Local Case Studies

Conquerall Bank, Lunenburg County, a small community about 5km outside the Town of Bridgewater, is experiencing failure of on-site systems. With the cost of providing traditional sewage collection and treatment being prohibitively expensive, the municipality undertook a study to explore alternatives. Pierre Breau, Director of Engineering, Municipality of the District of Lunenburg, and Willard D'Eon, CBCL, presented the findings of that study.

There was no formal presentation available to address this topic. Instead, Pierre Breau has provided the following information. Those seeking additional details should contact either Pierre Breau or Willard D'Eon.

Background and Project Description

This project is a feasibility study and pilot project regarding the installation of cost-effective on-site wastewater treatment systems for small rural subdivisions. The Conquerall Bank/Pleasantville area south of Bridgewater, Nova Scotia is the location for the study. This area borders the LaHave River, a major Nova Scotia watercourse that historically has provided an important shellfish industry, and today has high use in recreational boating and fishing. Development along the river, particularly around the major town, Bridgewater (approx. pop. 1996, 7,950), has increased the pollutant load on the LaHave River, primarily due to the lack of properly designed and operating on-site wastewater treatment systems (Nova Scotia Department of Health, 1991). A new wastewater treatment plant was put into operation for the Town of Bridgewater in 1991, and has alleviated some of the loading on the LaHave, but downstream pollutant discharges from small communities continue to have a negative effect, and shellfish cultivation and recreational swimming is restricted to the mouth of the LaHave near the LaHave Islands. The water quality problems encountered in the LaHave River are not unique in Atlantic Canada. The Federal government has identified the lack of wastewater treatment facilities for coastal Atlantic communities as a serious public health concern, as well as an impediment for future economic growth (Environment Canada, 1999).

In an effort to pinpoint discharge sources and develop treatment options, malfunctioning individual on-site wastewater treatment systems in this area were extensively surveyed in 1993 (Porter Dillon, 1993). The resulting report recommended that connection of homes in the Conquerall Bank area (approx. pop. 1996, 950) with malfunctioning systems be made to a proposed 5 kilometre long central collection and pumping system with disposal to the Town of Bridgewater wastewater treatment plant. This proposal was defeated in a 1995 plebiscite due to residents' concerns about one-time frontage charges, and on-going area rate costs. The Porter Dillon study provided only limited analysis regarding use of on-site cluster systems.

The Conquerall Bank/Pleasantville area consists primarily of clusters of single-family residences of varying age (new construction to pre-1900) located on small lots with highly variable permeable soil characteristics. With the exception of a 24 home subdivision on Riverside Drive, none of these residences are served by a central wastewater treatment system. The central system for the Riverside subdivision is at capacity, and no additional flows can be handled by the existing rotating biological contactor package plant system without expansion. Conventional on-site contour and mound systems for many individual homes in the study area either require greater land than exists in the lot confines or are often expensive to build ($10,000 - $15,000+).

This study will closely examine what options there are for small clusters of homes along the LaHave River generally, and in the study area in particular, with regard to on-site wastewater treatment "cluster" systems. The study will consist of three Phases: 1. location and system evaluation and selection, based on projected life cycle benefit-cost analysis; 2. installation of selected pilot system; 3. monitoring of effluent quality, and on-going costs. The study will be four years in length, with Phase 1 occurring in 2001, Phase 2 occurring in 2002, and Phase 3 occurring in 2003 – 2004. Costs for the study are as follows:

Phase 1, 2001 – 2002 –	
Sewage System Location, Evaluation & Selection	$ 39,000 total
	$ 19,500 FCM grant
	$ 19,500 Municipality
Phase 2, 2002 – 2003 –	
Installation of Selected Pilot System	$ 80,425 total
	$ 40,213 FCM grant
	$ 40,213 Municipality
Phase 3, 2002 – 2005 –	
Monitoring of Effluent Quality	$ 3,600 total
	$ 1,800 FCM
	$ 1,800 Municipality
All Phases	$ 123,025 total
	$ 61,513 FCM
	$ 61,513 Municipality

The number of homes in the selected cluster will likely be in the range of 6 – 8. The collection system could consist of a combination of gravity mains and pressure mains optimized to reduce excavation costs and pumping costs. The treatment system could be located on communal/public land adjacent the clustered homes that possesses superior soils for a soil absorption wastewater treatment system, or otherwise possesses superior topological characteristics for absorption/release of treated effluent. Treatment system technologies to be considered in the Phase 1 evaluation could include: contour and mound systems, re-circulating sand filter systems, biofilter systems including peat filters, and artificial wetland systems. Important consideration in the evaluation and selection of a candidate pilot system would be the installation of low-flow water devices in the homes to be connected to the candidate pilot system, and installation of water metres to the homes' potable water supply wells.

