Report

Associated Engineering

GLOBAL PERSPECTIVE. LOCAL FOCUS.

Pigeon Lake Regional Wastewater Steering Committee

Pigeon Lake Wastewater Strategy and Master Plan Study

October 2007

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

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Mr. Frank Coutney
County Administrator
Conty of Wetaskiwin
Box 6960

Re: PIGEON LAKE REGIONAL WASTEWATER STRATEGY AND MASTER PLAN
FINAL REPORT SUBMISSION

Dear Sir:

We are pleased to provide sixteen (16) original hard copies and sixteen (16) digital (pdf format) copies of final Pigeon Lake Regional Wastewater Strategy and Master Plan report.

Thank you for the opportunity to complete this project with the County and Committee. We certainly enjoyed the project and look forward to hopefully assisting with the successful implementation. Please contact the undersigned if the new Committee requires any ongoing advisory services.

We trust this meets your current needs.

Yours truly,

Jeff Fetter, P. Eng.
Project Manager

JF/ja

Enclosures

Executive Summary

The Pigeon Lake development area is growing and Lakeshore use is intensifying creating increased wastewater demands and environmental risks. The area municipalities and Alberta Environment have made positive strides in recent years prohibiting land spreading and encouraging (in some cases requiring) termination of on-site disposal practices. This has increased awareness that additional municipal wastewater capacity is required to deal with the additional truck disposal demand. A watershed basin wide (regional) wastewater solution is required to provide a suitable level-of-service to area users and ultimately assist to protect lake water quality.

The Pigeon lake Regional Wastewater Steering Committee (the Committee) retained Associated Engineering Alberta Ltd. (AE) to complete this feasibility study to review regional wastewater solutions and provide a wastewater strategy and master plan. The study provides an initial planning tool to gain public and stakeholder support of a long-term strategy enabling a coordinated implementation process to begin. The objectives of the study were to:

- Define logical project boundaries;
- Provide conceptual costs estimates for options;
- Consider community growth requirements; and
- Provide recommendations for a viable governance model.

The study included intensive public consultation efforts to ensure the public was informed and had opportunity to express their opinions. The public consultation component of the study was comprised of three distinct phases:

1. Profiling interviews - a series of one-on-one interviews conducted with two individual property owners from each of the six summer villages and the two counties
2. Community Meetings - a series of six public meetings held within the Pigeon Lake area.
3. An Information Session/Open House

Key messages heard throughout the public consultation process were:

- Proceed as fast as possible.
- Minimize rate implications.
- The chosen solution must ultimately be capable of servicing the entire lakeshore area.

Five feasible regional wastewater options were developed consisting of various combinations of treatment process, treated effluent disposal locations, transmission systems, and methods of local collection. Comparative cost analysis of the options considering capital costs, operating costs and funding opportunities identified three preferred options. A qualitative analysis of the three preferred options considering cost, implementation timing, operations, governance, regulatory, aesthetic and environmental advantages and disadvantages indicated Option 1 presents the best overall future strategy.

The recommended regional wastewater system (Option 1) would consist of the following:

- Upgrade of the Mulhurst treatment facility to an aerated lagoon (or higher level of treatment).
- Development of regional transmission system to service the north and south sides of the lake.
- Development of local pressure sewer collection system(s) in the existing developed areas and connect to the regional transmission system.
- Allowance for connections from future private development local collection systems and connect to the regional transmission system.

The total estimated cost to implement Option 1 in current day dollars is $69,900,000, which would be implemented in the following basic sequence:

- Treatment Facility and Effluent Disposal ($6,500,000);
- Regional Transmission ($20,200,000);
- Local Collection ($16,200,000); and
- Private Collection ($31,300,000).

Treatment facility upgrades are the first critical initial step is to ensure all residents within the study area are provided a suitable disposal location for trucked wastewater. Regional transmission systems could be developed at any time to lower truck haul distances and provide future connection point for local collection systems. Treatment and regional pipeline systems would be developed and operated by the responsible municipalities on a shared basis, likely with some type of regional governance structure. Provincial funding (up to 90%) may be provided for these regional components of the system under the Alberta Municipal Water and Wastewater Partnership (AMWWP) Water for Life grant program.

Local collection system(s) development would follow development of the regional transmission system. Each municipality would be responsible for the choice when to develop local collection systems. This would be the most significant financial step for the municipalities and will be governed by escalating truck haul costs.

Cost analysis suggests implementation of the recommended master plan will result in future costs similar to the typical range of current costs for sewage storage, truck haul and disposal. Those currently using on-site disposal systems would see increased costs to upgrade to holding tanks and/or a piped collection system.

The key steps to implementation of the master plan are as follows:

- Provide support to the study findings and recommendations;
- Identify a lead Municipality;
- Determine the future organizational structure;
- Enter discussions with the Northeast Pigeon Lake Regional Services Commission (NEPL) to develop an agreeable service agreement;
- Apply for provincial funding; and
- Develop systems as funds are available.

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1 Introduction

1.1 PROJECT OBJECTIVES

The Pigeon Lake Regional Wastewater Steering Committee (the Committee) was formed to develop a regional wastewater strategy and master plan for the Pigeon Lake watershed area as well as the Dorchester development.

Associated Engineering Alberta Ltd. (AE) was retained by The Committee to complete a feasibility level economically based assessment that:

- Defines logical project boundaries;
- Provides conceptual costs estimates for options;
- Considers community growth requirements; and
- Provides recommendations for a viable governance model.

1.2 SCOPE OF WORK

The study consists of the following:

1. Review existing studies for familiarity with the study area and project.

2. Review the proposed and existing development and meet with the identified stakeholders and other engaged stakeholders.

3. Consider but not necessarily be limited to the following alternatives:
   - Regional collection system with disposal at the Mulhurst Lagoon
   - Regional collection system with disposal at the Falun Lagoon
   - Regional collection system with a stand-alone treatment facility
   - Individual treatment facilities
   - Innovative wastewater solutions
   - Any combination of the above
   - “Do nothing” maintain the status quo

4. Develop a conceptual design of the wastewater system for the identified study area.

5. Develop a public communications plan to identify stakeholder/public issues, concerns and suggestions, as well as how and when to provide information on the project objectives and findings. This includes:
   - Profiling interviews
   - Neighbourhood meetings
   - Information brochure(s)
   - Committee meetings
   - Public meeting(s)

6. Prepare a concept engineering report that includes:
   - Description of alternative systems considered
   - System alignments
   - Capital cost of alternative systems
   - Potential funding and net cost to property owners
   - Operational costs
   - Staging options
   - Environmental issues and approval requirements
   - Maximum/minimum flows
   - Risk factors
   - Governance options
   - Project schedule

7. Work with the Committee comprised of the County of Wetaskiwin and the County of Leduc; Summer Villages of Sundance, Poplar Bay, Harris Beach, Crystal Springs, Grandview, Ma-Me-O Beach; Alberta Environment, Alberta Infrastructure and Transportation,; Alberta Community Development and Parks; the Pigeon Lake First Nation; landowners and developers.

1.3 PROJECT UNDERSTANDING

There are currently approximately 2,915 residential lots and 490 campground sites developed along the shores of Pigeon Lake. Of the 2,915 lots, 728 are serviced by a regional collection system which discharges into the Mulhurst Lagoon. The remaining residential lots are serviced by private sewage systems including disposal fields, holding tanks and some outhouses. It is estimated that up to half of the private sewage systems still use on-lot disposal fields or other undesirable disposal method. The remaining residents use holding tanks to store waste and truck to the Mulhurst or Thorsby Lagoon. Private sewage systems can be difficult and expensive to properly maintain. Poorly maintained sewage systems have been known to overflow, fail or leak, creating health and environmental concerns.

The Provincial Campground treats its wastewater with a conventional stabilization lagoon. A recent assessment of the lagoon identified that it may be leaking and action must be taken to eliminate potential lake impacts. Alberta Parks has also recently started to plan an expansion of the Provincial Campground to service 1,200 people, increasing the need for a new Regional solution.

Ongoing land development and the regulatory prohibition of wastewater land spreading has increased the disposal demand at the Mulhurst and Thorsby Lagoon. The existing Mulhurst Lagoon has reached its capacity and an expansion is scheduled for 2007. To counteract increasing operating costs, residents have been paying a dumping fee, as of July 31st, 2006. With a number of developments planned for the Pigeon Lake area, the need for a comprehensive wastewater collection and treatment strategy is imperative. The strategy must service future developments, but be ultimately suitable to retrofit into the existing communities to provide a higher level of service and environmental protection.

Development and recreation are increasing around lakes and in watershed areas. Therefore, we must consider how this encroaching urbanization may affect the lakes and surrounding natural areas. Locations such as Pigeon Lake are important to the sustainability of Alberta natural ecosystems and offer a great deal of water recreational opportunities. Activities such as canoeing, kayaking, sailing, fishing, power boating, swimming and water-skiing are just a few of the many activities residents commonly enjoy at Pigeon Lake. However, due to the impacts of urban/suburban and shoreline development, recreational activities could become less appealing.

Human health and environmental issues are important to people, which is why it is very important that a proper sewage system is implemented in lakeshore and watershed areas. Septic tanks and disposal fields are widely used in the area. Unfortunately, the increasing costs of tank pump outs, truck hauls and disposal fees may lead some residents to pump liquid to the surface or let it seep into the ground. Disposal fields are not intended for urban or suburban areas, as higher densities cause saturated ground conditions, limiting treatment effectiveness. More people generate more wastes and more wastes increase the chance of pollution and lake contamination.

These issues outlined above are reasons why we must pay careful attention to wastewater disposal and be cautious about the impact it can have on the environment and ultimately our use and enjoyment of lakes in Alberta.

1.4 PROJECT NEED

The existing shoreline development in the many Summer Villages, new emerging communities and extensive plans for future large scale housing developments and recreational sites are all very important to the future of this area. Residents in the area are concerned about the rising costs of waste disposal coupled with the ongoing environmental and public health concerns of such densely populated cottage and housing developments. A comprehensive area wide regional wastewater strategy is necessary to protect the future of Pigeon Lake as a productive natural area providing a superior living environment with abundant recreational opportunities.

This region has made significant past effort to improve wastewater collection and disposal services, but had difficulty getting buy-in from all stakeholders. Continued concerns with Lake water quality, deterioration of private systems and area wastewater treatment capacity limitations have encouraged the stakeholders to reconsider the options and a comprehensive long-term strategy. Municipalities and residents will face a more regulated environment for the Pigeon Lake area if practices do not change. Concerns will continue to rise by Alberta Environment, the Health Units, the Counties and the individual citizens, resulting in:

- Further community growth will be restricted;
- Existing septic disposal systems adjacent to lake will be monitored and upgrading regulated;
- Costs of trucking and disposal will increase;
- Misuse of holding tanks will persist; and
- The beautiful lake recreational environment may disappear.

The objectives of this study, and the Committee, are now focussed on creating the right plan, obtaining true consensus from all demographics and then launching a winning implementation program.

2 Study Area

The study area shown in Figure 2.1 includes the existing and future developments within the Pigeon Lake watershed boundary plus the Dorchester development.

2.1 EXISTING DEVELOPMENT

The existing development (Figure 2.2) along the shore of Pigeon Lake is made up of the following:

- Zeiner and Ma-Me-O Beach Campgrounds, and the Pigeon Lake Provincial Park recreational areas;
- the Summer Villages of Sundance, Itaska, Golden Days, Argentia Beach, Silver Beach, Ma-Me-O Beach, Norris Beach, Crystal Springs, Grandview and Poplar Bay; and
- the developments of Gilwood Beach/Fisher Home, Mitchell Beach, Mission Beach, Kerr Cape, Moonlight Bay, Lakeland Estates, Pigeon Lake Heaven, Mulhurst Bay, Cameron Highlands, Mulhurst Estates, Viola Beach, Westerose, Village of Pigeon Lake and Sunset Harbour.
- Pigeon Lake Indian Reserve No. 138 A

There are currently 3,405 lots (including campground units) throughout the existing developments. In discussion with the Committee members it was estimated only 25 to 30% of the cottages within the study area are occupied as year-round residences and the remainder are utilized as summer weekend and vacation getaways.

2.2 DEVELOPMENT PLANS

The pending and future development plans within the study area (Figure 2.3) were provided by the Committee.

2.2.1 Approved Development

Approved developments could add another 134 lots over the next five years. This includes the proposed Dorchester, Staroba, Nilsson and Howey developments and the Village of Pigeon Lake extension. A planned expansion of the Provincial Campground could add an additional 130 sites.

Any proposed regional system needs to provide flexibility to service these proposed developments, as most of these developments will be well underway prior to the regional system.

2.2.2 Ultimate Development Plans

Extensive development plans have been proposed within the study area. The developments will be much more feasible and likely accelerated once regional sewer systems are available. The development plans generally include extension and/or infill of the current proposed developments. For the purpose of this study it is assumed these ultimate developments will occur within the next 10 to 25 years.

NORTH PIGEON LAKE

NORTH EAST PIGEON LAKE

PIGEON LAKE

SOUTH PIGEON LAKE

WATERSHED BOUNDARY

BATTLE LAKE

BATTLE RIVER

BATTLE RIVER

PIGEON LAKE RIVER

36 31 32 33 34 35 36 34 35 36

25 30 29 28 27 26 25 27 26 25

LEGEND

- NORTH EAST STUDY AREA
- NORTH STUDY AREA
- SOUTH STUDY AREA

PIGEON LAKE REGIONAL WASTEWATER
STEERING COMMITTEE

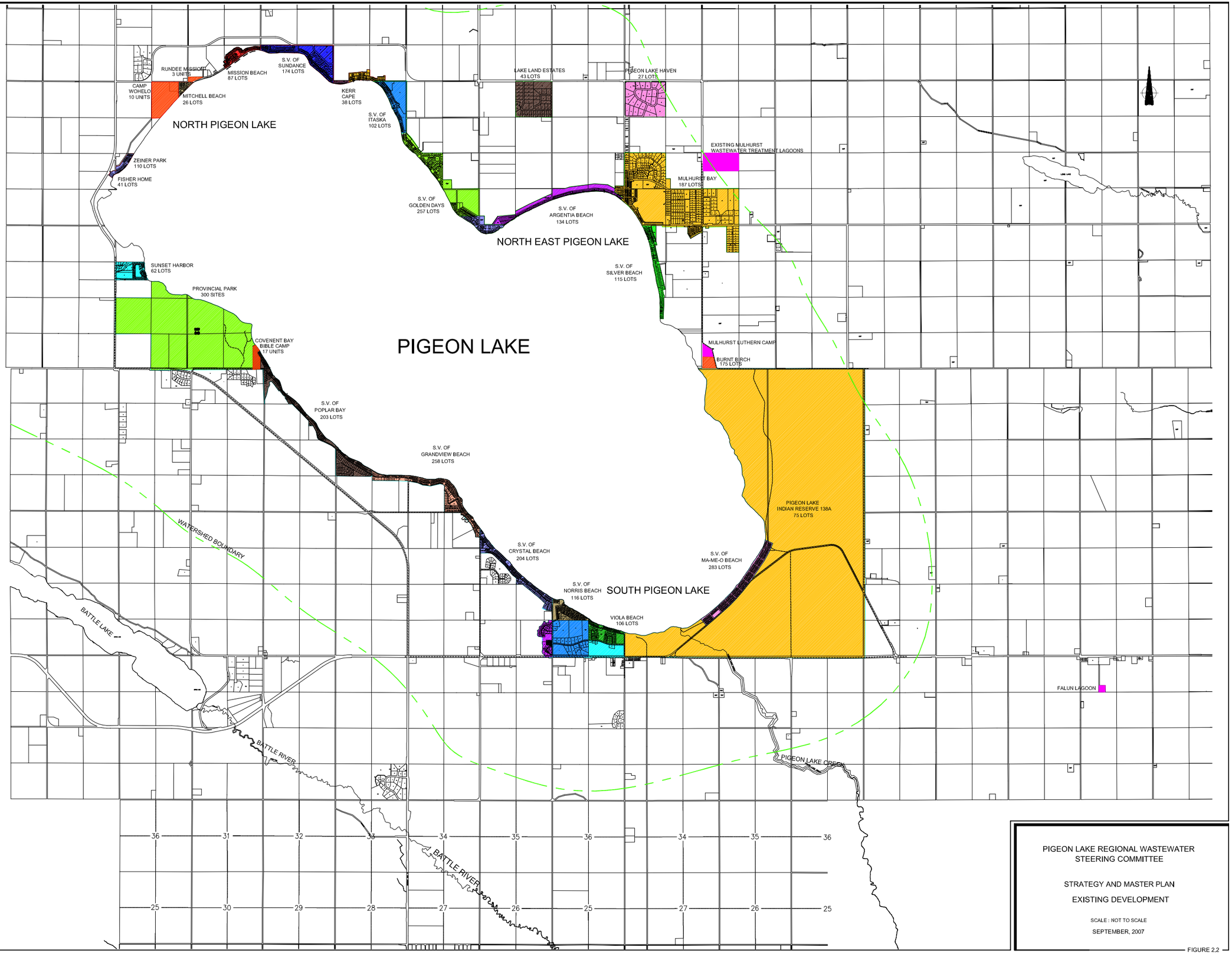
STRATEGY AND MASTER PLAN
STUDY AREA

SCALE : NOT TO SCALE

SEPTEMBER, 2007

Associated Engineering

FIGURE 2.1



PIGEON LAKE REGIONAL WASTEWATER STEERING COMMITTEE

STRATEGY AND MASTER PLAN

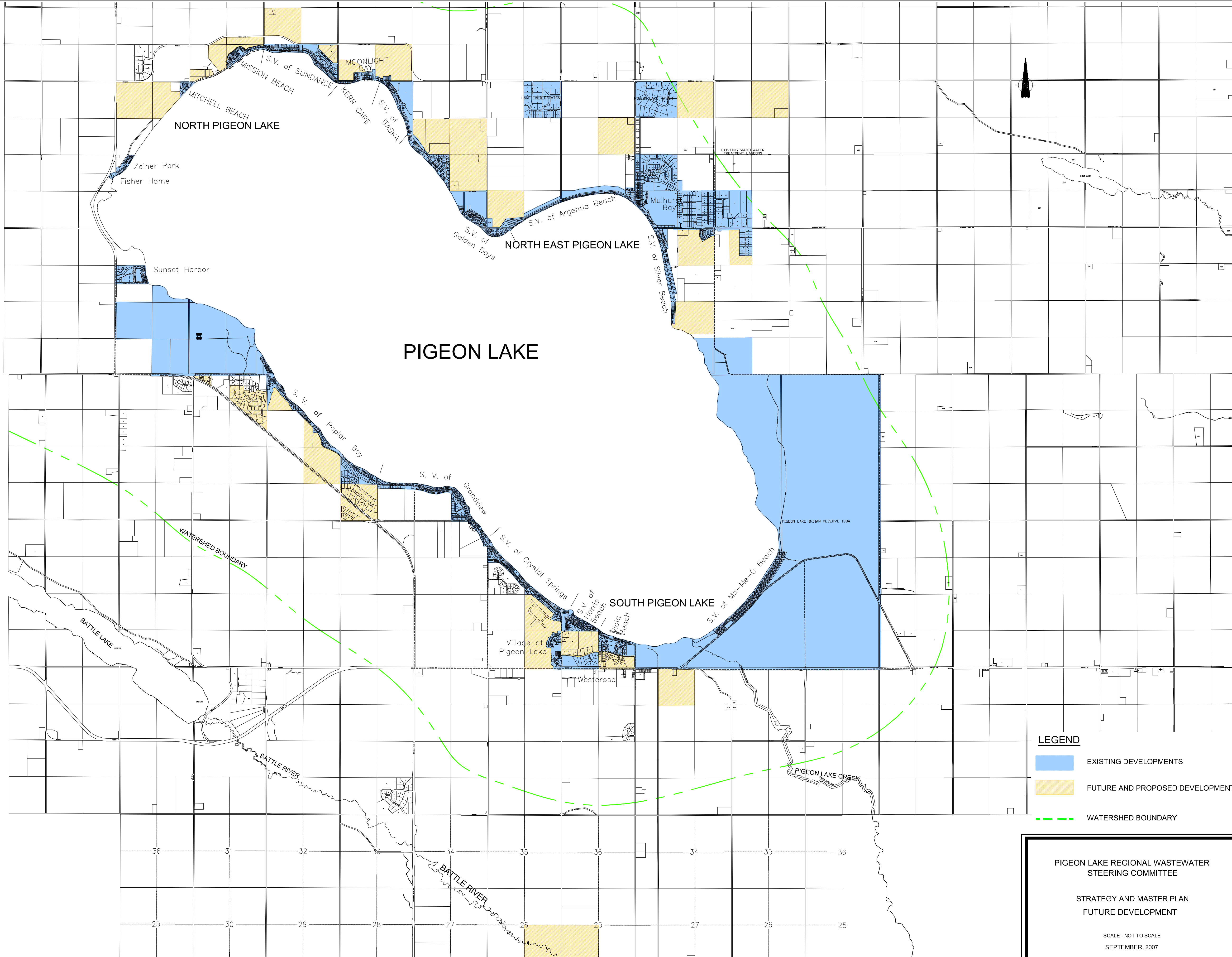
EXISTING DEVELOPMENT

SCALE : NOT TO SCALE

SEPTEMBER, 2007

Associated Engineering

FIGURE 2.2



PIGEON LAKE REGIONAL WASTEWATER STEERING COMMITTEE

STRATEGY AND MASTER PLAN
FUTURE DEVELOPMENT

SCALE : NOT TO SCALE
SEPTEMBER, 2007

FIGURE 2.3

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3 Regional Environmental Setting

3.1 TOPOGRAPHY

The topography in the Pigeon Lake area is generally level or undulating, while terrain more separated from the lake is gently rolling.

