers, and subsurface disposal treatment and disposal systems. This grant is normally not implemented unless there is tandem State or Federal grant/loan funding for the project.

U.S. Department of Agriculture, Rural Development (USDA-RD) Loans and Grants

The USDA Rural Development (RD) program includes both grants and loans, depending on the project and community's ability to pay, which is based on the Town's current water and sewer rates and MHI. Given the demographics of the service area, it does not appear likely that this project

would be eligible for grants under the RD program. Grants are dependent upon the MHI at the service area, and an income survey could be performed of the service area if the Town felt the area's MHI may be lower than the overall Town MHI. Funding through RD requires that the system either have water meters in place or that water meters be installed to qualify.

6.7 NEXT STEPS

If and when the Town decides to move forward with the either the water and/or sewer expansion projects evaluated in this Study, the following steps will need to be taken:

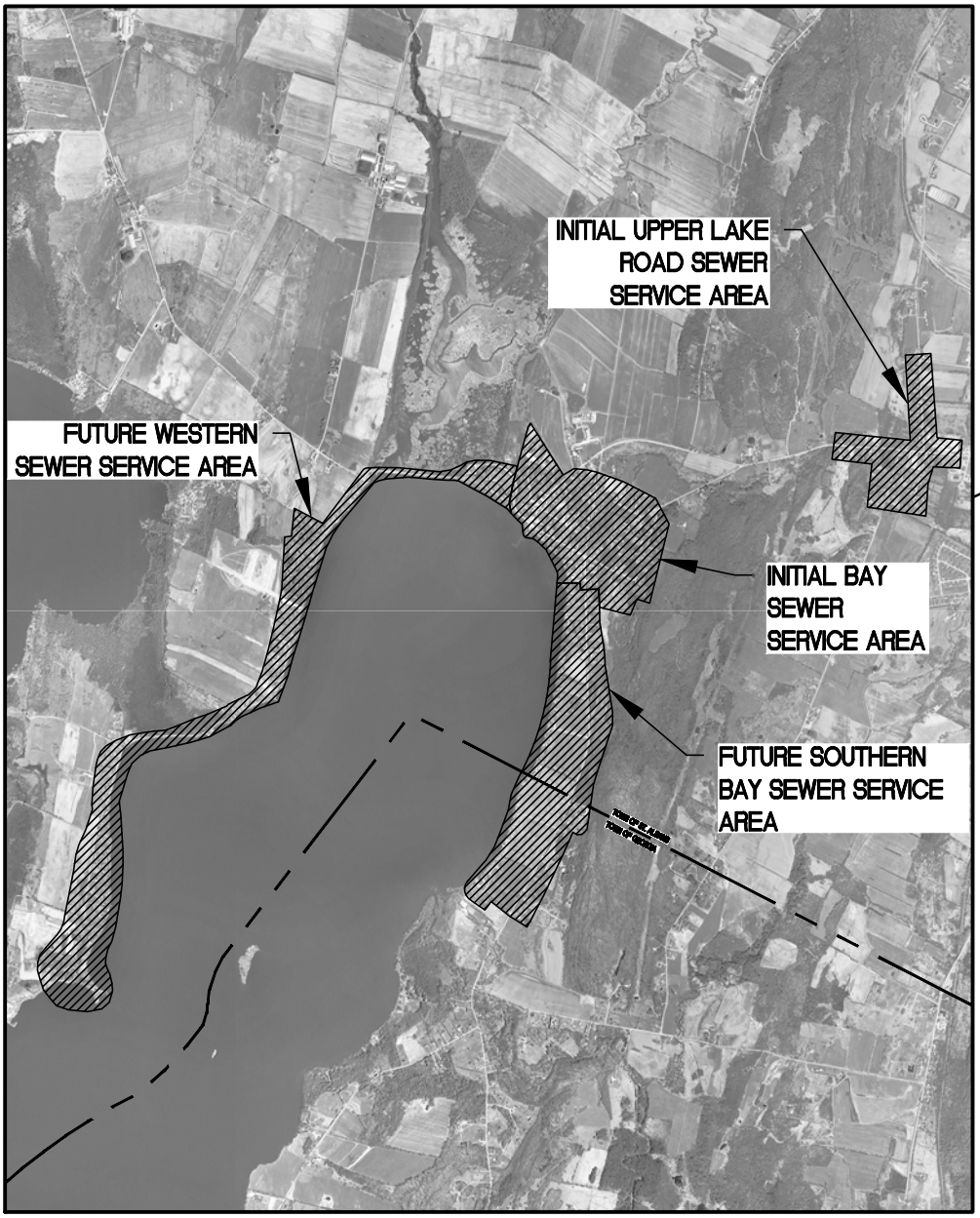
1. STEP I, Preliminary Engineering
    a. Updated project scope and cost estimates
    b. Coordination with the City on water and sewer allocation and discharge fees
    c. Funding alternatives are evaluated
    d. This is usually followed by a Bond Vote
2. STEP II, Final Design
    a. Permits are obtained
    b. Land and rights-of-way are acquired
    c. Project is designed
3. STEP III, Construction
    a. Bid phase
    b. Construction phase
    c. 1st Year Warranty phase

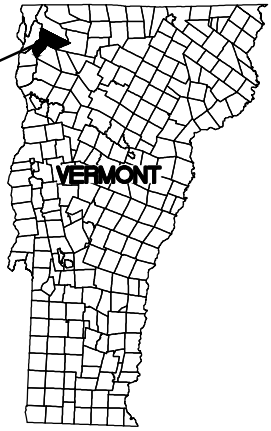
Before moving forward with any of the steps listed above, the Town should have a detailed discussion with the City regarding the possibility of connecting to the City's municipal systems. If an agreement can be made with the City, then the Town should proceed accordingly.

APPENDICES

APPENDIX A

FIGURES





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LOCATION MAP

SCALE: 1"=4000'

