(3)

# HALIBURTON

# SEWAGE TREATMENT PLANT EXPANSION

# FOR THE

# MUNICIPALITY OF DYSART ET AL

MINISTRY OF THE ENVIRONMENT

PROJECT NO. 3-0706

CLASS ENVIRONMENTAL ASSESSMENT

PHASES 1 AND 2 REPORT

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APRIL, 1989

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Attention: Mr. M. Latta, P. Eng.
Supervisor, Central and Southeast Regions

Re: Municipality of Dysart et al
Haliburton Sewage Treatment Plant Expansion
MOE Project No. 3-0706
TSH Project No. 52-7897

Dear Sir:

We are pleased to submit, for your review, our Class Environmental Assessment Report on the Haliburton Sewage Treatment Plant Expansion.

This report encompasses Phases 1 and 2 of the MEA Class EA Planning and Design Process, in accordance with the Terms of Reference provided by the MOE.

During the course of preparing this report, information was received from the Ministry of the Environment, Ministry of Natural Resources, Environment Canada/ Trent Severn Waterway and staff of the Municipality of Dysart et al. This assistance is gratefully acknowledged.

Yours very truly,

R. B. Baker, P. Eng.
Vice President
Environmental Engineering Group

RBB/la
Encl.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| AC | Asbestos Cement |
| ac | Acres |
| Ave. | Average |
| BOD | 5 day Biochemical Oxygen Demand |
| Conc. | Concrete |
| D.I. | Ductile Iron |
| E.A. | Environmental Assessment |
| ERU | Equivalent Residential Units |
| ESR | Environmental Study Report |
| F.M. | Forcemain |
| ft. | Feet |
| gal | Gallons |
| gal/d | Gallons per Day |
| gpm | Gallons per Minute |
| ha | Hectares |
| HP | Horsepower |
| kVA | Kilovolt-Amperes |
| kW | Kilowatts |
| in. | Inches |
| L/s | Litres per second |
| m | Metres |
| $m^3$ | Cubic Metres |
| MEA | Municipal Engineers Association |
| mgd | Million Gallons per Day |
| mg/L | Milligrams per Litre |
| MH | Manhole |
| mm | Millimetres |
| MOE | Ministry of the Environment of Ontario |
| P.S. | Pumping Station |
| PVC | Polyvinyl Chloride |
| RBC | Rotating Biological Contactor |
| rpm | Revolutions per Minute |
| STP | Sewage Treatment Plant |
| TDH | Total Dynamic Head |
| TSH | Totten Sims Hubicki Associates |
| VC | Vitrified Clay |
| WPCP | Water Pollution Control Plant |

## CONVERSION FACTORS

**Length**

| | | |
|---|---|---|
| 1 millimetre (mm) | = | 0.039 inches |
| 1 metre (m) | = | 3.28 feet |
| 1 kilometre (km) | = | 0.621 miles |

**Area**

| | | |
|---|---|---|
| 1 hectare (ha) | = | 2.47 acres |
| 1 square metre (sq.m) | = | 10.76 square feet |

**Volume**

| | | |
|---|---|---|
| 1 cubic metre (cu.m) | = | 35.29 cubic feet |
| | = | 220.26 gallons |
| 1 litre (L) | = | 0.220 gallons |

**Velocity**

| | | |
|---|---|---|
| 1 metre per second (m/s) | - | 3.28 feet per second |

**Flowrate**

| | | |
|---|---|---|
| 1 litre per second (L/s) | = | 0.035 cubic feet per second |
| | = | 13.22 gallons per minute |
| 1 cubic metre per day ($m^3$/day) | = | 220.0 gallons per day |

**Pressure**

| | | |
|---|---|---|
| 1 kilopascal (kPa) | = | 0.145 pounds per square inch |

# EXECUTIVE SUMMARY

In 1987, Totten Sims Hubicki Associates were retained by Rysco Engineering to assess the capacity of the existing sewage treatment plant in Haliburton and to provide a report on the findings. The report concluded that the existing sewage treatment plant had insufficient capacity to accommodate the anticipated future flows from both the sanitary sewer extension and the Hamlet of Haliburton, and recommended an expansion of the existing plant beyond its rated capacity.

Prior to finalizing and selecting the design for upgrading/expanding a sewage treatment plant beyond its rated capacity, a project must go through the Environmental Assessment procedure. The procedure outlined in the MEA Class EA document for municipal sewage and water projects has been followed in the implementation of this project. This report encompasses Phases 1 and 2 of the planning process in accordance with the Terms of Reference issued by the Ministry of the Environment and addresses the review comments provided by the Ministry of the Environment on the draft report. The report includes documentation of the problem, outlines alternative solutions to the problem, describes potential environmental impacts of the alternatives, evaluates the alternative solutions and provides recommendations for the preferred solution.

The Terms of Reference for this project are based on the assumption that the preferred solution will be a Schedule 'C' activity, requiring the completion of an Environmental Study Report. This requirement will be confirmed after review of the report by all interested parties.

# 1.0 INTRODUCTION

## 1.1 Background Information

In 1975, the Ministry of the Environment (MOE) constructed a sewage collection system and treatment plant to serve the Hamlet of Haliburton. The existing plant is located on Highway 121 at the westerly limit of the Hamlet and serves residences east of the plant.

On February 16, 1983, Rysco Engineering submitted a Feasibility Study Report on the provision of a sewage collection and transportation system to accommodate additional raw sewage from various resorts located on the north shore of Lake Kashagawigamog. In May 1986, the Provincial Government approved a grant for an extension of the existing sanitary sewer system to the north shore of Lake Kashagawigamog up to the Willow Beach cottages. The firm of Rysco Engineering was retained to undertake design of the sewer extension under MOE Project No. 3-0579. The design was completed and submitted to the MOE in 1985 for approval. Prior to granting approval of the works, the Environmental Approvals Division requested an assessment of the existing plant capacity.