The watershed for Pigeon Lake is approximately 187 km^2 or about twice the size of the lake (97 k m^2. The drainage basin takes the water from the western and north-western portions. Surface water enters the lakes through several intermittent streams in the western and north-western portions of the drainage basin. In addition, groundwater springs contribute to the inflow. Pigeon Lake Creek provides an outlet at the south-east end of the lake, flowing to the Battle River. (Atlas of Alberta Lakes, Prepas, Mitchell, 1990).

3.2 GEOLOGY

The surface of the drainage basin is composed primarily of glacial till that originated from the Paskapoo bedrock formation underlying the area. All through the basin the soils that dominate are Orthic Gray Luvisols, which are moderately well-drained soils developed on glacial till. Crop production is severely limited in north and west soils. Along the lakeshore, pockets of organic soil from parent materials of undifferentiated moss and sedge are scattered throughout the watershed. At the southeast end of the lake, in the region of Pigeon Lake Creek and Ma-Me-O Beach, Eluviated Black Chernozemic soils have developed on alluvial-aeolian material. (Atlas of Alberta Lakes, Prepas, Mitchell, 1990).

The water body of Pigeon Lake is a large rough oval, with one fairly shallow and simple basin that slopes down to an approximate depth of 9 m near the centre. Nearly 25% of the surface area of the lake is occupied by the litoral zone, which extends to a depth of 4.5 m. The littoral zone has a large proportion of coarse-textured sediments. Offshore from Ma-Me-O Beach, on the southeast side of the lake, wave-deposited sand occurs.

The shores of Ma-Me-O Beach, Zeiner Park, Itaska Beach and from Silver Beach to Argentia Beach are privileged with wide sandy beaches, which account for 28% of the shoreline. A gentle gradient devoid of a sandy beach is seen in about 42% of the shoreline. Low-lying regions of wetland with very gentle slopes, such as at the northwest end near Zeiner Campground occur on 19% of the shoreline. The 11% that remains, consists of a steep-sloped backshore with no beach area, such as the Crystal Springs area. (Atlas of Alberta Lakes, Prepas, Mitchell, 1990).

3.3 HYDROGEOLOGY

The information presented on this section was obtained from a regional study of the County of Leduc only and, as such, the results are to be used only as a guide. Detailed local studies are required to verify specific hydrogeological conditions. (Leduc County Regional Groundwater Assessment, 1999). A Regional Groundwater Study has not been completed within the County of Wetaskiwin.

The only readily identifiable aquifers in the surficial deposits are the sand and gravel deposits associated with the lows in the bedrock surface. The most noteworthy bedrock lows include the Buried Warburg Valley and the minor buried bedrock valleys. The aquifers are the Upper Lacombe, Lower Lacombe, Haynes, Upper Scollard, Lower Scollard, Upper Horseshoe Canyon, Middle Horseshoe Canyon, and Lower Horseshoe Canyon Aquifers. (Leduc County Regional Groundwater Assessment, 1999)

Surficial Aquifers: Surficial deposits in the County are mainly less than 20 metres thick, except in areas of linear bedrock lows where the thickness of the surficial deposits can exceed 40 metres. The base of the surficial deposits is the bedrock surface. The lower surficial deposits include pre-glacial fluvial and lacustrine deposits (i.e. clay, silt and fine-grained sand). The upper surficial deposits include the more traditional glacial deposits of till and meltwater deposits and there are several areas in the County where these deposits are not present. (Leduc County Regional Groundwater Assessment, 1999).

The surficial deposits consist of three hydraulic parts treated as one hydrogeological unit.

The first is the sand and gravel deposits of the lower surficial deposits, the second is the saturated sand and gravel deposits of the upper surficial deposits and the third is the sand and gravel close to ground level, which is usually unsaturated. (Leduc County Regional Groundwater Assessment, 1999).

Bedrock Aquifers: The upper bedrock includes the Paskapoo, Scollard and Horseshoe Canyon formations. In the County, the Paskapoo Formation consists of the Lacombe and Haynes members. The Bearpaw Formation underlies the Lower Horseshoe Canyon Formation and is a regional aquitard. (Leduc County Regional Groundwater Assessment, 1999).

The Paskapoo Formation is the upper bedrock and subcrops in the northwestern area of Pigeon Lake. The Paskapoo Formation consists of cycles of thick, tabular sandstones, siltstone and mudstone layers Glass, (D. J. [editor], 1990).

The Edmonton Group in the County includes the Scollard, Battle, Whitemud and Horseshoe Canyon formations. The Edmonton Group consists of fresh and brackish-water deposits of fine- rained sandstone and silty shale, thick coal seams, and numerous bentonite beds (Carrigy, 1971).

The Scollard Formation underlies the Haynes Member and subcrops in the western part. It consists mainly of sandstone, siltstone, shale and coal seams or zones. (Leduc County Regional Groundwater Assessment, 1999).

The Battle and Whitemud formations are beneath Scollard. The Battle Formation is composed mainly of claystone, tuff, shale and bentonite, and includes the Kneehills Member(a thick tuff bed). The Whitemud Formation is composed mainly of shale, siltstone, sandstone and bentonite. The Battle and Whitemud formations are significant geologic markers, and were used in the preparation of various geological surfaces within the bedrock. Because of the ubiquitous nature of the bentonite in the Battle and Whitemud formations, there is very little significant permeability within these two formations. (Leduc County Regional Groundwater Assessment, 1999).

The Horseshoe Canyon Formation is the lower part of the Edmonton Group and is the upper bedrock in the eastern half. It is the uppermost bedrock immediately east of the area where the Scollard Formation subcrops and consists of deltaic and fluvial sandstone, siltstone and shale with interbedded coal seams, bentonite and thin nodular beds of limestone and ironstone. (Leduc County Regional Groundwater Assessment, 1999).

The Bearpaw Formation includes transgressive, shallow marine (shoreface) and open marine facies deposits. In Leduc County, the Bearpaw Formation is composed mainly of shale and as such is a regional aquitard. (Leduc County Regional Groundwater Assessment, 1999).

Areas within the Buried Ellerslie Valley have an upward hydraulic gradient from the bedrock to the surficial deposits, mainly in the vicinity of the group of lakes. There is a downward hydraulic gradient from the surficial deposits to the bedrock, i.e. recharge to the bedrock aquifers between the surficial deposits and the Upper Horseshoe Canyon Aquifer. (Leduc County Regional Groundwater Assessment, 1999)

Water Quality: The total dissolved solids (TDS) concentrations in the groundwaters from the upper bedrock aquifer(s) range from less than 200 to more than 2,000 mg/L. The TDS values of more than 1,500 mg/L are mainly east of range 24, W4M (east of Highway 2).

The relationship between TDS and sulfate concentrations shows that when TDS values in the upper bedrock aquifer(s) exceed 1,200 mg/L, the sulfate concentrations generally exceed 400 mg/L. The chloride concentrations in the groundwaters from the upper bedrock aquifers are less than 100 mg/L in more than 90% of the County. In 85% of the County, the fluoride ion concentration in the groundwater from the upper bedrock aquifer(s) is less than 1.5 mg/L. All chemical types of groundwater occur in the bedrock aquifers. However, the majority of the groundwaters are sodium-bicarbonate or sodium-sulfate types. The Risk of Groundwater Contamination map shows that there is not a high or very high risk of the groundwater being contaminated. However, good environmental practices should be exercised in order to ensure that groundwater contamination would not affect groundwater quality at all locations. (Leduc County Regional Groundwater Assessment, 1999).

4 Design Criteria

4.1 SERVICE POPULATION

One of the variables in assessing the sanitary collection system of any community is the population. The population will:

- Provide a measure of the quantity of sewage to be collected and treated;
- Provide a basis for the spatial distribution at the collection systems;
- Have an impact on the sewage flows peaking factor (particularly seasonal variances); and
- Have an impact on the collection system based on population density.

The existing Pigeon Lake developments are primarily summer villages and rural subdivisions in which 25 to 30% of the population are considered year-round residents (permanent). The remaining population is transient with the peak season between May long weekend and September long weekend. A transition period of one month prior to and following the peak season was assumed, during which the population is assumed to be 70 % of the peak. It is expected that the amount of permanent residents will increase over the next ten years. Due to the seasonal nature of residency within the study area, any wastewater system will operate well below capacity during the low season and slow summer periods. The following population trends were used in this report:

- Permanent Residents, 0 to 10 years — 25% of summer peak
- Permanent Residents, Ultimate — 50% of summer peak

Existing peak seasonal population data was not available for the Pigeon Lake Area. To determine the existing and future population an “equivalent population”, or number of people per unit area, was derived.

The existing Pigeon Lake development is made up of 3,405 lots and recreational units. Related project experience and previous reports were used to determine the “equivalent population” during seasonal peaks. The population design criteria are as follows:

- Summer Villages and Country Residential — 3.0 people/lot
- Recreational Sites (Campground) — 2.5 people/site

Table 4.1 displays the estimated populations for the study area. Figures 4.1 and 4.2 show the existing and future developments within the study area. Refer to Appendix A for a detailed breakdown of the estimated populations.

Table 4-1
Pigeon Lake Region Development Population

Area	Lots/sites	Initial Population	Ultimate Population
Existing Lots:			
North East Pigeon Lake	865	2,595	2,595
North Pigeon Lake	709	2,110	2,110
South Pigeon Lake	1,831	5,303	5,303
Sub-Total	**3,405**	**10,008**	**10,008**
New Lots Approved:			
North Pigeon Lake	10	30	30
South Pigeon Lake	284	762	762
New Lots Proposed:			
North Pigeon Lake	689	-	2,067
South Pigeon Lake	751	-	2,253
Sub-Total	**1,734**	**-**	**5,112**
TOTAL	**5,139**	**10,800**	**15,120**

4.2 WASTEWATER FLOW GENERATION

Most wastewater is generated through everyday water use, (i.e. showers, toilets, laundry, etc.) Therefore, wastewater generation is directly related to water consumption. Pigeon Lake's existing water system consists of local wells and truck haul to supply water to the residents. This means of water supply is expected to continue into the foreseeable future.

The following wastewater generation design criteria have been adopted for the Pigeon Lake Wastewater Study:

- Residential (Existing NEPL), per capita 365 Lpcd*
- Residential (Existing Development), per capita 240 Lpcd
- Residential (New Developments), per capita 365 Lpcd
- Recreational, per site 380 Lpsd**

* Source: Northeast Pigeon Lake Regional Services Commission, Feasibility Report on the Expansion of the Northeast Pigeon Lake Regional Wastewater System, March 2004

** Source: Wastewater Engineering: Treatment and Reuse, Fourth Edition, Metcalf & Eddy, 2003

The existing NEPL sewer system uses a gravity system to collect wastewater. Gravity systems sometimes permit infiltration and inflow into the system at pipe joints and manholes. The wastewater generation of 365 Lpcd for the existing NEPL includes an allowance for infiltration and inflow.

It is assumed that the existing developments along the shores of Pigeon Lake will require a low pressure collection system, reducing if not eliminating infiltration. A wastewater generation rate of 240 lpcd is proposed for the existing developments along Pigeon Lake. New developments will likely have the flexibility of grading new subdivisions to suit a traditional gravity system. Therefore, a wastewater generation rate of 365 lpcd is proposed for all new developments.

The wastewater generation rate of 380 Lpcd for the recreational areas is considered conservative and should be revisited during the pre-design stage.

Table 4.2 presents the raw wastewater flows for the current 10-year and Ultimate design periods. Refer to Appendix A for a detailed list of the wastewater flows within the study area.

Table 4-2
Buffalo Lake Region Projected Raw Wastewater Flows*

Area	Initial Average Day Flows m^3/day	Ultimate Average Day Flows m^3/day
Existing Development:		
North East Pigeon Lake	947	947
North Pigeon Lake	482	482
South Pigeon Lake	1,189	1,189
Sub-Total	**2,618**	**2,618**
Approved Development:		
North Pigeon Lake	11	11
South Pigeon lake	182	182
Proposed Development:		
North Pigeon Lake	-	754
South Pigeon Lake	-	882
Sub-Total	**193**	**1,769**
TOTAL	**2,811**	**4,387**

*For peak seasonal population.

4.3 TREATMENT DESIGN CRITERIA

Municipal wastewater must be collected and treated to meet the effluent quality standards set by Alberta Environment prior to its release into the environment. The treatment processes used to meet the prescribed standards depend on the community size, influent quality, and required effluent quality. The effluent quality imposed by Alberta Environment will depend on the method and location of effluent disposal.

4.3.1 Raw Wastewater Characteristics

Actual wastewater characteristics cannot be ascertained since no collection system is available to sample. It is important to note that the actual wastewater constituent concentrations could vary from these estimates. For example, if the actual per capita wastewater flows are lower, the constituent concentrations could increase but the overall waste loads may remain unchanged.

Based on typical wastewater constituents and average per capita flows, the following wastewater characteristics are anticipated:

- Biochemical Oxygen Demand (BOD) 270 mg/L *
- Total Suspended Solids (TSS) 300 mg/L **
- Total Kjehdahl Nitrogen (TKN) 40 mg/L
- Ammonia Nitrogen (NH3-N) 25 mg/L
- Total Phosphorus (P) 8 mg/L

*Based on per capita BOD contribution of 80 g/capita/day
**Based on per capita TSS contribution of 90 g/capita/day

4.3.2 Raw Wastewater Flows

Design wastewater flows have been calculated for the following wastewater collection scenario:

- Combination of low pressure system installed in existing developments and gravity systems installed in all future developments

Gravity wastewater collection systems occasionally experience significant flow increases due to inflow and infiltration during wet weather. These increased flows do not generally impact the performance of lagoon-based treatment systems. However, mechanical treatment plants can be impacted.

For purposes of this study, mechanical wastewater treatment facilities are sized to accommodate the peak dry weather flow. Peak hour flows including inflow/infiltration will be accommodated with flow equalization tanks and pumping facilities.

Table 4.3 provides the estimated raw wastewater flow projections.

Table 4-3
Estimated Raw Water Flow Projections

DESCRIPTION	UNITS	INITIAL DEVELOPMENT			ULTIMATE DEVELOPMENT		
		Peak Season	Transition Season	Off Season	Peak Season	Transition Season	Off Season
Inhabitance	%	100%	70%	25%	100%	80%	50%
Duration	Months	3	2	7	3	2	7
Population							
NEPL Residents	Persons	2,595	1,817	649	2,595	2,076	1298
Residents (Existing)	Persons	6,188	4,332	1547	6,188	4,950	3,094
Residents (Proposed)	Persons	342	239	86	4,662	3,730	2,331
Campsites	Site	670	469	—	670	534	—
Per Capita Wastewater Generation							
NEPL Residents	L/c/d	365	365	365	365	365	365
Residents (Existing)	L/c/d	240	240	240	240	240	240
Residents (Proposed)	L/c/d	365	365	365	365	365	365
Campsites	L/s/d	380	380	380	380	380	380
Wastewater Flow							
Average Day Flow (ADF)	m^3/d	2,812	1,968	639	4,389	3,511	2067
Peak Month Factor* (xADF)		1.3	1.3	1.3	1.3	1.3	1.3
Peak Month Flow	m^3/d	3,655	2,559	831	5,705	4,564	2687
Peak Day Factor* (xADF)		2	2	2	2	2	2
Peak Day Flow (PDF)	m^3/d	5,623	3,936	1,279	8,777	7,022	4,134
Peak Hour Factor* (xADF)		3	3	3	3	3	3
Peak Hour Flow	L/s	101	71	22	52	122	72
Seasonal Volume	m^3	256,429	119,667	136,039	400,233	213,458	439,850
Annual Volume	m^3	512,135			1,053,541		

*Typical peaking factors have been used for this analysis. Peaking factors should be confirmed during future design phases, as these will depend on transmission and collection system designs.

4.3.3 Regulatory and Environmental Requirements

In selecting the type of wastewater treatment process, Alberta Environment mandates the treated effluent quality. The effluent quality is the more stringent of the "Best Practicable Technology" or the quality required based on receiving water assessments.

Technology-based limits establish the minimum required treatment level for municipal discharges, and are based on the use of established and proven treatment technologies. Table 4.3 outlines the "Best Practicable Technology Standards" for municipalities with a population less than 20,000, as would be the case for the entire Pigeon Lake Region.

