EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

Engineering Technologies Canada Ltd. (ETC) was retained by the Community of North Shore to carry out an ***Long-Term Water and Wastewater Servicing Study***.

The Community of North Shore is located in Queens County northwest of Charlottetown on the northern shore of Prince Edward Island. It is bounded on the north by the PEI National Park. The Community limits encompass approximately 92 sq. km of land.

North Shore adopted policies in its 2004 Official Plan for the purposes of growth regulation and to preserve the integrity of the environment and groundwater quality. Two unique zones were created by the Community and designated as the Coastal Zone(CZ) and Agricultural Zone (A).

Most residential and business development in the Community are reliant upon individual on-site sewage disposal systems and wells.

A conventional centralized water distribution system for the Stanhope Peninsula was investigated during a 2007 engineering study. The cost was estimated at $4.5 million. Public meetings were held to discuss the results of this engineering study. Several residents expressed concern with the study results and costs of central water and sewer services. Council decided to commission a study to investigate water and wastewater needs in more detail, as well as alternative options and approaches.

The Community received funding for this study through the *Canada – Prince Edward Island, Capacity Building Fund (New Deal for Cities and Communities).*

WASTEWATER NEEDS ASSESSMENT APPROACH

The first step in the process was to assemble, compile and review information on existing conditions within the community, and previous planning efforts.

Next, all property owners were surveyed about usage of their property, to solicit information on well construction, contamination, septic system type and location, malfunctions, management programs, and general comments. A ***questionnaire*** was mailed to all property owners and respondents were able to submit their survey in hard copy or by completing it on-line on ETC's web site.

A comprehensive ***Community Profile*** was prepared which summarized background information and existing conditions within the community, relevant to wastewater and water management, and integrated sustainability planning. The Community Profile is Volume I of this study.

Information relevant to the status of wells and septic systems was obtained from a variety of

sources including, the steering committee, councilors, residents, PEI government personnel, well drillers and septic system installers.

Subsequently a ***wastewater and water needs assessment*** was carried out to identify and define the needs within the study area. The results of the water and wastewater needs assessment were discussed with PEIDEEF personnel and also presented to residents for feedback and validation at a public meeting. The water needs assessment is presented as Volume III of the study.

Solutions to the water and wastewater needs which have been identified are presented in the Volume IV report. Various servicing solutions were analyzed and compared on a ***technical, regulatory and economic basis***.

Groundwater and septic system monitoring programs were discussed and presented as a tool which would allow the Community to identify changes in the level of need or urgency for central water or sewer servicing. Several ***on-site sewage system enhancements*** which have the potential to improve the performance and ease maintenance were investigated. The potential impacts of ***water conservation*** on sewage systems and water supplies is also discussed.

Finally, conclusions and recommendations were made regarding the most appropriate methods of water and wastewater management for the different subareas of the community

ASSEMBLING AND COMPILING BACKGROUND INFORMATION

A property owner survey consisting of 29 questions about the owner's property and the existing water and wastewater systems was mailed to all registered property owners. A total of 378 surveys (29% response rate) were completed and returned.

Several geographic information system (GIS) data layers were obtained for property/parcel information, soils, wetlands, waterways, buildings and contours as well as ortho-rectified photos.

Information from a Student Survey conducted in 2008 was obtained from the Community of North Shore.

Interviews with septic installer, residents and Members of Council were conducted.A septic permit database report was obtained from the PEI Dept. of Communities and Cultural Affairs (PEICCA). A report on domestic well construction was provided by the PEIDEEF.

All of the above information was incorporated into a master GIS database along with data obtained through the residents survey.

WASTEWATER NEEDS ASSESSMENT

Wastewater needs were determined on a lot-by-lot basis for all parcels in the study area. The results of the wastewater needs assessment for all ***developed*** parcels are summarized in Table ES 1.

Table ES 1: Results of On-site Servicing Needs Assessment for Developed Properties

Wastewater Needs Assessment Categories	Total Developed	% of Total Developed
Property Requires an Eventual Off-site Sewer Solution:		
Due to lot size and/or soil constraints	340	42.9
Due to ground water separation constraints	2	0.3
Due to wetland or watercourse buffer constraints	21	2.7
Property Will Accommodate an On-site Solution:		
Advanced (I/A) treatment system	123	15.5
above-ground dispersal field	49	6.2
No Solution Required:		
Property is viable with existing or future Conventional Septic	257	32.4
Total	792	100

As can be seen from Table ES 1, it is estimated that 363 (46%) of all existing developed properties will require an eventual off-site wastewater servicing solution. 24% of all developed properties can accommodate an on-site solution. 32% of the developed properties are considered viable for long term on-site sewer servicing with a conventional, in-ground septic system..

Preliminary Prioritization Of Wastewater Needs

Ten separate areas of the Community in close proximity to each other and having a similar wastewater needs, were identified. These lot groupings are referred to as servicing subareas. The subareas were chosen to facilitate further analysis and discussion.

Using "value criteria", a point value score was applied to each of the subareas to determine the relative level of need for a solution. These criteria were developed in consultation with the PEI Dept. of Environment during previous similar studies and approved by the North Shore steering committee.

The detailed results of the Wastewater Needs Assessment (including associated point scores) for developed year round and seasonal properties are shown in Volume II.

Seasonal Versus Year-Round Use Sensitivity Analysis

A ***sensitivity analysis*** was carried out in which results for the following two scenarios could be tested and compared:

1) SUF = 1.00, ie. 1 cottage = 1 year round home.
2) SUF = 0.50, ie. 1 cottage = 0.5 year round home.

By comparing the results, the subareas which are most affected by a lower weight for seasonal cottages are Stanhope Peninsula and Eagle's Path. This is due to the large percentage of seasonal properties in these subareas. Nevertheless, both the absolute and the relative level of need did not change enough to affect the final results. Based on feedback received at the public meeting on August 26, 2009, it was decided to apply the Seasonal Use Factor (SUF)of 0.5 as the default assumption.

Stanhope Peninsula Category I Sensitivity Analysis

The 1988 PEI Soil Survey designates the majority of Stanhope Peninsula soils as belonging to the Alberry map unit. In our experience, Alberry soils would typically be categorized as Category II (See map in Volume II). However, permit information supplied to us by the CCA and anecdotal information provided by local septic installers and residents indicate that the Stanhope Peninsula soils are typically classified as Category I (See Map 4 in Volume II). Therefore, a sensitivity analysis was conducted to compare the relative need results for the Stanhope Peninsula, using ETC's Category II classification (based on the PEI Soil Survey) versus if the soils were Category I.

The results show that the level of need is not highly sensitive to the soil category type. The Stanhope Peninsula has a "very high" relative level of need, regardless of the soil category, particularly if the seasonal properties are weighted at half that of the year-round properties (ie. 5,835 versus 5,055 points).