Totten Sims Hubicki Associates (TSH) were subsequently retained by Rysco Engineering to assess the capacity of the existing sewage treatment plant (STP). TSH submitted their report entitled "Township of Dysart et al, Haliburton Kashagawigamog Sewer System Extension, MOE Project No. 3-0579, Haliburton Sewage Treatment Plant Expansion" to Rysco and the MOE on August 17, 1987. The report concluded that the existing STP does not have sufficient capacity to accommodate the anticipated future flows from Haliburton and the proposed sewer extension and recommended that the existing plant be expanded to meet the projected future flows.

## 1.2 Scope of the Report

In May 1988, TSH were authorized to undertake an Environmental Assessment Report, the scope of which included investigating the various alternatives to expanding the existing STP and recommending a preferred solution. A discussion of the Environmental Assessment process in general is included in Section 2.1 of this report.

The Terms of Reference attached in Appendix 1 were compiled by the Ministry of the Environment (MOE) to satisfy the requirements outlined in the MEA Class Environmental Assessment (EA) document for Municipal Sewage and Water Projects. These Terms of Reference were developed on the assumption that the preferred solution will be a Schedule 'C' activity, thus requiring an Environmental Study Report (ESR) in Phase 4 of the project. This report encompasses Phases 1 and 2 of the Terms of Reference.

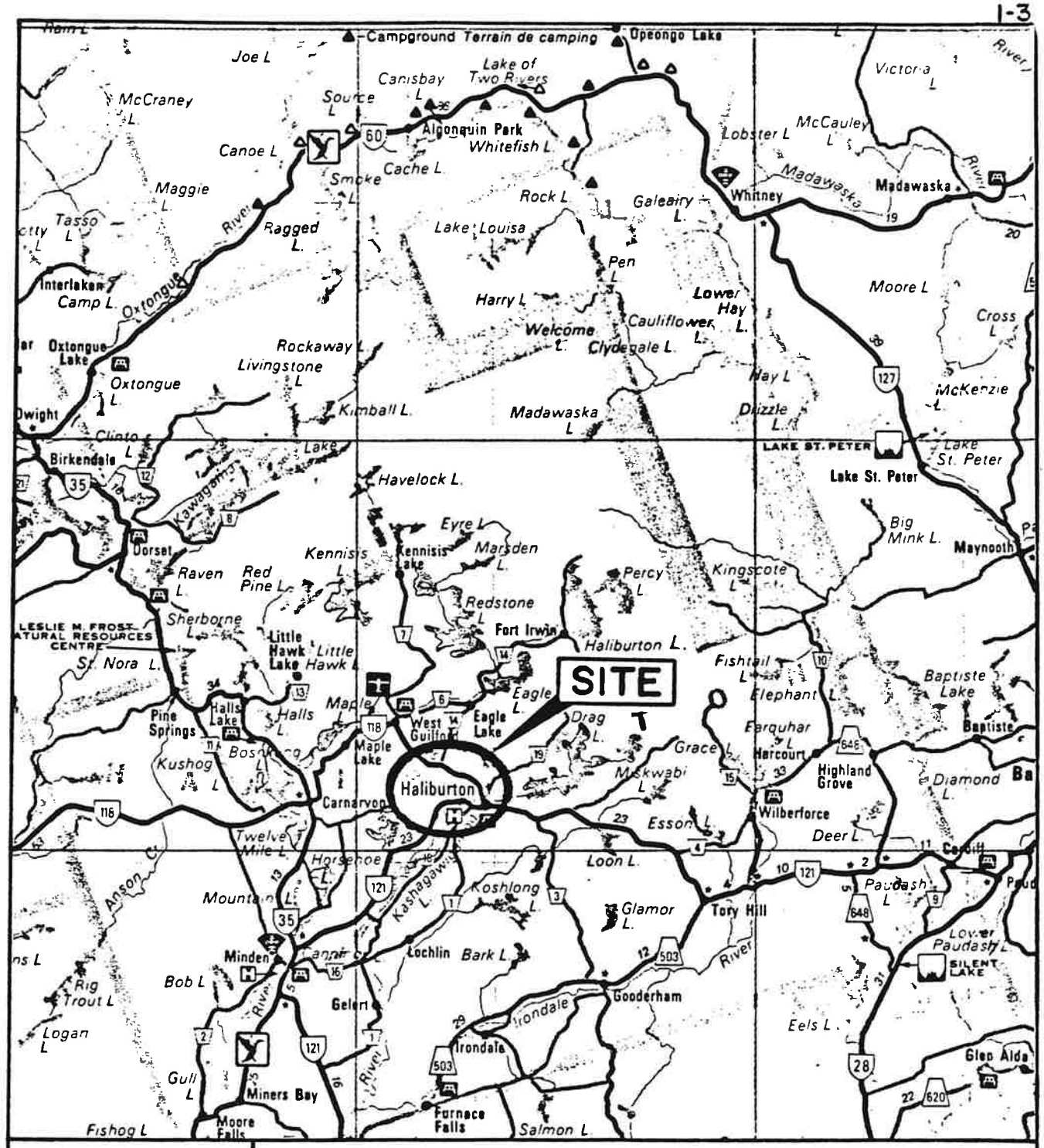
Following review and approval of the report by Municipal and Ministry staff, the study will proceed with Phase 3 and the completion of the ESR in Phase 4.

## 1.3 Hamlet of Haliburton

As shown in Figure 1.1, the Hamlet of Haliburton is located at the junction of Highways 118 and 121 in the County of Haliburton. The community is bisected by the Drag River and is situated on the eastern and southern shores of Head Lake. The Drag River connects Head Lake to Grass Lake, which drains into Kashagawigamog Lake and the Burnt River of the Trent River System.

Rock outcrops predominate around the perimeter of the community with shallow depths of overburden predominant throughout.

Historically, Haliburton is known for forest and water resources. Today, the community is the centre of the Haliburton Highlands vacation area, with an economy closely related to tourism and recreation.