Table 4-4
Best Practicable Technology Standards for Municipalities with Current Population <20,000

Treatment Type	Parameter	Standard	Sample	Comments
Secondary (Mechanical)	CBOD TSS	25 mg/L 25 mg/L	composite composite	Monthly average of daily samples Monthly average of daily samples
Aerated Lagoons	CBOD	25 mg/L	grab	Monthly average of weekly samples
Wastewater Lagoons 2 or 4 anaerobic cells (2 day retention time in each cell) 1 facultative cell (2 month retention time) 1 storage cell (12 month retention time)	none defined	none defined	none defined	Lagoons built to the specified design configuration and drained once a year between late spring and fall do not have a specified effluent quality standard. Early spring discharges may be allowed under exceptional circumstances to comply with any local conditions.

Source: Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems (AENV, 2007)

*CBOD = Carbonaceous Biochemical Oxygen Demand

**TSS = Total Suspended Solids

The Code of Practice for Wastewater Systems using a Wastewater Lagoon (2003) contains no specific effluent limits for wastewater lagoons.

Water quality based limits are often based on the assumption of worst-case conditions. If it can be established that there is a reasonable potential to adversely affect the quality of the receiving water body, then Water Quality Based Effluent Limits (WQBELs) are developed. To ensure that the limits are protective, regulators compare the water quality based limits with the technology-based limits and adopt the more stringent of the two limits.

4.3.3.1 AENV Effluent Quality Requirements

The trend in recent years is that effluent quality limits are becoming increasingly stringent. It is anticipated that Alberta Environment will mandate an extremely high effluent quality for any effluent discharged to a receiving waterbody for the Pigeon Lake Regional Wastewater Project. However, this decision will be influenced by the treatment options and the effluent management options available. Anticipated effluent quality requirements for different effluent management options are outlined in Section 6.0.

It is also likely that Alberta Environment will increasingly expect or mandate that nutrients (nitrogen and phosphorus) are removed from wastewater effluent streams.

4.3.3.2 Federal Effluent Requirements

The federal Fisheries Act prohibits the discharge of any deleterious substance into a water frequented by fish. An effluent discharge is considered deleterious if it fails to pass a 96-hour toxicity test on the undiluted effluent. Ammonia nitrogen (NH3-N) is recognized as the constituent of most concern with respect to municipal effluent toxicity. Environment Canada (EC) published a “Proposed Notice” on this topic in the Canada Gazette in June 2003. This Proposed Notice required, under certain conditions, the preparation and implementation of pollution prevention (P2) plans for ammonia dissolved in water, plus inorganic chloramines and chlorinated wastewater effluents, under the 1999 Canadian Environmental Protection Act (CEPA).

On October 20, 2006, the Canadian Council of Ministers of the Environment (CCME) published a consultation document, “Options for a Canada-Wide Strategy for the Management of Municipal Wastewater Effluent”. The proposals in that document are currently under review and subject to change. CCME categorizes wastewater treatment facilities by size. In the case of Pigeon Lake, a regional wastewater treatment facility would be classified as “small” and, as such, toxicity testing would not be required.

4.4 COLLECTION DESIGN CRITERIA

A Pigeon Lake wastewater collection system will likely be a combination of gravity sewer, pressure forcemain and low pressure forcemain. We must, therefore, define the design criteria for all systems.

4.4.1 Gravity Sewer Mains

As discussed, a significant portion of water used in a community is returned as sewage. In addition, mainly for the gravity collection system, infiltration into the sewer system from groundwater can increase sewage flows. A third source of sewage is extraneous flows (inflow) that may enter the sanitary sewer system during rain events (wet weather).

4.4.1.1 Infiltration and Inflow

Normal infiltration is defined as groundwater or surface water entering the sanitary sewer through joints, pipe cracks and manholes. It can be controlled with good construction standards such as watertight pipe joints, manholes and service connections. Inflows are rain-related flows that can enter the sanitary sewer through illegal storm water connections, roof connections, manhole covers and foundation drains.

The Feasibility Report on the Expansion of the Northeast Pigeon Lake Regional Wastewater System used a sewage contribution of 363.7 Lpcd which includes an allowance for infiltration. This sewage generation rate was used for anticipated gravity systems within the study area.

4.4.1.2 Peak Hourly Flow Ratios

The importance of the “equivalent population” concept in sanitary sewer system design is the calculation of the ratio of maximum hourly rate of flow to the average daily rate, excluding infiltration and inflow. This ratio varies with the number of services (persons) on the system. The following Harmon formula is used to estimate the maximum hourly rates of flow:

$$\text{Maximum Hourly Flow} = (\text{Average Daily Flow}) \times [1 + 14/(4 + P^{0.5})]$$

where P = population in thousands

Based on this formula, the Peak Hourly Ratio is higher for smaller populations.

The following summarizes the design criteria for the gravity collection portions of the system:

- Infiltration and Inflow — As Above
- Peak Hour Factor — 3.0
- Roughness coefficient for new PVC and PE pipes 'n' — 0.013
- Minimum velocity when pipe is flowing full, m/s — 0.61 m/s

4.4.2 Low Pressure Collection System

Sizing of low pressure sewer forcemains is based on the Hazen-Williams formula. The service pumps installed in each lot, as it is developed, provide the pumping requirements in a low pressure sewer system.

4.4.2.1 Flow rates

The low pressure collection main is sized for peak pumped flows. The peak flow in a low pressure system is determined by the probability of the number of pumps pumping at the same time, as per the table below.

Table 4-5
Maximum Number of Pumps Operating

Total Number of Grinder Pumps	Maximum Pumps Operating Simultaneously
1	1
2 - 3	2
4 - 9	3
10 - 18	4
19 - 30	5
31 - 50	6
51 - 80	7
81 - 113	8
114 - 146	9
147 - 179	10
180 - 212	11
213 - 245	12
246 - 278	13
279 - 311	14
312 - 344	15

Other design considerations are:

- Roughness coefficient for new PE pipes C = 130
- Minimum/maximum velocities V = 0.9 to 1.5 m/s
- Pumping design rate (per pump) 41.6 L/min
- Maximum Design Pressure 448 kPa
- Infiltration and Inflow negligible

Pressure sewers are constructed of pressure pipe and leak tested to the same AWWA Standards used for potable water supply; thus, they are, for all practical purposes, watertight. This eliminates most infiltration problems characteristic of gravity sewers. Since there are no elements corresponding to access manholes, the inflow from street runoff is virtually eliminated. In a pressure sewer system, the only element potentially vulnerable to infiltration/inflow problems is the gravity house sewer connection to the pump inlet chamber.

4.4.2.2 Pressure Forcemain

Sizing of pressure sewer forcemains are based on the Hazen-Williams formula. Design criteria used are:

- Roughness coefficient for new PE pipes C = 130
- Minimum/maximum velocities V = 0.9 to 1.5 m/s
- Capacity Peak flows

5 Wastewater Treatment Alternatives

The following section discusses feasible wastewater treatment technologies suitable to service the wastewater generation predicted from the study area. A summary of the options is provided in Section 5.4.

Choice of a wastewater treatment alternative is highly dependent on the effluent management plan, as effluent quality is the primary differing factor between technologies.

5.1 LAGOONS

Wastewater systems using facultative lagoons must be registered with Alberta Environment and operated in accordance with the Code of Practice for Wastewater Systems Using a Wastewater Lagoon. Registered systems are allowed to use treated wastewater for irrigation on suitably classified land according to the Guidelines for Municipal Wastewater Irrigation. Wastewater irrigation is discussed further in Section 6 of this report.

5.1.1 Conventional Stabilization (Facultative) Lagoon

Facultative waste stabilization ponds (lagoons) are earthen ponds that rely on the natural processes of bacteria and algae to reduce organic matter to acceptable levels. Facultative lagoons are not mechanically mixed or aerated. They typically consist of a treatment cell followed by one or more storage cells, with appropriate inlet and outlet structures to maximize effectiveness of treatment volume. The lack of mechanical mixing and aeration maintains three distinct layers:

(1) Aerobic Zone: The layer of water near the surface contains dissolved oxygen from the atmosphere (surface re-aeration) and from algal respiration. The oxygen is used by aerobic and facultative bacteria to stabilize organic material in the upper layer of water.
(2) Facultative (Anoxic) Zone: The intermediate anoxic zone ranges from aerobic near the top to anaerobic at the bottom.
(3) Anaerobic Zone: The bottom layer of the lagoon includes sludge deposits and supports anaerobic organisms.

During cold weather, biological activity under ice cover is significantly reduced, and the treatment process is essentially reduced to settling of the solids. As a result, discharge from facultative lagoons in winter is prohibited. Temperature fluctuations in the spring and fall can cause the surface water layer to have a higher density than lower layers, resulting in inversions. This higher density water sinks during these unstable periods, increasing turbidity, and often producing objectionable odours.

To prevent leakage of wastewater into the soil, a low-permeability compacted clay or synthetic liner is placed along the bottom and sloped sides of the lagoon. This is necessary to prevent pollution of the groundwater table and any nearby wells.

The design standard for conventional lagoons requires:

- 2 or 4 anaerobic cells, depending on the total wastewater flow, with a 2 day retention time in each cell;
- 1 facultative cell, with a 2 month (60 day) retention time; and
- 1 storage cell, with a 12 month retention time.

The purpose of such a large storage cell is to provide additional wastewater treatment (including nutrient removal) under facultative conditions, and to reduce the environmental impact on the receiving drainage course by facilitating the annual discharge of high quality effluent wastewater. Wastewater treated in this fashion can achieve very good nutrient removal, as long as the effluent is discharged during a period of high effluent quality in the fall.

5.1.2 Conventional Aerated Lagoon System

Aerated lagoon systems typically consist of two or more moderately sized ponds. Unlike conventional waste stabilization ponds (facultative lagoons), aerated ponds are mechanically aerated to supply oxygen for biological treatment of the wastewater and to keep more of the biosolids in suspension. Air blowers are typically used to force air through an air diffusion system near the bottom of the pond. This type of lagoon treatment provides a more consistent level of treatment throughout the year typically enabling continuous discharge, consumes less land (no large ponds) and rarely produces noticeable odour.

The design standard for aerated lagoons requires:

- A completely mixed aerated cell, having a total retention time of at least two days based on maximum monthly design flow;
- A minimum of two partially mixed aerated cells, having a total retention time of at least 28 days based on maximum monthly design flow.; and
- A polishing cell having a minimum hydraulic retention of five days based on maximum monthly design flow is required for continuous discharge systems.

A storage pond may also be required if the effluent receiving watercourse does not provide constant flow through the winter months.

5.2 MECHANICAL TREATMENT

While all of the mechanical treatment plants are variations on a theme (they all require mechanical means to treat the incoming wastewater), they can all readily incorporate nutrient removal. This nutrient removal can be achieved either through the addition of chemicals and/or with biological nutrient removal, which involves additional biological reactor tanks in a specific sequence.

5.2.1 Conventional Activated Sludge Treatment

The activated sludge process is so named because treatment is accomplished by the stabilization of organic material in the wastewater by an “activated” mass of micro organisms. A conventional activated sludge treatment system consists of:

- primary clarification for removal of readily settleable solids and floating material;
- aeration to provide oxygen to the micro-organisms responsible for treatment, and keep them suspended; and
- secondary clarification for final solids/liquid separation.

To keep the micro-organisms activated, a portion of the solids from the secondary clarifier is returned to the aeration tank through the return activated sludge (RAS) process.

5.2.2 Extended Aeration

In the Extended Aeration process, wastewater is screened and then aerated in a large capacity reactor for a long period of time (in the order of 24 hours), before progressing to a secondary sedimentation tank for solid/liquid separation. The settled water flows out of the tank for final disposal. The majority of the settled sludge in the bottom of the settling tank is drawn off and returned to the aeration tank. Some of the settled sludge is periodically directed into a holding tank where it is stabilized and thickened prior to final disposal.

5.2.3 Rotating Biological Contactor (RBC)

This process typically consists of a flow equalization chamber, a Rotating Biological Contactor (RBC) unit, and final settling tank. Removal of some settleable solids takes place in the flow equalization chamber upstream of the RBC.

The RBC includes a shaft with rotating plastic discs set in an open tank filled with wastewater. The discs rotate slowly in the tank and as they pass through the wastewater, organics are removed by biological growth on the rotating discs. The build-up of biological growth on the discs increases in thickness, forming a slime layer. When the discs pass through the air, oxygen is absorbed, further promoting the growth of this slime layer. When the slime layer on the discs gets thick enough, some of it sloughs off and settles in the bottom of the RBC while the rest enters the final settling tank, where it is removed before the treated water is discharged. Settled solids in the RBC and the final settling tank are often pumped back to the equalization/sedimentation chamber for storage and digestion.

RBC systems require pretreatment, consisting of primary clarification or fine screens. Secondary clarification is required for liquid/solids separation. A large biofilm surface area is developed on the discs, and the process relies on mass transfer of oxygen and substrates from the bulk liquid to this biofilm.

The RBC process typically consists of a number of units operated in series. The number of stages depends on the treatment goals, with two to four stages for BOD removal and six or more stages for nitrification.

5.2.4 Sequencing Batch Reactor

The Sequencing Batch Reactor (SBR) process typically utilizes at least two fill-and-draw reactors operating in five steps:

- Fill: the receiving of raw wastewater
- React: the full reactor is mixed and aerated so that the reactions can occur
- Settle: a motionless period during which reactor contents are allowed to settle by gravity
- Draw: the clarified supernatant in the reactor is drawn off and discharged without disturbing the settled solids blanket
- Idle: no aeration or mixing takes place in the period between the end of Draw and the beginning of Fill

For continuous flow applications, at least two SBR tanks must be provided so that one tank receives flow while the other completes its treatment cycle. Since both aeration and settling occur in the same chamber, no sludge is lost in the React step and none has to be returned to maintain the solids content in the aeration chamber. Therefore, the SBR system does not need a return activated sludge (RAS) system.

5.3 ADVANCED MECHANICAL TREATMENT

5.3.1 Membrane BioReactor (MBR)

Membrane biological reactors (MBRs) consist of a biological reactor (bioreactor) containing suspended biomass, with integrated solids separation provided by microfiltration or ultrafiltration membranes immersed directly in or after the bioreactor. Membrane filtration negates the need for the solids separation process of secondary clarification and tertiary filtration, found in conventional activated sludge wastewater treatment plants. The MBR process provides an effluent quality suitable for water reuse following disinfection. In addition, depending on effluent requirements, the process can readily incorporate nutrient removal.

There are several different membrane manufacturers who offer membrane bioreactor treatment for wastewater. The most well-known in North America are those supplied by ZENON Environmental Inc. and USFilter Memcor, although other low-pressure membrane manufacturers are starting to enter the market. Zenon and USFilter both manufacture proprietary MBRs that utilize submerged hollow-fibre microfiltration membranes. A Japanese company, Kubota, manufactures a proprietary MBR that utilizes submerged flat-sheet membranes.

The following description of the MBR process is based on Zenon Environmental's description of their technology, although it applies to the MBR process in general.

Membranes are synthetic polymers with nanoscopic pores that, when vacuum or pressure is applied as a driving force, can effectively filter a water or wastewater stream. In low-pressure membrane applications using MF and UF, these pores range from 0.1 um down to 0.01 um. Over time, some small organic and inorganic particles can penetrate the pores of the membrane and cause membrane fouling. MBR manufacturers have systems in place to minimize fouling and to periodically reverse the fouling. Membrane cleaning can take place in four ways: aeration of the membranes, periodic backpulses through the membranes (similar to backwashing of conventional filters), maintenance cleans, and in-situ flux recovery cleans. The frequency and duration of each type of clean are based on site specific factors. Maintenance cleans involve backflushing strong solutions of (typically) citric acid or sodium hypochlorite through the membrane at frequencies up to once per day. The combination of air scour, backflushing, and maintenance cleaning is not completely effective in controlling membrane fouling, and as a result the permeability of the membrane decreases over time (or the pressure required for filtration increases with time). If necessary, the membranes are removed from the aeration basin for a recovery clean, during which they are soaked in a chemical bath for several hours. Eventually, however, fouling will occur to an extent that is irreversible, at which point the membranes must be replaced. Effective membrane life appears to be improving, and expected membrane life has risen from about five to ten years.

The ZeeWeed membranes are typically submerged in the aeration tank, in direct contact with the mixed liquor. Through the use of a suction pump, the membranes are subjected to a vacuum that draws water through the membrane while retaining solids in the reactor. Treated water is drawn by the vacuum through the hollow fibre membranes, into the pump and then discharged. The energy associated with permeate pumping is relatively small, due to the use of a vacuum rather than positive pressure. Air is introduced to the bottom of the membrane module, producing turbulence which scours and cleans the external surface of the hollow fibres. This airflow also provides a portion of the biological process oxygen requirements; the remainder is provided by a diffused aeration system. Waste sludge is pumped directly from the aeration tank.

The MBR technology overcomes the problems associated with poor settling of sludge in conventional activated sludge processes. The technology permits bioreactor operation with considerably higher mixed liquor solids concentrations than conventional activated sludge systems, which are limited by sludge settling. The process is typically operated at a mixed liquor suspended solids (MLSS) concentration much higher than in the conventional activated sludge process. The elevated biomass concentrations allow for highly effective removal of both soluble and particulate biodegradable material in the waste stream. The process combines the unit operations of aeration, secondary clarification and filtration into a single process, simplifying operation and greatly reducing space requirements.

The process is readily adapted for biological denitrification and chemical phosphorus removal if the removal of total nitrogen and/or phosphorous is required. Where nitrogen removal is required, an upstream anoxic zone is incorporated in the bioreactor tank design. The elevated levels of biomass become readily anoxic in the absence of aeration, helping to achieve high denitrification rates. Also, the process is ideally suited for phosphorus removal, where required. Through the addition of metal coagulants, such as alum or ferric chloride, to the raw wastewater or mixed liquor, soluble phosphorus in the waste stream can be precipitated. The ZeeWeed membranes have a pore size that provides an absolute barrier to the discharge of precipitated phosphorus. The phosphorus is retained in the mixed liquor and removed with the waste activated sludge. The ZeeWeed MBR process can reliably achieve significantly lower effluent phosphorus concentrations than conventional municipal treatment processes.

5.4 SUMMARY COMPARISON

The treatment facility screening in Table 8.1 of Section 8 shows a comparison of the various levels of treatment technologies available.

6 Effluent Management Alternatives

The treated wastewater effluent may be discharged directly or indirectly to a water body, applied to the surface of the land, or disposed of below the surface. This report examines the following disposal options:

- indirect discharge to a lake;
- direct discharge to creek or river;
- surface irrigation; and
- rapid infiltration.

6.1 LAKE DISCHARGE

Alberta Environment generally discourages continuous or seasonal discharges of effluent directly to lakes or stagnant water bodies. Indirect discharge through a natural or constructed wetland is often a more acceptable alternative. Indirect discharge to the lake via rapid infiltration basins may also be considered; this option is discussed further in Section 6.4.

6.1.1 Indirect Lake Discharge Via Natural/Constructed Wetland

For effluent discharge to a wetland, a minimum of secondary or tertiary treatment must be provided. Wetlands must be evaluated and designed in accordance with the Alberta Environment Guidelines for the Approval and Design of Natural and Constructed Wetlands for Water Quality Improvement.

