4.0 ALTERNATIVES AND EVALUATION

4.1 Planning Alternatives

4.1.1 Summary of Design Parameters

The design parameters, as outlined in the Phase 1 and 2 Report, are as follows:

4.1.1.1 Service Population

The proposed sewage works system will serve the Hamlet of Haliburton as well as the resorts along the proposed Haliburton-Kashagawigamog Sewer Extension. The equivalent service population for the year 2009 is outlined in Table 4.1. Future population projections are based on a population growth rate of 4.0 percent per year for the Hamlet of Haliburton.

Table 4.1
Equivalent Service Population for the
Haliburton Sewage Treatment Plant

Year	Hamlet of Haliburton	Resorts Along The Haliburton-Kashagawigamog Extension	Total
1989	952	-	952
2009	1,928	2,331	4,259

4.1 Planning Alternatives (Cont'd)

4.1.1.2 Design Flows

A. Average Design Flow

As noted in the Phase 1 and 2 Report, the average per capita sewage flow including extraneous flow in the Hamlet of Haliburton during 1985, 1986 and 1987 was approximately 326 L/d. Rysco Engineering Corporation, however, used a per capita flow rate including extraneous flow of 454 L/d for the design of the Haliburton Kashagawigamog Extension. An average per capita flow rate of 454 L/d will be used for the expansion of the sewage treatment facilities.

Based on the projected equivalent service population outlined in Section 4.1.1.1, the average design flows for the plant expansion are indicated in Table 4.2.

Table 4.2

Projected Average Daily Flow

	Haliburton	Extension Kashagawigamog	Total
Projected Service Population	1,928	2,331	4,259
Per capita flow (L/d)	454	454	454
Average daily flow (m^3/d)	875	1,058	1,933

B. Peak Design Flow

Sewage from the Hamlet of Haliburton is conveyed to Pumping Station No. 1 prior to pumping to the sewage treatment plant. Since a flow meter is not provided at the pumping station inlet, actual peak flow data are not available for analysis. Therefore, the Harmon formula was used to estimate the peak flow as shown in the following Table 4.3.

4.1 Planning Alternatives (Cont'd)

Table 4.3

Projected Peak Flow

	Haliburton	Extension Kashagawigamog	Total
Projected Service Population	1,928	2,331	4,259
Average daily flow (m^3/d)	875	1,058	1,933
Peak factor	3.63	3.53	-
Peak flow	3,176 m^3/d	3,735 m^3/d	6,911 m^3/d
	(36.7 L/s)	(43.2 L/s)	(79.9 L/s)

4.1.1.3 Effluent Criterion

The effluent criterion from the expanded Haliburton Sewage Treatment Plant as confirmed by the Ministry of the Environment are as follows:

1) BOD_5 5 mg/l
2) Suspended Solids 5 mg/l
3) Total Phosphorus 0.2 mg/l

4.1.2 Summary of Preferred Alternative

4.1.2.1 General

As noted previously, five (5) proposed alternative solutions for the expansion of the Haliburton Sewage Treatment Plant, as outlined in the Phase 1 and 2 Report, are as follows:

Alternative 1 - Expand Existing Sewage Treatment Plant with Outlet Sewer to Drag River;

Alternative 2 - Expand Existing Sewage Treatment Plant with Outlet Sewer to Grass Lake;

4.1 Planning Alternatives (Cont'd)

Alternative 3 - Construct a New Sewage Treatment Plant to Service Highway 121 Development;

Alternative 4 - Construct a New Sewage Treatment Plant to Service Highway 121 Development and Hamlet of Haliburton; and

Alternative 5 - Expand Existing Sewage Treatment Plant with Outlet Sewer to Burnt River.

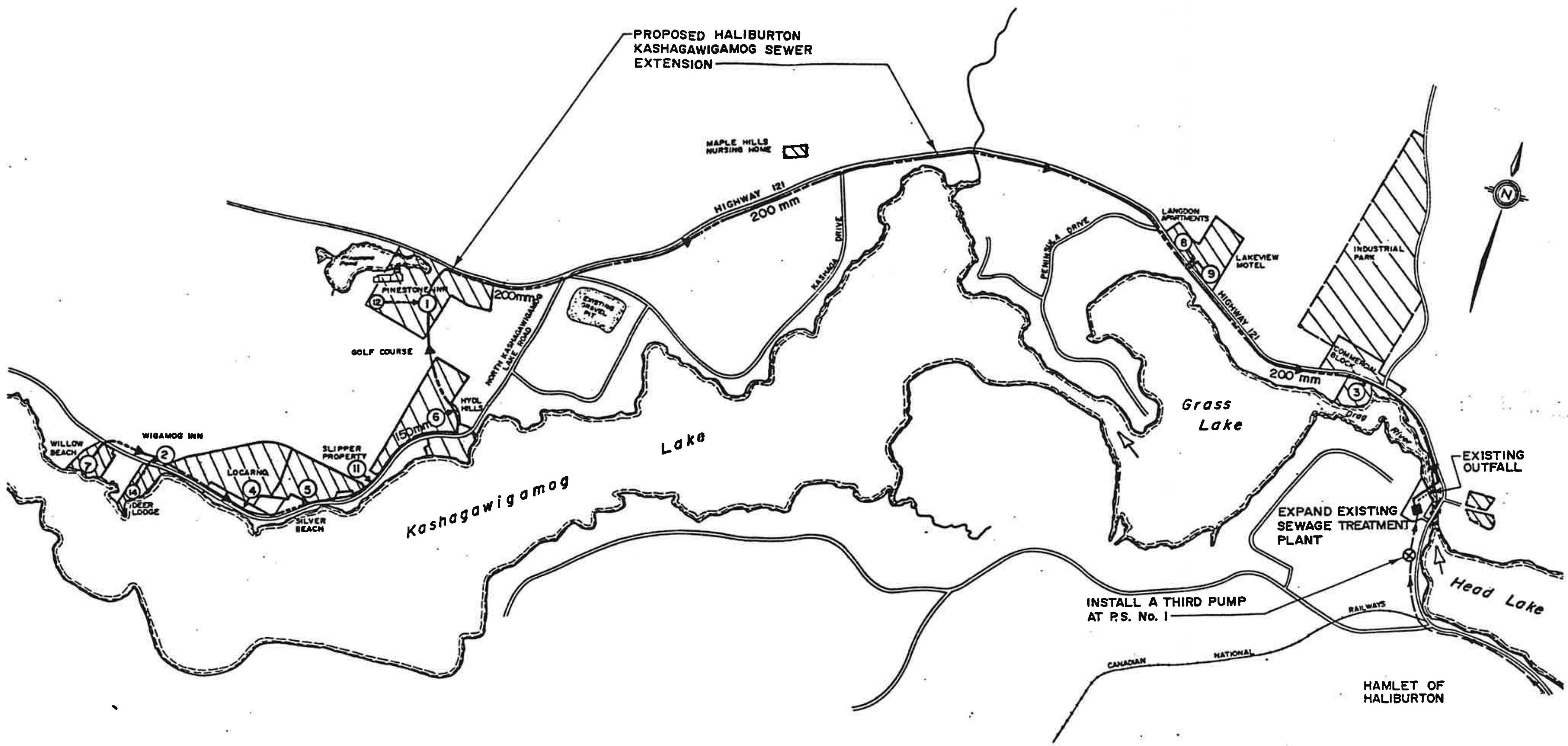
Based on a review of environmental impacts, technical performance, and estimated costs of each alternative, Alternative 1 is selected as the preferred alternative for the expansion of sewage treatment facilities at Haliburton. The system description for the preferred alternatives is outlined as follows:

4.1.2.2 System Description

Under Alternative 1, it is proposed to expand the existing Haliburton Sewage Treatment Plant to service the projected growth in the Hamlet of Haliburton as well as the resorts and commercial developments along Highway 121, as shown in Figure 4.1.

The resorts to be serviced include Deer Lodge, Hydl Hills, Locarno Resort, Pinestone Inn, Silver Beach Camp, Skippers Property, Wigamog Inn and Willow Beach. The commercial development includes the area near Haliburton Marina, Lakeview Motel, Langdon Apartments and Maple Hills Nursing Home on Highway 121.

The existing sanitary sewer system in the Hamlet has adequate capacity to handle the projected flows with the only upgrading required consisting of the installation of one additional pump in Pumping Station No. 1. During the initial design of the pumping station, provision had been made for the installation of this pump in the future.



LEGEND

(hatched)	SERVICE AREA
⑤	PROPOSED PUMPING STATION & No.
⊗	EXISTING SEWAGE PUMPING STATION
——-—-→—	PROPOSED SEWAGE FORCEMAIN
——←——	EXISTING SANITARY SEWER

totten sims hubicki associates
ENGINEERS ARCHITECTS AND PLANNERS

MUNICIPALITY OF DYSART et al
HALIBURTON
SEWAGE TREATMENT PLANT EXPANSION

PROPOSED SERVICE AREA

FIGURE 4·1

4.1 Planning Alternatives (Cont'd)

The Highway 121 development will be serviced by the Haliburton-Kashagawigamog Sewer Extension which has already been designed by Rysco Engineering Corporation under MOE Project No. 3-0579.

As noted previously, the existing plant has a rated capacity of 542 m^3/d as compared to the required capacity of 1,933 m^3/d, thus the expansion will have to provide an additional capacity of 1,391 m^3/d. The expansion will include:

- construction of a flow equalization tank
- construction of additional grit removal facilities
- construction of an additional extended aeration plant
- construction of effluent filters with a backwash system
- upgrading and replacement of existing equipment which is in poor condition.

Effluent from the plant will be chlorinated, filtered and discharged into the Drag River through the existing 300 mm diameter outlet sewer.

Digested sludge will be hauled away for off-site disposal, as is the current practice at the existing plant.

4.2 Alternative Design Concepts

4.2.1 General

Based on the design parameters and general system description outlined in the preferred Alternative 1, this section will conduct a comparison of the proposed facilities for the preferred alternative.

4.2 Alternative Design Concepts (Cont'd)

4.2.2 Main Sewage Pumping Station Expansion

As noted previously, sewage from the resorts along the proposed Haliburton-Kashagawigamog sewer extension will be discharged via a separate forcemain directly to the sewage treatment plant. Therefore, the existing main sewage pumping station will only handle the sewage flow from the Hamlet of Haliburton. The design parameters for the main sewage pumping station are outlined in Table 4.4

Table 4.4

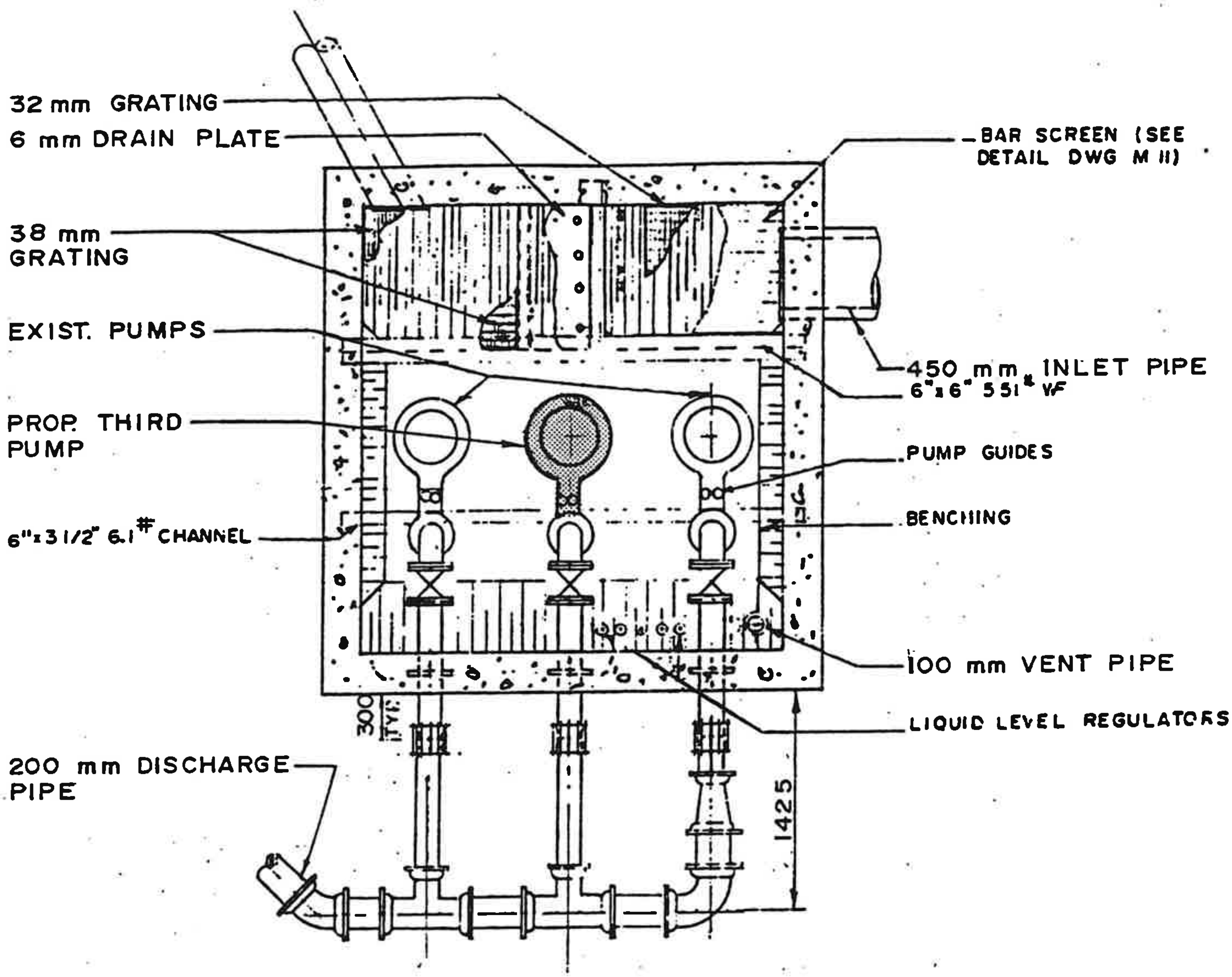
Projected Flow for Main Sewage Pumping Station (PS #1)