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ENGINEERS ARCHITECTS AND PLANNERS

MUNICIPALITY OF DYSART et al

HALIBURTON

SEWAGE TREATMENT PLANT EXPANSION

KEY PLAN

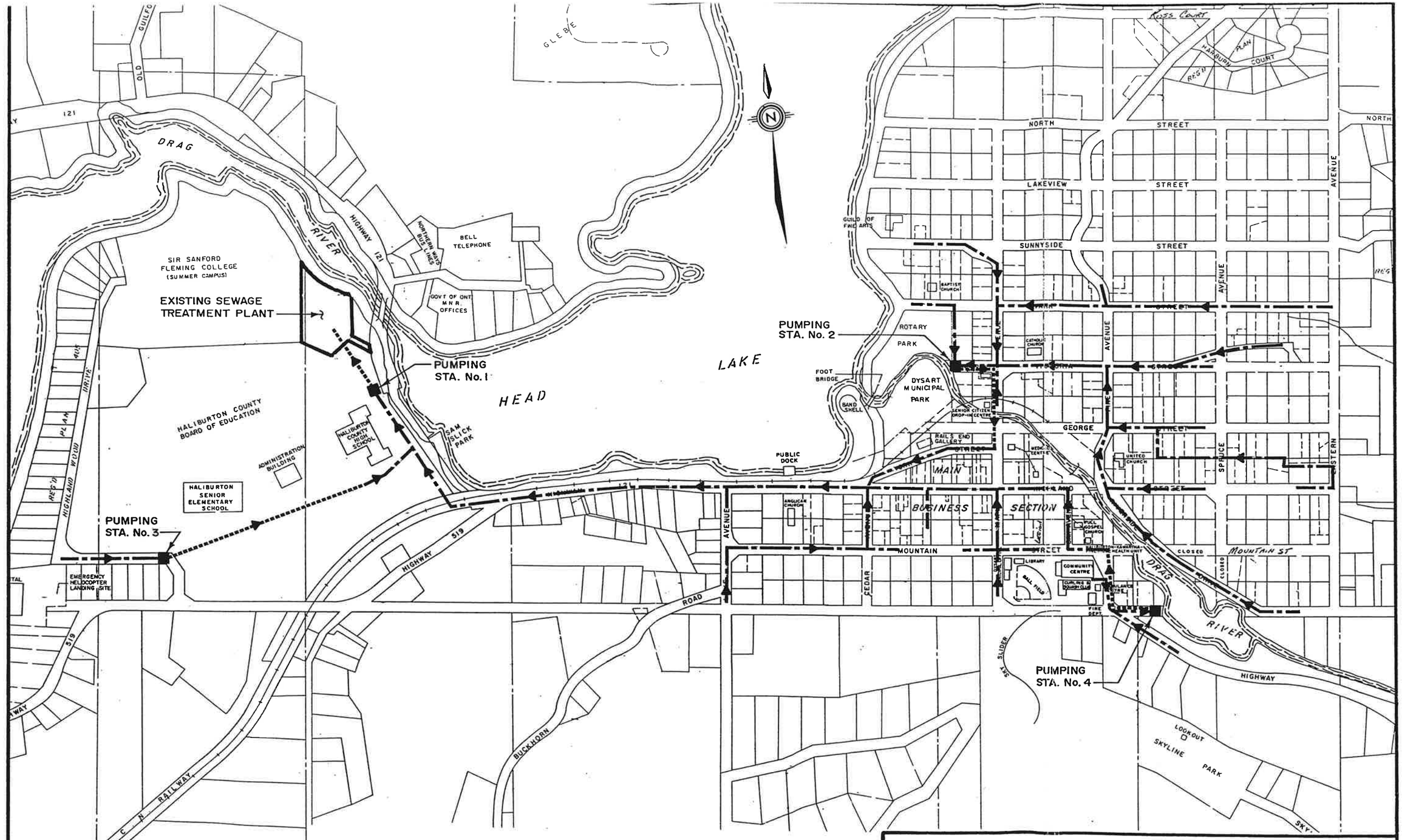
FIGURE 1.1

## 1.3 Hamlet of Haliburton (Cont'd)

Haliburton, in conjunction with the Townships of Bruton, Clyde, Dudley, Eyre, Guilford, Harburn, Harcourt and Havelock comprise the Municipality of Dysart et al, with administration offices located in Haliburton.

## 1.4 Population and Land Use

Haliburton is currently experiencing a rapid increase in population due to an increase in the construction of seasonal and permanent homes, the expansion of existing resorts and the increase in construction of new commercial and industrial establishments. Proposals for development either adjacent to or near the existing sewage treatment plant or proposed sewer extension have been received by the Municipality. Approval of these developments is contingent upon the provision of suitable sewage facilities, thus, the need for additional sewage facilities is a growing concern that must be readily addressed.

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LEGEND
- PUMPING STATION
- SANITARY SEWER
- FORCEMAIN

MUNICIPALITY OF DYSART et al
HALIBURTON
SEWAGE TREATMENT PLANT EXPANSION
EXISTING SANITARY SEWER SYSTEM

FIGURE 3.2

3.1 Existing Haliburton Sewage System (Cont'd)

Pumping Station No. 1 is a wet well underground pumping station with a plan area of 2.74 m x 2.74 m (inside dimensions) and a depth of approximately 7 m. The inlet consists of a 450 mm diameter gravity sewer connected to the station at an invert elevation of 316.3 m. Sewage from the inlet passes through a bar screen before entering the wet well.

The station contains two 13.4 kW Flygt CP3151 submersible sewage pumps with No. 415 impellers. Each pump is rated at 20 L/s against a TDH of 19.8 m. The pumps are controlled by float regulators suspended in the wet well which are set for automatic operation as follows:

| | |
|---|---|
| Pump Station floor elevation | 314.63 m |
| Stop both pumps | 315.09 m |
| Start lead pump | 315.63 m |
| Start lag pump | 315.85 m |
| Alarm level | 316.16 m |
| Emergency overflow invert | 319.54 m |

Provision has been made in the pumping station piping for the installation of an additional pump in the future.

The pump discharge consists of a 150 mm diameter main and is equipped with a check valve and a gate valve. It connects to a 200 mm diameter PVC forcemain outside the pumping station. Flow monitoring equipment is not provided at the pumping station except for the hour meter which records the run time of each pump.

A 100 kW diesel generator set complete with an automatic transfer switch is provided at the sewage treatment plant to supply standby power to the treatment plant as well as to Pumping Station No. 1.