Relative Level of Need by Subarea

The final results of the ranking process to estimate the relative level of need among the subareas is provided in Table ES 2. As discussed previously, these results are based on the following:

Table ES 2: ***Relative Level of Need for a Wastewater Solution by Subarea.***

Wastewater Servicing Subarea	Total # Developed Parcels	Points	Subarea Characteristics	Relative Level of Need
Stanhope Peninsula	370	5055	Has 242 lots requiring an off-site solution, 71% of properties require some type of solution now or in the future, 57% of the septic systems are older than 20 years or their age is unknown. 21 properties reported well contamination.	Very High
Golf Course	58	1420	Has 23 developed lots requiring an off-site solution, 100% of developed properties require some type of solution now or in the future, 85% of developed properties have systems > 20 yrs. old or unknown age.	High
Eagle's Path	52	1040	48 developed lots requiring an off-site solution, 98% of properties require some type of solution now or in the future, one report of well contamination. 88% of the septic systems are more than 20 years old or their age is unknown.	High
Covehead Road	50	935	21 developed properties require an off-site solution, 60% of developed lots require some type of solution now or in the future, 72% of the septic systems are older than 20 years or their age is unknown.	Moderate to High
Eastern Road	36	570	Has 4 lots requiring an off-site solution, 100% of properties require some type of solution now or in the future, 75% of the septic systems are older than 20 years or their age is unknown.	Moderate
Union Road	23	485	4 off-site solution needed, 87% of properties require some type of solution now or in the future, 65% of the septic systems are more than 20 years old or their age is unknown	Moderate
Community Center	20	330	4 developed properties require an off-site solution, 50% of developed lots require some type of solution now or in the future, 80% of the septic systems are older than 20 years or their age is unknown.	Low
Bell's Creek	18	235	Has 2 lots requiring an off-site solution, 33% of properties require some type of solution now or in the future, 72% of the septic systems are older than 20 years or their age is unknown.	Low
Auld's Creek	8	168	Has 2 lots requiring an off-site solution, 100% of properties require some type of solution now or in the future, 75% of the septic systems are older than 20 years or their age is unknown.	Very Low
Settler's Road	4	83	Has 4 lots requiring an off-site solution, 100% of properties require some type of solution now or in the future, 75% of the septic systems are older than 20 years or their age is unknown	Very Low

TECHNICAL AND REGULATORY ANALYSIS OF WASTEWATER SERVICING SOLUTIONS

The wastewater needs assessment identified lots which can accommodate an on-site sewage system should the existing septic system need to be replaced. Lots which are not considered to be sustainable with a conventional septic system will require either:

a) Above-ground dispersal fields - Lots where slowly permeable soils or a shallow groundwater table are typical conditions;

b) Advanced (I/A) treatment systems - I/A treatment systems can be used to overcome extremely limiting site conditions such as inadequate space for a conventional or above ground dispersal field, slowly permeable soils or high groundwater table.

Several options for central and cluster wastewater servicing were explored for those subareas which require an off-site wastewater system for sustainability. The three main components in any off-site wastewater system are:

1) **Wastewater collection** - Based on the experience of ETC and its partners, three main types of collection systems were selected for detailed investigation: Conventional gravity sewers, Septic Tank Effluent Gravity (STEG) sewers and Septic Tank Effluent Pump (STEP) pressure sewers.

2) **Wastewater treatment -** The following WWTS options were short listed for detailed evaluation: Textile Packed Bed Filter (PBF), Rotating Biological Contactors, PeatLand™ System, Facultative Lagoon, Aerated Lagoon.

3) **Dispersal or direct discharge** (continuous or seasonal) of the treated effluent - The PEI Department of Environment, Energy and Forestry (PEIDEEF) have indicated they are unlikely to approve any new continual direct discharges to watercourses, but would be willing to entertain a seasonal discharge of effluent to a receiving water. The PEIDEEF supports the reuse of treated effluent by a golf course (eg. Stanhope Golf Course) on the assumption that it meets the requirement levels set out by the department. Since the peak effluent output of the Stanhope Peninsula coincides with the peak water demand for irrigation at the golf course, the option to re-used treated effluent from a wastewater treatment system for irrigation at the golf course was thought to be a potential alternative to an LBED system. However, our preliminary analysis suggests that given the high year-round flow component, this would not be a preferred wastewater management option. A further detailed analysis in consultation with the PEIDEEF would be necessary to determine the ultimate technical and economic feasibility.

Footprints for LBED systems were calculated for flows using the building permit data and the Island Waste Management Corporation (IWMC) database.

The data indicate that if the building permit data is used, the Stanhope Peninsula could reach full build-out in 16 to 26 years. A footprint of approximately 21 hectares would be required to

accommodate a WWT/LBED system for full build-out of the SP and Golf Course subareas.

Alternatively, if the IWMC database is the better predictor of future growth rates, the SP will not have reached full build-out even after 50 years. The land required to accommodate an LBED system sized for the total number of homes predicted in 50 years would be approximately 18 hectares which is very close to the footprint projected using the building permit data.

Growth rates can and should be accurately monitored in future so that the required capacity of a future WWT site can be predicted with greater accuracy. However, for present planning purposes, it would be prudent to try to secure enough land to accommodate the full build-out scenario predicted by the building permit data.

Estimated land requirements for the various WWT/LBED options were estimated. Potential WWT sites are shown in Map 1 and Map 2 of Volume IV.

WWT site 1 does not have enough area to accommodate the WWT/LBED footprint required for a large central WWT system.

WWT sites 2 and 3 do appear to have the required capacity and can provide the required setbacks to individual dwellings and/or built up residential areas. These were the nearest feasible sites with adequate space and no nearby homes that could be identified. WWT site 4 would only have adequate space for a small cluster WWT site to service the Eagles Path subarea.

WATER SERVICING SOLUTIONS

The on-site water solutions which were considered in this study include:

a) New, deeper wells
b) Residential water treatment for nitrate or bacteria

On-site solutions are not practical as a means of dealing with salinity problems. If a domestic well has salt water intrusion problems its use should probably be discontinued since:

(i) it would not be practical to treat it since salinity levels would likely become higher with time making most treatment options ineffective, and

(ii) consistent use of the affected well could worsen the degree of saltwater intrusion in that immediate area, possibly causing other wells in the area to also become negatively affected by salinity issues.

The off-site (ie. central) water supply solution for the SP which had been previously investigated by CBCL in previous studies was reviewed in the context of the new information gained from TerrAtlantic's Water Needs Assessment.

TAE provided suggested potential wellfield locations (Volume III) for new central wells for

Stanhope Peninsula and Eagles Path subareas.

COST EFFECTIVENESS ANALYSIS

The cost effectiveness of various off-site and on-site water and wastewater management options was determined using a life cycle (present value) analysis. The life cycle analysis takes into consideration the *time value of money* by using a discount rate. The discount rate adjusts expenditures in future years to current dollar values so costs incurred across time can be compared to each other in present day dollars.