Projected Service Population	1,928
Average Daily Flow	875 m^3/d
Peak Factor	3.63
Peak Flow	3.176 m^3/d or 36.7 L/s

The existing main pumping station contains two (2) 13.4 kW Flygt submersible sewage pumps, each pump rated at 20 L/s against a TDH of 19.8 m. Provision has been made in the pumping station piping for the installation of an additional pump in the future.

It is proposed to install this third pump in the main sewage pumping station so that any two (2) pumps working together will meet the peak flow requirement of 36.7 L/s with one pump acting as a standby unit. The layout of the pumping station expansion is shown in Figure 4-2 of this report.

Sewage from the main pumping station is pumped via a 200 mm diameter forcemain approximately 230 m in length to the sewage treatment plant. The capacity of this forcemain is adequate to handle the required peak flow, thus no expansion of the forcemain is required.



totten sims hubicki associates
ENGINEERS ARCHITECTS AND PLANNERS

MUNICIPALITY OF DYSART et al
HALIBURTON
SEWAGE TREATMENT PLANT EXPANSION

PROPOSED MAIN PUMPING STATION EXPANSION

FIGURE 4·2

4.2 Alternative Design Concepts (Cont'd)

4.2.3 Type of Sewage Treatment Plant

To achieve the effluent concentration requirement of BOD_5 5 mg/l, suspended solids 5 mg/l, and total phosphorus 0.2 mg/l, a proposed tertiary sewage treatment plant will be provided for the Haliburton sewage treatment plant expansion. The proposed tertiary sewage treatment plant will consist of the flow equalization tank, grit removal facilities, extended aeration activated sludge process, chemical feed phosphorus removal facilities and effluent filtration facilities.

The existing extended aeration process tank will remain in operation with the new plant. Thus, the proposed plant facilities will consist of the existing extended aeration plan rated at 542 m^3/d and a new extended aeration plant sized for 1,391 m^3/d. The total plant capacity upon completion of the proposed expansion will be 1,933 m^3/d.

Polishing filters complete with a backwashing system will provide tertiary treatment and will be sized for the projected peak flow of the entire plan which is 6,911 m^3/d. The existing filter beds which have been taken out of service will be demolished to make room for the proposed new expansion.

The layout of the proposed plant expansion is shown in Drawing No. 1. The major facilities are outlined in subsequent sections of this report.

4.2.4 Flow Equalization Tank

To minimize the flow variations into the proposed sewage treatment plant expansion, a flow equalization tank will be provided. The flow equalization tank will equalize the influent flows from the new sewage collection system and the Hamlet of Haliburton, thus providing a constant sewage flow to the proposed sewage treatment plant expansion.

4.2 Alternative Design Concepts (Cont'd)

The proposed flow equalization tank will be sized to retain approximately one (1) hour of peak flow. Based on a projected peak flow of 6,911 m^3/d, a retention tank with a capacity of 288 m^3 will be required.

A review of the hydraulic profile and plant layout of the existing Haliburton sewage treatment plant indicates that two (2) options can be provided for the flow equalization tank as follows:

Option A - Provision of a flow equalization tank with gravity outlet
Option B - Provision of a flow equalization tank with submersible pumps

Under Option A, the proposed flow equalization tank will be located at the high ground area of the plant in order to provide a gravity outlet to the sewage treatment facilities. It is proposed to construct the equalization tank with dimensions of 8 m by 18 m by 2 m SWD in the existing grit channels site. In addition, it will be necessary to construct a new grit removal facility, via an aerated grit tank, to replace the existing grit channels.

Under Option B, it is proposed to construct the flow equalization tank in conjunction with the proposed extended aeration process tank using the common wall structure. The proposed tank with dimensions of 6 m by 16 m by 3 m SWD will be constructed in the east side of the process tank. The flow retained in the tank will be pumped continually at average day flow rate to the existing grit channels. Two (2) submersible sewage pumps, each rated at 22.4 L/s at 6 m TDH and driven by a 2.4 kW electric motor will be installed in the tank. One pump will be able to pump the average day flow rate while the other pump acts as a standby pump.

Based on our evaluation, it is recommended that Option A be used for the construction of the flow equalization tank.

4.2 Alternative Design Concepts (Cont'd)

4.2.5 Grit Removal Facilities

a) Aerated Grit Tank

A new aerated grit tank would be designed for a 5 minute detention time at the estimated peak flow of 79.9 L/s. The tank would be 2 m by 4 m by 3 m SWD. Air diffusers would be isntalled in the aerated grit tank. Grit would be removed by air lift to a grit storage tank for periodic removal and disposal off site.

b) Flow Divider

A flow divider will be provided downstream of the new aerated grit tank to divide flow between the existing and new portion of the plant.

4.2.6 Extended Aeration Process Tank

The proposed extended aeration process tanks will consist of the existing extended aeration process tank rated at 542 m^3/d and a new extended aeration tank sized for 1,391 m^3/d. Thus, the total plant capacity upon completion of the proposed expansion will be 1,933 m^3/d.

The proposed extended aeration process tank with a capacity of 1,391 m^3/d could be provided under two (2) options as follows:

Option A - Provision of a package treatment unit
Option B - Provision of a reinforced concrete treatment tank

4.2 Alternative Design Concepts (Cont'd)

Under Option A, it is proposed to construct a package treatment unit, similar to the existing unit. However, the package treatment unit, in general, is often used in the small size plant and is not economical to be used in the large sized plant. A review of the plant layout and the proposed plant capacity of 1,391 m^3/d indicates that the use of the package treatment unit for the plant expansion is not an economic solution. Thus, this option will not be further considered.