3.1 Existing Haliburton Sewage System (Cont'd)

Sewage from the pumping station is pumped to the grit channels at the sewage treatment plant through a 200 mm diameter forcemain approximately 230 m in length.

The pumping station is operating satisfactorily and appeared to be in good condition when inspected on August 6, 1987.

3.1.2.2 Pumping Station No. 2

Sanitary sewers from the contributory area north of the Drag River drain into Pumping Station No. 2 which is located near the junction of Victoria Street and Maple Avenue.

The station consists of a 2.4 m diameter precast concrete underground wet well 6.9 m deep. It contains two Flygt Model CP 3101 submersible sewage pumps, each rated at 18 L/s against a TDH of 12.2 m and equipped with a 3.7 kW submersible electric motor. The discharge pipe for each pump is 150 mm in diameter and has a check valve and a gate valve. The station is provided with an emergency overflow.

The pumps are controlled by float regulators suspended in the wet well which are set for automatic operation as follows:

| | |
|---|---|
| Pump Station floor elevation | 312.55 m |
| Stop both pumps | 313.10 m |
| Start lead pump | 313.72 m |
| Start lag pump | 314.33 m |
| Alarm level | 314.63 m |
| Emergency overflow invert | 318.60 m |

3.1 Existing Haliburton Sewage System (Cont'd)

A 25 kW Stamford diesel generator set with an automatic transfer switch is provided in a separate building near the pumping station to supply standby power to the station.

Sewage from the station is pumped through a 150 mm diameter PVC forcemain approximately 245 m long to a sanitary manhole located at the junction of York Street and Maple Avenue.

3.1.2.3 Pumping Station No. 3

Pumping Station No. 3 is located at the east end of Highlandwood Drive near the Red Cross Hospital.

The station consists of a 2.4 m diameter precast concrete underground wet well 5.64 m deep. It contains two Midlands submersible sewage pumps, each rated at 8.2 L/s against a TDH of 14.3 m and equipped with a 3.7 kW submersible electric motor. The discharge pipe of each pump is 100 mm in diameter and has a check valve and a gate valve.

The pumps are controlled by float regulators suspended in the wet well which are set for automatic operation as follows:

| | |
|---|---|
| Pump Station floor elevation | 315.40 m |
| Stop both pumps | 315.95 m |
| Start lead pump | 316.31 m |
| Start lag pump | 316.61 m |
| Alarm level | 317.83 m |

This station is not provided with an emergency overflow nor with standby power.

3.1 Existing Haliburton Sewage System (Cont'd)

Sewage from the station is pumped through a 100 mm diameter PE forcemain 419 m long to a sanitary manhole near the Haliburton County High School.

3.1.2.4 Pumping Station No. 4

Pumping Station No. 4 is located on the west bank of the Drag River near the junction of South Street and Highway 121.

The station consists of a 2.4 m diameter precast concrete underground wet well 6.0 m deep. It contains two Midlands submersible sewage pumps, each rated at 10 L/s against a TDH of 10.4 m and equipped with a 3.7 kW submersible electric motor. The discharge pipe of each pump is 100 mm in diameter and has a check valve and a gate valve.

The pumps are controlled by float regulators suspended in the wet well which are set for automatic operation as follows:

| | |
|---|---|
| Pump Station floor elevation | 321.80 m |
| Stop both pumps | 322.36 m |
| Start lead pump | 322.98 m |
| Start lag pump | 323.60 m |
| Alarm level | 323.93 m |
| Emergency overflow invert | 326.29 m |

This station does not have standby power.

Sewage from the station is pumped through a 100 mm diameter PVC forcemain 185 m long to a sanitary manhole located at the junction of Mountain Street and Highway 121.

## 3.1 Existing Haliburton Sewage System (Cont'd)

### 3.1.3 Sewage Treatment Plant

The sewage treatment plant is located on the north side of the Haliburton County High School as shown in Figure No. 3.1. The plant was constructed in 1975 and was originally designed to operate as an extended aeration process with a capacity of 455 $m^3/d$ for a population of 1,000 persons.

In the design, provision was made to allow conversion of the plant to a contact stabilization process with a capacity of 955 $m^3/d$ for a population of 2,100 persons. Since the initial plant design, the MOE quidelines have become more stringent such that the afore-noted design is no longer acceptable.

The plant is presently operating as an extended aeration process.

The major components of the plant are described below.

#### 3.1.3.1 Grit Channels

Flow from Pumping Station No. 1 is pumped to the two grit channels at the sewage treatment plant. Each channel has the following dimensions:

| | |
|---|---|
| Length | 6.4 m |
| Width | 0.46 m |
| Maximum liquid depth | 0.3 m |

The channels were designed for an ultimate peak flow of 40 L/s. One of the two channels can handle this flow at a controlled velocity of 0.3 m/s, as the velocity is controlled by a proportional weir installed at the outlet end of each channel. The grit channels are cleaned manually.

3.1 Existing Haliburton Sewage System (Cont'd)

The existing peak flow to the sewage treatment plant is approximately 20 L/s, determined by the pump capacity at Pumping Station No. 1. Therefore, both channels have a reserve capacity of 20 L/s.

3.1.3.2 Process Tank

The process tank is an Infilco Biosorption activated sludge package plant designed to operate initially as an extended aeration process, for an average flow of 455 $m^3$/d. Provision has been made for conversion of the plant to a contact stabilization process in the future, capable of treating an average flow of 955 $m^3$/d.

The plant is constructed with a reinforced concrete base and steel walls, has an outer wall diameter of 16.16 m and an overall outer wall height of 4.95 m. It is divided into the following compartments:

a) Inlet Chamber and Comminutor

Sewage flows by gravity from the grit channels through a 250 mm diameter pipe to the process tank inlet chamber. A 250 mm diameter comminutor is installed at the inlet chamber to continuously screen and comminute solids in the raw sewage. The comminutor is supplied by Cord Industrial Equipment Ltd. and has a capacity of 40 L/s. The comminutor is driven by a 0.7 kW electric motor with power transmission through a vertical reduction gear.