Installation and on-going operation of the cluster collection and treatment system would be through the Municipality, and legal agreements regarding land use/development among the cluster lot owners would be negotiated through the Municipality.

This study is unique in Nova Scotia, and its findings of relevance to the entire Atlantic region. The implementation of this study, and dissemination of its findings, is consistent with Federal and Provincial environmental and rural economic policies. It is expected that this study will provide valuable information on the performance of cost-effective wastewater treatment systems for very small communities/rural subdivisions, and will influence how public agency planners and engineers regulate future rural land usage in Nova Scotia and Atlantic Canada.

Fact Sheet

1. Project is for a demonstration sewage treatment plant to serve a small number of residences along Shore Drive, a public road along the LaHave River.

2. The exact number of homes will vary depending on final confirmation of participating homeowners, but is not expected to exceed 10.

3. Preliminary layout of connected homes, and possible treatment plant location is per sketch attached. The preliminary design is based on STEP – Septic Tank Effluent Pumping. The final design will be completed by a consulting engineering firm that is to be selected in mid-September. Based on the preliminary design, each residence will be provided with a septic tank from which sewage is pumped to the nearby small treatment plant. Piping will generally consist of small diameter, low-pressure, underground plastic conduit. Where possible, gravity flow (ie. non- pressurized) pipe will be used.

4. Project budget is set at $208,000. $61,512 will be funded by the Federation of Canadian Municipalities, $70,000 from the province of Nova Scotia, and the balance funded by the Municipality and residents (residents = $5,000).

5. One-time connection charges of $500 are proposed for the residences to be served by the study's pilot plant.

6. Dependent on demand, expansion of the plant to serve additional residences in the area beyond the first group is possible. Connection charges for homes beyond the first group would likely be considerably more expensive, ($7,000 per connection, plus) unless extra-agency infrastructure grants were received.

7. Annual operating costs are estimated to be approximately $250 per connection for the first few years of operation. The Municipality will own and operate the system. The piping located on service easements and rights-of-way, and the treatment plant, will be owned by the Municipality. Residents will own the septic tanks, pumps and piping installed on their property, but as part of the Municipal service, the Municipality will provide regular inspection and pump out of the residents' septic tanks.

8. Water meters will be installed at the connected homes' wellheads/supply piping as part of the pilot project. This will help engineers in selecting the proper capacity for the treatment plant.

9. Annual rates for the operation of the system can be charged to individual home owners via a number of methods:

    a. annual cost divided by assessment value of connected homes. The resulting area rate would be applied to each property value (per $100 of assessment). Each connected home owner would pay based on their property assessment.

    b. annual cost divided by number of connected homes. Each connected home owner would pay an equal, flat rate.

    c. annual cost divided by total water consumption as measured by installed water meters. The resulting rate per litre would be applied to the estimated period