Discharge of the treated effluent to Pigeon Lake, either directly or indirectly, will likely require an extremely high effluent quality. Based on recent experience by Associated Engineering in a similar project for the Southshore Communities in the M.D. of Lesser Slave River, the following effluent quality restrictions can be expected if the effluent is to be discharged to Pigeon Lake:

- Biochemical Oxygen Demand (BOD) < 5 mg/L
- Total Suspended Solids (TSS) < 1 mg/L
- Total Phosphorus (TP) < 0.5 mg/L
- Ammonia Nitrogen (NH3-N) < 5 mg/L
- Faecal Coliforms < 10 per 100 mL

This effluent quality represents an extremely high level of treatment, and even surpasses that available in some surface water bodies. In order for Alberta Environment to accept these effluent quality limits, we would have to show that the discharge would have no impact on Pigeon Lake. This would require considerable additional analysis and meetings with Alberta Environment.

6.2 STREAM DISCHARGE

Continuous discharge of effluent to a receiving watercourse is only permitted by Alberta Environment if the ratio of the recorded minimum mean monthly watercourse flow to the total average daily effluent discharge is at least 10:1. There are several stream discharge alternatives that are further screened later in this report, when evaluating treatment facility location: (1) discharge to Pipestone Creek; (2) discharge to Pigeon Lake Creek; (3) discharge to Strawberry Creek; and (4) pipeline to the Battle River.

While specific discussion on each of these alternatives is beyond the scope of this section, it has been reported that many of these small creeks around Pigeon Lake do not sustain consistent flow year-round. It is highly unlikely that flow in any of these creeks is sufficient to achieve the required dilution of 10:1 to allow for continuous discharge of effluent from a wastewater treatment facility. Depending on soil characteristics and base flow rate in the creeks, much of the effluent flow may infiltrate into a creek bed before it ever reaches its ultimate discharge point at a larger water course. Discharge to a creek during freezing conditions may not be feasible due to the risk of ice damming.

As it is unlikely that continuous wastewater effluent discharge would be allowed into any of these near-by water courses, intermittent discharge would be required. This would entail winter storage and possibly some transition season storage to allow for twice per year discharge: once in the spring, and once in the fall. Such storage would apply to aerated lagoons, conventional mechanical, and advanced mechanical treatment facilities. Conventional lagoons are already required to have storage for a period of one year, resulting in once per year discharge in the fall.

6.3 SURFACE IRRIGATION

Water quality standards for discharge of municipal wastewater effluent to surface water bodies is becoming increasingly stringent. The move to advanced mechanical wastewater treatment facilities is a result of these increasingly stringent water quality standards, however the capital cost for advanced mechanical plants is also increasing.

Disposal of treated wastewater effluent on land through wastewater irrigation is an increasingly attractive alternative because it avoids discharges of nutrient-rich wastewater to surface waters. Treated wastewater can often be safely released to land at water quality standards less restrictive than those that apply to surface water bodies such as Pigeon Lake or the surrounding area creeks. However, in comparison to fresh irrigation water, wastewater irrigation can pose some risks to public health and the environment. Alberta Environment has developed the Guidelines for Municipal Wastewater Irrigation (April 2000) to ensure that municipal wastewater is used for irrigation only when environmentally acceptable and agriculturally beneficial.

The suitability of the wastewater and the land in question must be evaluated for any wastewater irrigation application. Alberta Environment requires that the following three components be assessed where irrigation with municipal wastewater is proposed:

- Characteristics of the wastewater quality to be used for irrigation;
- Classification of the soils and lands onto which the irrigation wastewater will be applied to determine land suitability for wastewater irrigation; and
- Specific irrigation system design and management needs to promote long-term project viability.

6.3.1 Wastewater Quality Suitable for Irrigation

It is important to note that not all treated municipal wastewater meets a quality that is suitable for irrigation. In comparison with naturally occurring sources of irrigation water, treated municipal wastewater effluent typically contains elevated concentrations of nitrogen, phosphorus, sodium, salt and bacteria. The main constituents of concern for land application are sodium, salt, and the microbiological quality of the effluent. In some cases, treated municipal wastewater contains salt or sodium levels that would harm crops and other vegetation. The two indicators of salt and sodium are:

- Electrical Conductivity (EC): an indicator of the total dissolved solids (TDS) content of the water. The addition of wastewater irrigation to soils adds to the concentration of salt in the soil.

- Sodium Adsorption Ratio (SAR): an indicator of the sodium hazard of the water. Excess sodium in relation to calcium and magnesium can destroy soil structure, thereby reducing permeability of the soil to water and air. Sodium can also be toxic to some crops.

The wastewater effluent quality required for land application is presented in Table 6.1.

Table 6-1
Treated Effluent Quality Standards for Wastewater Irrigation of Forage, Coarse Grains, Turf and Oil Seeds

PARAMETER	STANDARD	COMMENTS
Biochemical Oxygen Demand (BOD)	< 100 mg/L	Typically ranges from 10 to 20 mg/L for most municipal wastewaters.
Chemical Oxygen Demand (COD)	< 150 mg/L	Typically ranges from 25 to 50 mg/L for most municipal wastewaters.
Total Suspended Solids (TSS)	< 100 mg/L	Typically ranges from 10 to 20 mg/L for most municipal wastewaters.
Electrical Conductivity (EC)	< 1.0 dS/m for unrestricted use 1.0 – 2.5 dS/m for restricted	Values vary widely within municipal wastewaters and can exceed levels that would be recommended for irrigation. EC

PARAMETER	STANDARD	COMMENTS
	use > 2.5 dS/m unacceptable	values are often high in communities that utilize groundwater as a water supply source.
Sodium Absorption Ratio (SAR)	< 4 for unrestricted use 4 – 9 for restricted use when EC > 1.0 dS/m > 9 unacceptable	Values vary widely within municipal wastewaters and can exceed levels that would be recommended for irrigation. If a community has a high TDS water source or uses ion-exchange softening on their water supply, this can significantly increase EC and/or SAR values in the wastewater.
pH	6.5 to 8.5	
Nitrogen	Subject to evaluation	Acceptable nitrogen levels are based on wastewater irrigation application rate and quantity, field moisture capacity during periods of application, and the nitrogen uptake rate of the crops being irrigated.
Phosphorus	Subject to evaluation	Acceptable phosphorus levels are based on wastewater irrigation application rate and quantity, field moisture capacity during periods of application, and the phosphorus uptake rate of the crops being irrigated.
Potassium	Subject to evaluation	Acceptable potassium levels are based on wastewater irrigation application rate and quantity, field moisture capacity during periods of application, and the potassium uptake rate of the crops being irrigated.

It should be noted that a preliminary analysis of the groundwater quality in the Pigeon Lake area reveals higher-than-average levels of sodium. Since this groundwater makes up the majority of the potable water for residents around the lake, this sodium will primarily end up in the sanitary sewer system, resulting in elevated sodium and SAR values in the wastewater. Initial calculations show that the wastewater effluent SAR would likely be unacceptably high to make it usable as irrigation water.

Where land application of wastewater effluent has significant public health concerns (e.g. parks, golf courses), disinfection is required prior to irrigation. In these cases, bacteriological quality must meet the standards outlined in Table 6.2.

Table 6-2
Bacteriological Standards for Wastewater Irrigation in Public Areas

PARAMETER	LIMIT
Total Coliform counts	< 1000 per 100 mL
Fecal Coliform counts	< 200 per 100 mL
Total Chlorine Residual	< 2.0 mg/L

6.3.2 Land Suitability and Wastewater Application Rate

Before wastewater irrigation development can proceed in Alberta, the lands to be irrigated must first be classified by an accredited land classification consultant. The classification assessment must then be reviewed by Alberta Agriculture, Food and Rural Development (AAFRD) and submitted to Alberta Environment. For a site to be classed as suitable for wastewater application, it must possess appropriate soil and geologic properties, topography, hydrology, climate, land use and cropping intentions. Site conditions and irrigation system design must also restrict any detrimental offsite movement of the wastewater through surface runoff, leaching, groundwater migration, or drift from irrigation spray.

Appropriate annual wastewater application rates, the frequency, duration and method of application, and the period over which such applications can occur will depend on several factors. These parameters are often determined by an irrigation specialist or agricultural consulting firm.

6.3.3 Restrictions

Wastewater irrigation faces a number of restrictions:

1. Wastewater must only be used for irrigation on crops authorized in the Guidelines for Municipal Wastewater Irrigation (AENV). The crops that are currently authorized for irrigation with treated wastewater include forages, coarse grains, turf, and oil seeds. Wastewater irrigation of crops that may be eaten raw or which have a leaf structure that can harbour micro-organisms has been prohibited in Alberta.
2. Wastewater irrigation is restricted to the period of May 1st to September 30th.

3. Treated wastewater irrigation on agricultural land must not occur during the following periods:
   - outside the growing season
   - during and for 30 days prior to harvesting of crops on land irrigated with wastewater
   - during and for 30 days prior to grazing by dairy cattle on land irrigated with wastewater
   - during and for 7 days prior to pasturing by livestock other than dairy cattle on the land irrigated with wastewater
4. Treated wastewater irrigation of golf courses and parks must not take place when members of the public are present.
5. Wastewater application is restricted to lands where the natural water table is more than 2 metres below the ground surface and/or impermeable bedrock or other geological barriers exist at more than 4 metres below the ground surface

6.4 RAPID INFILTRATION

In rapid infiltration systems, the wastewater effluent is applied to highly permeable soils (such as sands and gravels) through a number of rapid infiltration basins that are flooded, and then allowed to dry before flooding again. As wastewater effluent travels downward through the soil matrix, biological and chemical reactions occur in the soil to break down any remaining organic matter and remove bacteria. The treated percolate drains naturally to surface waters or moves downward to the groundwater. The drying period allows the organic material that collects on the soil surface to decay and the soil to re-aerate. As a result of additional treatment through the soil, rapid infiltration may further reduce the levels of BOD, TSS and bacteria prior to discharge to surface or groundwater. Depending on the depth of soil and other factors, nitrogen and phosphorus levels may also be further reduced via rapid infiltration.

For rapid infiltration, Alberta Environment stipulates that a minimum of primary treatment be provided and that the system be designed in accordance with the joint Alberta Environment – City of Red Deer Publication, Rapid Infiltration – A Design Manual. There are no Alberta Environment guidelines for the quality of effluent to be applied to the rapid infiltration process. However, a high quality effluent requirement is anticipated (to prevent contamination of the extensive aquifer system and groundwater wells in the area).

Preliminary analysis of the groundwater wells in the area show that many of the wells used by residents for potable use are relatively shallow, and may be negatively impacted by infiltration basins.

6.5 SUMMARY COMPARISON

The effluent management location screening in Table 8.2 of Section 8 shows a comparison of the various effluent management options available, relative to their location around Pigeon Lake.

7 Wastewater Collection Options

Due to the undulating topography throughout the study area, a continuous collection system (i.e. gravity or pressure sewer) to a wastewater treatment facility is not feasible. As a result, collection options will be reviewed as two primary systems:

- local collection systems conveying flows to centralized collection points for transmission; and
- a regional transmission system conveying flows from centralized collection points to the waste water treatment facility.

Options for these two primary systems are discussed in the following sections and summarized in Section 5.3.

7.1 LOCAL COLLECTION OPTIONS

The following outlines six(6) local wastewater collection system options to service existing and future developments within the study area. Figures 5.1 through Figure 5.5 provide schematic diagrams of the alternative wastewater collection systems discussed.

7.1.1 Option 1 – Status Quo

Option 1 would be to continue wastewater collection with septic and holding tanks. Septic tanks would treat wastewater with existing tile fields while holding tanks would require wastewater to be trucked to a local treatment facility.

7.1.2 Option 2 - Trucked Wastewater Collection System

With trucked water collection, wastewater from each individual home would be collected from a holding tank and transported to the wastewater treatment facility. This would essentially be the status quo, with the exception that truck haul distance to a new treatment facilitycould be slightly less than to the existing Mulhurst lagoon.

Truck haul systems are generally inconvenient, costly over the long-term and difficult for the municipality to control (i.e. leaking or perforated tanks).

7.1.3 Option 3 - Gravity Collection System

A gravity collection system is comprised of a sewer main laid to grade, to move a specific volume of sewage by gravity. Each house is connected to the sewer through a service main. Sewage from the residence flows directly by gravity through the service main.

The sewage collected will eventually end up at a wastewater treatment facility or in some cases, at a sewage pumping station. A sewage pumping station would be located at the low end of the gravity system, and lift sewage to its final destination - either to the treatment plant or another gravity section.

Manholes are strategically located along the sewer main to provide access for cleaning, inspection and other maintenance purposes.

The most common materials used in gravity systems include: Polyvinyl chloride (PVC) for the pipe, and concrete for manholes. Therefore, the gravity system is not a “closed” or a watertight system, and subject to infiltration and inflow. As such, gravity systems generate more sewage flow and require increased treatment capacity. However, the advantage of the gravity system is that it has no operating cost and low maintenance cost to the municipality and residents (excluding required sewage pumping stations), which is why gravity systems are typically the system of choice, if topography allows.

7.1.4 Option 4 – Small Diameter Gravity Sewer System

A small diameter gravity sewer system employs a septic tank to separate the solids from the liquids. The liquids would be transported by gravity to a sewage pumping station similar to Option 1. These systems require a smaller diameter pipe compared to traditional gravity sewers, as only liquids are being transported. However, the solids would need to be removed from the septic tank regularly to avoid potential clogging of the gravity piping.

7.1.5 Option 5 – Low Pressure Sewer System

A low pressure system is comprised of individual houses pumping into a common low pressure main. The main typically varies from 75 mm to 200 mm pipe sizes. The most common pipe material used in the low pressure system is high density polyethylene (HDPE) pipe. The pipe can be fused together for watertight joints; therefore the system is not subjected to infiltration or inflow.

In some low pressure systems the service (individual) pump pressure is adequate to transport the sewage to the treatment facility. However, for Pigeon Lake, regional booster stations would be required due to the distance and hilly terrain between the communities.

Generally, each house is equipped with a grinder pump or septic tank effluent pump (STEP). For the purpose of this report, the analysis is based on grinder pumps; however, a STEP system would have a similar design and operational philosophy. Analysis and choice between these two systems can be addressed in detail during a future preliminary design stage. The pump grinds the sewage into a fine slurry to pump through a 25 mm or 38 mm service pipe, which then ties into a 75 mm to 200 mm common pressure sewer header pipe.

Without the need for extensive sewage pumping stations, the low pressure system typically offers a much lower municipal capital cost; however, it can present much higher operating, maintenance and replacement costs than a gravity system, particularly for homeowners.

Other issues associated with a low pressure system are:

- The Municipal Operator must clearly define the responsibility of the Municipality and home owner limits, i.e. whether the Municipality or resident own the pumps at each property.
- For a low pressure system, pump sizing is one of the most crucial elements. Therefore, the Municipality must have a means to regulate and control pump supply and replacement.
- Due to the small diameter piping and also the low operating pressure associated, there is also an increased potential of pipeline clogging, especially during initial stages of implementation where the sewage volume can be substantially lower then design volumes, which results in low pipe flow velocity limiting internal scour. Dealing with plugged pipes may be more labour intensive for the Municipality.

7.1.6 Option 6 - Combination of Low Pressure and Gravity Systems

A combined system generally consists of gravity and pressure sewer systems servicing developments adjacent to a gravity trunk sewer line. Adjacent development can then implement either system based on specific desires and constraints.

A combined system really works well with a community that is highly undulating, whereas a full gravity system may require several lift stations, deep mains, and/or pressure sewer cannot pump over high terrain. Therefore, a combined system may be more suitable in this application.

7.2 REGIONAL TRANSMISSION

As previously noted, the service area is large with undulating terrain. A regional forcemain is required to transport the wastewater to the regional treatment facility location. Pump stations, placed in low-lying areas, will collect wastewater from the local collection system(s) and pump it through the forcemain to the treatment facility.

Selection of a collection system (gravity or low pressure) has direct impact on the routing, sizing and location of pumping stations. Additionally, the location of the treatment facility will also impact the number of pumping stations and alignment of a regional transmission system. Therefore, an analysis of the effects of each collection system and treatment location options on the transmission system is required.

7.3 SUMMARY COMPARISON

The wastewater collection options screening in Table 8.3 of Section 8, shows a comparison of the various collection options.

8 Wastewater Reclamation Opportunities

Sections 5, 6, 7 reviewed all the options for wastewater collection, treatment and disposal. Section 8 will refine the options through a pre-screening process to identify the best options for this project. The shortlist of options will be incorporated into the analysis of regional wastewater options within the study area.

8.1 SYSTEM PRE-SCREENING

8.1.1 Wastewater Treatment Alternatives

The following table presents advantages and disadvantages for each wastewater treatment alternative discussed in Section 5.

Table 8-1
Pigeon Lake – Treatment Process Option Pre-Screening

Treatment Type	Advantages	Disadvantages
1. Status quo • On-site • Mulhurst	• Minimal change • Low costs for seasonal users	• Unsuitable for increasing population densities and usage • Potential adverse affect to personal property • High costs for permanent users. • Ongoing maintenance and replacement by owners necessary. • Risk of illegal discharge • Potential long-term lake impacts. • Regulatory monitoring/issues
2. Conventional stabilization lagoons with one-year storage	• Reliable and easy-to-operate process • moderately effective in removing settleable solids, BOD, pathogens, fecal coliforms, and ammonia • requires little energy to operate • can easily handle hydraulic and organic shock loads • operator requires lower certification level than for mechanical plant • low O&M costs	• Land-intensive. Lagoon effluent discharge is only permitted once per year, requiring extensive land area for storage during the rest of the year • Strong odours can be a problem when the anaerobic conditions prevail during spring and fall turnovers • Effluent quality is not consistent throughout the year. The degree of treatment is significantly influenced by climatic conditions. Fall discharge is preferred • Settled sludge and inert materials require periodic removal and disposal, which can be costly • Difficult to control or predict ammonia levels in effluent • Expensive liners may be required to prevent seepage to groundwater • Potential adverse downstream impacts (flooding, lack of dilution, water quality)

Treatment Type	Advantages	Disadvantages
3. Aerated lagoons providing secondary effluent quality (BOD <25) with winter storage	• generally reliable performance • lower operator attention than for a full mechanical treatment plant • lower capital cost than for a full mechanical treatment plant • can handle shock loading • less land required than for stabilization ponds • typically no odour problems	• limited ability to remove ammonia nitrogen • algae can adversely impact effluent quality • high energy consumption of aeration blowers • sludge removal can be cumbersome and costly • maintenance of aeration equipment can be difficult/costly • may be insufficient dilution with continuous or periodic effluent discharges during spring, summer and/or fall seasons
4. Conventional mechanical plants (including package plants: Challenger, ASCOR, etc.) providing secondary effluent quality (BOD <25, TSS<25)	• requires much less land than lagoons • can incorporate biological nutrient removal • good response to variable flow and load • good year round quality effluent • Could discharge effluent to wetland to improve nutrient removal.	• high capital and O&M costs • likely still require land for effluent storage ponds due to lake of year-round receiving stream dilution • requires knowledgeable operators • package plant designs with hopper-type clarifiers have been problematic due to unreliable sludge return • excess sludge biomass is produced requiring further treatment and/or disposal • not well suited to significant seasonal flow and load variations
5. Advanced mechanical plants providing tertiary effluent quality (BOD <5, TSS <2, P<0.5, NH3-N <5, Coliforms <<200) Note: This is based on membrane bioreactors	• very reliable performance • higher volumetric loading rates and thus shorter reactor hydraulic retention times • longer sludge retention times (SRT), resulting in less sludge production • excellent quality effluent in terms of low turbidity, TSS, BOD, ammonia and bacteria • simpler to operate than most mechanical plants • low nutrient effluent levels with designs incorporating biological nitrification-denitrification and chemical phosphorus removal • small space requirements • can accommodate significant seasonal flow and load variations	• high capital and O&M costs • likely still require land for effluent storage ponds due to lake of year-round receiving stream dilution • requires knowledgeable operators • requirement for membrane replacement (5 to 10 years) • high energy costs • membrane fouling potential • need for flow equalization due to hydraulic limitations of membranes • excess sludge biomass is produced requiring further treatment and/or disposal
6. Natural treatment systems (greenhouses)	• Low development costs	• Unreliable year-round operations – costly winter operation • Will not respond well to shock loading or low winter demands

Treatment Type	Advantages	Disadvantages
7. Regional Treatment Plant away from Pigeon Lake (e.g. Red Deer via Ponoka, Wetaskiwin)	• No direct capital costs • No operational requirements • Access to high flow receiving waters	• No operational independence • Service fee fluctuations

8.1.2 Effluent Management Alternatives

The following Table presents advantages and disadvantages for potential effluent management alternatives.