Aldrich + Elliott
WATER RESOURCE ENGINEERS

6 Market Place, Suite 2
Essex Jct., VT 05452

P: 802.879.7733
AEengineers.com

PROJECT LOCATION MAP

LAKE ROAD SEWER/WATER FEASIBILITY STUDY

TOWN OF ST. ALBANS

ST. ALBANS VERMONT

DESIGNED JJD	PROJECT NO.
DRAWN JEN	12069
CHECKED (PM) JJD	
CHECKED (PE) JJD	FIGURE NO.
SCALE AS NOTED	1
DATE JUNE, 2013	

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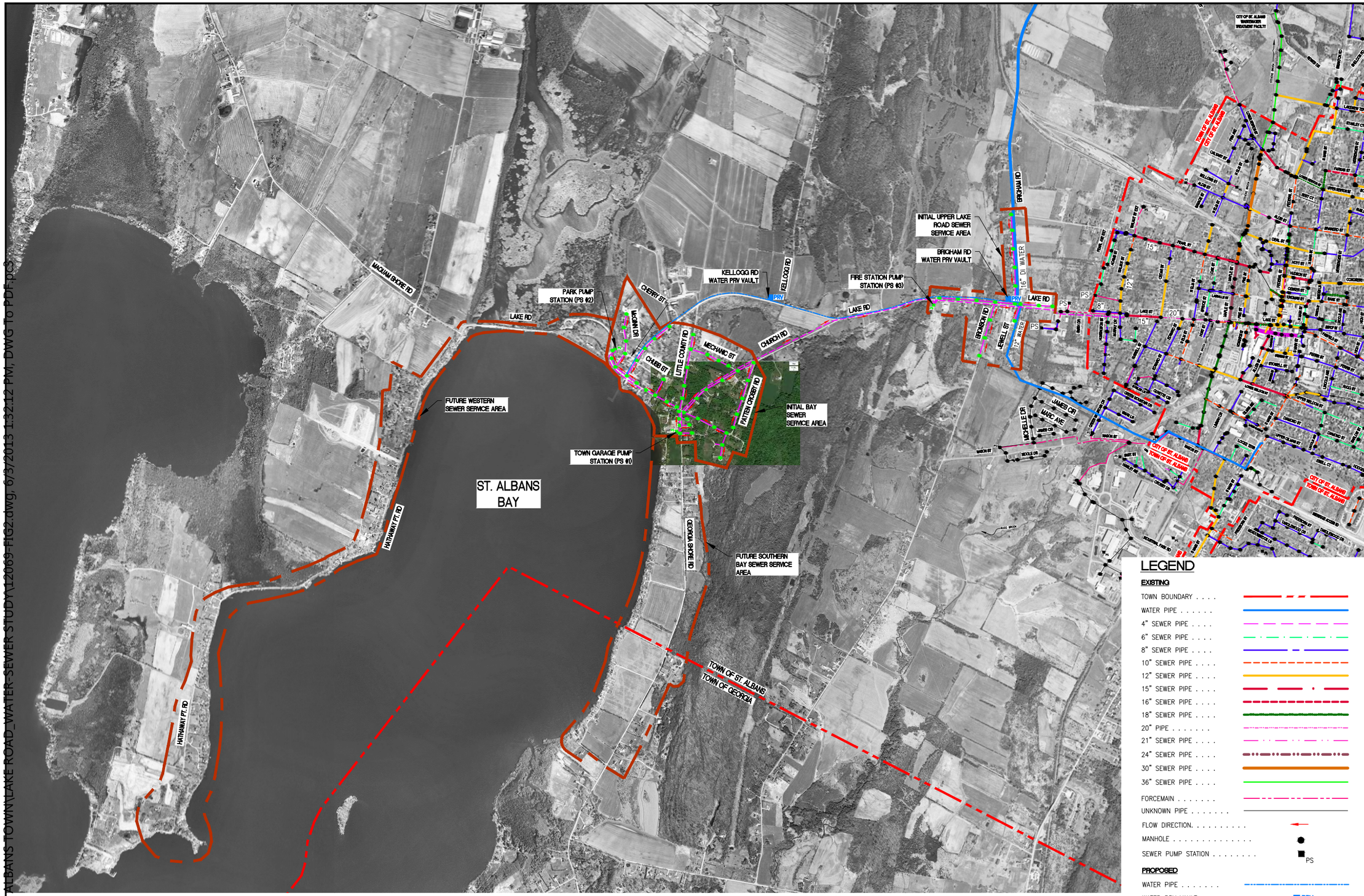

LEGEND

EXISTING

- TOWN BOUNDARY . . . .
- WATER PIPE . . . . . .
- 4" SEWER PIPE . . . .
- 6" SEWER PIPE . . . .
- 8" SEWER PIPE . . . .
- 10" SEWER PIPE . . . .
- 12" SEWER PIPE . . . .
- 15" SEWER PIPE . . . .
- 16" SEWER PIPE . . . .
- 18" SEWER PIPE . . . .
- 20" PIPE . . . . . .
- 21" SEWER PIPE . . . .
- 24" SEWER PIPE . . . .
- 30" SEWER PIPE . . . .
- 36" SEWER PIPE . . . .
- FORCEMAIN . . . . . .
- UNKNOWN PIPE . . . . . .
- FLOW DIRECTION. . . . . .
- MANHOLE . . . . . .
- SEWER PUMP STATION . . . . . PS

PROPOSED

- WATER PIPE . . . . . .
- WATER PRV VAULT . . . . PRV
- FORCEMAIN . . . . . .
- SEWER PIPE . . . . . .
- MANHOLE . . . . . .
- SEWER PUMP STATION . . . . . PS

PLAN
SCALE: 1"=1000'

GRAPHIC SCALE
1000 0 500 1000 2000 4000
(IN FEET)

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No.	DATE	DESCRIPTION	CHECKED

TOWN OF ST. ALBANS
ST. ALBANS, VT

LAKE ROAD SEWER/WATER FEASIBILITY STUDY

OVERALL PLAN

DESIGNED JJD	PROJECT NO. 12069
DRAWN JEB	FIGURE 2
CHECKED JJD	
DATE JUNE, 2013	

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LEGEND

PROPOSED

- INITIAL SEWER SERVICE AREA . . .
- FUTURE SERVICE AREA . . . . . .
- TOWN BOUNDARY . . . . . .
- FORCEMAIN . . . . . .
- SEWER PIPE . . . . . .
- FLOW DIRECTION . . . . . .
- MANHOLE . . . . . .
- PUMP STATION . . . . . .

N

PLAN
SCALE: 1"=800'

GRAPHIC SCALE

800 0 400 800 1600 3200

(IN FEET)

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No.	DATE	DESCRIPTION	CHECKED

TOWN OF
ST. ALBANS
ST. ALBANS, VT

LAKE ROAD
SEWER/WATER
FEASIBILITY STUDY

BAY SEWER SERVICE AREAS

DESIGNED JJD	PROJECT NO. 12069
DRAWN JEB	FIGURE 3
CHECKED JJD	
DATE JUNE, 2013	

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LEGEND

- NEW SEWER . . . . . .
- NEW FORCEMAIN . . . . . .
- NEW SEWER MANHOLE . . .
- NEW PUMP STATION . . . . PS
- NEW FLOW ARROW . . . . .

PLAN
SCALE: 1"=300'

GRAPHIC SCALE
600 0 150 300 600 1200
(IN FEET)

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No.	DATE	DESCRIPTION	CHECKED

TOWN OF ST. ALBANS
ST. ALBANS, VT

LAKE ROAD SEWER/WATER FEASIBILITY STUDY

INITIAL BAY SEWER SERVICE AREA

DESIGNED JJD	PROJECT NO. 12069
DRAWN JEB	FIGURE 4
CHECKED JJD	
DATE JUNE, 2013	

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Y:\12069-ST ALBANS-TOWN\LAKE ROAD_WATER-SEWER STUDY\12069-FIG5.dwg, 6/3/2013 1:36:41 PM, DWG To PDF.pc3

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No.	DATE	DESCRIPTION	CHECKED

TOWN OF ST. ALBANS
ST. ALBANS, VT

LAKE ROAD SEWER/WATER FEASIBILITY STUDY

INITIAL UPPER LAKE ROAD SEWER SERVICE AREA

DESIGNED JJD	PROJECT NO. 12069
DRAWN JEB	FIGURE 5
CHECKED JJD	
DATE OCT. 2012	

LEGEND

NEW WATER 12 IN . . . . .

NEW WATER 8 IN . . . . .

GATE VALVE . . . . . .

FIRE HYDRANT . . . . . .

PRV VAULT . . . . . PRV

PLAN
SCALE: 1"=300'

GRAPHIC SCALE

600 0 150 300 600 1200

(IN FEET)

Aldrich + Elliott
WATER RESOURCE ENGINEERS
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Essex Jct., VT 05452
P: 802.879.7733
AEengineers.com