Under Option B, it is proposed to construct a reinforced concrete rectangular tank using the common walls for various tank components. The rectangular tank concept has been successfully used in the Millbrook, Colborne and Uxbridge sewage treatment plants which have approximately similar capacities as Haliburton. Thus, Option B will be used for the provision of process tanks for the Haliburton sewage treatment plant expansion.

The design parameters used to size the various tank components will be in accordance with the MOE Guidelines for the design of sewage treatment plants. In particular, the design parameters for the nitrification process as specified in the MOE guidelines will be used for the aeration equipment capacity, secondary clarifier overflow rate and solids loading.

The proposed rectangular concrete tank will consist of the following components:

a) Comminutor

A new comminutor would be installed for the peak flow of 4,973 m^3/d at the inlet to the new process tank.

b) Metering Facilities

A 300 mm throat parshall flume would be located downstream of the comminutor.

4.2 Alternative Design Concepts (Cont'd)

c) Aeration Tank

One (1) tank would be provided to treat a design flow of 1,391 m^3/d at a BOD loading of 0.21 $kg/m^3/d$. The tank would be 28 m by 9.6 m by 4.3 m SWD which would provide a retention time of approximately 20 hours at the design flow of 1,391 m^3/d. The tank would contain two (2) - 11.3 kW electric motor driven mechanical surface aerators.

d) Final Settling Tank

One (1) final settling tank would be provided for a peak flow of 4,973 m^3/d. The tank would be designed for a surface settling rate of 0.34 $L/m^2/s$ at the peak flow or a maximum solids loading rate of 120 $kg/m^2/d$ at the peak flow including 100% return sludge. The tank would be 28 m by 6 m by 3.7 m SWD. It would be equipped with sludge scrapping equipment.

e) Sludge Holding Tanks

Two (2) equivalent sized sludge holding tanks would be provided for the aerobic digestion of the sludge. The tanks would be sized for a loading of 1.6 $kg/m^3/d$ volatile suspended solids based upon first stage volume only. Each tank would be 6.0 m by 5.0 m by 4.3 m SWD. Air would be supplied through a diffused aeration system at a rate of 0.85 $L/m^3/s$. Two (2) of the existing three (3) air blowers located in the control building would be replaced with larger units for supplying air to the existing plant as well as the sludge holding tanks.

f) Sludge Recirculation and Transfer Pumps

Variable speed submersible sewage pumps would be provided for sludge recirculation and the constant speed submersible sewage pump would be provided for sludge transfer. The pump capacity for the recirculation pumps would be based on a rate equal to 50 to 200 percent of the design flow.

4.2 Alternative Design Concepts (Cont'd)

4.2.7 Phosphorus Removal Chemical Feed Facilities

Phosphorus removal chemical feed facilities consist of the addition of polymer as a coagulant aid to the alum or ferric chloride. This method has been successfully used at the Bradford, Wallaceburg, Bell River and Clarkson Water Pollution Control Plants.

Polymer addition requires monitoring by the plant operators since it is important that concentrations are maintained between a certain range. The following are important points about the implementation and application of polymer.

1. Polymer dosages should be maintained between 0.6 and 0.9 mg/l and adjusted according to flow variation.

2. Alum or ferric chloride dosages should be adjusted by trial and error until desired treatment is achieved.

3. Polymer is added in the channel between the aeration tank and clarifier in non-turbulent water. Alum or ferric chloride is added into the channel before aeration tanks in relatively turbulent water.

4. The polymer solution is prepared in two (2) tanks where dry polymer is added to water to achieve a concentration of 1.1 g/l. The solution is mechanically mixed for 30 minutes, allowed to sit for 24 hours for proper wetting, and then pumped into the wastewater.

5. Chemical feed pumps should be thoroughly cleaned every 2-3 months since a polymer related bacteria will build up in the system. Pumps should be of the easily maintained variety.

4.2 Alternative Design Concepts (Cont'd)

Based on the above-noted information, the proposed phosphorus removal chemical feed facilities will include the following:

a) Use the existing 27.3 m^3 chemical storage tank and two (2) chemical metering pumps for alum or ferric chloride addition.

b) Install the polymer addition facilities including pumps, solution tanks in the storage room of the existing control building. A new storage room will be included in the new effluent filter building.

4.2.8 Effluent Filters and Chlorine Contact Tank

Effluent from the existing and new secondary clarifiers will be collected and flow through the polishing filters.

A filter building with a plan area of 11 m by 7 m would be constructed to house two (2) mixed media filters as well as the filter backwash facilities. Each filter would be designed for a filtration rate of 2.4 $L/m^3/s$ at the peak flow of 79.9 L/s, which is less than the allowable filtration rate of 3 $L/m^2/s$ as recommended by the MOE design guidelines. The backwash system would be designed for a backwash rate of 10 $L/m^2/s$. Each filter would be 3.8 m by 4.2 m by 3.5 m SWD.

A chlorine contact tank and a backwash wastewater holding tank would be provided under the filter building. The chlorine contact tank would be sized to provide a minimum retention time of 30 minutes for the entire plant's average flow of 1,933 m^3/d while the backwash holding tank would be sized to provide a storage volume for 10 minutes' backwash. The backwash wastewater from the holding tank would be pumped to the grit channels at a rate of 3 to 4 L/s.

4.2 Alternative Design Concepts (Cont'd)

A backwash pump and air blower would be provided in the filter gallery on the lower floor while the filter controls would be housed on the main floor.

4.2.9 Outlet Sewer

Effluent from the chlorine contact tank will be discharged via approximately 40 m of 300 mm diameter outlet sewer to the existing MH No. 1 and then via the existing 300 mm diameter outlet sewer to the Drag River. As noted previously, the existing 300 mm diameter outlet sewer from the existing MH No. 1 to the Drag River has a capacity of approximately 320 L/s which is adequate to handle the required peak flow of 79.9 L/s. Thus, no expansion of the outlet sewer is required.

Based on the seven day minimum flow for a return period of 20 years (7Q20) in the Drag River of 0.28 m^3/s, and the expanded plant capacity of 1,933 m^3/d, an initial dilution ratio of 14:1 would be realized. Using the effluent criterion of BOD_5 5 mg/l, suspended solids 5 mg/l, and total phosphorus 0.2 mg/l, the initial dilution concentration in the Drag River would be BOD_5 0.35 mg/l, suspended solids 0.35 mg/l and total phosphorus 0.014 mg/l.

4.3 Environmental Impacts

4.3.1 Natural Environment

a) Physiography

The amount of land required to expand the sewage treatment facilities is minimal and is within the existing property, therefore, the selected design will not impact the physiography of the study area.