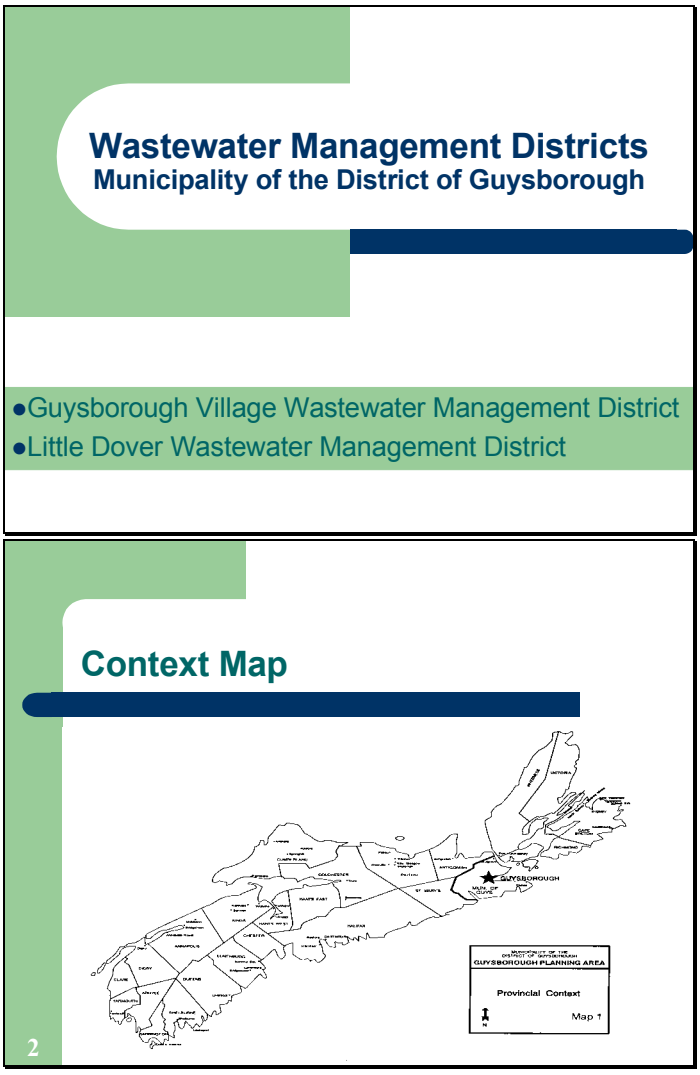
consumption of water by each household, and the owner would pay accordingly. The period of measure would likely be semi-annual per our current property tax billing practice.

10. How do I join?

Under the Municipal Government Act, a municipality does not have to have a petition to establish an area rate. Council does use a petition for street improvements, under its Street Improvement By-law, that requires a 75% majority. In lieu of a formal policy, Council has generally used majority petitions for setting area rates.

It is suggested that for this pilot program, connections be made to the pilot plant only for those residents that indicate such by signing a written confirmation. Such written notice will be sent to residents for confirmation once the final design is complete.

The Municipality of the District of Guysborough now has two wastewater management districts, the last being for Little Dover which will be the first community in N.S. to use a small diameter sewer approach to resolve its on-site problems. Gary Cleary, Director of Planning and Development, Municipality of the District of Guysborough, related his experience with wastewater management districts, focusing on the management aspects.

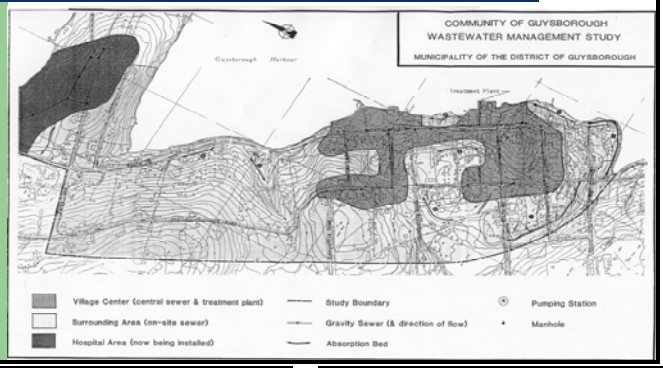


Guysborough Wastewater Management District

- Guysborough Village (Community) is situated on the western shore of Guysborough Harbour at the head of Chedabucto Bay, (a beautiful inlet of the Atlantic Ocean) near the east end of the province approximately 60 Km east from the Town of Antigonish (context map attached).
- Guysborough is the shiretown (seat of Government/service area) for the Municipality of Guysborough and has approximately 2-3 Km of shoreline and many small brooks.

3

Guysborough Wastewater Management District Map



4

Guysborough Wastewater Management District Background

- In 1986, Guysborough Municipal Council recognized that there was a very serious environmental problem related to sewage in the village (community) of Guysborough.
- Porter Dillon Consultants Ltd. were employed to carry out a Wastewater Management Study in Guysborough.

5

Guysborough Wastewater Management District Background Page 2

- This study was completed in October, 1986 and concluded that approximately 90 percent of the buildings (homes & businesses) had inadequate sewer systems.
- Problems identified in the study included sewage: surfacing on private lots, draining to ditches on public streets, draining to brooks and streams, draining to shoreline and a high level of contamination of dug wells.

6

Guysborough Wastewater Management District

Background Page 3

- Porter Dillon Ltd. Identified the area that had to be cleaned up in order to allow the dug wells, brooks, water table and shorelines to have sewage infiltration removed and allow them to be used without threat to health or environment.