In the present value analysis of central and cluster options, the total eligible capital costs were reduced by 66.6% to reflect the minimum grant funding levels typically received for infrastructure projects. A CEA of collection systems was carried out independently of WWT/LBED systems to arrive at the most appropriate and least-cost off-site wastewater management solution.

It should be emphasized that estimates of capital costs and rates are very preliminary so as to allow for comparison of various options and for long term planning purposes. These rates should be refined upon completion of more substantive, Class A or B capital cost estimates, before they are presented to residents for approval. Furthermore, the Community may wish to commission a detailed study of rate design options before deciding on which approach would best serve the needs of residents.

CEA Wastewater Collection

Two main options for off-site wastewater management were explored – 1) Central/cluster wastewater management systems for Stanhope Peninsula and the Golf Course subarea, and for these two subareas plus Eagles Path; 2) Individual cluster wastewater management system to service small subareas such as Eagles Path. The cost of off-site management options can then be compared to the cost of various on-site wastewater management options, where on-site solutions are considered sustainable.

During the preliminary analysis stage, two options were considered to hook Eagle's Path subarea to an existing central sewer system for the SP and Golf Course subareas. Option 1 was connecting Eagle's Path via a Covehead Bay marine crossing and connecting into the Stanhope Peninsula collection system. Option 2 was the overland route which required substantially more piping and lift stations with little benefit of connecting more residents to the system.

The cost of the two overland route options were orders of magnitude higher than the Bay Crossing option. Therefore, the Bay Crossing was assumed in the subsequent life cycle analysis of a central sewer system which included Eagles Path.

Three different collection approaches were compared: ***conventional gravity sewer, Septic Tank Effluent Pumping (STEP) System and Septic Tank Effluent Gravity (STEG) System***.

Cost estimates were developed for the Stanhope Peninsula and Golf Course subareas combined, the Stanhope Peninsula, Golf Course, Eagle's Path subareas via Covehead Bay combined scenario and Eagle's Path subarea as an individual cluster system.

A life cycle costing approach was used on these alternatives in an attempt to determine the present value per connected home and a preliminary rate for the collection system component.

Summaries of the results of the life cycle cost analysis and preliminary rate calculations for a central collection system servicing Stanhope Peninsula/Golf Course and Eagles Path subareas are presented in Table ES 3.

In Options 1, 2 and 3 in the tables, costs for three different collection systems (STEP, STEG and conventional gravity sewers) were compared. On the basis of capital cost, the STEP collection system appears to be less expensive than conventional gravity sewer. The STEG/STEP costs include the costs associated with the primary treatment tanks installed on private properties and all hook-up and decommissioning costs. The capital cost of a STEG tank installation was estimated at $9,100 per EDU and a STEP installation at $11,600. A further 25% was added for engineering and contingencies.

The conventional gravity sewer costs shown in the tables do not include primary treatment, whereas the STEP/STEG sewer costs include the cost of primary treatment at the source.

The life cycle costs of installing and operating STEP collection systems over a 20 year planning period was lower than conventional gravity sewers and STEG collection systems. A conventional sewer system was on average 14% more expensive than a STEG system and 21% more expensive than a STEP system based on the total present value per connected EDU.

On the basis of rates, conventional sewers for Stanhope Peninsula, Golf Course and Eagles Path were on average 23% more expensive than STEP assuming a five year rate planning period. The higher cost of the conventional gravity option is attributed to the several lift stations required due to topography, and the larger diameter piping necessary for conventional gravity sewers.

The STEG option is slightly less expensive than conventional gravity as it requires smaller diameter piping and no manholes. The STEP systems eliminate the cost of lift stations by pumping directly into the forcemain. For the subareas of Stanhope Peninsula/Golf Course and Eagles Path, rates for conventional sewers were on average 14% more expensive than STEG assuming a five year rate planning period.

Table ES 3: ***Life Cycle Cost Analysis & Preliminary Rate Comparison of Collection Options - Stanhope Peninsula, Golf Course & Eagles Path Subareas with Covehead Bay Crossing.***

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Time Value of Money and Other Data	
Real Rate of Return or Real Discount rate (%)	3.00%
Inflation rate (%)	2.30%
Nominal Discount Rate (%)	5.37%
Life Cycle Planning/Amortization Period (PAP) (years)	20
Rate Planning Period (years)	5
% of Eligible Phase I Capital Costs Covered by Grants (%)	66.6%
Inflation Rate for Maintenance Costs (%)	3.00%

Summary of Life Cycle Cost Analysis & Preliminary Rate Comparison
Central Sewer Collection System Options

Stanhope Peninsula (SP), Golf Course (GC) & Eagles Path (EP) Subareas with Covehead Bay Crossing

Total Number of Serviceable Lots:	730	Lots
Number of EDUs Connected:	666	Equivalent Dwelling Units (EDUs)
Number of Undeveloped, Servicable Lots:	250	Lots

Sewer Collection System Option No.	1	2	3
Sewer Collection System Option Description:	STEP System	STEG System	Conv. Gravity Sewer System
Capital Cost (not including land)	$16,746,148	$18,342,773	$14,495,916
Total Capital Cost per EDU:	**$21,171**	**$23,189**	**$18,326**
Annual Operations & Maintenance Cost	$35,840	$25,760	$35,291
Major Equip. Replace/Repair – Equiv. Annual Cost	$14,657	$1,855	$10,491
Expected System Life (years)	50	50	50
Total Present Value (PV):	$2,792,849	$2,679,385	$3,416,839
Total PV per Connected EDU:	**$3,531**	**$3,387**	**$4,320**
Total PV for Preliminary Rate Calculation (PRC) Purposes:	$4,795,805	$5,283,349	$5,961,735
Total Annualized Cost (AC) for PRC Purposes:	$421,440	$454,910	$517,571
Projected Annual Collection Portion of Rate per EDU:	**$533**	**$575**	**$654**

In the case of STEP and STEG collection, rates assume customers make a one-time capital contribution of $2000 towards the Communities' share of the project capital costs.
In the case of conventional gravity sewer collection, rates assume customers will pay $2000 to hook-up to the sewer and decommission their septic tank.

The estimated rates given in the collection system table, only represent the collection system portion of the total annual rate a customer would pay. The rate for the collection system must be added to the rate for the WWT/LBED portion (including primary tankage if applicable) to get an estimate of the approximate total annual rate a customer would pay. Costs and rates for the WWT/LBED portion of a cluster system are discussed in the following paragraphs, and in detail in Section 4.3 .

CEA of Wastewater Treatment and Dispersal Systems

The results of the CEA for the five WWT and dispersal options are shown in Table ES 4. and resulted in the determination of approximate "per EDU" costs. These "per EDU" costs are considered sufficiently accurate for the present planning purposes and can be applied to slightly larger or smaller clusters. For smaller clusters (eg. similar in size to Eagles Path) the costs to develop a separate, small WWT site would be somewhat higher due to certain minimum fixed costs being spread among a much smaller number of customers.