Table 8-2
Pigeon Lake Effluent Management Option Pre-Screening

Discharge Location	Advantages	Disadvantages
1. Status quo • Ground • Lake (indirect) • Pipestone Creek	• Minimal change • Low costs for seasonal users	• Unsuitable for increasing population densities and usage • Potential adverse affect to personal property • High costs for permanent users. • Ongoing maintenance and replacement by owners necessary. • Risk of illegal discharge • Potential long-term lake impacts. • Monitoring of non-point source discharge very difficult. Impacts generally severe are difficult to mitigate before identifiable.
2. Pigeon Lake Creek – once per year discharge	• Least stringent treatment requirements • Suitable for stabilization lagoons • Simple, predictable monitoring	• Large storage pond required at treatment facilities. • Periodic odours during discharge • Sizing of storage facilities difficult • Limited base flow within creek • Cumulative downstream loading issues
3. Drainage channel to Battle River watershed – once per year discharge.	• Least stringent treatment requirements • Suitable for stabilization lagoons • Simple, predictable monitoring	• Large storage pond required at treatment facilities. • Periodic odours during discharge • Sizing of storage facilities difficult • Cumulative loading issues within Battle River
4. Pigeon Lake Creek – spring/fall discharge	• Moderate storage requirements • Moderate treatment requirements • Suitable for aerated lagoons	• Moderate storage requirements • Limited options during drought periods
5. Irrigation – golf course(s)	• Water retained within the drainage basin • Beneficial re-use of effluent	• Water quality not likely suitable due to high sodium adsorption ratio.
6. Irrigation – forest or farmland	• Water retained within the drainage basin • Beneficial re-use of effluent	• Water quality not likely suitable for most crops due to high sodium adsorption ratio (SAR).

Discharge Location	Advantages	Disadvantages
7. Infiltration basins with groundwater recharge	• Water retained within the drainage basin	• Requires favourable soils and groundwater conditions • Potential for infiltration basin plugging • Potential for adverse impacts on existing wells without adequate set-backs and good effluent quality
8. Constructed surface wetlands followed by indirect lake discharge	• With excellent treatment before wetland, lake impact would be negligible • Water retained within the drainage basin • Improved water fowl habitat • Wetland provides a additional buffer or safety that effluent quality will be excellent	• Likely requires winter storage • May not be accepted by AENV or the public (especially if excellent treatment does not precede the surface wetland) • May not suit high SAR.
9. Constructed subsurface wetlands followed by indirect lake discharge	• With excellent treatment before wetland, lake impact would be negligible • Water retained within the drainage basin • Wetland provides a additional buffer or safety that effluent quality will be excellent • Can function during winter (winter storage not required)	• High cost relative to surface wetlands • May not be accepted by AENV or the public (especially if excellent treatment does not precede the subsurface wetland) • May be susceptible to clogging unless effluent quality applied to the subsurface wetland is excellent
10. At grade forest effluent dispersion	• Water retained within the drainage basin • Can function during winter (winter storage not required)	• Not well established technology (design and performance risks)
11. Snowfluent	• Water retained within the drainage basin • Avoids requirements for winter storage	• Appears not to be practical at this scale • Requires large land area for winter snow accumulation • Unreliable performance during periodic warm periods
12. Deep well injection	• No surface water risk/impact.	• Generally not accepted by municipal regulations • Water lost.

8.1.3 Treatment Facility Location Option Pre-Screening

Section 6 describes a number of effluent disposal alternatives, some of which require specific geographical features, such as a river or lake. In order for the effluent alternatives to be considered feasible, the treatment facility should be located in reasonable proximity to the disposal location. Similarly, the regional transmission system is impacted by the location of the treatment facility. The facility location will affect route selection and pumping station locations.

A treatment facility location option pre-screening was conducted to identify potential treatment sites as well as suitable effluent discharge and regional transmission alternatives. The following table identifies advantages and disadvantages of various treatment locations.

Table 8-3
Treatment Facility Location Option Pre-Screening

Treatment Location	Advantages	Disadvantages
1. Status quo –onsite holding tanks and onsite treatment systems	• Minimal change • Lower short-term capital • Water retained in lake water cycle	• Unsuitable for increasing population densities and usage • Potential adverse affect to personal property • High haulage costs, especially for permanent users with holding tanks. • Truck traffic associated mostly with holding tank pumpouts • Ongoing maintenance and replacement by owners necessary. • Potential on-site odors • Limits developable land • Risk of illegal discharge • Potential long-term lake impacts and other environmental concerns • Regulatory monitoring/issues • Public health concerns
2. One treatment facility SE of Pigeon Lake (near Pigeon Lake Creek)	• One central operations hub • Economy of scale advantage • Pigeon Lake Creek could be used as a constructed wetland. • Pigeon Lake Creek higher dilution then Pipe Stone Creek • Regional governance and operation options •	• Extensive piping requirements around lake • Water lost from lake water cycle • Limited re-use of existing Mulhurst infrastructure • O&M costs for longer pipeline could be significant. • Expect difficult easement negotiations for use of First Nations Lands.
3. One treatment facility at or near Mulhurst Lagoon	• One central operations hub, already accepted as a treatment site • Economy of scale advantage • Some re-use of existing Mulhurst Infrastructure • Regional governance and operation options	• Extensive piping requirements around lake • Water lost from lake water cycle • Pipe Stone Creek provides minimal dilution • Water lost from lake water cycle. • Capital costs to upgrade and repair the Mulhurst Lagoon could be high. • Current gravity sewer repairs needed to reduce volumes.
4A. Two treatment facilities (SE Pigeon Lake and Mulhurst Lagoon)	• Reduced pumping and piping requirements • Distribution of effluent loads, but remain concentrated to Battle River • Some re-use of existing Mulhurst Infrastructure • Two locations nearest to population centers • Regional governance and operation options	• Operation of two facilities • Water lost from lake water cycle • Similar pipeline, easement and infrastructure problems as noted above.
4B. Two treatment facilities (NW Pigeon Lake and Mulhurst Lagoon)	• Reduced pumping and piping requirements • Distribution of effluent loads, including re-use component • Some re-use of existing Mulhurst Infrastructure • Regional governance and operation options	• Operation of two facilities • NW location not nearest to population centers • Some water lost from lake water cycle • Effluent discharge from NW site requires provisions to avoid any impacts on the lake. • Long pipeline from south,

Treatment Location	Advantages	Disadvantages
	• Some water retained in lake water cycle • Could use existing Provincial Park lagoon with some upgrades.	
5. Decentralized treatment systems serving individual (or pods) summer villages and other developments (e.g. campgrounds, golf courses)	• Target small facilities near various population areas to limit piping • Reduced pumping and piping requirements and easement issues • Still requires relatively high level of treatment • Some water retained in lake water cycle	• Numerous facilities to operate and regulate • No economy of scale advantage • Extensive effluent monitoring requirements • Independent governance •
6. Treatment location outside of the Pigeon Lake area (as part of a broader regional system)	• No Pigeon Lake treatment facility required • Minimal operational requirements	• Costly pumping and transmission requirements • No short term solution available • Water loss from the lake.

8.1.4 Wastewater Collection Alternatives

The following table lists advantages and disadvantages with each potential collection system.

Table 8-4
Pigeon Lake – Wastewater Collection Option Pre-Screening

Collection	Advantages	Disadvantages
1. Status quo – limited piping and some haulage	• Lower short term capital costs	• Reduced long term reliability • Ongoing cost increases (system replacement and haulage) • Risk of leaking tanks • Risk of illegal releases
2. Haulage	• Limited short term capital costs	• Limited long term reliability • High haulage costs and ongoing cost increases • Truck traffic • Road maintenance • Risk of leaking tanks • Risk of illegal releases

Collection	Advantages	Disadvantages
3. Grinder pumps with small diameter, low pressure sewers	• Small pipe sizes (from 50 mm to 150 mm) • Layout independent of topography • Most conducive to trenchless construction methodologies (HDD) • Reduced excavation compared to gravity sewer • Sewer system infiltration greatly reduced • Eliminates manholes • Typically lower construction costs compared to gravity • Multiple pump operation less problematic than STEP pumps – greater pumping head and overall flow capability	• Small pump needed at each residence • Electrical power required • Air release valves needed • Flushing connections required • Power outages interrupt service • Maintenance of pump • Grinder pumps cost more than STEP pumps • Existing storage tanks typically can not be re-used • Less surface disturbance then gravity sewer
4. Septic tank effluent pumping (STEP) system with small diameter, low pressure sewers	• As per grinder pumps • Lower pump cost • Can use HDD • No infiltration. • Can make use of existing tanks. • Possibly use the tanks as upstream storage volume.	• As per grinder pumps • Requires septic tank • Can use existing tank, if in good condition • Multiple pump operation not as capable grinder pumps – more interference between pumps (danger of zero flow)
5. Conventional gravity sewers and lift stations/force mains.	• Lower operational cost for gravity line compared to low pressure system • Flushing of system not required • Simpler, lower capital cost for private property connections.	• Minimum pipe size of 200 mm for gravity sections • Deep sewers and manholes required • Additional lift stations required with hilly terrain or long sewers over flat terrain • Higher construction costs • Significant surface disturbance
6. Septic Tanks with small diameter gravity sewers and lift stations/force mains	• Small diameter pipe sizes (from 100 mm) • Lower operating cost than for low pressure sewer systems	• Requires all residents to have septic tanks • Potential for pipe clogging if septic tanks are not properly maintained (sludge pump outs) • Requires immediate pump station in hilly terrain
7. Combination of low pressure and gravity systems	• Flexibility for development • Optimize advantages of both systems • Minimize disadvantages of both systems	• More difficult for Municipality: maintenance of varied systems
8. Combination of haulage and piped collection	• Reduced capital cost compared to all-piped options • Amenable to staging (future servicing by pipe)	• • As per haulage options for those residents with holding tanks/haulage

8.2 WASTEWATER MANAGEMENT ALTERNATIVES

Based upon the option pre-screening analysis, conducted with the Steering Committee, a short list of suitable regional effluent disposal, treatment, collection and transmission options were derived. Figure 8.1 summarizes the suitable options.

Each discharge location identified in Figure 8.1 requires the wastewater to meet very specific criteria to prevent damage to the environment. The criteria required will vary depending on the location of effluent discharge. For this reason it is important to identify what treatment technologies are required with each effluent discharge location. Table 8.5 shows a selection matrix for potential Pigeon Lake Regional Wastewater Treatment Plant and Effluent Management Options.

Table 8.5
Selection Matrix for Pigeon Lake Regional Wastewater Treatment Plant and Effluent Management Options

		Intermittent Discharge (Will require some storage)				Potentially Continuous Discharge	
WWTP Location	**Treatment Process \ Effluent Management**	Pipestone Creek	Pigeon Lake Creek	Battle River	Rapid Infiltration Basins (groundwater flow to Pigeon Lake) [3]	Wetlands (Surface or Subsurface) [4]	Indirect Lake Discharge
Mulhurst (Treating All Flow: Option 1)	Conventional Stabilization Lagoons						
	Aerated Lagoon	● [2]					
	Conventional Mechanical WWTP	● [2]					
	Advanced Mechanical WWTP	● [2]			● [2]	●	●
Mulhurst (Treating NEPL OR Treating NEPL and North Side: Options 2, 3, 4, and 5)	Conventional Stabilization Lagoons	● [1]					
	Aerated Lagoon	● [2]					
	Conventional Mechanical WWTP						
	Advanced Mechanical WWTP						
SE Corner of Pigeon Lake (Options 2, 3, and 5)	Conventional Stabilization Lagoons		● [1]	● [1]			
	Aerated Lagoon		● [2]	● [2]			
	Conventional Mechanical WWTP		● [2]	● [2]			
	Advanced Mechanical WWTP				● [2]	●	●
Western Tip of Pigeon Lake Options (3, 4, and 5)	Conventional Stabilization Lagoons						
	Aerated Lagoon						
	Conventional Mechanical WWTP						
	Advanced Mechanical WWTP				● [2]	●	●
Southern Edge of Pigeon Lake (Option 5)	Conventional Stabilization Lagoons			● [1]			
	Aerated Lagoon			● [2]			
	Conventional Mechanical WWTP			● [2]			
	Advanced Mechanical WWTP			● [2]		●	●

Footnotes:
1 – Requires one year of effluent storage (Discharge to creek/river once per year)
2 – Requires winter + some transition season effluent storage (Winter storage for infiltration basins, or discharge to creek/river twice per year)
3 – Suitability subject to geotechnical conditions, topography, groundwater hydrology and hydrogeology, and distance from potable water wells.
4 – Use of wetlands requires confirmation that Sodium Adsorption Ratio of wastewater will not be detrimental to wetland vegetation and soils.

8.3 REGIONAL OPTION REVIEW

Based upon the approved wastewater management alternatives six regional wastewater options were reviewed. The following will describe each option.

8.3.1 Option 1 – Mulhurst Treatment Facility

Option 1 is illustrated in Figure 8.2

Treatment Location
Option 1 reviewed the use of the existing Mulhurst Treatment Facility to treat wastewater for the study area.

Effluent Disposal
The following effluent discharge options were analyzed:

- Pipestone Creek
- Rapid Infiltration Basins (groundwater flow to Pigeon Lake)
- Indirect Lake Discharge

Treatment Technology
The following treatment technologies were assessed for Option 1:

- Aerated Lagoon
- Conventional Wastewater Treatment Plant
- Advanced Mechanical Wastewater Treatment Plant

Regional Transmission
The regional transmission system would be separated into two parts, north and south. The northern system would extend east from Moonlight Bay and collect wastewater from the rural subdivisions along the route. The southern developments would require an extensive regional system to pipe wastewater to the Mulhurst Treatment Facility. It is assumed the regional transmission system would be required construct outside of the Pigeon Lake First Nations Indian Reserve.

8.3.2 Option 2 – Mulhurst and South-east Treatment Facility

Figure 8.3 shows Option 2.

Treatment Locations
Option 2 reviewed the use of the existing Mulhurst Treatment Facility and the construction of a new wastewater treatment facility south-east of Pigeon Lake. If the south-east treatment facility can not be located adjacent the lake an alternative site would be the Falun Lagoon located east of Pigeon Lake.

Effluent Disposal

Mulhurst WWTF

- Pipestone Creek

South-East WWTF

- Pigeon Lake Creek
- Battle River
- Rapid Infiltration Basins (groundwater flow to Pigeon Lake)
- Indirect Lake Discharge

Treatment Technology

The following treatment technologies were assessed for Option 1.

Mulhurst Treatment Facility:

- Aerated Lagoon

South-East Treatment Facility:

- Aerated Lagoon
- Conventional Wastewater Treatment Plant
- Advanced Mechanical Wastewater Treatment Plant

Regional Transmission

A regional transmission system would be required for the north and south sides of Pigeon Lake. Similar to option 1 the northern system would service the north side of Pigeon Lake by constructing a pipeline east from Moonlight Bay to the Mulhurst WWTF. Wastewater from the rural subdivisions would be collected by pumping stations along the pipeline. The south transmission system would service the south side of Pigeon Lake by a pipeline from the Summer Village of Poplar Bay to a new WWTF in the south-east corner of Pigeon Lake. The south regional transmission system would be required to extend approximately 8.0 km to the east if the treatment facility must be located at the Falun Lagoon.

8.3.3 Option 3 – Mulhurst, South-East and North-West Treatment Facilities

Figure 8.4 illustrates Option 3.

Treatment Locations

Option 2 reviewed the use of the existing Mulhurst Treatment Facility and the construction of new wastewater treatment facility in the north-west and south-east of Pigeon Lake. If the south-east treatment facility can not be located adjacent the lake an alternative site would be the Falun Lagoon located east of Pigeon Lake.

Effluent Disposal

Mulhurst WWTF

- Pipestone Creek

South-East WWTF
- Pigeon Lake Creek
- Battle River
- Rapid Infiltration Basins (groundwater flow to Pigeon Lake)
- Indirect Lake Discharge

North-west Treatment Facility
- Strawberry Creek
- Rapid Infiltration Basins (groundwater flow to Pigeon Lake)
- Indirect Lake Discharge

Treatment Technology
The following treatment technologies were assessed for Option 3.
Mulhurst Treatment Facility:
- The Mulhurst Lagoon would service the NEPL only. There would be no incremental costs to the Regional Group.

South-East Treatment Facility:
- Aerated Lagoon
- Conventional Wastewater Treatment Plant
- Advanced Mechanical Wastewater Treatment Plant

North-West Treatment Facility
- Aerated Lagoon
- Advanced Mechanical WWTP

Regional Transmission
A regional transmission system would be required for the north-west and south-east corners of Pigeon Lake. The NEPL would continue t service the north-east end of Pigeon Lake. The north-east would be serviced by two transmission pipelines from the Provincial Campground and the Summer Village of Sundance. The south-east transmission system would require a pipeline from the Summer Village of Grandview to a new WWTF in the south-east corner of Pigeon Lake. The south regional transmission system would be required to extend approximately 8.0 km to the east if the treatment facility must be located at the Falun Lagoon.

8.3.4 Option 4 – Mulhurst and North-West Treatment Facilities

Figure 8.5 displays Option 4.

Treatment Locations
Option 2 reviewed the use of the existing Mulhurst Treatment Facility and the construction of a new wastewater treatment facility in the north-west corner of Pigeon Lake.