4.3 Environmental Impacts (Cont'd)

b) Soils

Construction of the expanded sewage treatment facilities is within the existing property. Since the existing plant site is located adjacent to the bank of the Drag River, it is likely that some soil and silt may wash into the river and increase the turbidity of the water during construction. Thus, mitigative measures include the installation of silt curtains, or other silt barriers at the site as well as good construction practices to ensure that the disturbed areas are restored as soon as possible. Therefore, the selected design will have minor impact on the soils.

c) Water Resources

Effluent from the expanded Haliburton sewage treatment plant discharges to the Drag River which discharges to Grass Lake for subsequent discharging into Kashagawigamog/Canning Lake. Kashagawigamog Lake is part of the Trent-Severn Waterway water resources system and is used as a reservoir lake in supplying water to meet minimum flow requirements in the rivers and waterway.

As the effluent from the existing Haliburton sewage treatment plant does not adversely effect lake levels in Kashagawigamog Lake, the effluent from the expanded plant will not impact lake levels in Kashagawigamog Lake.

The selected design will not impact existing water resources.

4.3 Environmental Impacts (Cont'd)

d) Aquatic Life and Fisheries

The effluent criteria from the expanded Haliburton sewage treatment plant has been set to ensure that discharge of the effluent does not have an adverse impact on the quality of the receiving waters and that the water quality is in compliance with the Provincial Water Quality Objectives (PWQO).

To evaluate the potential impacts on water quality resulting from the sewage treatment plant expansion, impacts on total phosphorus dissolved oxygen concentrations have been outlined in the Phase 1 and 2 Report and are summarized as follows:

1) Phosphorus Loading

The MOE Central Region has indicated that, in keeping with the Policy 2 status of North Kashagawigamog Lake, no increase in phosphorus loading either upstream or directly to North Kashagawigamog Lake will be permitted. To maintain the existing loading of 160 kg/yr., an effluent phosphorus concentration of 0.2 mg/L would be required. Effluent criteria of 0.2 mg/L phosphorus will be evaluated, both on environmental and technical considerations to determine the preferred solution for the Haliburton sewage treatment plant expansion.

The projected phosphorus budgets for the selected design are presented in Table 4.6. The budgets were determined by including the baseline phosphorus concentrations for those cottages and resorts not connected to the sewage collection system, and phosphorus concentrations of 0.2 mg/L in the treated effluent from the expanded sewage treatment plant.

4.3 Environmental Impacts (Cont'd)

Table 4.5

Projected Phosphorus Budgets

1,933 m^3/d Treated Effluent with Outlet Sewer to Drag River

	Grass Lake 0.2 mg/L	Kashagawigamog Lake (North Basin) 0.2 mg/L	Kashagawigamog Lake (South Basin) 0.2 mg/L
Natural Load from Watershed (kg/y)	17.6	181.2	336.4
Anthropogenic Sources (kg/y)	20.6	108.2	121.3
Influent Load (kg/y)	971.6	960.4	898.0
Total Load (kg/y)	1,009.8	1,249.8	1,355.7
Retention Coefficient	0.05	0.28	0.30
Areal Loading ($mg/m^2.y$)	1,585.2	396.8	275.0
Total Phosphorus (mg/m^3)	12.7	9.2	7.0

It is noted from Table 4.5 that with an effluent phosphorus concentration of 0.2 mg/L, the baseline anthropogenic sources constitute a phosphorus loading of 20.6 kg/y, 108.2 kg/y and 121.3 kg/y for Grass Lake, North Kashagawigamog and South Kashagawigamog, respectively. The maximum phosphorus load from the plant would be 141.1 kg/y based on the design flow of 1,933 m^3/d.

It is noted that with an effluent phosphorus concentration of 0.2 mg/L, the existing loading of 160 kg/year will be able to be maintained as per the MOE requirements. Thus, the selected design will not impact total phosphorus in the existing receiving waters.

4.3 Environmental Impacts (Cont'd)

2) Dissolved Oxygen Concentrations

Dissolved oxygen criteria have been established by the MOE for the protection of aquatic life. The minimium allowable concentration for cold water biota is 5 mg/L.

Senes Consultants utilized two models to predict the impacts on the dissolved oxygen concentrations resulting from the sewage treatment plant expansion. Senes evaluated the hypolimnetic oxygen demand of Kashagawigamog Lake based on phosphorus, BOD and ammonia discharges from the existing and proposed sewage treatment plant. The predicted volumetric oxygen demand data reproduced from the Senes report are summarized in Table 4.6.

Table 4.6

Predicted Volumetric Hypolimnetic Oxygen Demand

($g\ O_2/m^3$.month)

	Kashagawigamog Lake			
	North Basin		South Basin	
	(1)	(2)	(1)	(2)
Current/Chl-a*	-	1.62*	-	1.15*
Current/TP**	1.85**	1.78**	0.99**	0.99**
After Plant Expansion	1.71	1.83	0.82	0.99

Notes:

* Based on measured chlorophyll-a concentration.
** Based on measured phosphorus concentrations.
(1) Welch-Perkins Model
(2) Vollenweider-Janus Model

4.3 Environmental Impacts (Cont'd)

The expected minimum oxygen concentrations over the depth of the hypolimnion at the end of summer stratification were 5.2 and 6.5 mg/L O_2 for the north and south basins of Kashagawigamog Lake, respectively. Somewhat lower values may be expected at lake turnover in the fall.

The selected design will not impact aquatic life and fisheries.

e) Woodlots

There may be some minor loss of trees in the existing plant site as a result of construction of the sewage treatment plant expansion. Measures should be implemented during the construction period to minimize tree losses.

The selected design will have minor impact on existing woodlots.

f) Wildlife

The construction activity related to the plant expansion will be restricted to the fenced enclosure of the existing treatment plant site. Therefore, the loss of wildlife habitat is minimal.

The selected design will not impact wildlife in the study area.

g) Groundwater Supply

There is not a piped municipal water supply system in the general area and the residents as well as the commercial and industrial establishments rely on private wells for their water supply. Expansion of the sewage treatment plant will reduce the number of individual sewage disposal systems utilized, thus decreasing the chances for groundwater contamination.

4.3 Environmental Impacts (Cont'd)

4.3.2 Socio-Economic Environment

a) Land Use

The existing sewage treatment plant site will be used for the expansion of the treatment facilities, therefore, no land use conflicts are anticipated.

b) Economy

The construction of the Kashagawigamog Sewer Extension and the expansion of the treatment plant will enable the resort owners to expand their businesses. This, in turn, will stimulate tourism and commercial and industrial development, thereby creating job opportunities.