It was also necessary to devise a means of comparing the costs of wastewater treatment and collection system options requiring centralized primary settling tanks at the WWT site, to combinations of options that would not (eg. Conventional sewers to Lagoons or STEG/STEG collection). Therefore, cost estimates for large central primary settling tanks at the WWT site were prepared and are summarized under Option 5 in Table ES 4.

Table ES 4: Results of CEA for WWT and LBED System Options.

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Time Value of Money and Other Data	
Real Rate of Return or Real Discount rate (%)	3.00%
Inflation rate (%)	2.30%
Nominal Discount Rate (%)	5.37%
Life Cycle Planning/Amortization Period (PAP) (years)	20
Rate Planning Period (years)	5
% of Eligible Phase I Capital Costs Covered by Grants (%)	66.6%
Inflation Rate for Maintenance Costs (%)	3.00%

Summary of Life Cycle Cost Analysis & Preliminary Rate Comparison
Wastewater Treatment and Dispersal Systems

Central System for Stanhope Peninsula (SP), Golf Course (GC) Subareas

Peak Daily Domestic Design Flow: 564,028 Lpd (not including Infiltration & Inflow)
Systems Designed for: 614 Equivalent Dwelling Units (EDUs)

Option No.	1	2	3	4	5[2]
WWT and Dispersal System Option Description:	Textile PBF or RBC + Secondary LBED	Facultative Lagoon + Secondary LBED	Aerated Lagoon + Secondary LBED	PeatLand System	Central Primary Treatment Tanks
Capital Cost (not including land)	$5,998,610	$7,819,381	$6,252,486	$6,728,078	$1,268,077
Land Cost (Non-eligible for grants)	$284,810	$545,974	$347,928	$179,392	$0
Total Capital Cost	$6,283,420	$8,365,354	$6,600,414	$6,907,471	$1,268,077
Total Capital Cost per EDU:	**$10,227**	**$13,615**	**$10,743**	**$11,242**	**$2,064**
Value of Land @ End of PAP (appreciates at 3%)	$514,399	$986,089	$628,396	$324,003	$0
Present Value of Land	$180,735	$346,465	$220,788	$113,839	$0
Annual Operations & Maintenance Cost[1]	$153,463	$110,221	$98,399	$52,287	$21,504
Major Equip. Replace/Repair – Equiv. Annual Cost	$16,645	$81,247	$32,756	$11,585	$0
Expected System Life (years)	40 (PBF)/30 (SL)	50 (LG)/30 (SL)	50 (LG)/30 (SL)	30	40
Total Present Value (PV):	$3,776,463	$4,091,554	$3,057,983	$2,472,638	$532,472
Total PV per EDU:	**$6,146**	**$6,659**	**$4,977**	**$4,024**	**$867**
Total PV for Preliminary Rate Calculation (PRC) Purposes:	$2,984,545	$3,657,675	$2,882,657	$2,665,174	$521,094
Total Annualized Cost (AC) for PRC Purposes:	$351,860	$378,040	$305,815	$256,527	$57,821
Projected Annual WWT Portion of Rate per EDU:	**$493**	**$530**	**$428**	**$359**	**$81**

(1) Administrative costs are not included in the above operations and maintenance costs as they were carried in the collection system rates.
(2) Central primary treatment tanks would be located at the WWT site if primary treatment is required and a conventional gravity sewer was being used.

Based on the results in Table ES 4, the PeatLand system (Option 4) was found to be the most cost effective WWT/LBED option with a present value of $4,024 per EDU and an estimated annual rate of $359. This was followed by Option 3 Aerated Lagoon, with a present value which was only 19% higher and a rate 16% higher than the PeatLand Option.

The Facultative lagoon (Option 2) was the least cost effective (most expensive) option with a present value of $6,659 per EDU.

The costs in Table ES 4 only represent the wastewater treatment and land-based effluent dispersal portion for cluster systems. The costs for the collection system portion must be added to these figures to get an estimate of the approximate total annual present value for a particular wastewater management option or to estimate the total rate a customer would pay.

CEA for Individual On-site Sewage System Options

A cost effectiveness analysis was carried out for three main on-site sewage treatment and

dispersal system options described in this report. These options are:

1. Conventional in-ground septic systems
2. Above-ground (raised bed) dispersal fields; or
3. Advanced (I/A) treatment systems.

These results of the CEA are presented in Table ES 5

Table ES 5: Life Cycle Analysis and Annualized Costs for On-site Sewage Systems.

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Do not need for needs assessment

Time Value of Money and Other Data	
Real Rate of Return or Real Discount rate (%)	3.00%
Inflation rate (%)	2.30%
Nominal Discount Rate (%)	5.37%
Life Cycle Planning/Amortization Period (PAP) (years)	20
Rate Planning Period (years)	5
% of Eligible Capital Costs Covered by Grants (%)	0.0%
Inflation Rate for Maintenance Costs (%)	3.00%

Summary of Life Cycle Cost Analysis & Theoretical "Rate" Comparison
Individual On-site Sewage Treatment and Dispersal Systems

Do O&M costs assume system is part of a SSMP? **Yes**

Peak Daily Domestic Design Flow: 918 Lpd
Systems Designed for: 1 Equivalent Dwelling Unit (EDU)

Option No.	1	2	3
Individual On-site Sewage System Option Description:	Conventional Septic System	Above Ground Dispersal Field	Advanced (I/A) Treatment System
Total Capital Cost (not including land) per EDU:	**$8,000**	**$20,000**	**$30,000**
Annual Operations & Maintenance Cost*	$53	$276	$651
Major Equip. Replace/Repair – Equiv. Annual Cost	$0	$49	$85
Expected System Life (years)	30	30	30
Total Present Value (NPV):	$7,873	$22,501	$37,550
Total PV per EDU:	**$7,873**	**$22,501**	**$37,550**
Total PV for Preliminary Rate Calculation (PRC) Purposes:	$8,238	$21,250	$32,951
Total Annualized Cost (AC) for PRC Purposes:	$718	$1,947	$3,172
Projected Annual Theoretical "Rate" per EDU:	**$718**	**$1,947**	**$3,172**

**Administrative costs associated with a Septic System Management Program are included in the above operations and maintenance costs.*

As might be expected, the total present value and total annualized cost of a conventional septic system is much less than an above-ground dispersal field or an advanced (I/A) treatment system.

Overall Wastewater CEA Results

In order to determine the most cost effective method of wastewater management, the least cost, cluster off-site servicing solutions were compared to the "connect to a theoretical Stanhope Peninsula sewer utility (SPSU)" option.

The results of this comparison is presented in Table ES 6 which should also be compared to the on-site servicing costs in Table ES 5. All costs in the table are expressed on a "per EDU" basis.