No.	DATE	DESCRIPTION	CHECKED

TOWN OF
ST. ALBANS
ST. ALBANS, VT

LAKE ROAD
SEWER/WATER
FEASIBILITY STUDY

BAY AREA WATER

DESIGNED JJD	PROJECT NO. 12069
DRAWN JEB	FIGURE 6
CHECKED JJD	
DATE NOV. 2012	

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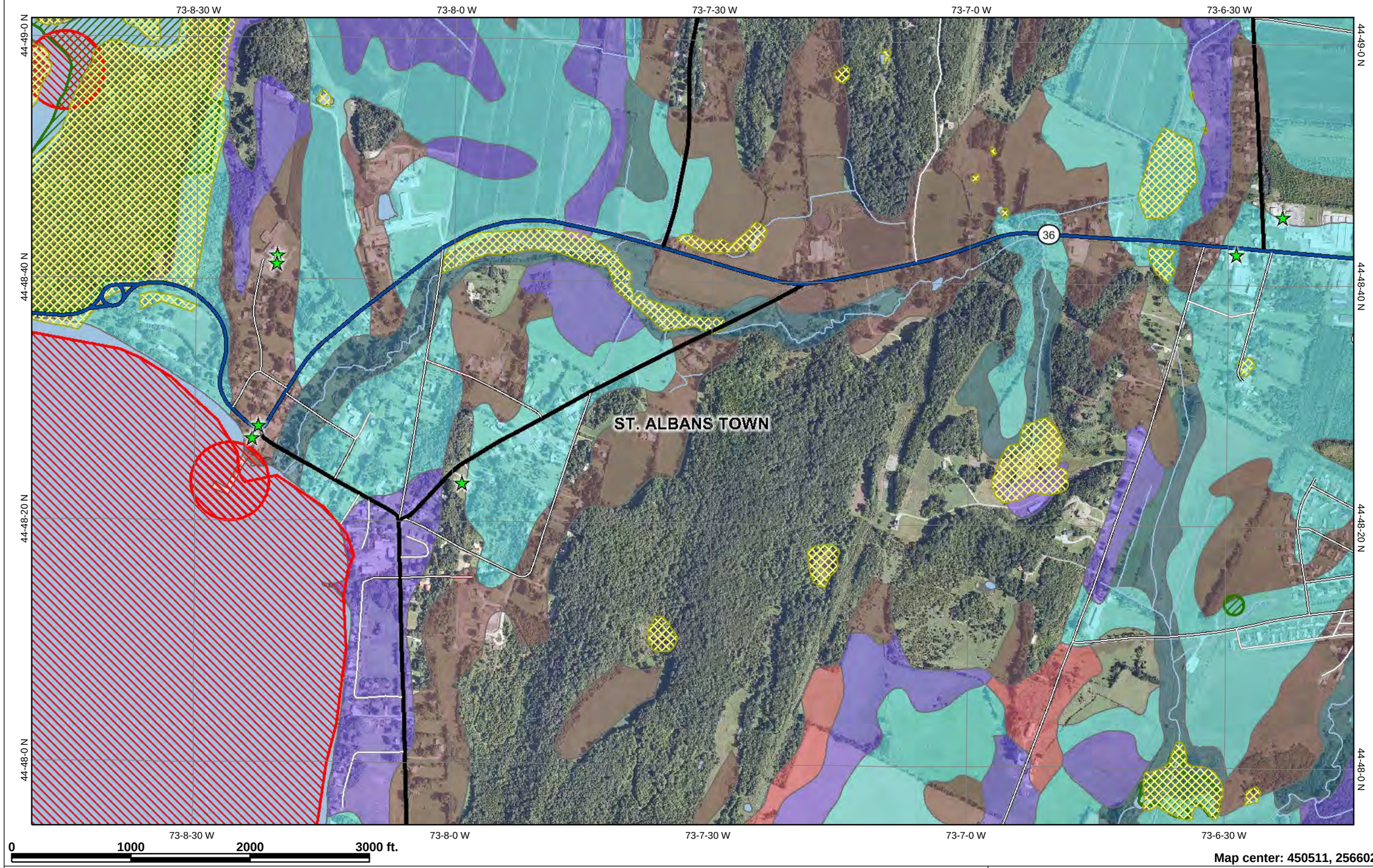
ANR Environmental Interest Locator

Vermont Agency of Natural Resources (ANR)

St. Albans Town Sewer/Water



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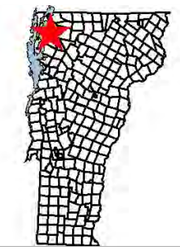

Legend

- Hazardous Waste Site
- Roads
  - US Highway
  - Vermont State Highway
  - Class One
  - Class Two
  - Legal Trail
  - Emergency U-Turn Area
  - Proposed Class Two
  - Proposed Class Three
  - Proposed Vermont State Highway
  - Proposed US Highway
  - Proposed Interstate
  - Discontinued
  - Interstate
  - Class Three
  - Class Four
  - State/National Forest Highway
  - Military Road (No Public Access)
  - Private Road
- DFIRM Floodways (Preliminary)
  - FLOODWAY
- Special Flood Hazard Areas (Preliminary DFIRMS)
  - AE (1-percent annual chance floodplains with elevations)
  - A (1-percent annual chance floodplains without elevations)
  - AO (1-percent annual chance zone of shallow flooding 1-3 feet)
  - 0.2-percent annual chance flood hazard zone
- DFIRM Floodways (All Available Counties Effective 7.2011)
  - FLOODWAY
- Special Flood Hazard Areas (All Available Counties Effective 7.2011)
  - AE (1-percent annual chance floodplains with elevations)
  - A (1-percent annual chance floodplains without elevations)
  - AO (1-percent annual chance zone of shallow flooding 1-3 feet)
  - 0.2-percent annual chance flood hazard zone
- Wetland Advisory Layer: Class 3 Wetlands
- VSWI
  - Class 1 Wetland
  - Class 2 Wetland
- Rare, Threatened, and Endangered Species
  - Threatened or Endangered
  - Rare (Not T or E)
- Hydrography Lakes and Ponds (VHD 5k)
- Hydrography (VHD 5k)
- VT County Boundary
- Soils - Prime Agricultural
  - Local
  - Local (b)
  - Prime
  - Prime (b)
  - Prime (c)
  - Statewide
  - Statewide (a)
  - Statewide (b)
  - Statewide (c)
- VT Town Boundaries (No Fill)

VT State Plane Meters (NAD83)

NAD CAMA Orthophotos 2006

N

Scale: 1:10,000

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. VCGI and the State of Vermont make no representations of any kind, including but not limited to the warranties of merchantability or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

FIGURE NO. 7

TOWN OF SAINT ALBANS

Zoning*

The Official Zoning Map is on file at the town clerk's office.

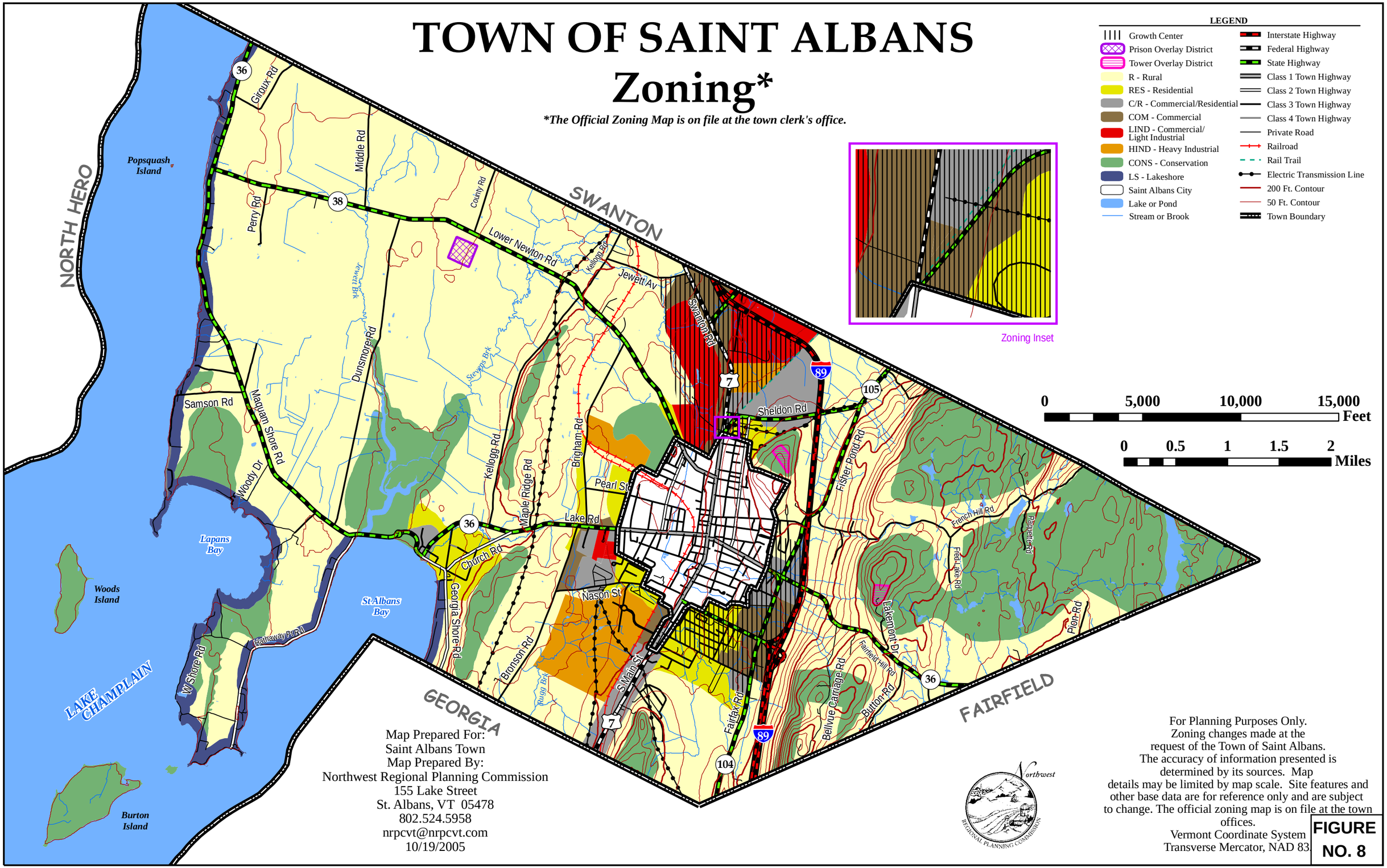

FIGURE NO. 8

APPENDIX B

WASTEWATER FLOW CALCULATIONS

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Initial Year Flow Estimate Calculation Sheet
January 8, 2013