The Municipality will benefit from the resultant increase in the tax base and the higher revenues which could be utilized to provide better services to the residents. Thus, the Municipality and the Hamlet of Haliburton in particular, will reap long term economic and social benefits from the project.

In the short term, the money spent and the temporary jobs created during the construction will also benefit the local economy.

The selected design will benefit the economy in the Hamlet of Haliburton.

c) Public Health

Protection of public health will be improved by the implementation of any of the proposed alternatives. Provision of adequate hydraulic capacity and proper sewage treatment will reduce the discharge of untreated or inadequately treated sewage from individual disposal systems to Head, Grass and Kashagawigamog Lakes.

The selected design will benefit public health in the Hamlet of Haliburton.

4.3 Environmental Impacts (Cont'd)

d) Aesthetics

Aesthetic concerns are generally long term in nature. Short term effects due to construction are normal and are generally tolerated. Implementation of the selected design will not involve the construction of high structures which may have adverse effects on the landscape of Haliburton.

The major portion of construction activity will be restricted to the plant site. The area surrounding the existing plant is hilly terrain, heavily wooded and secluded from any development. The new plant will be located near an existing open gravel pit. The site is surrounded by mature trees and is not visible from either Highway 121 or Kashagawigamog Lake.

As the proposed sewage treatment plant expansion is not readily visible to the community, the selected design will not have any negative impacts on the aesthetic quality of Haliburton.

e) Growth Potential

The growth potential of the community could be affected by the availability of an adequate sewage treatment facility. The installation of a piped sewage system for the resorts and other commercial and industrial development may increase the demand for land development within the service area, resulting in an increased population size.

The selected design will benefit growth potential in the Hamlet of Haliburton.

4.4 Construction and Operation Requirements

The construction of the proposed sewage treatment plant expansion for the Hamlet of Haliburton will involve a number of construction activities as follows:

- installation of additional pump at the Main Sewage Pumping Station
- construction of flow equalization tank
- construction of additional grit removal facilities
- construction of extended aeration activated sludge plant
- construction of effluent filtration facilities
- extensive excavation operation
- potential restoration of existing site

The above mentioned construction components are generally most economically and efficiently carried out during the relatively dry summer months. Construction during this time of the year will minimize the potential for erosion of unprotected, partially completed earthworks; allow protective vegetative cover the opportunity to catch thereby providing erosion protection during the relatively wet fall and spring seasons; and allow overall construction to be completed as quickly as possible, thereby providing improved sewage works service without weather related delays.

A number of mitigating measures aimed at minimizing or eliminating the potential detrimental effects of certain construction activities must be specified and implemented. These measures will include:

- efforts to prevent eroded soil from entering receiving waters
- appropriate disposal of waste construction materials
- maintenance of local drainage systems
- control excessive noise levels during or after normal working hours

The completed sewage treatment plant expansion must be operated under the terms of the Certificate of Approval issued by the Ministry of the Environment for the proposed sewage works system. Appropriate maintenance activities should continue to ensure proper long term operation of the completed facilities.

4.4 Construction and Operation Requirements (Cont'd)

The sewage treatment and pumping equipment installed will require routine inspection and maintenance. Consequently, it will be necessary to maintain the existing access road and provide maintenance and snow clearing as required to ensure that the plant site is accessible year round.

5.0 SELECTED DESIGN AND CONSTRUCTION REQUIREMENTS

The purpose of this section is to describe the project, and present related engineering considerations and environmental concerns.

5.1 Selected Design - Description

The preferred design concept generally involves the following:

a) Installation of the third pump in the main sewage pumping station.
b) Construction of a new flow equalization tank at the existing site.
c) Construction of a new aerated grit tank.
d) Construction of an extended aeration activated sludge plant including aeration tank, secondary clarifiers, sludge holding tanks and sludge recirculation pumps.
e) Installation of phosphorus removal chemical feed facilities including ferric chloride or alum feed system and polymer addition system.
f) Construction of new effluent filtration facilities including polishing filters and backwash water system.

5.2 Selected Design - Potential Environmental Impacts

The potential direct and indirect environmental impacts associated with the selected design concept will be identified in both beneficial and adverse environmental impacts as follows.

5.2.1 Potential Beneficial Environmental Impacts

The selected design concept will result in a number of potential beneficial environmental impacts as follows:

5.2 Selected Design - Potential Environmental Impacts (Cont'd)

a) Improved Effluent Quality

The proposed sewage treatment plant expansion consists of an extended aeration type of plant followed by effluent filtration. The treatment process would produce a high quality of effluent containing BOD_5 less than 5 mg/L, suspended solids less than 5 mg/L and phosphorus concentration of 0.2 mg/L or less.

The proposed sewage treatment plant expansion and upgrading will result in improved effluent quality.

b) Increased Sewage Treatment Capability

The proposed expansion of the sewage treatment facilities will increase the treatment plant capacity to meet the 20 year requirement for the study area. This may stimulate increased population growth and tourism trade with associated economic benefits.

In addition, expansion of the sewage treatment plant will reduce the number of individual sewage disposal systems utilized, thus decreasing the chances for groundwater contamination.

5.2.2 Potential Adverse Environmental Impacts

The selected design concept will result in a number of potential adverse environmental condition changes as follows:

1) Impact from Plant Expansion

Construction of the sewage treatment plant expansion will require destruction of existing woodlot. In addition, construction of a sewage treatment plant expansion may not be aesthetically pleasing.

5.2 Selected Design - Potential Environmental Impacts (Cont'd)

2) Impact from Plant Operation

The sewage treatment process may break down and result in sewage by-pass to the receiving waters.

3) Impact from Undesirable Sewage

The possibility of new industrial or commercial growth which may produce undesirable sewage to the expanded sewage treatment plant expansion. This undesirable sewage may not be accommodated by the proposed sewage treatment plant expansion.

4) Impact on Community Development

The possibility of community development may put pressure on existing services.

5.3 Selected Design - Mitigating Measures

As outlined in Section 5.2.2, the selected design concept will result in a number of potential adverse environmental impacts in the Hamlet of Haliburton.

The mitigating measures associated with the potential adverse environmental impacts are presented as follows:

1) Impact from Plant Expansion

The proposed sewage treatment plant expansion is to be located on the existing site. The area surrounding the existing site is hilly terrain, heavily wooded and secluded from any development. The proposed plant expansion includes the construction of a reinforced concrete tank and a concrete block building which would not seem out of place in this area and would be an asset to the surroundings if properly landscaped.

5.3 Selected Design - Mitigating Measures (Cont'd)

In order to reduce the visual impact on the expanded treatment facilities, every effort will be made to leave existing trees on the property. Additional trees will be planted for screening.