Table ES 6: CEA Results of Various Off-site Wastewater Management Options

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Comparison of Per EDU Costs for Various Wastewater Management Options

SERVICED AREA	PeatLand with STEP Sewer	Aerated Lagoon Conv. Gravity	Aerated Lagoon STEP Sewer
STANHOPE PENINSULA/GOLF COURSE CENTRAL SYSTEM:			
Total Number of EDUs:	714	714	714
Total Capital Costs per EDU:	$32,168	$28,624	$31,669
Total Present Value (PV) per EDU[1]:	$7,514	$9,189	$8,467
Projected Annual Sewer Rate per EDU:	$886	$1,069	$955
STANHOPE PENINSULA/GOLF COURSE PLUS EAGLES PATH CENTRAL SYSTEM:			
Total Number of EDUs:	791	791	791
Total Capital Costs per EDU:	$32,413	$29,069	$31,914
Total Present Value (PV) per EDU[1]:	$7,555	$9,297	$8,508
Projected Annual Sewer Rate per EDU:	$892	$1,083	$961
SEPARATE EAGLE'S PATH CLUSTER SYSTEM:			
Total Number of EDUs:	791	791	791
Total Capital Costs per EDU:	$31,046	$27,766	$30,609
Total Present Value (PV) per EDU:	$7,074	$8,696	$7,908
Projected Annual Sewer Rate per EDU:	$898	$1,088	$967

EDU = Equivalent Dwelling Unit
(1) Assumes 66% of eligible capital costs for off-site options are covered by grants and on-site systems receive no grants.

It can be noted that connecting Eagles Path to the SP central sewer system is essentially the same cost (present value, rates) as constructing a separate cluster WWT system. Given the assumptions which had to be made in preparing these cost estimates, these rates are considered sufficiently similar that we cannot conclude which servicing approach is clearly more cost effective at the present time. Further analysis would be needed at the time of detailed design to determine the most cost effective option.

Of the cluster system combinations considered, the PeatLand system with STEP sewers was more cost effective than conventional gravity sewers or STEP to an aerated lagoon. However, the costs are within 20% of each other. Therefore, further analysis would be needed at the time of detailed design to confirm the most cost effective cluster option.

CEA of Water Servicing Summary

The water quality problems that have been prevalent within the Stanhope Peninsula have been known for some time. The Community of North Shore commissioned CBCL Limited to study these perceived issues in 2000. This resulted in CBCL Limited publishing a report addressing the Communities concerns. The *Stanhope Point Water Study* presented an environmental overview

of the peninsula, its land use, growth characteristics, annual precipitation considerations, and an estimated capital cost for a central water system and its associated operating costs.

This report was later extended and updated by CBCL Limited in 2007. The primary objective of this second report was to address the costs involved with providing a central water system solution for the residents of Stanhope Peninsula.

The 2007 report produced by CBCL Limited suggests that the total capital cost to the Community of North Shore to cover their third of the funding for a central water system for the SP would be $1,511,500. The report proposes to retire this debt by charging an approximate $65 per meter frontage charge. The operating cost for the system would be covered by an annual $120 water rate fee.

If the community indicated that this one time capital contribution of approximately $2000 (based on a 30 m frontage) was too significant a financial burden on its residents, then the debt could be retired with a higher annual sewer rate. The residents would have to cover their own central water system hook up and well decommissioning costs which could be approximately $1500 regardless of which debt retirement option was selected. The lump sum costs of connecting to a central water system would appear to be cost prohibitive to some residents. Alternatively, in lieu of a frontage charge, the annual rate could be increased from approximately $120 to $420 per year per EDU in addition to the approximate $1500 hook up cost.

One key finding of the water needs assessment completed by TAE was that the central supply well location proposed in the CBCL Limited 2007 report is not considered the most appropriate site (refer to Volume III, Section 4.1). Local well drillers have indicated that there has been high dissolved iron concentrations (hard water) and there are elevated nitrate concentrations in this area. A more appropriate site is recommended which is located some 2,600 m to the East at the end of Beaver Run Road.

This additional capital cost to have the water supply site at this alternative location would be approximately $485,000, a third of which the community would be responsible for financing. This added cost would increase the annual rate by approximately $30.

A cost effectiveness analysis was carried out for the two on-site water options.. These options were:

a) New, deeper wells
b) Residential water treatment for nitrate or bacteria

The first option to consider the cost of digging deeper wells was determined from consultation with local well drillers. The lump sum price of $3500 was assumed based on a 5” well, dug to 100 ft. at $31/ft. A $300 decommissioning fee for the old well was included and $100 for labour to rework the pumps. Operation and maintenance costs of $73 per year were assumed based on $23 for electricity to run the well pump and $50 per year for water testing.

The cost effectiveness of a water treatment system for nitrate was also determined. A unit cost of $750 was assumed for a Reverse Osmosis (RO) system based on consultations with a supplier.

An operation and maintenance value was assumed to be $153 per year, this included the necessary filter and membrane replacements, annual water testing and well pump power costs.

It should also be borne in mind that no serious unresolved water needs were identified in the Community. Therefore, compared to the cost of off-site servicing of an entire subarea, individual well upgrades and treatment systems would be a much less expensive means of solving a small number of widely distributed water quality problems.

RECOMMENDATIONS FOR WATER AND WASTEWATER SERVICING

Recommendations for Wastewater Servicing

Taking into consideration the results of the needs assessment, technical, regulatory and economic analysis of servicing options, our recommendations for wastewater servicing for the Community are presented in Table ES 7.

Table ES 7: Summary Of Recommended Wastewater Management Option By Subarea

Subarea	Relative Level of Need	Recommended Wastewater Management Option(s)	Comments
Stanhope Peninsula	Very High	Maintain on-site servicing for the short term. Plan for off-site servicing for the long term.	Implementing a SSMP would extend the lifespan of on-site systems until off-site servicing can be provided. Implement monitoring strategies.
Golf Course	High	Maintain on-site servicing for the short term. Plan for off-site servicing for the long term	Implementing a SSMP would extend the lifespan of on-site systems until off-site servicing can be provided. Implement monitoring strategies.
Eagle's Path	High	Maintain on-site servicing for the short term. Plan for off-site servicing for the long term	Implementing a SSMP would extend the lifespan of on-site systems until off-site servicing can be provided. Implement monitoring strategies.
Covehead Road	High to Moderate	Maintain on-site servicing for the short term. Plan for off-site servicing for the long term.	Implementing a SSMP would extend the lifespan of on-site systems and avoid the need for future off-site servicing. Implement monitoring strategies.
Eastern Road, Union Road, Community Center, Bell's Creek, Auld's Creek, Settler's Road	Moderate to very low	Maintain on-site servicing.	Implementing a SSMP would extend the lifespan of on-site systems and avoid the need for future off-site servicing. Implement monitoring strategies.

Recommendations for Water Servicing

It is noted that one of the key factors in determining long term risk to groundwater is the presence of closely spaced septic systems, or homes constructed down gradient of one another. By providing off-site sewer servicing for a subarea the source of actual or potential bacterial well contamination is effectively eliminated, which may eliminate the need for an off-site central water supply for some subareas.