Area No.	Service Area Name	Use Category	Flow Volumes	Quantity	Flow	Equivalent Users
1	**Lake Road and Upper Georgia Shore Road**	**Residential**				
		Single family homes, apts, mobile homes	210 gpd/unit	20	4,200	20
			Sub-Total Residential Flow		**4,200**	**20**
		Commercial				
		The Bay Store	320 gpd/1st pump	2	640	3
		Bayside Pavilion	24 gpd/seat	50	1,200	6
		Post Office				
		Employees	12 gpd/person	2	24	1
		Municipal Building	12 gpd/person (Employees)	10	120	1
		Baptist Church	4 gpd/25% seating	50	50	1
		Church	4 gpd/25% seating	50	50	1
			Sub-Total Commercial Flow		**2,084**	**13**
		Municipal/Institutional				
		Municipal Building	12 gpd/person (Employees)	10	120	1
			Sub-Total Municipal/Institutional		**120**	**1**
		Infiltration				
		8 " Pipe	300 gpd/in-mi	2.7	818	
			Sub-Total Infiltration Flow		**818**	
			Total Lake Road and Upper Georgia Shore Road		**7,222**	**34**
2	**McGinn Drive and Cherry Street**	**Residential**				
		Single family homes, apts, mobile homes	210 gpd/unit	11	2,310	11
			Sub-Total Residential Flow		**2,310**	**11**
		Municipal/Institutional				
		Project Soar Elementary/HS	20 gpd/person	120	2,400	11
			Sub-Total Municipal/Institutional		**2,400**	**11**
		Infiltration	300 gpd/in-mi	2.1	636	
		8 " Pipe	**Sub-Total Infiltration**		**636**	
			Total McGinn Drive and Cherry Street		**5,346**	**22**
Total Initial Year Average Daily Flows (gpd) - Flowing to Park Pump Station					**12,569**	
Total Initial Year Average Daily Flows (gpm)					**9**	
Peak Flows (gpm) (Peaking Factor of 4)					**35**	
Minimum Flow to Maintain 2.5 fps in 4" diameter forcemain (gpm)					**100**	
Minimum Flow to Maintain 2.5 fps in 6" diameter forcemain (gpm)					**225**	
Minimum Flow to Maintain 2.5 fps in 8" diameter forcemain (gpm)					**400**	
3	**Georgia Shore Rd and Chubb Street**	**Residential**				
		Single family homes, apts, mobile homes	210 gpd/unit	23	4,830	23
			Sub-Total Residential Flow		**4,830**	**23**
		Municipal/Institutional				
		Public Works Garage	12 gpd/person (Employees)	10	120	1
			Sub-Total Municipal/Institutional		**120**	**1**
		Infiltration				
		8 " Pipe	300 gpd/in-mi	2.7	818	
			Sub-Total Infiltration Flow		**818**	
			Total Georgia Shore Road and Chubb Road		**5,768**	**24**
4	**Seminary Hill Road and Bouthilette Circle**	**Residential**				
		Single family homes, apts, mobile homes	210 gpd/unit	14	2,940	14
			Sub-Total Residential Flow		**2,940**	**14**
		Infiltration				
		8 " Pipe	300 gpd/in-mi	0.9	273	
			Sub-Total Infiltration Flow		**273**	
			Total Seminary Hill Road and Bouthilette Circle		**3,213**	**14**
5	**Patten Crosby Road and Church Road**	**Residential**				
		Single family homes, apts, mobile homes	210 gpd/unit	36	7,560	36
			Sub-Total Residential Flow		**7,560**	**36**
		Infiltration				
		8 " Pipe	300 gpd/in-mi	6.1	1,818	
			Sub-Total Infiltration Flow		**1,818**	
			Total Patten Crosby Road and Church Road		**9,378**	**36**

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Initial Year Flow Estimate Calculation Sheet
January 8, 2013

Area No.	Service Area Name	Use Category	Flow Volumes		Quantity	Flow	Equivalent Users
6	**Mechanic Street and Little County Road**	**Residential**					
		Single family homes, apts, mobile homes	210	gpd/unit	19	3,990	19
				Sub-Total Residential Flow		**3,990**	**19**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	3.9	1,182	
				Sub-Total Infiltration		**1,182**	
				Total Mechanic Street and Little County Road		**5,172**	**19**
Total Initial Year Average Daily Flows (gpd) - Flowing to Town Garage Pump Station						**36,099**	**149**
Total Initial Year Average Daily Flows (gpm)						**25**	
Peak Flows (gpm) (Peaking Factor of 4)						**100**	
Minimum Flow to Maintain 2.5 fps in 6" diameter forcemain (gpm)						**225**	
Minimum Flow to Maintain 2.5 fps in 8" diameter forcemain (gpm)						**400**	
7	**Upper Lake Road Service Area**	**Residential**					
		Ex. single family homes, apts, mobile homes	210	gpd/unit	40	8,400	40
				Sub-Total Residential Flow		**8,400**	**40**
		Commercial					
		Hair Loft Building (15,000 sf)	68	gpd/1,000 sf	15	1,020	5
		2-78 Brigham Road (5,000 sf)	68	gpd/1,000 sf	5	340	2
		Green Mountain Transit Agency	68	gpd/1,000 sf	13.7	932	4
		Hands On Car Wash	2,500	gpd (estimate)		2,500	12
		Harley D's Bar & Grill	30	gpd per seat	50	1,500	7
		Bonnett Supply (office building 4,800sf)	68	gpd/1,000 sf	4.8	326	2
		Bonnett Supply (warehouse building 10,000sf)	30	gpd/1,000 sf	10	300	1
				Sub-Total Commercial Flow		**6,918**	**33**
		Municipal					
		Fire Station (assume 10 employees)	15	gpd/employee	10	150	1
				Sub-Total Municipal Flow		**150**	**1**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	6.3	1,886	
				Sub-Total Infiltration		**1,886**	
				Total Upper Lake Road		**17,354**	**74**
Total Initial Year Average Daily Flows (gpd) - Flowing to Fire Station Pump Station						**53,454**	**223**
Total Initial Year Average Daily Flows (gpm)						**37**	
Peak Flows (gpm) (Peaking Factor of 4)						**148**	
Minimum Flow to Maintain 2.5 fps in 6" diameter forcemain (gpm)						**225**	
Minimum Flow to Maintain 2.5 fps in 8" diameter forcemain (gpm)						**400**	

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Design Year Flow Estimate Calculation Sheet
January 8, 2013