In addition, a good architecturally designed concrete block building will be aesthetically pleasing.

2) Impact from Plant Operation

Plant process operation, i.e. aeration system, breakdown for short time periods is not critical to the treatment process. Since a flow equalization tank and a standby power diesel generator set are provided in the plant, impact from a plant breakdown is minimal.

3) Impact from Undesirable Sewage

The Municipality of Dysart et al should establish and/or enforce the municipal sewer use by-laws related to the quantity and quality of sewage allowed to be processed in the expanded Haliburton sewage treatment system.

The Ministry of the Environment has developed a MISA program which intends that municipalities incorporate all provincial and local pollution control discharge limits and develop a program to monitor, audit and enforce discharge limits. The Municipality of Dysart et al should incorporate the MISA program when it is in place in 1991.

4) Impact on Community Development

In order to reduce the pressure on existing services, community development should proceed in accordance with the Official Plan for the community.

5.4 Selected Design - Construction and Operation Requirements

The proposed sewage treatment plant expansion will involve specific construction and operational activities as follows.

5.4.1 Construction Requirements

a) Main Sewage Pumping Station

- Install the third pump.
- Modify the electrical and control systems.

b) Sewage Treatment Plant

- Excavate plant site including blasting rock.
- Construct a flow equalization tank including pumps.
- Construct an aerated grit tank.
- Construct an extended aeration activated sludge plant.
- Install phosphorus removal chemical feed facilities.
- Construct effluent filter building.

5.4.2 Operation Requirements

- Routine inspection of sewage treatment plant site.
- Supply and installation of chemical required for phosphorus removal and chlorination.
- Routine inspection of pumps and diesel generator set.
- Keep flow records, chemical dosage, raw sewage quality and effluent quality in the plant performance sheet.

5.5 Specific Construction and Operation Requirements - Potential Environmental Impacts

The potential adverse environmental impacts associated with specific construction and operation requirements has been identified and are summarized as follows.

5.5.1 Aesthetics and Inconvenience

Construction requirements will impact the aesthetics of the surrounding landscape. In general, tourists and residents will be inconvenienced by road detours and the visual impact of construction equipment. Aesthetic impacts from construction are short term and they are generally tolerated by the public.

5.5.2 Other Environmental Condition Changes

Other environmental condition changes associated with construction requirements are outlined as follows:

a) disposal of brush and trees from clearing operation
b) construction activity adjacent to watercourses
c) erosion of partially completed earthworks and sediment in adjacent watercourses
d) increase in noise and vibration levels
e) refueling and maintenance of construction vehicles
f) general construction site condition and disposal of waste materials and refuse
g) continuation of sewage flow during construction

5.6 Specific Construction and Operation Requirements - Mitigating Measures

As outlined in Section 5.5.1, two (2) potential adverse environmental impacts from construction requirements have been identified as follows:

1. Aesthetics and inconvenience, and
2. Other environmental condition changes.

The mitigating measures that will be implemented to offset these impacts are as follows.

5.6.1 Aesthetics and Inconvenience

To minimize the impact of construction on aesthetics and reduce inconvenience to the public, two (2) mitigating measures will be implemented:

a) The contractor will be required to control dust emissions.

b) All detour routes will be clearly identified.

5.6.2 Other Environmental Condition Changes

To minimize the impact of construction on the other environmental condition changes, the mitigating measures which correspond to Section 5.5.2 will be implemented as follows:

a) Disposal in approved dump site or on-site burning provided prior approval is obtained.

b) Appropriate setback requirements during construction.

c) Installation of silt curtains, or other silt barriers, prompt sodding of cleared areas and ensuring that the cleared and excavated areas do not remain open for an extended period of time.

5.6 Specific Construction and Operation Requirements - Mitigating Measures (Cont'd)

d) Use of properly maintained and adequately muffled construction equipment. Construction activity confined to predetermined work area.

e) Confined to specific maintenance area with appropriate controls to prevent excessive spillage and dumping of fuel or lubricants.

f) Construction site to be maintained in neat and tidy condition with provision for collection and disposal of waste materials and refuse.

g) Sewage flow to be uninterrupted during construction period with provision to adequately bypass construction activity or minimize delay so as not to allow any sewage overflow.

5.7 Summary of Identified Concerns and Mitigating Measures

The Class Environmental Assessment process has provided an opportunity for review agencies and the general public to make comments related to the proposed sewage treatment plant expansion. This external involvement has prompted the following identified concerns and proposed mitigating measures.

	Concern	Mitigating Measure
a)	No increase in phosphorus loading in Kashagawigamog Lake	- Phosphorus removal facilities will be included to reduce effluent phosphorus to 0.2 mg/L.
b)	No reduction in oxygen concentration in Kashagawigamog Lake	- The proposed tertiary sewage treatment plant will provide high effluent quality to ensure no reduction in oxygen concentration in Kashagawigamog Lake.
c)	Bank erosion and siltation	- Erosion control will be considered during final design process.
d)	Environmental aspect of the proposed undertaking	- Natural and socio-economic environmental impact have been evaluated.

5.7 Summary of Identified Concerns and Mitigating Measures (Cont'd)

The Class EA process does not end with the submission of the Environmental Study Report. Any reasonable concerns or comments will be accepted and appropriate mitigating measures incorporated into the final design of the proposed sewage treatment plant expansion.

5.8 Monitoring

The proposed sewage treatment plant expansion will require construction and operation monitoring programmes. Regular construction site inspection will be required during the course of the work to ensure that the work is undertaken in accordance with approved plans and specifications.

The construction inspection programme will include monitoring of the potential environmental condition changes identified and confirmation that corresponding mitigating measures have been implemented as detailed in Sections 5.5 and 5.6 of this report.

Construction monitoring will also include inspection and testing of concrete structures, pipe works, pumps, mechanical aerators, standby power diesel generator, chemical feed equipment operation, and ventilation system. The consulting engineer will be responsible for the collection, analysis and evaluation of test results and general construction supervision on behalf of the proponent, the Municipality of Dysart et al.

The Municipality of Dysart et al will continue to be responsible for monitoring operational aspects of the completed project. Periodic sampling, testing and evaluation of raw sewage and effluent will be continued. Additional operation and maintenance activities will be monitored after the system is operational. The results of the operational monitoring programme will provide valuable information to assess the efficiency and reliability of the sewage treatment process currently under consideration.

6.0 FINANCIAL IMPLICATIONS

6.1 Financial Assistance

The Ministry of the Environment funds Municipal Sewage projects under the Direct Grant Programme.

The amount of funding under the Direct Grant Programme ranges from 85% for communities of 1,000 people or less, to a minimum of 15% for communities of 7,500 or more.