Effluent Disposal

Mulhurst WWTF

- Pipestone Creek

North-West Treatment Facility

- Strawberry Creek
- Rapid Infiltration Basins (groundwater flow to Pigeon Lake)
- Indirect Lake Discharge

Treatment Technology

The following treatment technologies were assessed for Option 3.

Mulhurst Treatment Facility:

- The Mulhurst Lagoon would service the NEPL only. There would be no incremental costs to the Regional Group.

North-West Treatment Facility

- Aerated Lagoon
- Advanced Mechanical WWTP

Regional Transmission

A regional transmission system would be required for the north-west and south sides of Pigeon Lake. The NEPL would continue to service the north-east end of Pigeon Lake. The north-west would be serviced by a transmission pipelines from the Summer Village of Sundance to the north-west WWTF. The south side of Pigeon Lake would be serviced by an extensive regional transmission system. The transmission system would originate south of Ma-Me-O Beach and pipe wastewater to the north-west WWTF.

8.3.5 Option 5 – Mulhurst, South-East, South and North-West Treatment Facilities

Figure 8.6 illustrates Option 5.

Treatment Locations

Option 5 reviewed the use of the existing Mulhurst Treatment Facility and the construction of new wastewater treatment facilities in the north-west, south and south-east of Pigeon Lake. If the south-east treatment facility can not be located adjacent the lake an alternative site would be the Falun Lagoon located east of Pigeon Lake.

Mulhurst WWTF

- Pipestone Creek

South-East WWTF

- Pigeon Lake Creek
- Battle River
- Rapid Infiltration Basins (groundwater flow to Pigeon Lake)

- Indirect Lake Discharge

South WWTF
- Battle River
- Indirect Lake Discharge

North-West Treatment Facility
- Strawberry Creek
- Rapid Infiltration Basins (groundwater flow to Pigeon Lake)
- Indirect Lake Discharge

Treatment Technology

The following treatment technologies were assessed for Option 3.

Mulhurst Treatment Facility:
- The Mulhurst Lagoon would service the NEPL only. There would be no incremental costs to the Regional Group.

South-East Treatment Facility:
- Aerated Lagoon
- Conventional Wastewater Treatment Plant
- Advanced Mechanical Wastewater Treatment Plant

South WWTF
- Conventional Stabilized Lagoons
- Aerated Lagoons
- Conventional Wastewater Treatment Plant
- Advanced Mechanical Wastewater Treatment Plant

North-West Treatment Facility
- Aerated Lagoon
- Advanced Mechanical WWTP

Regional Transmission

The introduction of a fourth treatment facility simplifies the required transmission system. The NEPL would continue to service the north-east end of Pigeon Lake. The north-east would be serviced by two transmission pipelines from the Provincial Campground and the Summer Village of Sundance. The south-east transmission system would require a pipeline from the Village at Pigeon Lake to a new WWTF in the south-east corner of Pigeon Lake. The south regional transmission system would be required to extend approximately 8.0 km to the east if the treatment facility must be located at the Falun Lagoon.

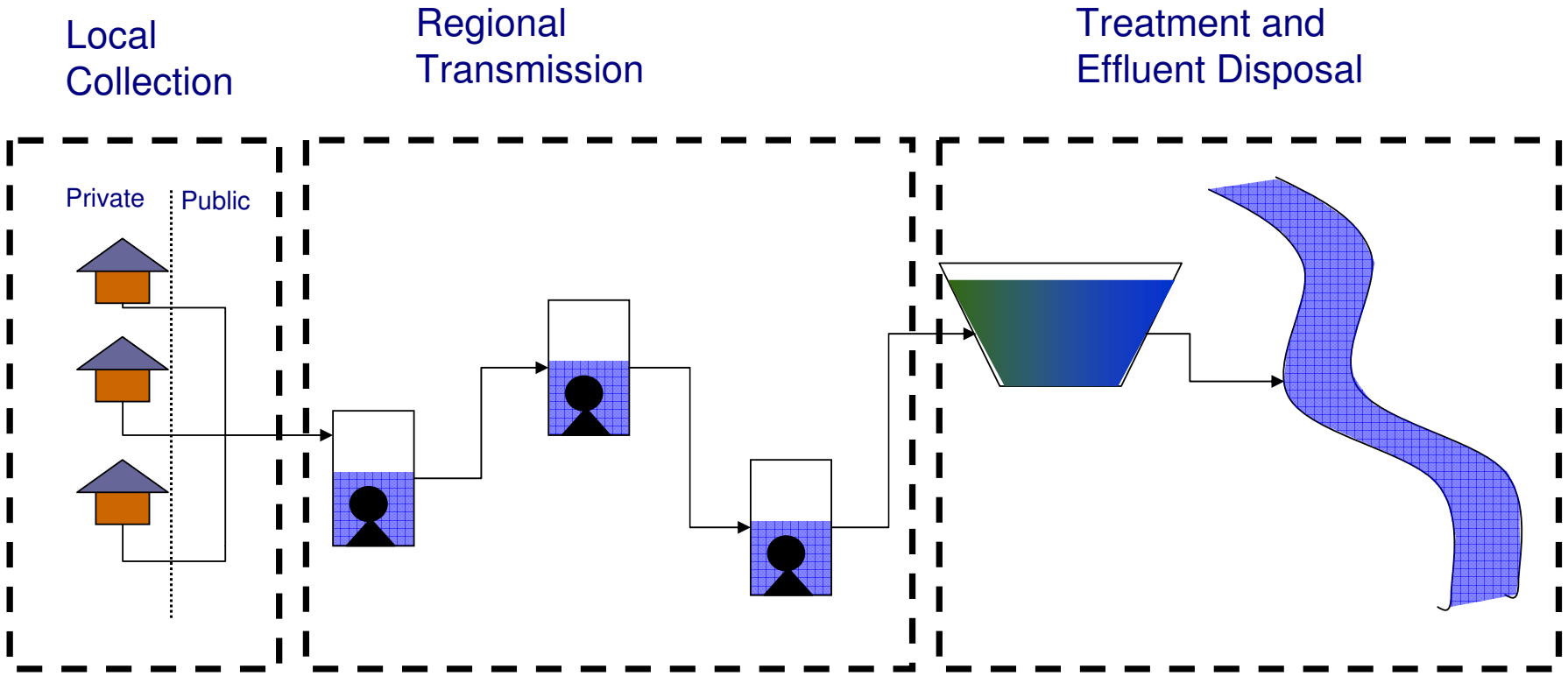
8.4 OPTION INFRASTRUCTURE REVIEW

The following table summarizes the infrastructure required for each option.

Table 8-6
Summary of Option Infrastructure Requirements

Option	Length of Collection and Transmission Pipe	Number of Lift Stations	No. of WWTF
Option 1	88,800 m	6	1
Option 2	70,950 m	5	2
Option 3	67,400 m	4	3
Option 4	78,000 m	4	2
Option 5	64,500 m	3	4

There is a distinct relationship between the collection and transmission system and the number of wastewater treatment facilities. In general, the amount of piping required decreases with the increase in treatment facilities.



- Haulage
- Pressure Sewer
  - Grinder
  - STEP
- Conventional Gravity
- Combined Systems

- One Treatment Facility
- Two Treatment Facilities
- Decentralized Facilities
- Combinination

- Stabilization Lagoons
- Aerated Lagoons
- Conventional Mechanical Plants
- Advanced Mechanical Plants

- Pigeon Lake Creek or Pipstone Creek
- Battle River
- Constructed Wetlands - Indirect Lake Discharge
- Strawberry Creek

FIGURE 8.1
WASTEWATER SYSTEM PRE-SCREENING SUMMARY

Associated Engineering

NORTH PIGEON LAKE

NORTH EAST PIGEON LAKE

UPGRADE EXISTING LIFT STATION AND FORCEMAIN

PIGEON LAKE

SOUTH PIGEON LAKE

WATERSHED BOUNDARY

BATTLE LAKE

BATTLE RIVER

PIGEON LAKE CREEK

Treatment Options:

- Aerated Lagoon Upgrade
- Conventional Mechanical WWTP
- Advanced Mechanical WWTP

Legend:

- Pump Station
- Transmission
- Collection
- Treatment
- Watershed Boundary

PIGEON LAKE REGIONAL WASTEWATER STEERING COMMITTEE

STRATEGY AND MASTER PLAN

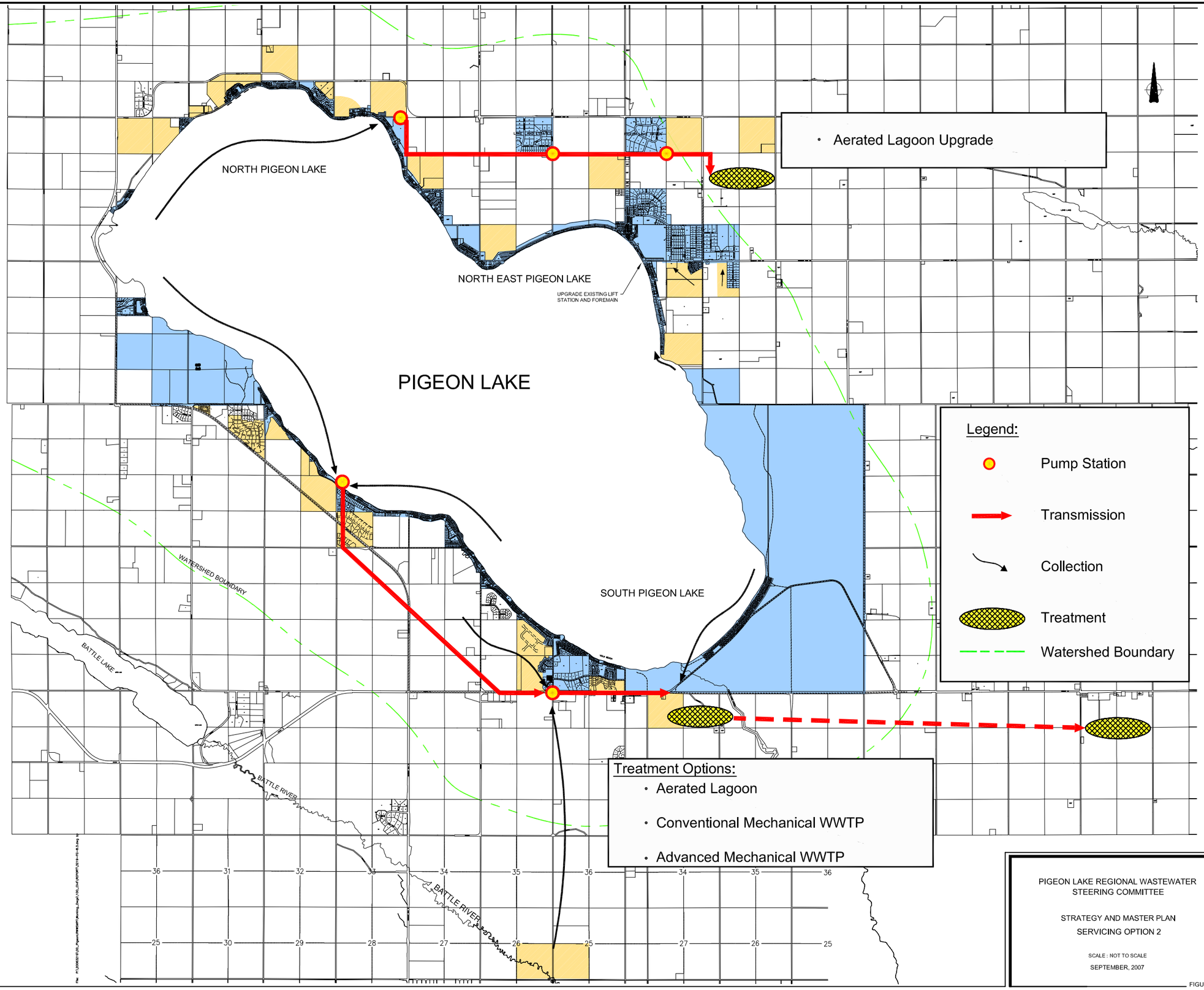
SERVICING OPTION 1

SCALE : NOT TO SCALE

SEPTEMBER, 2007

FIGURE 8.2

Associated Engineering



Associated Engineering

PIGEON LAKE REGIONAL WASTEWATER STEERING COMMITTEE

STRATEGY AND MASTER PLAN

SERVICING OPTION 2

SCALE : NOT TO SCALE

SEPTEMBER, 2007

FIGURE 8.3

NORTH PIGEON LAKE

NORTH EAST PIGEON LAKE

UPGRADE EXISTING LIFT STATION AND FOREMAIN

PIGEON LAKE

SOUTH PIGEON LAKE

WATERSHED BOUNDARY

BATTLE LAKE

BATTLE RIVER

BATTLE RIVER

- No Incremental Cost to Regional Group

Treatment Options:

- Advanced Mechanical WWTP
- Aerated Lagoon

Treatment Options:

- Aerated Lagoon Upgrade
- Conventional Mechanical WWTP
- Advanced Mechanical WWTP

Legend:

- Pump Station
- Transmission
- Collection
- Treatment
- Watershed Boundary

36 31 32 33 34 35 36

25 30 29 28 27 26 25 27 26 25

PIGEON LAKE REGIONAL WASTEWATER STEERING COMMITTEE

STRATEGY AND MASTER PLAN

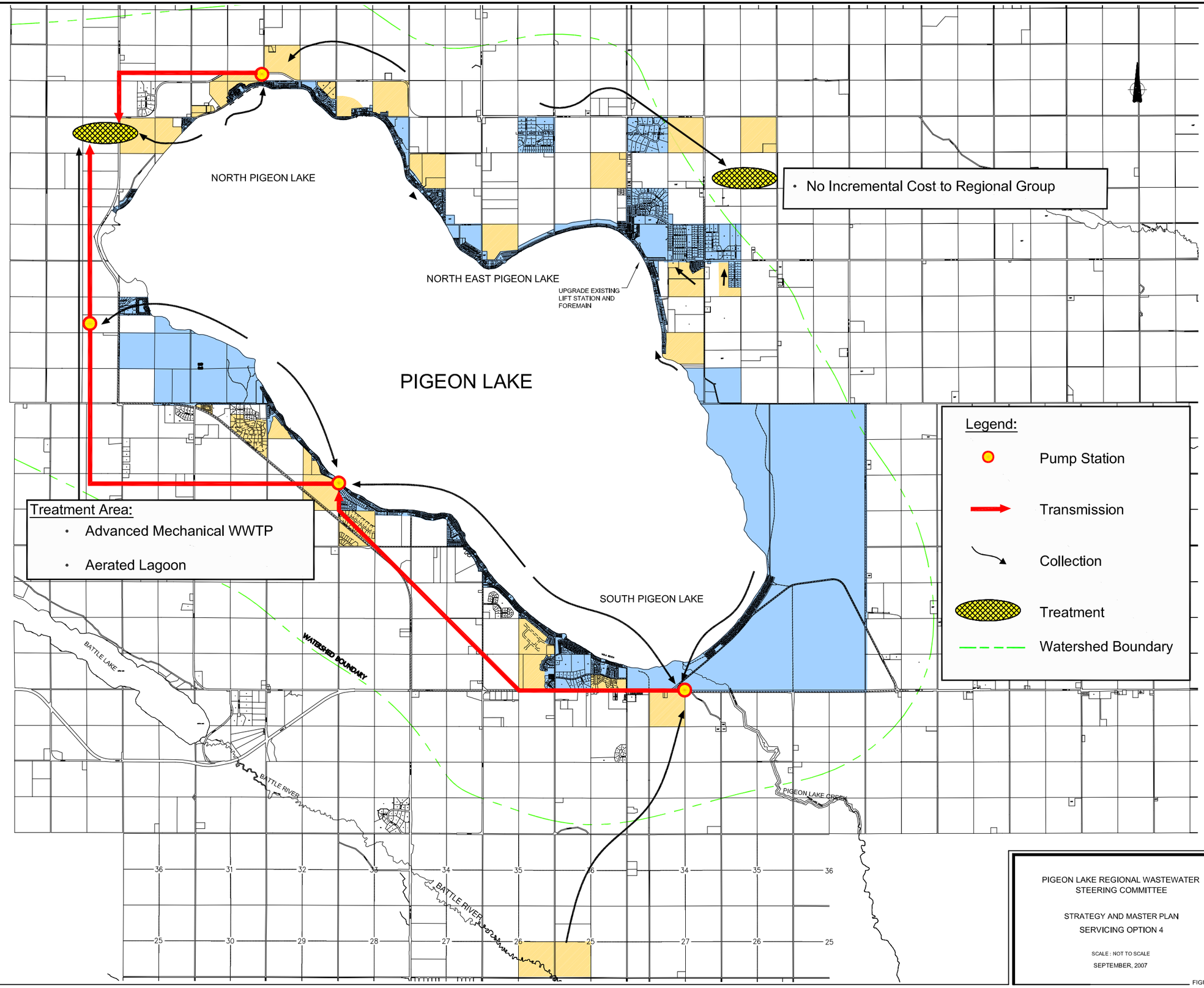
SERVICING OPTION 3

SCALE : NOT TO SCALE

SEPTEMBER, 2007

FIGURE 8.4

Associated Engineering



PIGEON LAKE REGIONAL WASTEWATER STEERING COMMITTEE

STRATEGY AND MASTER PLAN

SERVICING OPTION 4

SCALE : NOT TO SCALE

SEPTEMBER, 2007

Associated Engineering

FIGURE 8.5

NORTH PIGEON LAKE

NORTH EAST PIGEON LAKE

UPGRADE EXISTING LIFT STATION AND FOREMAIN

PIGEON LAKE

SOUTH PIGEON LAKE

BATTLE LAKE

WATERSHED BOUNDARY

BATTLE RIVER

- No Incremental Cost to Regional Group

- Advanced Mechanical WWTP
- Aerated Lagoon

- Conventional Stabilized Lagoons
- Conventional Mechanical WWTP

- Aerated Lagoon
- Conventional Mechanical WWTP
- Advanced Mechanical WWTP

Legend:

- Pump Station
- Transmission
- Collection
- Treatment
- Watershed Boundary

36 31 32 33 34 35 36 34 35 36

25 30 29 28 27 26 25 27 26 25

PIGEON LAKE REGIONAL WASTEWATER STEERING COMMITTEE

STRATEGY AND MASTER PLAN

SERVICING OPTION 5

SCALE : NOT TO SCALE

SEPTEMBER, 2007

Associated Engineering

FIGURE 8.6

9 Cost Implications

This section outlines the estimated capital, operation and maintenance costs associated with the regional wastewater management options.

9.1 CAPITAL COST

The capital costs estimates for various options are based on the concepts proposed. These estimates are "Order of Magnitude" and should be verified and updated during the pre-design and design stages of this project.

Over recent years estimating of construction projects has become a major challenge. Construction materials and labour costs have escalated beyond normal inflation over recent years, and with the number of major projects planned in northern Alberta this upward volatility is not expected to flatten in the near future. Projects of particular concern are those requiring skilled labour in the mechanical, electrical and structural trades, and concrete and steel materials. Increases over the past two years have ranged from 25 to 50% depending on the project and location. Looking into the future is even more difficult due to recent spikes in fuel costs, and volatile supply chains from the US.