Area No.	Service Area Name	Use Category	Flow Volumes		Quantity	Flow	Equivalent Users
1	**Lake Road and Upper Georgia Shore Road**	**Residential**					
		Ex. single family homes, apts, mobile homes	210	gpd/unit	20	4,200	20
		Future allowance	210	gpd/unit	10	2,100	10
				Sub-Total Residential Flow		**6,300**	**30**
		Commercial					
		The Bay Store	320	gpd/1st pump	2	640	3
		Bayside Pavilion	24	gpd/seat	50	1,200	6
		Post Office					
		Employees	12	gpd/person	2	24	1
		Municipal Building	12	gpd/person (Employees)	10	120	1
		Baptist Church	4	gpd/25% seating	50	50	1
		Church	4	gpd/25% seating	50	50	1
		Future allowance	1,500	gpd	1	1,500	7
				Sub-Total Commercial Flow		**3,584**	**20**
		Municipal/Institutional					
		Municipal Building	12	gpd/person (Employees)	10	120	1
				Sub-Total Municipal/Institutional		**120**	**1**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	2.7	818	
				Sub-Total Infiltration Flow		**818**	
				Total Lake Road and Upper Georgia Shore Road		**10,822**	**51**
2	**McGinn Drive and Cherry Street**	**Residential**					
		Single family homes, apts, mobile homes	210	gpd/unit	11	2,310	11
		Future allowance	210	gpd/unit	5	1,050	5
				Sub-Total Residential Flow		**3,360**	**16**
		Municipal/Institutional					
		Project Soar Elementary/HS	20	gpd/person	120	2,400	11
				Sub-Total Municipal/Institutional		**2,400**	**11**
		Infiltration	300	gpd/in-mi	2.1	636	
		8 " Pipe		**Sub-Total Infiltration**		**636**	
				Total McGinn Drive and Cherry Street		**6,396**	**27**
8	**Future Western Service Area**	**Residential**					
		Ex. single family homes, apts, mobile homes	210	gpd/unit	135	28,350	135
		Future allowance	210	gpd/unit	30	6,300	30
	(Hathaway Point)			**Sub-Total Residential Flow**		**34,650**	**165**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	16.7	5,000	
				Sub-Total Infiltration		**5,000**	
				Total Mechanic Street and Little County Road		**39,650**	**165**
Total Design Year Flows (gpd) - Flowing to Park Pump Station						**56,869**	
Total Initial Year Average Daily Flows (gpm)						**39**	
Peak Flows (gpm) (Peaking Factor of 4)						**158**	
Minimum Flow to Maintain 2.5 fps in 4" diameter forcemain (gpm)						**100**	
Minimum Flow to Maintain 2.5 fps in 6" diameter forcemain (gpm)						**225**	
Minimum Flow to Maintain 2.5 fps in 8" diameter forcemain (gpm)						**400**	
3	**Georgia Shore Rd and Chubb Street**	**Residential**					
		Single family homes, apts, mobile homes	210	gpd/unit	23	4,830	23
		Future allowance	210	gpd/unit	10	2,100	10
				Sub-Total Residential Flow		**6,930**	**33**
		Municipal/Institutional					
		Public Works Garage	12	gpd/person (Employees)	10	120	1
				Sub-Total Municipal/Institutional		**120**	**1**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	2.7	818	
				Sub-Total Infiltration Flow		**818**	
				Total Georgia Shore Road and Chubb Road		**7,868**	**34**
4	**Seminary Hill Road and Bouthilette Circle**	**Residential**					
		Single family homes, apts, mobile homes	210	gpd/unit	14	2,940	14
				Sub-Total Residential Flow		**2,940**	**14**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	0.9	273	
				Sub-Total Infiltration Flow		**273**	
				Total Seminary Hill Road and Bouthilette Circle		**3,213**	**14**

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Design Year Flow Estimate Calculation Sheet
January 8, 2013

Area No.	Service Area Name	Use Category	Flow Volumes		Quantity	Flow	Equivalent Users
5	**Patten Crosby Road and Church Road**	**Residential**					
		Single family homes, apts, mobile homes	210	gpd/unit	36	7,560	36
		Future allowance	210	gpd/unit	20	4,200	20
				Sub-Total Residential Flow		**11,760**	**56**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	6.1	1,818	
				Sub-Total Infiltration Flow		**1,818**	
				Total Patten Crosby Road and Church Road		**13,578**	**56**
6	**Mechanic Street and Little County Road**	**Residential**					
		Single family homes, apts, mobile homes	210	gpd/unit	19	3,990	19
		Future allowance	210	gpd/unit	20	4,200	20
				Sub-Total Residential Flow		**8,190**	**39**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	3.9	1,182	
				Sub-Total Infiltration		**1,182**	
				Total Mechanic Street and Little County Road		**9,372**	**39**
9	**Future Southern Service Area (Georgia Shore)**	**Residential**					
		Ex. single family homes, apts, mobile homes	210	gpd/unit	100	21,000	100
		Future allowance	210	gpd/unit	25	5,250	25
				Sub-Total Residential Flow		**26,250**	**125**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	11.4	3,409	
				Sub-Total Infiltration		**3,409**	
				Total Mechanic Street and Little County Road		**29,659**	**125**
Total Design Year Flows (gpd) - Flowing to Town Garage Pump Station						**120,559**	**511**
Total Initial Year Average Daily Flows (gpm)						**84**	
Peak Flows (gpm) (Peaking Factor of 4)						**335**	
Minimum Flow to Maintain 2.5 fps in 6" diameter forcemain (gpm)						**225**	
Minimum Flow to Maintain 2.5 fps in 8" diameter forcemain (gpm)						**400**	

7	**Upper Lake Road Service Area**	**Residential**					
		Ex. single family homes, apts, mobile homes	210	gpd/unit	40	8,400	40
		Future allowance	210	gpd/unit	15	3,150	15
				Sub-Total Residential Flow		**11,550**	**55**
		Commercial					
		Hair Loft Building (15,000 sf)	68	gpd/1,000 sf	15	1,020	5
		2-78 Brigham Road (5,000 sf)	68	gpd/1,000 sf	5	340	2
		Green Mountain Transit Agency	68	gpd/1,000 sf	13.7	932	4
		Hands On Car Wash	2,500	gpd (estimate)		2,500	12
		Harley D's Bar & Grill	30	gpd per seat	50	1,500	7
		Bonnett Supply (office building 4,800sf)	68	gpd/1,000 sf	4.8	326	2
		Bonnett Supply (warehouse building 10,000sf)	30	gpd/1,000 sf	10	300	1
				Sub-Total Commercial Flow		**6,918**	**33**
		Municipal					
		Fire Station (assume 10 employees)	15	gpd/employee	10	150	1
				Sub-Total Municipal Flow		**150**	**1**
		Infiltration					
		8 " Pipe	300	gpd/in-mi	6.3	1,886	
				Sub-Total Infiltration		**1,886**	
				Total Upper Lake Road		**20,504**	**89**
Total Design Year Flows (gpd) - Flowing to Fire Station Pump Station						**141,063**	**600**
Total Initial Year Average Daily Flows (gpm)						**98**	
Peak Flows (gpm) (Peaking Factor of 4)						**392**	
Minimum Flow to Maintain 2.5 fps in 6" diameter forcemain (gpm)						**225**	
Minimum Flow to Maintain 2.5 fps in 8" diameter forcemain (gpm)						**400**	

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Project No. 12069

PS #1 - Town Garage Pump Station - Initial Year
Design Pumping Capacity

As of January 4, 2013

General

Above-Ground Self-Priming	
Ground Elevation	117.00
Top of Wetwell	117.50
Wetwell Diameter (ft)	8
Design Pumping Capacity (gpm)	225
Influent Average Daily Flow Rate	
Initial Year (gpm)	100
--	
Forcemain Discharge Elev. (ft)	255.00
Pump Elev. (ft)	120.00
Suction Elev. (ft)	105.00
Pump On Elev. (ft)	108.00
Pump Off Elev. (ft)	105.00

Suction Line	
Diameter (in)	6
Velocity (ft/s)	2.55
Length (ft)	10
Roughness Coefficient	130
Friction Headloss (ft/100 ft)	0.47
Forcemain	
Diameter (in)	6
Velocity (ft/s)	2.55
Length (ft)	6,600
Roughness Coefficient	140
Friction Headloss (ft/100 ft)	0.41

Total Dynamic Suction Lift

Static Suction Lift (ft)			15.0
Friction, Suction (ft)			
Pipe, Total Length (ft)		10	
90 bends (ft)	2	16	
Total Pipe (ft)		26	
Total Suction Loss (ft)			0.1
Total Dynamic Suction Lift (ft)			**15.1**

Net Positive Suction Head

Barometric Pressure (PSIA)	14.7
Total Dynamic Suction Lift (ft)	15.1
Safety Factor (ft)	2.0
NPSH Available (ft)	16.3
NPSH Required (ft)	-5.0
NPSH Excess Available (ft)	**11.3**

Total Discharge Head

Static Discharge Head (ft)			135.00
Friction, Discharge (ft)			
Pipe, Total Length (ft)		6,600	
45 bends (ft)	10	74	
90 bends (ft)	6	48	
Total Pipe (ft)		6,722	
Total Friction Loss (ft)			27.62
Total Dynamic Discharge Head (ft)			**162.6**