7

Design of Infrastructure

- The area identified as having serious sewage problems is spread out over a 2 Km length with approximately 4 Km of roads to be serviced within the defined area.
- The amount of funds available to clean up the area would not possibly allow control sewage collection and treatment to be provided to all properties within the defined area. Therefore it was necessary for Porter Dillon to find another approach for the clean up of this large area.

8

Design of Infrastructure

Page 2

- The area was divided into three sections for sewer service identified as the Village Center (East end), Hospital Area (West end), and area surrounding Village Center.
- The decision was made that the Village Center and Hospital Area could be primarily serviced with central sewer but surrounding area would have to be serviced with on-site systems (including cluster systems) in order to allow the entire area to be cleaned up.

9

Design of Infrastructure

Page 3

- In order for the wells, brooks, and shoreline to be environmentally reinstated from sewage contamination, it was determined that it would have to be a Community effort with all properties within the defined area being addressed.
- Problems that had to be overcome were: access to private properties, different levels of service within the area, costs to residents, etc.

10

Design of Infrastructure

Page 4

- In order to address many of the issues with servicing this large area, it was recommended that Council establish a Wastewater Management District.

11

Adoption of a Wastewater Management District

- In 1987, the Municipality proceeded with the first step in addressing the sewage problems by installing a sewer lagoon and central sewage collection system to service the new hospital, nursing home and Belmont Resort as well as homes in the Western end of the defined area.

12

Adoption of a Wastewater Management District Page 2

- Before proceeding any further, Council decided that it was necessary in accordance with provincial legislation to hold a Plebiscite (vote) on the provision of sewer service to the remainder of the area.
- Approximately 200 properties required sewer service to clean up the area. A public meeting was held to present the plans for sewer service to the entire area and engineer's cost estimates including costs to residents to carry out the plans and voted in favour of proceeding with the system.

13

Adoption of a Wastewater Management District Page 3

- The next step to proceed was the adoption of a Wastewater Management By-law which was approved by Council and included capital connection charges, operating charges, type of materials to be used for private land, application form for a sewer hook-up, etc.

14

Operation of the Guysborough Wastewater Management District

- Operation of Aerated Lagoon treatment & collection system commenced in 1987 servicing approximately 50 equivalent units at the Western end of the Guysborough Wastewater Management District.
- Operation of an RBC (Rotating Biological Contactor) treatment & collection system commenced in 1989 servicing 150 equivalent units toward Eastern end of the District.

15

Operation of the Guysborough Wastewater Management District 2

- Operation of on-site sewer systems in the areas not serviced by public sewer commenced in 1991. Approximately 25 on-site sewer systems were replaced or upgraded to complete the environmental clean-up of the total area designated as a Wastewater Management District.

16

Operation of the Guysborough Wastewater Management District 3

- The Municipality assumed responsibility for all sewer service in the Management District including sewer service to any new lots being developed. Based on costs and environmental constraints, the Municipality determined if lots could be connected to a central collection system or if the lot could be serviced with an appropriate on-site system.

17

Operation of the Guysborough Wastewater Management District 4

- Lots connected to central collection systems had a sewer lateral installed to the property line and the Municipality assumed responsibility for operations to the property line only, but the on-site systems which were installed on private land were operated by the Municipality with the Municipality being responsible to within 1m of the building.

18

Operation of the Guysborough Wastewater Management District 5

- On-site sewer systems were scheduled for pump out every fourth year.
- Annual operating costs were based on previous years total cost of operation and the average annual operating charge has been $125.00 per equivalent unit.
- Capital connection charge for existing buildings was $2,495.00 per unit and the charge for a new connection to the central system or a new on-site within the District is $3,500.00

19

Little Dover Wastewater Management District Background

- In 1999, based on many previous studies, the Municipality decided to proceed to address sewage contamination in Little Dover.
- In the Summer of 2000, the Municipality proceeded with a call for tenders for Final Design for a public sewer system for Little Dover. The Final Design of the System was awarded to CBCL Consultants Limited as they were the lowest tender to meet all the requirements of the Terms of Reference for the Design. The Terms of Reference had been prepared and approved by the Steering Committee of the Little Dover Sewer Projects.

20

Little Dover Wastewater Management District Background Page 2

- Also in 2000, prior to proceeding with the Final Design for the Little Dover Sewer System, the Municipality employed CBCL Consultants Limited to carry out a Sanitary Survey of the Community of Little Dover to ensure that new information on the environmental conditions in the Community was available. This Sanitary Survey indicated that up to 70% of the wells in the Community of Little Dover were contaminated and up to 65% of the lots were unsuitable for the construction of on-site sewer systems.