An overflow type of bypass chamber equipped with a bar screen is provided to bypass the comminutor.

3.1 Existing Haliburton Sewage System (Cont'd)

b) Aeration Tank

The aeration tank consists of two (2) components, a contact mixing tank and a re-aeration tank. As mentioned above, the process tank has been designed to function either in the extended aeration mode or in a contact stabilization mode. Piping is arranged in such a way that the flow from the inlet chamber can be directed to either the contact mixing tank through a 250 mm diameter pipe when the plant is operating in the contact stabilization mode or through a 150 mm diameter pipe to the inlet end of the re-aeration tank when the plant is operating in extended aeration mode. A 250 mm diameter transfer pipe is provided between the re-aeration and the contact mixing tanks.

The contact mixing tank has a liquid retaining volume of 109 $m^3$ and the re-aeration tank has a capacity of 327 $m^3$.

Air is supplied to the contact mixing tank through four (4) groups of fine bubble diffusers. Each group has four (4) diffusers and is supplied from a 150 mm diameter air header via a 38 mm diameter drop pipe.

Liquid from the contact tank is conveyed to the centre stilling well of the clarifier through a 250 mm diameter pipe.

A 200 mm diameter sludge return pipe is installed between the central sludge well of the settling tank and the inlet end of the aeration tank to return sludge continuously by means of an air lift, the discharge being controlled by a ball valve in the air feed line.

Excess sludge from the re-aeration tank can be transferred to the aerobic digester through an air lift.

3.1 Existing Haliburton Sewage System (Cont'd)

c) Settling Tank

A 16.16 m diameter settling tank is provided in the central area of the process tank.

The settling tank has a central inlet well and a peripheral effluent trough with an adjustable weir plate. The weir plate has 38 mm Vee notches equally spaced around the periphery of the trough and is provided with a sludge and scum removal mechanism. The sludge collector is suspended from the bridge and includes a 0.37 kW electric motor with a speed reducing mechanism, drive shaft and scraper arms with adjustable flights.

The settled sludge is moved continuously across the floor of the tank to the central sludge well. The sludge is then returned continuously to the aeration tank by means of an air lift as previously described.

The sludge collector shaft also drives a surface skimmer which moves the scum trough and ejector and is controlled by a mechanically operated air valve activated by the skimmer. The ejector discharges the scum into the sludge holding tank.

The settling tank has a surface area of 57.2 $m^2$ and was designed for a surface settling rate of 0.19 $L/m^2/s$ at an average flow rate of 955 $m^3/d$. According to the present MOE guidelines, the maximum allowable settling rate with phosphorus removal is 0.41 $L/m^2/s$ at the peak flow rate. At present, the peak flow rate to the plant is approximately 20 L/s based on the capacity of Pumping Station No. 1. Thus, the current surface settling rate of the tank is 0.35 $L/m^2/s$.

3.1 Existing Haliburton Sewage System (Cont'd)

d) Aerobic Digesters and Sludge Holding Tank

Two aerobic digesters and a sludge holding tank are provided in the plant for the digestion and storage of the waste sludge before it is hauled away for disposal. The capacities of the tanks are as follows:

Stage 1 digester - 111 $m^3$
Stage 2 digester - 83 $m^3$
Sludge holding tank - 28 $m^3$

The Stage 1 digester is provided with three (3) groups of air diffusers, the Stage 2 digester is provided with two (2) groups of air diffusers and the holding tank is provided with one (1) group of air diffusers. Each group includes four (4) fine bubble diffusers and is supplied with air in the same way as in the aeration tanks.

e) Chlorine Contact Tank

The chlorine contact tank is provided at the outlet end of the process tank. It has a liquid retaining capacity of about 20 $m^3$ and was designed to provide a retention time of 30 minutes at a design flow rate of 955 $m^3/d$.

A V-notch weir is provided at the outlet of the chlorine contact tank to meter the effluent being discharged from the plant. Flow measuring equipment includes an electronic level transmitter located at the process tank and a recorder/totalizer installed in the control building.

3.1 Existing Haliburton Sewage System (Cont'd)

3.1.3.3 Filter Beds

Two open filters, each with a surface area of 117 $m^2$, are provided to polish the effluent of the process tank before it is discharged to the Drag River.

The filter beds were designed for seasonal operation at an average flow rate of 455 $m^3/d$. The filter media consists of the following layers of granular material.

600 mm of sand passing 6 mm sieve
75 mm of sand, 0.8-1.2 mm in size
150 mm of gravel 3 mm - 25 mm in size

The underdrainage system consists of 100 mm diameter perforated V.C. pipe laid at 0.9 m centres. The 100 mm diameter pipes are connected to a 150 mm diameter perforated V.C. pipe header leading to a 250 mm diameter outlet pipe. All the pipes are laid at a slope of 1.25%.

The inlet chamber is designed to distribute flow to any one or both of the filters or to bypass the filters entirely.

Information obtained from the plant operation staff has indicated that the filters became plugged and were consequently removed from service in 1986 to replace sand. The replaced sand was unsuitable and requires changing again. As of this date, the filters are still out of service.

3.1 Existing Haliburton Sewage System (Cont'd)

3.1.3.4 Control Building

The control building includes the following facilities:

- Office and laboratory
- Washroom
- Storage room
- Chlorine room
- Standby power room
- Chemical storage and metering facilities
- Blower room which also includes process water pumps
- Sewage Pumping Station

Electrical controls for the plant and effluent flow recorder are installed in the office and laboratory.

A brief description of the main equipment installed in the control building is as follows:

a) Diesel Generator Set

The diesel generating set consists of a Ruston Model LE heavy duty, water cooled diesel engine driven generating set, having a continuous rating of 100 kW (125 kVa) at a 0.8 power factor. The set includes a Dorman Model 6L.F diesel engine and a Stamford Model C40A generator operating at a speed of 18 rpm. The installation complies with the MOE Specifications and is equipped with a 200 amp Westinghouse Robonic Model RO 512 transfer switch.

Information obtained from the plant operation staff indicates that the generating set is in good condition and is operated for approximately 30 minutes every week.