TOTAL DYNAMIC HEAD (ft)	**177.7**

Priming Lift

Priming Lift (ft)	**12.0**
Pump Repriming Lift Capability (ft)	**14.0**

Pumping Cycle Dose Volume

Wetwell Volume per foot (gal/ft)	376
Available Dose Volume (gal)	1128
Pump Run Time (min)	5.0
Dose Volume Fill Time	
Initial Year (min)	11

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Project No. 12069

PS #1 - Town Garage Pump Station - Design Year — As of January 4, 2013
Design Pumping Capacity — Page 1 of 1

General			
Above-Ground Self-Priming			
Ground Elevation	117.00	Suction Line	
Top of Wetwell	117.50	Diameter (in)	6
Wetwell Diameter (ft)	8	Velocity (ft/s)	5.11
Design Pumping Capacity (gpm)	450	Length (ft)	10
Influent Average Daily Flow Rate		Roughness Coefficient	130
--		Friction Headloss (ft/100 ft)	1.70
DesignYear (gpm)	335	Forcemain	
Forcemain Discharge Elev. (ft)	255.00	Diameter (in)	8.48528 *
Pump Elev. (ft)	120.00	Velocity (ft/s)	2.55
Suction Elev. (ft)	105.00	Length (ft)	6,600
Pump On Elev. (ft)	108.00	Roughness Coefficient	140
Pump Off Elev. (ft)	105.00	Friction Headloss (ft/100 ft)	0.27

Total Dynamic Suction Lift			
Static Suction Lift (ft)			15.0
Friction, Suction (ft)			
Pipe, Total Length (ft)		10	
90 bends (ft)	2	16	
Total Pipe (ft)		26	
Total Suction Loss (ft)			0.4
Total Dynamic Suction Lift (ft)			**15.4**

Net Positive Suction Head	
Barometric Pressure (PSIA)	14.7
Total Dynamic Suction Lift (ft)	15.4
Safety Factor (ft)	2.0
NPSH Available (ft)	16.0
NPSH Required (ft)	-5.0
NPSH Excess Available (ft)	**11.0**

Total Discharge Head			
Static Discharge Head (ft)			135.00
Friction, Discharge (ft)			
Pipe, Total Length (ft)		6,600	
45 bends (ft)	10	74	
90 bends (ft)	6	48	
Total Pipe (ft)		6,722	
Total Friction Loss (ft)			18.44
Total Dynamic Discharge Head (ft)			**153.4**

Pumping Cycle Dose Volume	
Wetwell Volume per foot (gal/ft)	376
Available Dose Volume (gal)	1,128
Pump Run Time (min)	2.5
Dose Volume Fill Time	
DesignYear (min)	3

TOTAL DYNAMIC HEAD (ft)	**168.9**

Priming Lift	
Priming Lift (ft)	**12.0**
Pump Repriming Lift Capability (ft)	**14.0**

Notes:
* Two 6" diameter forcemain pipes have a combined effective area equal to 8.4853 inches.

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Project No. 12069

PS #2 - Park Pump Station - Initial Year
Design Pumping Capacity

As of January 7, 2013

General

Above-Ground Self-Priming	
Ground Elevation	108.00
Top of Wetwell	108.50
Wetwell Diameter (ft)	8
Design Pumping Capacity (gpm)	225
Influent Average Daily Flow Rate	
Initial Year (gpm)	35
--	
Forcemain Discharge Elev. (ft)	103.00
Pump Elev. (ft)	111.00
Suction Elev. (ft)	96.00
Pump On Elev. (ft)	99.00
Pump Off Elev. (ft)	96.00

Suction Line	
Diameter (in)	4
Velocity (ft/s)	5.74
Length (ft)	10
Roughness Coefficient	130
Friction Headloss (ft/100 ft)	3.39
Forcemain	
Diameter (in)	6
Velocity (ft/s)	2.55
Length (ft)	1,315
Roughness Coefficient	140
Friction Headloss (ft/100 ft)	0.41

Total Dynamic Suction Lift

Static Suction Lift (ft)			15.0
Friction, Suction (ft)			
Pipe, Total Length (ft)		10	
90 bends (ft)	2	16	
Total Pipe (ft)		26	
Total Suction Loss (ft)			0.9
Total Dynamic Suction Lift (ft)			**15.9**

Net Positive Suction Head

Barometric Pressure (PSIA)	14.7
Total Dynamic Suction Lift (ft)	15.9
Safety Factor (ft)	2.0
NPSH Available (ft)	15.6
NPSH Required (ft)	-5.0
NPSH Excess Available (ft)	**10.6**

Total Discharge Head

Static Discharge Head (ft)			-8.00
Friction, Discharge (ft)			
Pipe, Total Length (ft)		1,315	
45 bends (ft)	4	30	
90 bends (ft)	2	16	
Total Pipe (ft)		1360.6	
Total Friction Loss (ft)			5.59
Total Dynamic Discharge Head (ft)			**-2.4**

TOTAL DYNAMIC HEAD (ft)	**13.5**

Priming Lift

Priming Lift (ft)	**12.0**
Pump Repriming Lift Capability (ft)	**14.0**

Pumping Cycle Dose Volume

Wetwell Volume per foot (gal/ft)	376
Available Dose Volume (gal)	1,128
Pump Run Time (min)	5.0
Dose Volume Fill Time	
Initial Year (min)	32

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Project No. 12069

PS #2 - Park Pump Station - Design Year
Design Pumping Capacity

As of January 7, 2013

General

Above-Ground Self-Priming	
Ground Elevation	108.00
Top of Wetwell	108.50
Wetwell Diameter (ft)	8
Design Pumping Capacity (gpm)	225
Influent Average Daily Flow Rate	
--	
DesignYear (gpm)	158
Forcemain Discharge Elev. (ft)	103.00
Pump Elev. (ft)	111.00
Suction Elev. (ft)	96.00
Pump On Elev. (ft)	99.00
Pump Off Elev. (ft)	96.00

Suction Line	
Diameter (in)	4
Velocity (ft/s)	5.74
Length (ft)	10
Roughness Coefficient	130
Friction Headloss (ft/100 ft)	3.39
Forcemain	
Diameter (in)	6
Velocity (ft/s)	2.55
Length (ft)	1,315
Roughness Coefficient	140
Friction Headloss (ft/100 ft)	0.41

Total Dynamic Suction Lift

Static Suction Lift (ft)			15.0
Friction, Suction (ft)			
Pipe, Total Length (ft)		10	
90 bends (ft)	2	16	
Total Pipe (ft)		26	
Total Suction Loss (ft)			0.9
Total Dynamic Suction Lift (ft)			**15.9**

Net Positive Suction Head

Barometric Pressure (PSIA)	14.7
Total Dynamic Suction Lift (ft)	15.9
Safety Factor (ft)	2.0
NPSH Available (ft)	15.6
NPSH Required (ft)	-5.0
NPSH Excess Available (ft)	**10.6**

Total Discharge Head

Static Discharge Head (ft)			-8.00
Friction, Discharge (ft)			
Pipe, Total Length (ft)		1315	
45 bends (ft)	4	30	
90 bends (ft)	2	16	
Total Pipe (ft)		1,361	
Total Friction Loss (ft)			5.59
Total Dynamic Discharge Head (ft)			**-2.4**

TOTAL DYNAMIC HEAD (ft)	**13.5**

Priming Lift

Priming Lift (ft)	**12.0**
Pump Repriming Lift Capability (ft)	**14.0**

Pumping Cycle Dose Volume

Wetwell Volume per foot (gal/ft)	376
Available Dose Volume (gal)	1,128
Pump Run Time (min)	5.0
Dose Volume Fill Time	
DesignYear (min)	7

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Project No. 12069

PS #3 - Fire Station Pump Station - Initial Year
Design Pumping Capacity

As of January 8, 2013

General

Above-Ground Self-Priming	
Ground Elevation	255.00
Top of Wetwell	255.50
Wetwell Diameter (ft)	8
Design Pumping Capacity (gpm)	225
Influent Average Daily Flow Rate	
Initial Year (gpm)	148
--	
Forcemain Discharge Elev. (ft)	372.00
Pump Elev. (ft)	258.00
Suction Elev. (ft)	243.00
Pump On Elev. (ft)	246.00
Pump Off Elev. (ft)	243.00