Therefore, our recommendations for water servicing (as presented in Table ES 8) assume that the preceding recommendations for long term wastewater servicing will be implemented. We have also taken into account the results of the water needs assessment, technical, regulatory and economic analysis of water servicing options.

Table ES 8: Summary Of Recommended Water Supply Management Options By Subarea.

Subarea	Relative Level of Need	Recommended Water Supply Option(s)	Comments
Coastal Zone 1: Stanhope Peninsula	Medium to high	In the longer-term, a central water supply may be warranted for the peninsula (particularly the outer 200 metre rim). Area A (in Figure 11, Vol III) might be considered.	In the shorter-term for the Stanhope Peninsula, local groundwater supply problems could be resolved by: (a) drilling new wells, (b) connecting to neighbouring unaffected wells, (c)water treatment, and/or (d) trucking of water for on-site storage.
Coastal Zone 2: South and East of North Shore and Covehead Bays	Low to Medium	Maintain on-site wells. An alternate central water supply might eventually be sought for Eagle's Path, Area B (in Figure 11, Vol III) might be considered.	If local problems develop, deepen wells and/or provide water treatment.
Agricultural Zone 1: Outside the Winter River Watershed	Low	Maintain on-site wells. If local problems develop, deepen wells and/or provide water treatment.	Due to potentially high nitrate concentrations in this area, it may be advisable to drill test wells to confirm water quality before developing new lots.
Agricultural Zone 2: Within the Winter River Watershed	Low	Maintain on-site wells. If local problems develop, deepen wells and/or provide water treatment.	Further domestic well development in the Winter River basin may also be restricted.

MAXIMIZING LIFE EXPECTANCY OF ON-SITE SEPTIC SYSTEMS AND WELLS

Numerous options to maximize the life expectancy of on-site septic systems and wells are discussed in Section 6 of Volume IV. The various options can also be useful in helping the community work towards standardizing older systems, ensuring all systems are working well and

protecting water quality.

MANAGEMENT PROGRAMS

Septic System Management Program (SSMP)

In general, the resident survey showed that the on-site sewage systems which are in use throughout the Community are almost exclusively simple, conventional gravity septic systems. There would not be much rationale for a high level SSMP to ensure maintenance is being carried out on mechanically complex systems, since few to none of these systems presently exist within the Community. However, it should be anticipated that as existing septic systems fail and require replacement, an increasing percentage will likely require above-ground dispersal fields with pumps or advanced treatment systems.

The results of the resident survey indicated that basic maintenance such as septic tank pumping, is being carried out on a regular basis by most residents of North Shore. 56% of survey respondents had their tanks pumped in the past three years. A SSMP can help to identify the location of failing septic systems in other areas of North Shore. Proper follow-up and enforcement as part of the program should result in timely replacement or upgrades before groundwater contamination becomes a serious problem.

In the survey, residents were also asked if they would be interested in some kind of SSMP. 81% of respondents either replied with “yes” or “maybe, need more information”.

Based on the above information, at the present time it would seem a Level 1 or 2 SSMP would meet the needs of the Community of North Shore. It is estimated that annual program fees could be in the range of $50 to $100 per home per year, depending on the level of service provided and whether the program fees included any maintenance activities such as pumping septic tanks.

Utility Models for Centralized and Cluster Systems

Two possible options open to the Community to address ownership and operation of a centralized or cluster sewer or water system are discussed in Section 9.2 .

- North Shore Municipal Utility Model
- Cooperative (Multi-Community) Utility Model

The pros and cons of each model are discussed in the report.

MONITORING PROGRAMS

Monitoring programs are designed to maximize the community's data collection while organizing it for useful applications. They are a tool that can be used to to evaluate growth rates, environmental quality and water quality/quantity within the community.

Following are recommended components of a groundwater well and septic system monitoring program.

- Maintain the databases referred to in Section 10 .
- Obtain updates on groundwater test results from the Province (nitrate, bacteria, etc.).
- Monitor water levels (and conductivity if possible) on a continuous basis at a minimum of three well locations with automated dataloggers. These locations could be checked for salt levels as well..
- Sample minimum 12 well sites annually and conduct a full suite of laboratory testing (chemistry, metals, bacteriological).
- Check all residential wells every two to four years for salt levels using a field Conductivity Meter (i.e. from which the degree of saltwater intrusion can be assessed on a routine basis);
- If home owners are not mandated to report septic malfunctions or well contaminations, residents could be surveyed /interviewed about any well (or septic) issues in conjunction with the check for salt levels;
- Consultants review data periodically to update models, identify trends and refine projections (See Section 11.3);

DEVELOPMENT TRENDS/PATTERNS

An analysis of the Community's historic trends and patterns in population growth, land use and development levels was investigated in order to determine future water and wastewater management servicing needs in the Community. We obtained records from two resources: Island Waste Management Corporation (IWMC) and North Shore Building Permit records.

The building permit database indicates a much higher rate of growth predicting that full buildout of the Stanhope Peninsula could occur in 16 to 26 years. In comparison the IWMC data predicts that full buildout might not be reached even within 50 years.

CONCLUSIONS

Wastewater Needs Assessment

- Ten separate ***subareas*** of the Community having a high density of lots with wastewater needs were designated as ***wastewater servicing subareas.*** The relative level of need for an eventual wastewater solution is ranked from low to high as indicated in the following table, assuming a *seasonal use factor* = 0.50.

Wastewater Subarea	Total # Developed Parcels	Points	Relative Level of Need
Stanhope Peninsula	370	5055	Very High.
Golf Course	58	1420	High
Eagle's Path	52	1040	High
Covehead Road	50	935	High to Moderate
Eastern Road	36	570	Moderate
Union Road	23	485	Moderate
Community Center	20	330	Low
Bell's Creek	18	235	Low
Auld's Creek	8	168	Very Low
Settler's Road	4	83	Very Low

- Of 1281 properties assessed, 36% are considered viable with the existing or a future conventional septic system.

- Of the 792 developed properties, 67.5% have wastewater needs. 22% of homes could be sustainable with on-site systems requiring either an above-ground dispersal field (6%) or an advanced (I/A) treatment system (16%). The remaining 45.5% of homes (363) will require an eventual off-site solution.

- Stanhope Peninsula has a high point value and therefore, **very high level of need for an eventual wastewater solution**. There does not appear to be a large number of unresolved wastewater needs which is likely due to the relatively low number of properties used year-round. Therefore an immediate wastewater solution for this subarea is not required.

- Golf Course Subarea is considered to have a **high level of need for an eventual wastewater solution**. There are no unresolved wastewater needs, therefore, an immediate wastewater solution for this subarea is not required. Costing of sewer service to the subarea was carried out in conjunction with the Stanhope Peninsula due to its small size in proportion to and its close proximity to the Stanhope Peninsula.

- It was determined that 98% of the lots in Eagle's Path Subarea will eventually need some type of off-site sewage system, primarily due to a lack of space which is exacerbated by coastal buffers. Yet an immediate solution is not necessary likely due to the relatively low number of properties used year-round.