The following estimates are our best estimate of likely project costs for 2007 budgeting purposes. We recommend the budget of each component be reviewed based on more detailed estimating and current market knowledge, as project scope and timing is better defined.

The following cost estimates are based on aerated lagoon system with winter effluent storage in for all options for fair comparison purposes. Future design phases may consider other treatment process options, but in this case, aerated lagoons are suitable for all options and provide the most fair basis of comparison.

Cost estimates include construction and non-construction components.

9.1.1 Construction Cost

Costs of major construction components include:

Construction Cost:

- Wastewater Treatment Facility
  - Topsoil stripping and replacing in a controlled fashion
  - Excavation and Backfill
  - Aeration Equipment (dependant on Option)
  - Liner (dependant on Option)
  - Effluent discharge piping
  - Access roads to facilities
  - Power to facilities

- Pipeline construction
  - Topsoil stripping and replacing in a control fashion
  - Trenching, bedding, piping, backfilling (where permitted)
  - Horizontal Directional Drill (under existing roadways)
  - Utility, pipeline, river, highway, roadway and railway crossings
  - Valves, air vacuum valve chambers, blow-offs, flushing connections
  - Testing, cleaning, disinfection and commissioning of pipeline
  - Pumping Stations
  - Access roads to facilities
  - Power to facilities
  - SCADA system
- Private Collection System
  - Horizontal Directional Drill of necessary piping
  - Private pumping station
  - Connection to existing service piping
  - Power to pumping station

9.1.2 Non-Construction Cost

Costs of the major non-construction components include:

- Engineering
- Survey
  - Legal
  - Topographic
- Geotechnical and Groundwater Assessment
  - Investigation
  - Material Testing
  - Geophysical
  - Hydrogeological
- Environmental
  - Agrology
  - Archaeological
  - Historical
- Land
  - Acquisition
  - Compensation – e.g. crop
  - Landman Services
- Legal Services (Solicitor)

9.2 REGIONAL

The costs for the regional system would include the treatment facility, effluent disposal, and regional transmission.

9.2.1 Treatment and Effluent Disposal

Table 9.1 presents the capital costs for the recommended treatment options. The "Initial Costs For Development" are for development of treatment systems to service the projected flow in 2017, and the "Estimated Future Expansion Costs" are for expansion of the respective facilities to service ultimate flow once the 2017 design flows are met. In all cases, it is recommended the original facility be developed to service the 2017 design flow, as actual flows could be considerably less than the design criteria due to less future development than currently projected and/or lower summer use peaks.

Table 9-1
Preliminary Capital Cost Estimates for Treatment and Effluent Discharge

Option	Treatment	Effluent	TOTAL
Option 1	$6,500,000	-	$6,500,000
Option 2	$9,700,000	-	$9,700,000
Option 3	$9,800,000	$3,200,000	$13,000,000
Option 4	$7,200,000	$3,200,000	$10,400,000
Option 5	$11,700,000	$5,600,000	$17,300,000

Option 1 would require an aerated lagoon upgrade and the remaining options would require new facilities.

9.2.2 Transmission

Table 9.2 presents the capital costs for the regional transmission system. The costs are based upon generation from combined sewage collection systems, for ultimate development throughout the study area.

Table 9-2
Estimated Regional Transmission Costs

Option	Piping	Lift Stations	TOTAL
Option 1	$17,800,000	$2,400,000	$20,200,000
Option 2	$9,400,000	$2,000,000	$11,400,000
Option 3	$7,100,000	$1,600,000	$8,700,000
Option 4	$13,600,000	$1,600,000	$15,200,000
Option 5	$6,600,000	$1,200,000	$8,200,000

9.3 LOCAL COLLECTION

As previously discussed, a low pressure sewer system is recommended to service the existing developments, which requires small pump stations at each resident and forcemain system throughout the community. The low pressure systems would discharge into nearby regional pump stations.

9.3.1 Public

Capital cost estimates for retrofitting forcemains on public property and low pressure pump stations on private property into the existing developments are as follows.

- Municipal mains (Off-Site) $16,200,000

9.3.2 Private

The cost of retrofitting private services with pump stations vary significantly based on the distance of service pipe required on each lot and physical constraints around the existing septic tank location. Simple installations (i.e. no above or below ground conflicts) can typically be completed for approximately $8,000, while difficult installations can cost up to $18,000 or more if circumstances are very unique. If the Committee completes work on private property, it is recommended each lot is reviewed with the property owner prior to cost estimates being finalized. An alternative option is for all work on private property remain the responsibility of the homeowner,

based on provided design and construction standards. For the purposes of this study, a cost of $15,000 was used for the installation of the private collection system.

The current fee for truck haul and sewage disposal is approximately $150 to per service. Annual cost for disposal depending on the property and water usage for truck disposal in the area is typically $600 to $1,800.

9.4 SUMMARY OF CAPITAL COSTS

The following Table summarizes the costs for each option.

Table 9-3
Summary of Total Estimated Capital Costs

Option	Treatment ($)	Transmission ($)	Local Collection Public ($)	Local Collection Private ($)	Total ($)
1	6,500,000	20,200,000	16,200,000	31,800,000	69,900,000
2	9,700,000	11,400,000	16,200,000	31,800,000	64,300,000
3	13,000,000	8,700,000	16,200,000	31,800,000	69,700,000
4	7,200,000	15,200,000	16,200,000	31,800,000	70,400,000
5	17,300,000	7,800,000	16,200,000	31,800,000	73,100,000

All options appear to have similar total order-of-magnitude capital costs.

9.5 LIFE CYCLE COSTS

The life cycle cost analysis was performed to compare the long term cost of owning and operating the various regional wastewater system. This assists to differentiate options with similar capital cost, as operational cost of process mechanical system (i.e. pump stations and treatment facilities) is significant.

The life cycle cost comparison includes the following operation and maintenance costs:

- Labour
- Materials
  - Chemicals
  - Waste Disposal
  - Filter Media

- Power
- Equipment
  - Pump Replacements
  - Instruments
  - Blowers
  - Screens
  - Mixers
  - Valves

The analysis is based upon the following assumptions:

- 25 year analysis period
- Interest rate of 6.0%
- Inflation rate of 2.5%

The following table shows the life cycle cost comparison.

Table 9-4
Summary of Total (Gross) Life Cycle Cost Comparison

	Treatment ($000,000)	Transmission ($000,000)	Local – Public ($000,000)	Local - Private ($000,000)	Total ($000,000)
Truck Haul	11.3	80.2			91.5
Option 1	11.1	30.3	15.5	48.5	105.4
Option 2	16.5	18.0	15.5	48.5	98.5
Option 3	38.3	14.0	15.5	48.5	116.3
Option 4	19.3	23.1	15.5	48.5	106.4
Option 5	45.7	12.3	15.5	48.5	122.0

A truck haul options was added for this analysis to compare the long term costs of piped collection systems to truck haul. This analysis does not consider increased road maintenance or other indirect costs of truck haul.

10 Funding Consideration

10.1 FUNDING SOURCES

There are various financial assistance programs available through the Alberta Government and the Federal Government. These are identified, reviewed, and evaluated as to the applicability to a Regional Wastewater System. The application of the best program for financial assistance will enable the Steering Committee to estimate the financing requirements and ultimate cost implications to the communities.

The current funding grants available from the Alberta and Canada governments have their priorities set on regional water and wastewater projects. The primary funding program applicable to this study is the new Water for Life - Regional Water and Wastewater Partnership Initiative released on April 5, 2006. Under this initiative, the Alberta government will cover up to 90 per cent of the capital costs of building regional municipal water and wastewater pipelines.

The new initiative will be part of the existing Alberta Municipal Water/Wastewater Partnership and is also part of the overall Water for Life Strategy adopted by the Alberta government in 2003. The new initiative will also provide 100 per cent funding for engineering feasibility studies for regional systems, plant expansions for "hub" suppliers required to serve new regional customers, and expanding pipeline capacity to serve future regional customers.

The Alberta Municipal Water/Wastewater Partnership (AMWWP) may consider funding the development of local wastewater collection systems. Canada-Alberta Municipal Regional Infrastructure Fund (CAMRIF) funding has been provided to similar project and provides a 66% grant.

The cost to retrofit pressure sewer systems on private property is typically not funded; however, the remaining portions of the system would likely be favourably viewed for Provincial and/or Federal funding. One of the primary purposes of this report is to provide a basis for the Committee to acquire a funding commitment from government agencies. For the purpose of the study it is assumed funding could be acquired for the following components.

- Local Collection - Public Systems (0 – 66% Funding)
  - Federal/Provincial CAMRIF
- Regional Transmission (75% - 90% Funding)
  - Provincial Water for Life Program
  - Water/Wastewater Partnership Programs
- Treatment Facility (75 – 90%)
  - Provincial Water for Life Program
  - Water/Wastewater Partnership Programs
- A high level of funding support would be expected for the regional transmission and treatment systems (75% to 90%), while assistance for the local collection system may be much less (0 to 66%).

10.2 NET MUNICIPAL COST COMPARISON

The following table summarizes the net municipal (after likely funding amounts) life cycle cost comparison.

Table 10-1
Summary of Net Municipal Life Cycle Cost Comparison

	Treatment ($000,000)	Transmission ($000,000)	Local – Public ($000,000)	Local - Private ($000,000)	Total ($000,000)
Truck Haul	3.0	80.2	-	-	**83.2**
Option 1	2.6	5.2	15.5	48.5	**71.8**
Option 2	6.1	3.4	15.5	48.5	**73.5**
Option 3	10.6	2.8	15.5	48.5	**77.4**
Option 4	9.1	3.7	15.5	48.5	**76.8**
Option 5	13.9	2.5	15.5	48.5	**80.4**

Based upon the preceding life cycle analysis Truck Haul, Option 3 and 5 can be eliminated as feasible options. Option 3 has similar costs, but requires two new treatment facilities. The construction and operation of additional treatment facilities presents the most significant cost risk.

11 Rate Implications

The following rate implications are provided for the likely future cost to implement a regional wastewater system within the area. The actual methods of cost recovery and cost sharing for the capital and operating costs of the wastewater system would be determined at a later time.

11.1 EXISTING COSTS

Property owner current wastewater costs around Pigeon Lake vary significantly depending on the frequency of property usage, type of system, level of awareness and condition of the system. Regulatory changes and increasing awareness has also changed and resulted in increased costs for many. All Summer Villages intend to eliminate disposal fields and any surface pumping, which will ultimately require all property owners to provide suitable holding tanks and dispose of wastewater at an approved Municipal wastewater treatment facility.

Assuming all property owners store wastewater on-site and pay for truck haul and disposal, typical costs will range from $600 to over $2,000 per year. The current cost range is based solely on lot usage, with the low end representing 4 truck loads per year and the high end 12. Obviously there are exceptions to this range; however, the general public opinion seemed to agree with this range.

11.2 FUTURE MUNICIPAL COSTS

All of the three preferred options each would result in development of significant municipal infrastructure and require ongoing operations and maintenance. The capital cost components would be eligible under various Provincial and Federal funding programs, which would then result in a smaller residual cost to be the responsibility of the municipalities. The municipalities would then be responsible for financing their portion, which would have to be recovered from the rate payers typically as a levy or directly through tax.

Table 11-1
Total Likely Annual Municipal Cost Range Per Lot

Component	Treatment	Transmission	Local Collection Public	Regional Operations	Total Municipal
Option 1	0 - 60	80 - 230	240 - 600	240	560 - 1130
Option 2	90 - 180	50 - 220	240 - 600	150	530 - 1140
Option 4	100 - 200	60 - 290	240 - 600	175	570 - 1250

The above annual rate implications (Table 11.1) are broken out into the primary development stages (Treatment, Transmission, Local Collection and Operations). The system would have to be sequentially developed and the eventual decision to develop local collection systems would be the sole decision and responsibility of the various individual municipalities.

The above table shows the total annual rate implication range ($370 to $970) per lot does not vary significantly for the various options. The cost range is determine by the level of funding provided to the capital cost if various options; therefore, the option most likely to be approved for funding puts the municipalities at the least cost risk. The Province has indicated preference to finance expansion of existing facilities rather then development of new facilities.

11.3 FUTURE PRIVATE COSTS

In all options any work required on private property is the sole responsibility of the property owners. As previously discussed it is assumed that the majority of lots will be serviced with low pressure sewer systems that require each lot to provide a pump to deliver wastewater from the lot to the municipal collection system.

The type of pressure sewer system may vary between municipalities resulting in slightly different costs. For this discussion of the rate implications we have assumed each lot would be retrofitted with a new dedicated grinder pump station. The for the supply and installation of a new grinder pump station on an existing lot is estimated costs to range from $10,000 to $15,000 depending on the nature of the lot (i.e. surface obstacles, length of pipe required, soil conditions, electrical issues and conditions of existing sewer system).

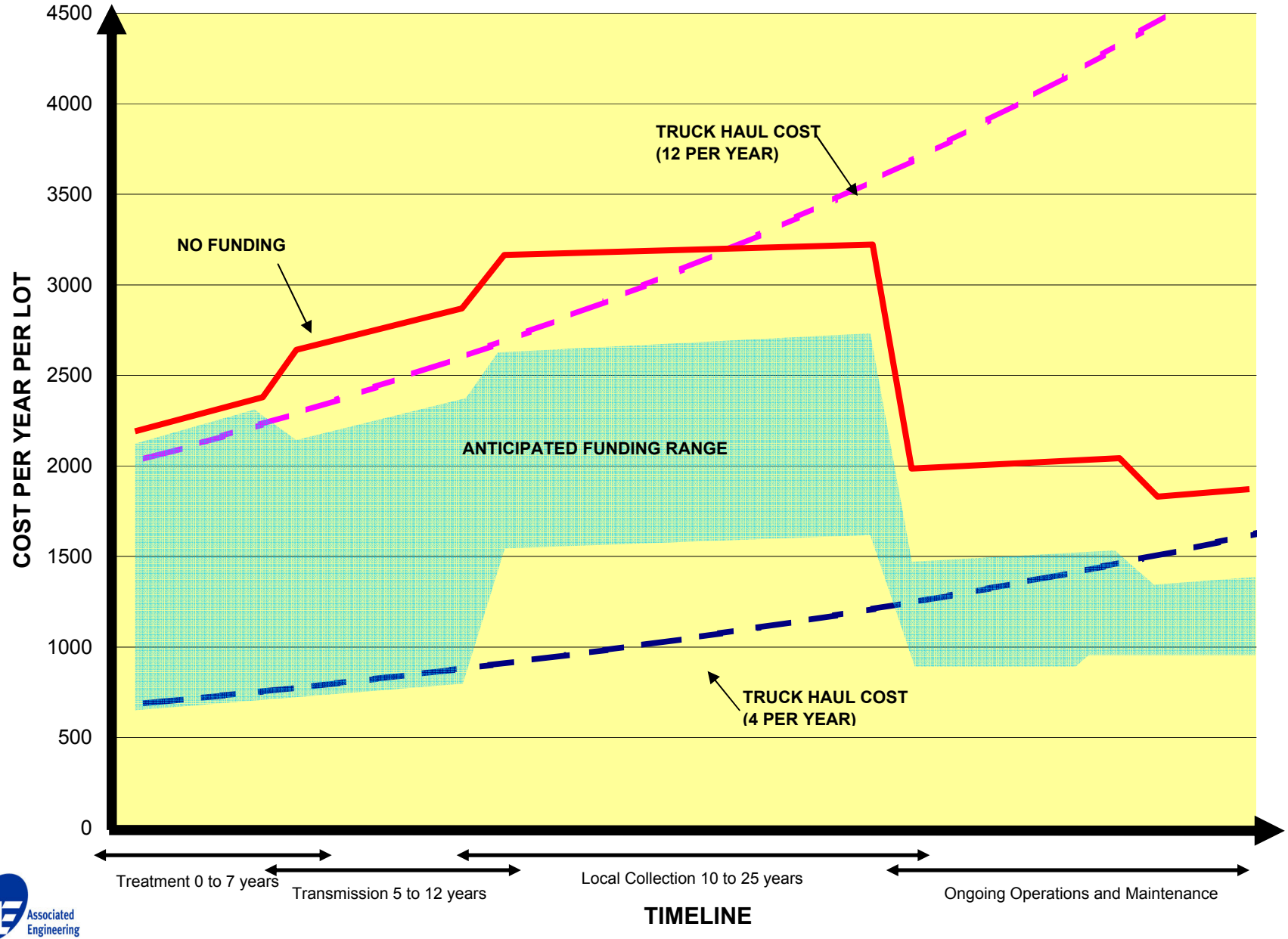
Based on the above cost range and assuming the property owners would borrow funds to complete the work the annual costs would range from $1030 to $1540 per year based on a 15 year debenture and 6% interest rate. Note: this work would not be required until the various Municipalities decide to develop local collection systems.

11.4 OVERALL COST IMPACTS

The overall cost impacts and timing for each resident would vary significantly depending on the decision of the various municipalities when to develop local collection systems. Ongoing truck haul will have to continue in the interim and some may wish to rely on truck haul long-term, however, public opinion indicated long-term truck haul would become costly and pose too much continued road wear and tear.

The following Figure 11.1 demonstrates how the above cost impacts of a regional wastewater system would compare to long-term truck haul over time.

FIGURE 11.1
RATE IMPLICATION TIMELINE



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12 Governance

There are a number of options available to the member municipalities in the system ownership, operation and cost sharing options of regional wastewater systems.

The types of regional municipal utility systems currently operating in Alberta are varied and there are advantages and disadvantages associated with each system. The majority of operating systems are municipal potable water and solid waste operations, but the same governance options would apply to municipal wastewater systems. The sizes of regional systems vary from small two community systems to large regional water commissions involving numerous communities and complex infrastructure.

The main ownership and operational scenarios that would apply to a Pigeon Lake regional wastewater system are discussed in the following sections.

12.1 INDIVIDUAL OWNERSHIP

This option for administration assumes each individual municipality retains ownership of their own wastewater facilities. Common services such as regional pipelines and treatment systems would then be owned and operated by one (lead) municipality, which would likely be the municipality requiring the majority usage. The cost of service for each user is dependent upon the negotiation of the cost wastewater from each municipality.

- Each community would own a specific percentage of the system (pipeline, treatment plant, etc.) based on the projected demand requirements.
- Each community would provide the capital funding and finance their share of the capital costs of the system.
- One community would take the lead role in the operation and financial management of the system.
- Costs of operations and administration would be documented and reported yearly and shared by all municipalities based on percentage of system ownership
- Ownership percentages of the system could be adjusted at later dates based on changes of demand or possible new customers.
- Detailed legal agreements would be required between all members of the system.

Under this model, capital cost share and operating cost agreements would be critical in the successful implementation of the system. Considering the number of municipalities and intensive administrative requirements of this approach it is not considered viable for the Pigeon Lake area. This approach would likely lead to ongoing rate disputes amongst the various parties.