Suction Line	
Diameter (in)	6
Velocity (ft/s)	2.55
Length (ft)	10
Roughness Coefficient	130
Friction Headloss (ft/100 ft)	0.47
Forcemain	
Diameter (in)	6
Velocity (ft/s)	2.55
Length (ft)	4,150
Roughness Coefficient	140
Friction Headloss (ft/100 ft)	0.41

Total Dynamic Suction Lift

Static Suction Lift (ft)			15.0
Friction, Suction (ft)			
Pipe, Total Length (ft)		10	
90 bends (ft)	2	16	
Total Pipe (ft)		26	
Total Suction Loss (ft)			0.1
Total Dynamic Suction Lift (ft)			**15.1**

Net Positive Suction Head

Barometric Pressure (PSIA)	14.7
Total Dynamic Suction Lift (ft)	15.1
Safety Factor (ft)	2.0
NPSH Available (ft)	16.3
NPSH Required (ft)	-5.0
NPSH Excess Available (ft)	**11.3**

Total Discharge Head

Static Discharge Head (ft)			114.00
Friction, Discharge (ft)			
Pipe, Total Length (ft)		4,150	
45 bends (ft)	2	15	
90 bends (ft)	2	16	
Total Pipe (ft)		4,181	
Total Friction Loss (ft)			17.18
Total Dynamic Discharge Head (ft)			**131.2**

TOTAL DYNAMIC HEAD (ft)	**146.3**

Priming Lift

Priming Lift (ft)	**12.0**
Pump Repriming Lift Capability (ft)	**14.0**

Pumping Cycle Dose Volume

Wetwell Volume per foot (gal/ft)	376
Available Dose Volume (gal)	1128
Pump Run Time (min)	5.0
Dose Volume Fill Time	
Initial Year (min)	8

Town of St. Albans
Lake Road Sewer and Water Feasibility Study
Project No. 12069

PS #3 - Fire Station Pump Station - Design Year — As of January 8, 2013
Design Pumping Capacity —

General

Above-Ground Self-Priming	
Ground Elevation	255.00
Top of Wetwell	255.50
Wetwell Diameter (ft)	8
Design Pumping Capacity (gpm)	450
Influent Average Daily Flow Rate	
--	
Design Year (gpm)	392
Forcemain Discharge Elev. (ft)	372.00
Pump Elev. (ft)	258.00
Suction Elev. (ft)	243.00
Pump On Elev. (ft)	246.00
Pump Off Elev. (ft)	243.00

Suction Line	
Diameter (in)	6
Velocity (ft/s)	5.11
Length (ft)	10
Roughness Coefficient	130
Friction Headloss (ft/100 ft)	1.70
Forcemain	
Diameter (in)	8.48528 *
Velocity (ft/s)	2.55
Length (ft)	4,150
Roughness Coefficient	140
Friction Headloss (ft/100 ft)	0.27

Total Dynamic Suction Lift

Static Suction Lift (ft)			15.0
Friction, Suction (ft)			
Pipe, Total Length (ft)		10	
90 bends (ft)	2	16	
Total Pipe (ft)		26	
Total Suction Loss (ft)			0.4
Total Dynamic Suction Lift (ft)			**15.4**

Net Positive Suction Head

Barometric Pressure (PSIA)	14.7
Total Dynamic Suction Lift (ft)	15.4
Safety Factor (ft)	2.0
NPSH Available (ft)	16.0
NPSH Required (ft)	-5.0
NPSH Excess Available (ft)	**11.0**

Total Discharge Head

Static Discharge Head (ft)			114.00
Friction, Discharge (ft)			
Pipe, Total Length (ft)		4,150	
45 bends (ft)	2	15	
90 bends (ft)	2	16	
Total Pipe (ft)		4,181	
Total Friction Loss (ft)			11.47
Total Dynamic Discharge Head (ft)			**125.5**

Pumping Cycle Dose Volume

Wetwell Volume per foot (gal/ft)	376
Available Dose Volume (gal)	1128
Pump Run Time (min)	2.5
Dose Volume Fill Time DesignYear (min)	3

TOTAL DYNAMIC HEAD (ft)	**140.9**

Priming Lift

Priming Lift (ft)	**12.0**
Pump Repriming Lift Capability (ft)	**14.0**

Notes:
* Two 6" diameter forcemain pipes have a combined effective area equal to 8.4853 inches.

APPENDIX C

WATER CONSTRUCTION COSTS AND TOTAL PROJECT COSTS

Town of St. Albans
Lake Street Sewer/Water Feasibility Study
Construction Cost Estimate
Lake Road Waterline Extension
As of January 15, 2013

Description of Item		Estimated Quantity	Unit	Unit Price	Cost ENR 9410
A - Waterline					
A- 1	12" DI CL52 Waterline	9,250	L.F.	$80	$740,000
A- 2	8" DI CL52 Waterline	14,800	L.F.	$75	$1,110,000
B - Waterline Appurentances					
B- 1	New Fire Hydrant Branch Connection	33	EA.	$4,500	$148,500
B- 2	12" Gate Valve	33	EA.	$2,000	$66,000
B- 3	8" Gate Valve	33	EA.	$1,700	$56,100
B- 4	3/4" Water Service	4,500	L.F.	$60	$270,000
B- 5	3/4" Curb Stop and Box	150	EA.	$200	$30,000
B- 6	3/4" Corporation Stop	150	EA.	$150	$22,500
C - Earthwork					
C- 1	Rock Excavation	500	C.Y.	$120	$60,000
C- 2	Boulder Excavation	250	C.Y.	$90	$22,500
C- 3	Misc. Extra. Below Grade Excavation	500	C.Y.	$40	$20,000
C- 4	Exc. & Replac. Unsuitable	500	C.Y.	$40	$20,000
D - Roadwork					
D- 1	Permanent Bit. Pavement Repair	17,300	S.Y.	$70	$1,211,000
D- 2	Perm. Gravel Road & Drive Repair	150	S.Y.	$65	$9,750
D- 3	Perm. Gravel Shoulder Repair	9,250	L.F.	$15	$138,750
E - Incidental Work					
E- 1	Class B Concrete	25	C.Y.	$175	$4,375
E- 2	Calcium Chloride	10	TON	$600	$6,000
E- 3	Rigid Trench Insulation	3,000	L.F.	$6	$18,000
E- 4	Uniform Traffic Officers	800	HRS	$55	$44,000
E- 5	Silt Fence	3,000	L.F.	$3	$9,000
F -Lump Sum					
F- 1	Brigham Road PRV Vault	1	L.S.	$75,000	$75,000
F- 2	Kellogg Road PRV Vault	1	L.S.	$75,000	$75,000
F- 3	Preparation of Site and Misc. Work (8%)	1	L.S.	$332,518	$332,518
F- 4	Bonds (2%)	1	L.S.	$90,000	$90,000
				TOTALS	$4,578,993
				USE	**$4,580,000**

Notes:

1. ENR 9410 = December 2012

Town of St. Albans
Lake Street Sewer/Water Feasibility Study
Total Project Cost - Lake Road Waterline Extension
As of January 15, 2013

ITEM DESCRIPTION	TOTAL ESTIMATED COST
CONSTRUCTION	
Construction	$4,580,000
CONSTRUCTION SUBTOTAL	$4,580,000
CONSTRUCTION CONTINGENCY	
Construction Contingency (10%)	$458,000
CONSTRUCTION CONTINGENCY SUBTOTAL	$458,000
STEP I - PRELIMINARY ENGINEERING AND PRE-DESIGN	
Feasibility Study	$0
STEP I SUBTOTAL	$0
STEP II - FINAL DESIGN	
Final Design Allowance[(2)]	$276,000
STEP II SUBTOTAL	$276,000
STEP III - CONSTRUCTION SERVICES	
Construction Services Allowance[(2)]	$506,000
STEP III CONSTRUCTION SERVICES SUBTOTAL	$506,000
STEP III - ENGINEERING CONTINGENCY	
Construction Engineering Contingency (5%)	$25,300
STEP III ENGINEERING CONTINGENCY SUBTOTAL	$25,300
OTHER COSTS	
Administrative	$5,000
Project Coordinator	$2,500
Easement Assistance	$2,500
Legal & Fiscal	$10,000
Short Term Interest	$229,000
OTHER SUBTOTAL	$249,000
ESTIMATED TOTAL PROJECT COST	$6,094,300
USE	$6,100,000