The Ministry of the Environment has already approved a grant of 81% for the treatment plant expansion under the "Direct Grant Program for Sewage Works". The remaining 19% of the cost will be shared by the users of the proposed sewer extension.

6.2 Estimated Capital Costs

The estimated capital costs for the preferred design concept, based on Fall 1990 prices and including an allowance for engineering and contingencies, are shown in Table 6.1.

6.2 Estimated Capital Costs (Cont'd)

Table 6.1

Estimated Capital Costs

Proposed Works	Cost ($)
1. Pumping Station No. 1	
1.1 Install one additional pump	48,000
2. Treatment Plant	
2.1 Sitework	48,000
2.2 Excavation and backfill	120,000
2.3 Cast-in-place concrete	840,000
2.4 Yard piping and appurtenances	60,000
2.5 Equipment	648,000
2.6 Misc. metal and process piping	120,000
2.7 Air piping	36,000
2.8 Superstructure at effluent filters	84,000
2.9 Electrical	156,000
2.10 Storage, piping and equipment for polymer addition	150,000
TOTAL	2,310,000

6.3 Direct and Indirect Costs

Based on a grant of 81% of the capital costs for the selected design, a cost breakdown of the direct and indirect costs are shown in Table 6.2.

Table 6.2

Direct and Indirect Costs Under MOE Direct Grant Program

1)	Total Cost	$2,310,000
2)	MOE Subsidy 81%	$1,871,100
3)	Cost to users of the proposed sewer extension	$ 438,900

6.4 Estimated Operating Costs

The estimated annual operating costs of the sewage treatment plant expansion for the selected design are summarized in the following Table 6.3.

Table 6.3
Annual Operating Costs
(Year 1 Costs)

Operator	$ 40,000
Power Cost	$ 40,000
Chemicals	$ 16,000
Repair & Maintenance	$ 20,000
Sludge Disposal	$ 36,000
Miscellaneous	$ 7,000
Total Cost	$159,000

6.5 Capital Cost Recovery

A financial analysis has been carried out to determine how the capital cost of the proposed sewage treatment plant expansion and Kashagawigamog sewer extension can be recovered. The copy of the report is attached in Appendix H of this report. The findings of the report are summarized as follows:

1) The Kashagawigamog sewer extension capital costs should be completely recovered up front from benefitting properties. This is already Dysart policy and has been agreed by all properties already allocated capacity. Currently 593 Equivalent Residential Units (ERU) of capacity have been allocated out of a total of 777 ERU capacity provided. Reserve capacity is available for development (184 ERU) and should also be charged upfront as new requests for capacity are granted. The estimated charge is $2,694/ERU (based on current cost estimates, and 15 year debentures at 11% interest) plus the cost of private works needed by each customer.

6.5 Capital Cost Recovery (Cont'd)

2) This method of charging benefitting customers directly for the cost of the Kashagawigamog sewer extension works is similar to the frontage and connection charges in the existing Haliburton system.

3) All remaining costs, including operating and maintenance costs plus the Sewage Treatment Plant (STP) capital costs are currently recovered from User Rates paid by each customer plus a 2 mill property tax charge. It is proposed that this method be continued for new systems.

4) The current flat rate is $100 per Billing Unit. A projection of customer and financial data ($ current) indicates that a 5% increase in charges applied against both new and old customers should be sufficient to recover the projected operating, maintenance and STP capital costs.

5) Debt for the existing system will not be repaid for 25 years. The annual principal plus interest payment for the existing debt is $40,000. It is noted that an increase in the annual payment by about $8,000 would allow the debt to be repaid in 15 years, that is ten years sooner. This would be equivalent to about $2/Billing Unit annually once the new customers are connected.

7.0 SEWER USE BY-LAW

7.1 Existing Sewer Use By-Law

At present, sewer use in the Hamlet of Haliburton is governed by Municipal By-Laws No. 74-13 and No. 79-14. A copy of each by-law is included in Appendix J1 and J2 of this report.

By-Law No. 74-13 is regulating the use of public and private sewers and drains, private sewage disposal, the installation and connection of building sewers and discharge of waters and wastes into the public sewer system, and providing penalties for violations.

By-Law No. 79-14 is to require owners of certain classes of buildings in the service areas to connect such buildings to the sewage works of the Municipality.

7.2 Draft Sewage Control By-Law

In addition to the above-noted sewer use by-law, it is suggested that a sewage control by-law be prepared to govern the usage of the municipal sewage treatment facilities. A draft copy of the sewage control by-law is attached in Appendix H.

8.0 CONCLUSIONS AND RECOMMENDATIONS

1) In accordance with the environmental, technical and economical evaluation of the five (5) proposed alternatives, it was determined in the Phase 1 and 2 report that Alternative 1, expand the existing plant with discharge to the Drag River is the preferred solution for the expansion of the Haliburton sewage treatment plant.

2) Under Alternative 1, it will be necessary to expand the existing plant capacity from 542 m^3/d to 1,933 m^3/d in order to serve an equivalent population of 4,259 persons with an average per capita flow of 454 L/d.

3) The preferred design concepts for Alternative 1 are as follows:

    a) Installation of the third pump in the main sewage pumping station.

    b) Construction of a new flow equalization tank at the existing site.

    c) Construction of a new aerated grit tank.

    d) Construction of an extended aeration activated sludge plant including aeration tank, secondary clarifiers, sludge holding tanks and sludge recirculation pumps.

    e) Installation of phosphorus removal chemical feed facilities including ferric chloride or alum feed system and polymer addition system.

    f) Construction of new effluent filtration facilities including polishing filters and backwash water system.

8.0 <u>CONCLUSIONS AND RECOMMENDATIONS</u> (Cont'd)

4) It is expected that the effluent from the expanded Haliburton sewage treatment plant will produce an acceptable effluent concentration to meet the effluent criterion of 5 mg/l for BOD_5, 5 mg/l for suspended solids, and 0.2 mg/l for total phosphorus. Those effluent criterion have been confirmed by the Ministry of the Environment.

5) The estimated cost to undertake the proposed sewage treatment facilities expansion under the preferred alternative, based on Fall 1990 prices and including an allowance for engineering and contingencies, is $2,310,000.

6) Upon approval of this report by the Ministry of the Environment and the Municipality of Dysart et al, the ESR will be submitted to the Clerk of the Municipality of Dysart et al and then placed in the Public Record for a review period of thirty (30) days. If there are no irreconcilable objections to the proposed action, the project may then proceed to final design and construction.

All of which is respectfully submitted,

J. H. Tsai, P. Eng.
Design Manager
Environmental Engineering Group