21

Guysborough Wastewater Management District Background Page 3

- There are approximately 150 homes in Little Dover and each home releases approximately 200 gallons of contaminated water and sewer per day.
- Approximately 30,000 gallons of contaminated water per day enters the water table within the Community (Collection system will collect all contaminated water and transport to the treatment facility).
- Based on the Many studies and reviews the Municipality decided that a Small Diameter Gravity Sewer system was the best solution for Little Dover.

22

Little Dover Wastewater Management District Background Page 4

- Based on the Many studies and reviews the Municipality decided that a Small Diameter Gravity Sewer system was the best solution for Little Dover.
- Tendered cost for Small Diameter Gravity Sewer in Little Dover was $2.8 million whereas engineering estimates for conventional sewer systems were in the range of $4 million.

23

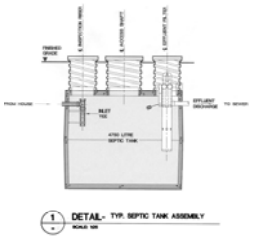
Type of System to be Installed in Little Dover

- The type of system to be installed in Little Dover is a small Diameter Gravity Sewage Collection System and a Recirculating Sand Filter Treatment System.
- A Small Diameter Gravity Sewer System Consists of….

24

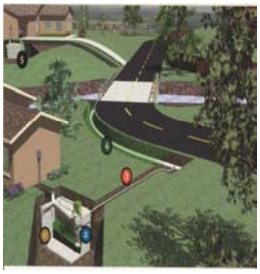
(A) A 1000 Gallon Waterproof Tank

- A filter in tank to ensure no solids escape.
- Tank will have watertight risers to surface.
- Tanks below elevation of flow line in the main, requires a pump.
- Tank system provides primary treatment which is 75% of the necessary treatment.
- Scheduled for semi-annual monitoring for thickness of solids on top of tank. Tank will only be pumped as required.



25

(B) Sewage Collection Lines



- Main line along street approx. 5 feet deep for liquids. (6 inch & 4 inch diameter pipe.)
- Whereas lines collect liquid only, clean outs are used instead of expensive man holes.
- Considered a closed system eliminating storm water problems. Pumps are water pumps only. Clean out protected by an outside manhole eliminate storm water to enter the system.
- 4 inch or 2 inch lateral extends to 1000 gallon tank on property.

26

Little Dover Wastewater Management District By-law

- Prior to commencing the installation of a Public Sewer System in Little Dover it is necessary to adopt a Wastewater Management District By-law.
- The Wastewater Management District By-law provides the necessary authority to proceed with the installation of a sewer system on both Public and Private property.

27

Little Dover Wastewater Management District By-law Page 2

- The By-law also authorizes the Municipality to collect rates from residents toward the Capital charge for the project and also rates for the operation and maintenance of the sewer system. In accordance with the By-law these rates are established by motion of Council.

28

Little Dover Wastewater Management District By-law Page 3

- The By-law also establishes a Wastewater Management District Area and in this By-law the area described extends from the Lloyd Haines property at the Northern end of the Community to the former Western Union property (now Black Duck Cove Development) at the Southern end of the Community.
- The By-law also regulates the type of pipe used and installation procedures and other matters concerning the installation and operation of the system.

29

Public Participation in Little Dover

All registered property owners were given the opportunity to advise Council if they were in favour or not in favour of a new sewer system and Wastewater Management District. A confirmation letter was forwarded to each owner and they were requested to check one of the following and sign their response.

☐ I/We are in favour of the installation of a public sewer system for Little Dover.

☐ I/We are in not favour of the installation of public sewer system for Little Dover.

30

Advantages of Wastewater Management Districts (incl. By-law)

- Identifies a specific target area with environmental problems resulting from Wastewater discharge.
- Provides Council with Authority to determine the most economical method of correcting all Wastewater problems within defined area.
- Provides access to both public and private properties to allow either on-site or central connections to be used.

31

Advantages of Wastewater Management Districts (incl. By-law)

- Allows much larger area's to be considered for clean-up.
- Allows capital and operation costs to be contributed to by larger group of property owners.
- Municipality assumes responsibility for the management of wastewater for all existing and new developments.
- Provides assurance to residents that all wastewater within the defined area is managed to ensure protective of the environment.

32

Questions & Answers

33