Notes:

1. Construction cost based on ENR 10100 = April 2015.
2. Costs are based upon the State curve.

APPENDIX D

SEWER CONSTRUCTION COSTS AND TOTAL PROJECT COSTS

Town of St. Albans
Lake Street Sewer/Water Feasibility Study
Construction Cost Estimate
Initial Bay Sewer Service Area
As of January 9, 2013

	Description of Item	Estimated Quantity	Unit	Unit Price	Cost ENR 9410
A - Sewers					
A- 1	8" PVC Gravity Sewer	10,700	L.F.	$65	$695,500
A- 2	10" PVC Gravity Sewer	1,400	L.F.	$75	$105,000
A- 3	6" PVC FM	1,350	L.F.	$60	$81,000
A- 4	(2) - 6" PVC FM same trench	6,600	L.F.	$100	$660,000
B - Sewerline Appurentances					
B- 1	4' Diameter Sewer Manholes	406.0	V.F.	$500	$203,000
B- 2	8" x 4" Service Wye	80	EA.	$100	$8,000
B- 3	8" x 6" Service Wye	30	EA.	$150	$4,500
B- 4	10" x 4" Service Wye	20	EA.	$115	$2,300
B- 5	10" x 6" Service Wye	10	EA.	$165	$1,650
B- 6	4" Sewer Service	4,000	L.F.	$50	$200,000
B- 7	6" Sewer Service	1,600	L.F.	$53	$84,800
C - Earthwork					
C- 1	Rock Excavation	500	C.Y.	$120	$60,000
C- 2	Boulder Excavation	250	C.Y.	$90	$22,500
C- 3	Misc. Extra. Below Grade Excavation	500	C.Y.	$40	$20,000
C- 4	Exc. & Replac. Unsuitable	500	C.Y.	$40	$20,000
D - Roadwork					
D- 1	Permanent Bit. Pavement Repair	17,900	S.Y.	$70	$1,253,000
D- 2	Perm. Gravel Road & Drive Repair	500	S.Y.	$65	$32,500
D- 3	Perm. Gravel Shoulder Repair	5,000	L.F.	$15	$75,000
E - Incidental Work					
E- 1	Class B Concrete	25	C.Y.	$175	$4,375
E- 2	Calcium Chloride	10	TON	$600	$6,000
E- 3	Rigid Trench Insulation	1,000	L.F.	$6	$6,000
E- 4	Uniform Traffic Officers	500	HRS	$55	$27,500
E- 5	Silt Fence	5,000	L.F.	$3	$15,000
E- 6	Degradable Erosion Control Blankets	1,000	S.Y.	$3	$3,000
E- 7	Temporary Stone Check Dams	100	EA.	$120	$12,000
F -Lump Sum					
F- 1	Town Garage Pump Station (PS #1)	1	L.S.	$450,000	$450,000
F- 2	Park Pump Station (PS #2)	1	L.S.	$350,000	$350,000
F- 3	Preparation of Site and Miscellaneous Work (8%)	1	L.S.	$353,000	$353,000
F- 4	Bonds (2%)	1	L.S.	$96,000	$96,000
				TOTALS	$4,851,625
				USE	**$4,860,000**

Notes:

1. ENR 9410 = December 2012

Town of St. Albans
Lake Street Sewer/Water Feasibility Study
Construction Cost Estimate
Initial Upper Lake Road Sewer Service Area
As of January 9, 2013

	Description of Item	Estimated Quantity	Unit	Unit Price	Cost ENR 9410
A - Sewers					
A- 1	8" PVC Gravity Sewer	0	L.F.	$65	$0
A- 2	10" PVC Gravity Sewer	6,200	L.F.	$75	$465,000
A- 3	6" PVC FM	0	L.F.	$60	$0
A- 4	(2) - 6" PVC FM same trench	4,150	L.F.	$100	$415,000
B - Sewerline Appurentances					
B- 1	4' Diameter Sewer Manholes	120.0	V.F.	$500	$60,000
B- 2	10" x 4" Service Wye	54	EA.	$115	$6,210
B- 3	10" x 6" Service Wye	10	EA.	$165	$1,650
B- 4	4" Sewer Service	2,160	L.F.	$50	$108,000
B- 5	6" Sewer Service	400	L.F.	$53	$21,200
C - Earthwork					
C- 1	Rock Excavation	100	C.Y.	$120	$12,000
C- 2	Boulder Excavation	25	C.Y.	$90	$2,250
C- 3	Misc. Extra. Below Grade Excavation	100	C.Y.	$40	$4,000
C- 4	Exc. & Replac. Unsuitable	100	C.Y.	$40	$4,000
D - Roadwork					
D- 1	Permanent Bit. Pavement Repair	9,200	S.Y.	$70	$644,000
D- 2	Perm. Gravel Road & Drive Repair	150	S.Y.	$65	$9,750
D- 3	Perm. Gravel Shoulder Repair	250	L.F.	$15	$3,750
E - Incidental Work					
E- 1	Class B Concrete	10	C.Y.	$175	$1,750
E- 2	Calcium Chloride	2	TON	$600	$1,200
E- 3	Rigid Trench Insulation	250	L.F.	$6	$1,500
E- 4	Uniform Traffic Officers	150	HRS	$55	$8,250
E- 5	Silt Fence	1,000	L.F.	$3	$3,000
E- 6	Degradable Erosion Control Blankets	250	S.Y.	$3	$750
E- 7	Temporary Stone Check Dams	30	EA.	$120	$3,600
F -Lump Sum					
F- 1	Fire Station Pump Station (PS #3)	1	L.S.	$450,000	$450,000
F- 2	Preparation of Site and Miscellaneous Work (8%)	1	L.S.	$179,000	$179,000
F- 3	Bonds (2%)	1	L.S.	$49,000	$49,000
				TOTALS	$2,454,860
				USE	**$2,460,000**

Notes:

1. ENR 9410 = December 2012

Town of St. Albans
Lake Street Sewer/Water Feasibility Study
Total Project Cost Estimate
Initial Bay and Initial Upper Lake Road Sewer Service Areas
As of January 9, 2013

ITEM DESCRIPTION	TOTAL ESTIMATED COST
CONSTRUCTION	
Initial Bay Sewer Service Area	$4,860,000
Initial Upper Lake Road Sewer Service Area	$2,460,000
Small Purchases	$50,000
CONSTRUCTION SUBTOTAL	$7,370,000
CONSTRUCTION CONTINGENCY	
Construction Contingency (10%)	$737,000
CONSTRUCTION CONTINGENCY SUBTOTAL	$737,000
STEP I - PRELIMINARY ENGINEERING AND PRE-DESIGN	
Feasibility Study	$35,500
Preliminary Engineering Study(2)	$214,000
Act250 Permitting	$20,000
Archeological Phase IB	$10,000
Archeological Phase II	$20,000
Environmental Assessment Report	$5,000
Bond Vote Technical Assistance	$7,500
Sewer Use Ordinance	$5,000
STEP I SUBTOTAL	$317,000
STEP II - FINAL DESIGN	
Final Design Allowance(2)	$428,000
STEP II SUBTOTAL	$428,000
STEP III - CONSTRUCTION SERVICES	
Construction Services Allowance(2)	$784,000
STEP III CONSTRUCTION SERVICES SUBTOTAL	$784,000
STEP III - ENGINEERING CONTINGENCY	
Construction Engineering Contingency (5%)	$39,200
STEP III ENGINEERING CONTINGENCY SUBTOTAL	$39,200
OTHER COSTS	
Administrative	$5,000
Project Coordinator	$2,500
Easement Assistance	$2,500
Legal & Fiscal	$10,000
Short Term Interest	$368,500
OTHER SUBTOTAL	$388,500
ESTIMATED TOTAL PROJECT COST	$10,063,700
USE	**$10,100,000**

Notes:

1. Construction cost based on ENR 9410 = December 2012.
2. Costs are based upon the State curve.