- The remaining subareas had a level of wastewater needs which ranged from moderate to high to very low. On-site sewage servicing for these subareas should be sustainable well into the future and should be considered secondary to the three preceding subareas discussed.

- A sensitivity analysis was carried out to determine the effects of applying a seasonal factor of 0.5 to cottages. Stanhope Peninsula and Eagle's Path are most affected by a lower weight for seasonal cottages likely due to the large percentage of seasonal properties in these subareas. Nevertheless, the absolute and the relative level of need did not change enough to affect the final results for the level of need.

- Although the 1988 Soil Survey showed soils on the Stanhope Peninsula to be primarily Category II soils, the septic system permit database and interviews with septic installers indicated the Stanhope Peninsula is predominantly Category I soils. A sensitivity analysis carried out showed that the level of need is not highly sensitive to the soil category type. The Stanhope Peninsula has a "very high" relative level of need, regardless of the soil category, particularly if the seasonal properties are weighted at half that of the year-round properties.

Water Needs Assessment

- Four separate ***subareas*** of the Community were designated as ***water servicing subareas.*** The relative level of need for a solution is ranked from low to high as indicated in the following table.

Water Subarea	**Relative Level of Need**
Coastal Zone 1 - Stanhope Peninsula	Medium to High
Coastal Zone 2 – South and East of Brackley and Covehead Bays	Low to Medium
Agricultural Zone 3 – Outside the Winter River watershed	Low
Agricultural Zone 4 – Inside the Winter River watershed	Low

- Groundwater quality in North Shore is generally very good. In the shorter-term, groundwater supply problems could be resolved by: (a) drilling new wells, (b) connecting to neighbouring unaffected wells, (c) water treatment, and/or (d) trucking of water for onsite storage.

- No serious unresolved water needs were identified in the Community. Therefore, compared to the cost of off-site servicing of an entire subarea, individual well upgrades and treatment systems would be a much less expensive means of solving a small number of widely distributed water quality problems.

- Of the four subareas, Coastal Zone 1 - Stanhope Peninsula is likely to require water servicing in the longer term due to increases in nitrate levels and salt water intrusion.

- In the longer-term, the existing central water supply will need to be maintained for MacMillan point. Homes from the Eagle's Path area are not eligible to be connected to this supply in future, therefore if water supply becomes necessary for these homes a cluster well could be located in Area B as shown in Volume III, Appendix A.

- Coastal Zone 2 - South and East of Brackley and Covehead Bays may require water servicing in the longer term. Deepening of the wells and casings, and/or adding water treatment for those affected domestic wells may provide a solution to water quality issues.

- The remainder of Coastal Zone 2 and the other two subareas have a low level of water needs. Therefore, continue to service these subareas with individual wells.

- The prior recommended location for a central well to supply the Stanhope Peninsula (ie. Near the south end of Stanhope Lane, as recommended by CBCL in 2007) is not appropriate due to two issues (refer to Section 4.1, Volume III) found during the water needs assessment. An alternative location (Area A, Figure 11, Volume III) is suggested for consideration.

Options and Solutions

- The PEIDEEF has indicated that it would be very difficult to obtain regulatory approval for a new direct continuous discharge. A land based effluent dispersal (LBED) system is the preferred option for effluent management.

- Our preliminary analysis suggests that given the high year-round flow component from the Stanhope Peninsula, re-use of treated effluent for golf course irrigation would not be a preferred wastewater management option due to the cost of the ponds and the cost to increase the size of the LBED system to accommodate precipitation captured by the ponds.

- Concerns raised previously by Mr. Somers (PEIDEEF) regarding "large scale" or centralized, land based effluent dispersal systems versus numerous individual LBED (ie. septic) systems were addressed by TAE. Based on TAE's preliminary investigation into these issues, they found that the size of the disposal area is much less important than the degree of treatment achieved. TAE concluded that if the small-scale systems are not causing significant groundwater contamination, they would not expect a centralized cluster system servicing an equivalent number of EDUs to be problematic, particularly if the degree of treatment is greater.

- It has been also been suggested by PEIDEEF that biofouling or cementation of void spaces within the bedrock aquifer may result from the continued operation of a cluster or central LBED systems. TAE state that although this is a possibility, they would intuitively expect the performance of the dispersal system to suffer long before one would observe

any significant change in the aquifer properties.

- Five technically feasible wastewater treatment (WWT) and land based effluent dispersal (LBED) options were identified as possible cluster solutions meeting the criteria of the community. Of these, the PeatLand system *plus mantle* requires the least amount of land, while the Facultative Lagoon plus mantle or wetland requires almost four times as much land.

- Although it would appear that North Shore has an abundance of available land for a potential WWTS for the Peninsula, this is not the case. A difficulty arose when trying to find a suitable parcel with adequate size (clear of buffers and wetlands) and suitable soils.

- A potential location for a central WWTS to accommodate the Stanhope Peninsula was identified by CBCL in 2007 near the north end of Stanhope Lane in the vicinity of an existing Parks Canada septic dispersal field. This Crown Land site is not considered to be feasible. due to a lack of space to accommodate the large LBED system which would be required, and due to a significant portion of this parcel consisting of wetlands. Potential alternative locations were identified (WWT sites 2 and 3, Maps 1 and 2, Volume IV).

- PeatLand WWT system with STEP sewers were found to be the most cost effective, technically feasible, off-site servicing approach to addressing wastewater needs in the Community.

- Connecting Eagles Path to the SP central sewer system (via a Covehead Bay crossing) is essentially the same cost (present value, rates) as constructing a separate cluster WWT system. Given the assumptions which had to be made in preparing these cost estimates, these rates are considered sufficiently similar that we cannot conclude which servicing approach is clearly more cost effective at the present time. Further analysis would be needed at the time of detailed design to determine the most cost effective option.

- By providing off-site sewer servicing for a subarea, a source of actual or potential bacterial well contamination is effectively eliminated. This may eliminate the need for an off-site central water supply in some cases. Therefore, assuming no budget or funding limitations exist, or that salt water intrusion is not an issue, central sewer servicing of subareas should generally take priority over central water servicing.

- Estimated rates for wastewater servicing would be higher than other sewer rates on PEI. Based on the USEPA *Municipal Preliminary Screener*, rates would be expected to cause mid-range economic impacts on households.

- Maintenance, performance and longevity of on-site sewage systems where they will be maintained could be improved through the implementation of a Septic System Management Program (SSMP). Given the initial feedback received from residents during the survey, a model program level 1 or 2 may be most easily accepted by residents.

- At a minimum, the *life expectancy* of existing septic systems can be increased through regulation that requires retro-fitting the septic tank with outlet filters and risers. At a

minimum, the *life expectancy* of new septic systems can be increased through regulation that requires the installation of outlet filters and larger disposal fields.