3.1 Existing Haliburton Sewage System (Cont'd)

b) Chlorination Equipment

The chlorination equipment consists of a Wallace and Tiernan Series A-741 gas chlorinator. It is a wall mounted, manually operated, vacuum type unit having a capacity of 90 kilograms per day. The unit is supplied with a 34 kilograms per day rotameter.

c) Process Water Pumps

The process water pumps consist of Weinman Model 4 AEK-86 pumps rated at 1.9 L/s at 38 m TDH. Two pumps have been installed in the blower room but one of them serves as a standby.

d) Ferric Chloride Storage Tank and Metering Pumps

The lower floor of the Control Building houses a 27.3 $m^3$ tank for the storage of ferric chloride solution.

Two BIF Model 1731 chemical metering pumps, each with a capacity of 57 litres per hour against a pressure of 340 kPa and equipped with an SCR drive unit, are used for feeding ferric chloride for phosphorus removal. Ferric chloride is injected at the inlet chamber of the process tank and is proportional to the effluent flow.

Two metering pumps have been provided, one of which is utilized while the other is kept as a standby unit.

## 3.1 Existing Haliburton Sewage System (Cont'd)

### e) Air Blowers

The blower room houses 3 Sutrobuilt Model 6MB air blowers rated at 106 L/s (225 cfm) at a pressure of 47 kN/m$^2$ (7 psi) when operating at 900 rpm. Each air blower is driven by an 11 kW electric motor operating at 1750 rpm.

Two blowers are used continuously while the third one is kept as standby.

## 3.2 Existing Sewage Systems for Commercial and Resort Properties

### 3.2.1 General

The following inventory of existing sewage systems for the commercial and resort properties to be serviced by the proposed Haliburton Kashagawigamog Sewer Extension was obtained from Rysco Engineering Corporation, designers of the sewer extension.

### 3.2.2 Existing Sewage Systems for Commercial Properties

The following is a brief summary of the existing sewage systems for the properties in the commercial sector west of the Hamlet of Haliburton:

| | | |
|---|---|---|
| a) | Driftwood Restaurant | - holding tanks, pumped out as required |
| b) | Haliburton Lumber | - holding tanks, pumped out as required |
| c) | Haliburton Marine | - small septic tanks and tile field |
| d) | Brewers Retail and Skyline Automotive | - small septic tank and leaching field |
| e) | Curry Motors Body Shop | - small septic tank and small tile bed serving washrooms only |
| f) | Kashaga Ford | - holding tanks, pumped out as required |

3.2 Existing Sewage Systems for Commercial and Resort Properties (Cont'd)

| | | |
|---|---|---|
| g) | Haliburton Truck Service | - holding tanks, pumped out as required serving one bathroom |
| h) | Floyd Hall Real Estate | - small septic tank and tile bed (very old system) |
| i) | Brooklin | - holding tanks, pumped out as required serving one bathroom |

3.2.3 Existing Sewage Systems for Resort Properties

The following is a brief summary outlining the existing sewage systems for the resorts to be served by the proposed sewer extension:

| | | |
|---|---|---|
| a) | Old Apple Tree Resort | - series of septic tanks and tile beds scattered through the resort property |
| b) | Lakeview Motel | - proprietary aerobic (Aquarobic) and small tile bed |
| c) | Langdon Apartments | - septic tank and two tile beds |
| d) | Pine Stone Inn | - central gravity collection system with raw sewage pump and forcemain to three lagoons; disposal by spray irrigation on forested lands and golf course |
| e) | Highland Hills Estate | - vacant land not served |
| f) | Old Slipper Property | - no service |
| g) | Silver Beach | - central collection system; septic tank treatment and leaching bed |
| h) | Locarno Lodge | - series of septic tanks and leaching beds scattered through the resort property |
| i) | Wigamog Inn | - series of septic tanks and leaching beds through the resort property |
| j) | Willow Beach Cottages | - series of septic tanks and leaching beds scattered through the resort property |
| k) | Deer Lodge | - septic tank and leaching beds |

# 4.0 ANALYSIS OF EXISTING SEWAGE QUANTITY AND QUALITY

## 4.1 Sewage Flows

### 4.1.1 Flow Records

Flow from the existing Haliburton sewage system is conveyed by gravity to Pumping Station No. 1 which is located approximately 200 m south of the sewage treatment plant. Sewage is then pumped to the treatment plant through a 200 mm diameter PVC forcemain by a submersible sewage pump rated at 20 L/s.

Flow records are obtained by the plant operations staff from the totalizer for the Vee-notch weir located at the outlet of the package treatment plant. Discussions with the plant operations personnel revealed that the flow meter is checked regularly by the MOE inspectors and is fairly reliable.

The average and the maximum day flows for the years 1980 to 1987 are summarized in Table 4.1 and Table 4.2.

The data were obtained from the plant performance sheets kept by the plant operations personnel.

4.1 Sewage Flows (Cont'd)

Table 4.1

Average Daily Sewage Flow ($m^3/d$)

| Month | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| January | 157 | 119 | 138 | 180 | 198 | 228 | 201 |
| February | 257 | 148 | 146 | 217 | 207 | 237 | 212 |
| March | 211 | 166 | 151 | 209 | 217 | 257 | 253 |
| April | 253 | 255 | 174 | 233 | 288 | 240 | 392 |
| May | 242 | 165 | 218 | 203 | 252 | 213 | 336 |
| June | 208 | 150 | 232 | 182 | 205 | 212 | 402 |
| July | 181 | 158 | 208 | 222 | 230 | 222 | 343 |
| August | 180 | 118 | 184 | 189 | 201 | 194 | 325 |
| September | 171 | 111 | 163 | 174 | 229 | 210 | 336 |
| October | 151 | 144 | 183 | 152 | 244 | 251 | 354 |
| November | 135 | 169 | 198 | 187 | 243 | 216 | 376 |
| December | 127 | 154 | 185 | 203 | 234 | 206 | 277 |
| Average | 189 | 155 | 182 | 196 | 229 | 224 | 317 |

4.1 Sewage Flows (Cont'd)

Table 4.2

Maximum Daily Sewage Flow ($m^3/d$)

| Month | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| January | 233 | 163 | 222 | 224 | 265 | 277 | 236 |
| February | 503 | 167 | 273 | 357 | 351 | 296 | 257 |
| March | 323 | 243 | 191 | 292 | 375 | 352 | 326 |
| April | 284 | 354 | 236 | 354 | 460 | 352 | 649 |
| May | 290 | 267 | 422 | 261 | 306 | 269 | 396 |
| June | 259 | 263 | 297 | 252 | 256 | 248 | 959 |
| July | 211 | 193 | 264 | 287 | 263 | 300 | 452 |
| August | 294 | 175 | 236 | 259 | 255 | 231 | 369 |
| September | 216 | 161 | 201 | 219 | 297 | 268 | 400 |
| October | 177 | 178 | 247 | 207 | 283 | 273 | 424 |
| November | 167 | 265 | 255 | 246 | 327 | 228 | 454 |
| December | 160 | 289 | 309 | 403 | 297 | 270 | 381 |
| Max. Day for the Year | 503 | 354 | 422 | 403 | 460 | 352 | 959 |
| Ave.Day from Table 4.1 | 189 | 155 | 182 | 196 | 229 | 224 | 317 |
| Ratio of Max.Day to Ave. Day | 2.7 | 2.3 | 2.3 | 2.1 | 2.0 | 1.6 | 3.0 |

As shown in Table 4.1 and Table 4.2, the average daily flow has varied between 155 $m^3/d$ to 229 $m^3/d$ and the maximum daily flow has varied between 160 $m^3/d$ and 503 $m^3/d$ during the period from 1981 to 1986. In 1986 and 1987, the average daily sewage flows were 224 $m^3/d$ and 317 $m^3/d$, representing 50% and 70% of the plant capacity (455 $m^3/d$). The ratio of the maximum daily flow to average daily flow has varied between 1.6 and 2.7. The corresponding values of the average daily flow, maximum daily flow and the ratio of the maximum daily flow to the average daily flow for 1987 have been 317 $m^3/d$, 959 $m^3/d$ and 3.0 respectively which are considerably higher than values in previous years.

4.1 Sewage Flows (Cont'd)

Since the flow entering Pumping Station No. 1 is not metered, it is not possible to determine the actual peak hour sewage flow for the system. Discussions with plant operations personnel indicated that one pump in Pumping Station No. 1 has been adequate to handle the peak sewage flow so far. Therefore, it can be inferred that the existing peak hour flow is less than 20 L/s, the rated capacity of the pump.

4.1.2 Existing Serviced Population

Information obtained from staff of the Municipality of Dysart et al indicates that the existing sewage system has 285 service connections. As of 1985, approximately 250 had been connected to buildings with the remaining 35 still available for connection. The majority of the buildings in Haliburton are single family dwellings. Assuming that the 250 connections represent 250 Equivalent Residential Units (ERU) with a population density of 3 persons per unit, the existing serviced equivalent population is 750.

4.1.3 Average Per Capita Flow

Based on the above-noted flow records and serviced population, the average per capita flow has been computed for the years 1985, 1986 and 1987 as follows:

Table 4.3

Average Per Capita Flow (L/c/d)

| Year | Equivalent Serviced Population | Average Daily Flow ($m^3/d$) | Average Per Capita Flow (L/c/d) |
|---|---|---|---|
| 1985 | 720 | 229 | 318 |
| 1986 | 750 | 224 | 299 |
| 1987 | 880 | 317 | 360 |

## 4.1 Sewage Flows (Cont'd)

The per capita sewage flow for the period 1985 to 1987 is between 299 L/d and 360 L/d with an average value of 326 L/d. This value is approximately 28% less than the average per capita flow used for the design of the sewage treatment plant and the design flow used by Rysco Engineering Corporation for the Haliburton Kashagawigamog Sewer Extension.

## 4.2 Sewage Characteristics and Treatment Efficiencies

Analyses of the plant influent and effluent have been conducted by Ministry of the Environment personnel at various times. The results of these analyses and removal efficiencies with respect to $BOD_5$, suspended solids and total phosphorus are outlined in the following subsections.

### 4.2.1 BOD5 Removal Efficiency

Based on the results of the analyses, $BOD_5$ removal efficiencies were computed and are shown in Table 4.4.

4.2 Sewage Characteristics and Treatment Efficiencies (Cont'd)

Table 4.4

$BOD_5$ Removal Efficiency

| Month | 1985 | | | 1986 | | | 1987 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Inf. mg/l | Eff. mg/l | Removal % | Inf. mg/l | Eff. mg/l | Removal % | Inf. mg/l | Eff. mg/l | Removal % |
| January | 26 | 0.2 | 99 | 93 | 3.7 | 96 | 195 | 0.9 | 99 |
| February | 91 | 1.3 | 98 | 61 | 5.6 | 91 | 32 | 7.5 | 77 |
| March | 164 | 4.3 | 97 | 54 | 5.3 | 90 | 109 | 6.4 | 94 |
| April | 270 | 0.9 | 99 | 55 | 4.0 | 93 | - | - | - |
| May | 43 | 0.5 | 99 | 138 | 3.5 | 97 | 45 | 3.6 | 92 |
| June | 390 | 0.9 | 99 | 73 | 1.2 | 98 | 29 | 8.4 | 71 |
| July | 186 | 2.0 | 99 | 88 | 1.2 | 99 | 67 | 4.5 | 93 |
| August | 73 | 0.9 | 99 | - | 2.3 | - | 127 | 3.6 | 97 |
| September | 78 | 0.9 | 99 | - | - | - | 73 | 1.4 | 98 |
| October | 54 | 2.0 | 96 | 124 | 2.0 | 98 | 68 | 10.6 | 84 |
| November | 215 | 0.4 | 99 | 102 | 3.2 | 97 | 49 | 7.0 | 86 |
| December | 106 | - | - | 64 | | 91 | 51 | 3.7 | 93 |
| Average | 141 | 1.3 | 99 | 85 | 3.4 | 95 | 77 | 5.2 | 89 |

The average $BOD_5$ concentration in the influent during the period 1985 to 1987 is in the range of 77 to 141 mg/l. These concentrations are below the normally accepted level of 200 mg/l in municipal wastewater systems.