- The following septic system enhancements are considered essential to facilitate the regular inspections, monitoring and maintenance requirements associated with a SSMP and to protect groundwater resources and environmental quality:
  - ✔ septic tank access risers
  - ✔ septic tank outlet filters
  - ✔ septic tank water tight testing
  - ✔ disposal field inspection ports

- The theoretical value of an ULF toilet replacement was calculated as $98 per toilet per year to a NS Utility with a cluster sewer system. A rebate offered to residents of $49 per toilet would have a maximum one year payback for the Utility.

- In cases where it may not be practical or affordable to create a new utility with a very small number of customers, a viable alternative may be a C*ooperative Utility* whereby several communities would join forces with each other in order to realize more affordable sewer and water rates. A Cooperative Utility would allow several small rural communities to benefit from "economy of scale" by increasing their customer base and sharing certain fixed administrative costs such as administrator and operator labour, accounting fees and equipment.

- On-going monitoring and sampling of wells and septic systems will aide the community in determining threats to future water quality/quantity or community health before actual contamination of wells or septic field breakouts occur.

- Rates of residential growth cannot be predicted with certainty since various factors can impact on the real estate industry and new home construction. Monitoring of growth accompanied by well and septic system monitoring are the most effective tools in predicting when the community will reach the point where action will need to be taken to protect groundwater, the environment and public health.

- The existing rates of septic malfunction and groundwater contamination do not suggest that there presently are large numbers of urgent water and wastewater needs throughout the Community, although the Stanhope Peninsula is starting to show signs of problems.

- The challenge for the Community will be in predicting when a "tipping point" will be reached so that the need to implement water and/or wastewater solutions is understood and supported by the majority of residents.

- The time to reach this tipping point is very difficult to predict because it will be affected by several factors such as: Community growth rates, rate of conversion of seasonal cottages to year round use, the need for and cost of septic system and well upgrades, septic system maintenance practices, regulatory factors (eg. changes to sewage disposal regulations, controls or restrictions on development) among other factors. Media scrutiny and public perception of the incidence of problems may negatively impact property

values and cause increased pressure for central or cluster servicing.

- It is our professional opinion that the "tipping point" for the Stanhope Peninsula is likely to occur before the area reaches full build-out. Based on the historical building permit data it is possible the Stanhope Peninsula could reach a full build-out situation in as little as 16 years to 26 years. However, the IWMC data predicts that full buildout might not be reached even within 50 years.

RECOMMENDATIONS AND SUGGESTIONS FOR NEXT STEPS

Following are our recommendations and suggested next steps:

- Our recommendations for **wastewater** servicing for the Community are summarized in the following table.

Summary Of Recommended Wastewater Management Option By Subarea

Subarea	Relative Level of Need	Recommended Wastewater Management Option(s)	Comments
Stanhope Peninsula	Very High	Maintain on-site servicing for the short term. Plan for off-site servicing for the long term.	Implementing a SSMP would extend the lifespan of on-site systems until off-site servicing can be provided. Implement monitoring strategies.
Golf Course	High	Maintain on-site servicing for the short term. Plan for off-site servicing for the long term	Implementing a SSMP would extend the lifespan of on-site systems until off-site servicing can be provided. Implement monitoring strategies.
Eagle's Path	High	Maintain on-site servicing for the short term. Plan for off-site servicing for the long term	Implementing a SSMP would extend the lifespan of on-site systems until off-site servicing can be provided. Implement monitoring strategies.
Covehead Road	High to Moderate	Maintain on-site servicing for the short term. Plan for off-site servicing for the long term.	Implementing a SSMP would extend the lifespan of on-site systems and may avoid the need for future off-site servicing. Implement monitoring strategies.
Eastern Road, Union Road, Community Center, Bell's Creek, Auld's Creek, Settler's Road	Moderate to very low	Maintain on-site servicing.	Implementing a SSMP would extend the lifespan of on-site systems and may avoid the need for future off-site servicing. Implement monitoring strategies.

- Our recommendations for **water** servicing for the Community are summarized in the following table.

Summary Of Recommended Water Supply Options By Subarea.

Subarea	Relative Level of Need	Recommended Water Supply Option(s)	Comments
Coastal Zone 1: Stanhope Peninsula	Medium to high	In the longer-term, a central water supply may be warranted for the peninsula (particularly the outer 200 metre rim). Area A (in Figure 11, Vol III) might be considered.	In the shorter-term for the Stanhope Peninsula, local groundwater supply problems could be resolved by: (a) drilling new wells, (b) connecting to neighbouring unaffected wells, (c)water treatment, and/or (d) trucking of water for on-site storage.
Coastal Zone 2: South and East of North Shore and Covehead Bays	Low to Medium	Maintain on-site wells. An alternate central water supply might eventually be sought for Eagle's Path, Area B (in Figure 11, Vol III) might be considered.	If local problems develop, deepen wells and/or provide water treatment.
Agricultural Zone 1: Outside the Winter River Watershed	Low	Maintain on-site wells. If local problems develop, deepen wells and/or provide water treatment.	Due to potentially high nitrate concentrations in this area, it may be advisable to drill test wells to confirm water quality before developing new lots.
Agricultural Zone 2: Within the Winter River Watershed	Low	Maintain on-site wells. If local problems develop, deepen wells and/or provide water treatment.	Further domestic well development in the Winter River basin may also be restricted.

- Present the results of this study (and the results of any post study consultations) to residents at a public meeting. It should be explained that capital costs and rates contained in the study are preliminary estimates for long term community planning purposes only. Cost estimates and rates will have to be re-examined in future, if and when the need for an infrastructure project becomes apparent.

- Monitor growth rates through the the ongoing compilation and analysis of detailed building permit records (including follow-up to determine if construction was actually completed). Monitor growth rates and and seasonal cottage *conversion* rates through periodic acquisition and review of the IWMC database. Use this data to refine predictions on Community growth rates, water and wastewater planning and the required capacity of a future WWT site.

- For present planning purposes, try to secure enough land (of suitable quality) for a future WWT site to accommodate the full build-out scenario for the aerated lagoon plus LBED option.

- Confirm the location for a central well site for the Stanhope Peninsula and consider implementing well field protection measures to safeguard groundwater quality for the future.

- Through consultation with residents, develop water and wastewater monitoring strategies and an implementation plan for the Community based on the results of this study.

- In consultation with North Shore residents and PEIDEEF, develop a water and wastewater management strategy and implementation plan for the Stanhope Peninsula, Golf Course and Eagles Path subareas, based on the results of this study,

- Decide whether or not to proceed with a Septic System Management Program and which level model (Level 1 or 2 should be adequate) to implement.

- Determine which septic system enhancements will be adopted, if any, and develop appropriate specifications to ensure these new standards are fair and enforceable.

- Decide whether or not to proceed with a municipal water efficiency program and identify which program activities (eg. ULF toilet or waterless urinal replacements, low flow showerheads, water meters, xeriscaping) would best suit the water conservation objectives of the community.