The $BOD_5$ concentration in the effluent is in the range of 1.3 mg/l to 5.2 mg/l with a $BOD_5$ removal efficiency from 89% to 99%. It can thus be concluded that the existing plant produces excellent effluent and has a high $BOD_5$ removal efficiency.

## 4.2 Sewage Characteristics and Treatment Efficiencies (Cont'd)

### 4.2.2 Suspended Solids Removal Efficiency

Based on the results of the analyses, suspended solids removal efficiencies were computed and are shown in Table 4.5.

Table 4.5
Suspended Solids Removal Efficiency

| Month | 1985 | | | 1986 | | | 1987 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Inf. mg/l | Eff. mg/l | Removal % | Inf. mg/l | Eff. mg/l | Removal % | Inf. mg/l | Eff. mg/l | Removal % |
| January | 36 | 2.3 | 94 | 239 | 10.2 | 96 | 98 | 1.3 | 99 |
| February | 53 | 2.7 | 95 | 70 | 8.0 | 88 | 20 | 4.2 | 79 |
| March | 205 | 5.2 | 97 | 70 | 12.3 | 82 | 92 | 5.3 | 94 |
| April | 159 | 3.3 | 98 | 34 | 6.7 | 83 | - | - | - |
| May | 64 | 5.2 | 92 | - | - | - | 25 | 7.2 | 71 |
| June | 239 | 3.9 | 98 | 122 | 6.8 | 94 | 27 | 5.6 | 79 |
| July | 216 | 4.5 | 98 | 404 | 5.0 | 99 | 41 | 3.5 | 91 |
| August | 104 | 3.7 | 96 | - | 3.9 | - | 73 | 4.6 | 94 |
| September | 99 | 3.2 | 97 | - | - | - | 65 | 2.3 | 96 |
| October | 41 | 3.3 | 92 | 134 | 3.8 | 97 | 55 | 9.2 | 83 |
| November | 137 | 3.4 | 97 | 87 | 6.2 | 93 | 58 | 5.1 | 91 |
| December | 101 | - | - | 56 | 4.4 | 92 | 101 | 4.8 | 95 |
| Average | 121 | 3.7 | 97 | 136 | 6.7 | 92 | 60 | 4.8 | 88 |

The average suspended solids concentration in the influent during the period 1985 to 1987 is in the range of 60 to 136 mg/l. Similarly to the $BOD_5$ concentrations, the suspended solids concentrations are below the normally accepted level of 200 mg/l, indicating dilute sewage.

4.2 Sewage Characteristics and Treatment Efficiencies (Cont'd)

The suspended solids concentration in the effluent is in the range of 3.7 mg/l to 6.7 mg/l with suspended solids removal efficiency in the range of 88% to 97%. Thus, the plant produces excellent effluent quality and has high suspended solids removal efficiency.

4.2.3 Total Phosphorus Removal Efficiency

Based on the results of the analyses, phosphorus removal efficiencies were tabulated and are shown in Table 4.6.

Table 4.6

Total Phosphorus Removal Efficiency

| Month | 1985 | | | 1986 | | | 1987 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Inf. mg/l | Eff. mg/l | Removal % | Inf. mg/l | Eff. mg/l | Removal % | Inf. mg/l | Eff. mg/l | Removal % |
| January | 2.0 | 1.06 | 48 | - | 0.96 | - | 6.2 | 0.11 | 98 |
| February | 2.8 | 1.66 | 41 | 3.4 | 0.68 | 80 | 2.2 | 0.26 | 88 |
| March | 15.6 | 1.30 | 92 | 3.1 | 0.62 | 80 | 4.8 | 0.26 | 95 |
| April | 1.9 | 0.50 | 74 | 3.6 | 0.38 | 89 | - | - | - |
| May | 1.6 | 0.34 | 79 | 5.1 | 0.36 | 93 | 1.8 | 0.48 | 73 |
| June | 2.2 | 0.26 | 88 | 3.7 | 0.42 | 87 | 5.5 | 1.00 | 82 |
| July | 7.1 | 0.42 | 94 | 5.0 | 0.38 | 42 | 3.3 | 0.47 | 86 |
| August | - | 0.36 | - | - | 0.28 | - | 8.1 | 0.55 | 94 |
| September | 4.4 | 0.38 | 91 | - | - | - | 4.7 | 0.42 | 91 |
| October | 3.6 | 0.30 | 92 | 4.9 | 0.28 | 94 | 5.6 | 0.96 | 83 |
| November | 0.8 | 0.26 | 68 | 5.3 | 0.28 | 95 | 7.5 | 0.26 | 96 |
| December | 7.0 | - | - | 2.3 | 0.34 | 85 | 5.7 | 0.35 | 94 |
| Average | 4.4 | 0.62 | 77 | 4.0 | 0.45 | 83 | 5.0 | 0.47 | 89 |

4.2 Sewage Characteristics and Treatment Efficiencies (Cont'd)

The average phosphorus concentration in the influent during the period 1985 to 1987 is in the range of 4.0 to 5.0 mg/l. The average phosphorus concentration in the effluent is in the range of 0.47 mg/l to 0.62 mg/l with an average removal efficiency in the range of 77% to 89%.

4.2.4 Summary of Effluent Quality

Based on the above-noted data, the following Table 4.7 summarizes the average effluent quality from the Haliburton Sewage Treatment Plant for the period 1985 to 1987.

Table 4.7

Summary of Effluent Quality

| | BOD5 (mg/L) | Suspended Solids (mg/L) | Total Phosphorus (mg/L) |
|---|---|---|---|
| 1985 | 1.3 | 3.7 | 0.62 |
| 1986 | 3.4 | 6.7 | 0.45 |
| 1987 | 5.2 | 4.8 | 0.47 |
| Current MOE Effluent Criteria | 15 | 15 | 1 |

From Table 4.7, it is concluded that the $BOD_5$, suspended solids and phosphorus levels in the effluent are well within the current MOE effluent criteria.