12.2 CONSORTIUM APPROACH (AUTHORITY)

With the development of a regional wastewater system, the member municipalities may consider the administration of the system on a "consortium" approach where the individual municipalities hold their proportionate share of the debt incurred for the development of a regional system. The capital costs, operation, and maintenance costs would be allocated on a pre-determined formula. The development of this formula is a matter of negotiation among the member municipalities. Such issues as cost sharing based on population and/or specific benefit of a pipeline needs to be included in any formula. It should be noted that the individual municipality holds the debt incurred for the development of the infrastructure system.

- Each municipality holds their proportionate share of the debt
- Ownership formula is a matter of negotiation among municipalities
- Capital costs, operation, and maintenance costs allocated pre-determined formula
- Individual municipality holds agreed proportion of the debt

Summer Villages have minimal debt capacity and would likely not be financially capable of operating under this approach. This may be a valid interim structure to enable joint negotiation of servicing agreements with the NEPL and prior to the requirement of significant capital contributions, but not a valid long-term structure.

12.3 REGIONAL UTILITY SERVICES COMMISSION

The Province of Alberta has developed legislation whereby two or more municipalities may come together and form a Regional Utility Services Commission for the effective delivery of municipal services. This provides for the centralized management and control of the regional wastewater system where the principles of system and the development of rates are specifically oriented to its members. The Regional Utility Services Commission is a separate legal entity, which can have ownership and in turn debt for the development of regional utility system. This form of governance is the standard within the Province with over 11 Regional Water Services and some Wastewater Commissions being in existence.

Each municipality has membership in the Regional Commission but the actual administration of the Commission is the responsibility of the Commission Board.

Wastewater rates could be equal for all members or could vary depending on location and length of pipeline.

A wastewater commission could be formed for the region in accordance with the Municipal Government Act. The wastewater commission would own, finance and operate the water system and incorporate all costs into an equitable cost recovery formula. Each community would have representation on the commission and any changes, upgrades, and the commission would determine cost recovery adjustments. The Commission holds the debt incurred to construct and operate the system.

This is a viable structure for the Pigeon Lake area.

12.4 PRIVATIZATION

There are examples within the Province where the private sector has become involved in the administration of a regional water and wastewater system. The most notable is CU Water and the delivery of water to the Town of Tofield, Town of Ryley, Village of Holden, Hamlet of Bruce, and the Town of Viking. It should be noted that the municipalities have formed the Highway No. 14 Water Services Commission and the Commission has entered into an agreement with CU Water for the financing, operation, and maintenance of the water supply system. CU Water provides the specialized management and operational skills required for the management of the system. There is a perceived reduced amount of municipal “control” over the day-to-day operations of the system although performance standards and deliverables can be set.

All ownership and operation scenarios should be reviewed in detail by the municipalities and the long-term implications considered. Examples of all systems available in Alberta and detailed discussions and review of current systems would be advisable before finalizing the ownership system.

- Municipalities could contract with a private company or authority to build, finance and operate a regional water system.
- Water rates could vary yearly and would be subject to adjustment by the private owner/operator and subject to review by the Public Utilities Board.
- Precedence has been established where grants available to municipalities could be transferred to a private water operator.

This would be a viable structure if a private company had interest in developing and operating the systems for the Pigeon Lake area. To our knowledge, no private interests have been expressed in this project to date.

12.5 SINGLE UTILITY OWNER

Another method of ownership and operation is for one municipality to be the utility owner. Construction, ownership, operation and maintenance of the system would be undertaken by one municipality. Individual supply agreements would be entered into with each customer.

12.6 UTILITY CORPORATION

Another model currently in existence in Alberta is a member municipality, shareholder owned corporation. Aquatera in the Grande Prairie region is an example of this form of utility ownership, operation and maintenance. In this model, the Corporation owns and operates the entire utility system including the distribution system. The shareholders of the corporation are also the stakeholders.

12.7 SUMMARY

This section outlines a number of different approaches the Pigeon Lake Regional Wastewater Committee can consider. The choice is dependent on the stakeholders and the form of control each wishes to retain or relinquish.

Experience has shown that Regional Commissions have worked well and successfully throughout the Province for over 20 years. This is presently the most common form of regional water and wastewater utility ownership and operation. This is also the structure of the existing Northeast Pigeon Lake Wastewater Commission that owns and operates the Mulhurst sewage lagoon.

The group may want to consider an interim Consortium Approach (Authority) to get the process started (i.e. studies, service agreement negotiations) and then change to Commission structure once significant capital projects are required.

Professional legal advice is recommended to assist the Pigeon Lake Regional Wastewater Committee (Steering Committee) in deciding on the form of ownership and the legal process to execute an ownership agreement and any third party service agreements.

13 Public Consultation

Gray Scott Consulting Group Inc. was retained by Associated Engineering to undertake the stakeholder consultation and public involvement component of the Pigeon Lake Regional Wastewater Strategy and Master Plan study in December 2006.

The stakeholder consultation and public involvement component of the study was comprised of three distinct phases:

4. **Profiling interviews** - a series of one-on-one interviews conducted with two individual property owners from each of the six summer villages and the two counties
5. **Community Meetings** - a series of six public meetings held within the Pigeon Lake area.
6. **An Information Session/Open House**

13.1 FEEDBACK

Feedback from all three components of the public involvement process yielded a number of strong and consistent themes:

- Proceed with the implementation of the strategy and master plan as soon as possible.
- Options 2 and 4 were preferred.
- Relatively strong understanding and acceptance of the sequencing of implementation.
- Relatively strong understanding and acceptance of overall system costs.
- Relatively strong understanding and acceptance of costs to the property owner.
- User-pay and a fair and equitable distribution of capital, operation and maintenance costs has been a cornerstone assumption of a large number of the engaged participants.
- Mistrust of the NEPL operations at the Mulhurst Lagoon.
- NEPL involvement may be more acceptable if the NEPL governance structure could be revisited with the member municipalities of the Steering Committee.
- Concern that the First Nations people were not participating in the study.
- A high level of satisfaction with the public involvement process and communication programs.

The complete Stakeholder and Public Involvement Report is located in Appendix C.

14 Preferred Option Comparisons

Based on the option costs analysis previously discussed there is no clear one preferred option; however, it is apparent Options 1 ,2 and 4 are within the same order-of-magnitude and could be developed with the least risk, as only up to one new treatment facility is required. Construction and operations costs of additional treatment facilities required in Options 2 and 4 would present significant additional risk that is not warranted. To further compare the preferred options (1, 2 and 4) a qualitative analysis was completed considering a number of evaluation criteria. The following criteria were used for this comparison:

- Cost (capital and life-cycle)
- Implementation timing
- Operations
- Organizational
- Regulatory and Aesthetic
- Environmental

CONSIDERATIONS	ADVANTAGES	DISADVANTAGES
COST (CAPITAL AND LIFE CYCLE)		
Option 1 (NEPL)	- Lowest net Municipal costs (capital and life cycle) - Similar potential rate impacts to Option 2 - Pipeline construction costs less volatile then treatment facility.	- Requires most pipeline ROW and construction. - Highest gross regional costs
Option 2 (SE)	- Lowest gross regional capital costs - Lowest gross life cycle costs - Similar potential rate impacts to Option 1	- Land costs for WWTF are significant risks - Treatment facility construction costs more volatile then pipeline costs.
Option 4 (NW)	- Requires least pipeline ROW purchase	- Land costs for WWTF are significant risks - Highest life cycle and capital costs (gross and net) - Highest potential rate impacts
IMPLEMENTATION TIMING		
Option 1 (NEPL)	- Implementation could be immediate (established WWTF site) - Truck haul service is currently available	- Significant pipeline construction required around the First Nation before service tie-ins. - Costs could be reduced if land can be negotiated with the First nations; however, this would not allow an aggressive pipeline schedule.

CONSIDERATIONS	ADVANTAGES	DISADVANTAGES
Option 2 (SE)	- Least pipeline required to service large generation area in SE - Preliminary site locations have been identified	- WWTF site identification, purchase and approval could delay implementation
Option 4 (NW)	- Would provide simplest service to the NW area. - Preliminary site locations have been identified	- WWTF site identification, purchase and approval could delay implementation - Significant pipeline required along south side before high generation service tie-in
OPERATIONS		
Option 1 (NEPL)	- Isolate future operations and maintenance to one facility - Limit future operating risk to one facility. - Proven administrative and operational structure	

Option 2 (SE)	- Provision of second facility within area for increased reliability
	- During transition phase to regional transmission and local collection systems, haul distances and costs lower relative to Options 1 and 4
		- Additional operational risks with second facility:
		  - lack of trained operators
		  - cost sensitivity
		  - additional regulatory monitoring
		- Higher operating costs then Option 1 (two systems)

Option 4 (NW)	- Provision of second facility within area for increased reliability
	- During transition phase to regional transmission and local collection systems, haul distances and costs lower relative to Option 1
		- Additional operational risks with second facility:
		  - lack of trained operators
		  - cost sensitivity
		  - additional regulatory monitoring
		- Higher operating costs then Option 1 (two systems)

ORGANIZATIONAL		
Option 1 (NEPL)	- Enables best possibility of future migration to one organizational structure. - New organization to represent remaining municipalities is viable.	- Requires service agreement with NEPL and new organization(s).

CONSIDERATIONS	ADVANTAGES	DISADVANTAGES
Option 2 (SE)	- New independent organizational structure would be required. - Most of the area without current service could be serviced by one new facility	- Require the NW area to work separately with NEPL for piped service, but could truck to the SE and not have to deal with NEPL.
Option 4 (NW)	- New independent organizational structure would be required. - The entire area without current service could be serviced by one new facility	
REGULATORY AND AESTHETIC		
Option 1 (NEPL)	- Best meets regional objectives. - Expansion of existing approved regional facility minimizes additional monitoring/risk. - Least impact (cost risk) due to potential future more stringent effluent quality limits and increased treatment requirements and costs.	- Concern with capacity of existing discharge outlet to accept greater discharge rates need to be reviewed.
Option 2 (SE)	- New WWTF for current unserviced area centered in area of greatest population density and growth.	- Increased impact (cost risk) for future more stringent effluent quality limits and increased treatment requirements and costs. - New facility approval required. - Battle River downstream stakeholders will need to be consulted.
Option 4 (NW)	- No impact from the additional wastewater effluent discharge on the Battle River watershed (more readily assimilated in the North Saskatchewan River).	- Increased impact (cost risk) for future more stringent effluent quality limits and increased treatment requirements and costs. - New facility approval required. - Will engage extensive spectrum of stakeholders.
ENVIRONMENTAL		
Option 1 (NEPL)	- Facility outside the Pigeon Lake surface water and shallow groundwater basin	- Increases total loading to the upper reaches of Pipestone creek , which could be mitigated by enhanced phosphorous removal - Concern with capacity of existing discharge outlet to accept greater discharge rates

CONSIDERATIONS	ADVANTAGES	DISADVANTAGES
Option 2 (SE)	- Limits total loading on the Pipestone Creek	- Impacts of discharge on Pigeon lake Creek would have to be evaluated - Total loading issues on the Battle River may require enhanced treatment. - Shallow soil and groundwater regime would have to be evaluated.
Option 4 (NW)	- Limits total loading on the Pipestone and Pigeon Lake Creek	- Shallow soil and groundwater regime would have to be evaluated. - Strawberry Creek would have to be evaluated. - Pigeon Lake area downwind of prevailing winds

From the above option evaluation the advantages clearly trend towards Option 1 for the following key reasons:

1. Lowest net municipal costs and ultimate future rate impacts.
2. Would provide the fastest implementation timeline, as no new treatment facilities are required.
3. Would likely enable the most rapid piped service to the major wastewater generating area in the SE area of Pigeon Lake Village.
4. Limits future operational staff load and costs to one facility.
5. Provides the most likely system for future amalgamation of all the stakeholders into one regional wastewater (or utility) organizational structure.
6. Does not require new regulatory approvals and pose additional future regulatory monitoring requirements.
7. Does not engage a broad range of new stakeholders that could resist development of new facilities (avoiding NIMBY “Not in my Backyard” issues).

15 Conclusions

We provide the following conclusions based on the engineering analysis of feasible regional wastewater solutions, extensive public input and Committee discussions.

15.1 PROJECT NEED

The Pigeon Lake area is growing and Lakeshore is intensifying. A basin wide wastewater solution is required to protect the lake water quality and surrounding environment. The area municipalities and Alberta Environment have made positive strides in recent years prohibiting land spreading and encouraging (in some cases requiring) termination of on-site disposal practices, but this has increased awareness that additional municipal wastewater capacity is required to deal with the additional truck disposal demand.

A comprehensive wastewater strategy and master plan will provide the initial planning tool required to gain public and stakeholder support of a long-term strategy enabling a coordinated implementation process to begin.

15.2 WASTEWATER GENERATION

The first key planning component is the estimation of current and future wastewater generation amounts to enable determination and sizing of feasible options. Lakeshore areas are somewhat unique as the area population fluctuates significantly from the peak summer season to the low winter season. The proposed master plan design criteria account for seasonal changes in use and all foreseeable growth within the area.

In summary, the key wastewater generation rates during peak summer periods are as follows.

Existing Total Average Day Flow 2618 m^3/day:

Northeast Pigeon Lake (NEPL)	-	947 m^3/day
North Pigeon Lake	-	487 m^3/day
South Pigeon Lake	-	1189 m^3/day

Ultimate Total Average Day Flow 4340 m^3/day:

Northeast Pigeon Lake (NEPL)	-	947 m^3/day
North Pigeon Lake	-	1252 m^3/day
South Pigeon Lake	-	2141 m^3/day

The annual use within the study area is estimate to result in the current and ultimate annual generation of 500,000 m^3 and 1,000,000 m^3, respectively.

15.3 WASTEWATER SYSTEM OPTIONS

Five feasible regional wastewater options were developed consisting of various combinations of treatment facility effluent and disposal locations, transmission systems, and methods of local collection. Comparative cost analysis of the options considering capital costs, operating costs and funding opportunities identified three preferred options. A qualitative analysis considering cost, implementation timing, operations, governance, regulatory, aesthetic and environmental advantages and disadvantages of the three preferred options indicated Option 1 presents the best overall plan.

Key messages heard throughout the public consultation process were:

- Proceed as fast as possible.
- Minimize rate implications.
- The chosen solution must ultimately be capable of servicing the entire lakeshore area.

Option 1 would consist of the following:

- Upgrade of the Mulhurst treatment facility to an aerated lagoon (or higher level of treatment).
- Development of regional transmission system to service the north and south sides of the lake.
- Development of local pressure sewer collection system in the existing developed areas.
- Future connections from private development local collection systems.

15.4 PROJECT PHASES

The total estimated cost to implement Option 1 in current day dollars is $69,900,000.

All options would be implemented in the following basic sequence:

- Treatment Facility and Effluent Disposal ($6,500,000);
- Regional Transmission ($20,200,000);
- Local Collection ($16,200,000); and
- Private Collection ($31,300,000).

The critical initial step is to ensure all residents within the study area are provided a suitable disposal location for trucked wastewater. Regional transmission systems could be developed at any time to lower truck haul distances and provide future connection point for local collection systems. Treatment and regional pipeline systems would be developed and operated by the responsible municipalities on a shared basis, likely with some type of regional governance structure. Provincial funding may be provided for these components of the system under the AMWWP grant program.

The development of local collection systems would have to follow development of the regional transmission system. Each municipality would be responsible for the choice when to develop local collection systems. This would be the most significant financial step for the municipalities and will be governed by ongoing truck haul costs. Funding may be provided under the joint Federal/Provincial CAMRIF (or similar future program) for the public portion of the local collection system. No funding is available for the private portion of the local collection system.

15.5 VIABLE GOVERNANCE OPTIONS

Public and Committee consultations identified a reluctance to proceed with Option 1 due to ongoing concerns and hearsay regarding the condition and costs of the North East Pigeon Lake system and costs. This issue will be a significant future hurdle, but should not sway the implementation of the most cost effective and beneficial system.

The NEPL has indicated they will service new regional customers at the Mulhurst lagoon, but does want to consider re-organization in partnership with the remaining municipalities at this time. Future relations and business transactions with the NEPL would be best managed by a new regional group representing the remaining municipalities. Ongoing individual dealing with the NEPL would create extensive unnecessary administrative overlaps and potentially result in further degradation of inter-municipal relations.

Viable governance options for the Committee members are to create a new Wastewater Authority or Commission. The Authority would be simplest to initially organize and enable a united voice for short-term planning and service agreement negotiations between this new group and the NEPL, but would only work in the interim. Once the group attains funding commitments and embarks upon development of a transmission system requiring borrowing the group would likely want to transition to a Commission.

If the Committee intends to aggressively pursue the development of transmission pipelines there is no merit to the interim step and a new Commission should be constituted.

The implementation of the proposed system will require improved inter-municipal communication, which provides an opportunity for improved relationships and a lake wide effort to enhancing future environmental protection.

16 Recommendations

We recommend the Committee adopt Option 1, as the Pigeon Lake Regional Wastewater Master Plan and Strategy.

The implementation steps to initiate funding requests and establish a new organizational structure would be:

1. Support the findings of this study.
2. Appoint a lead Municipality for administrative and funding application purposes.
3. Request Council resolutions from each municipality in support of the finding of this study.
4. Submit funding application to Alberta Infrastructure and Transportation for the regional transmission systems. Funding application for upgrade of the regional treatment system would have to be made by the NEPL.
5. Establish a new regional Authority (interim) or Commission of supporting municipalities.
6. Negotiate a service agreement with the NEPL for continued wastewater disposal by truck at the Mulhurst lagoon. This should likely include installation of a dedicated truck dump station for this group to enable automated wastewater sampling and load tracking (by municipality or resident).

Once funding is approved (or before) the new group could proceed with development of regional transmission mains.

1. Complete a preliminary design to confirm; pipe flows, size, material and alignments; and pump station locations, process, capacity, electrical servicing and controls; Mulhurst metering station basis.
2. Negotiate a service agreement with the NEPL for long-term wastewater disposal by pipeline at the Mulhurst lagoon.
3. Initiate purchase of pipeline right-of-way.
4. Complete geotechnical evaluations and topographic surveys.
5. Attain require regulatory approvals.
6. Complete detailed design.
7. Tender and construct.

Ongoing stakeholder and public support of the plan requires the development and effective communication of a fair and equitable service agreement. If the groups can not develop an agreeable service agreement, Option 2 is the recommended alternate solution.

NEPL could proceed with funding approval for treatment upgrades, design and construction. Implementation of the treatment upgrade would include the following steps:

1. Complete a preliminary design to confirm treatment processes, process unit flow demands, effluent disposal demands/issues, civil works, mechanical works, electrical servicing and controls.
2. Complete geotechnical evaluations and topographic surveys.
3. Attain required regulatory approvals.
4. Complete detailed design.
5. Tender and construct.

Each Municipality could then proceed with development of local collection system as they feel benefits their individual needs.

Closure

This report was prepared for the Pigeon Lake Regional Wastewater Steering Committee to provide a comparison of regional wastewater strategies and recommend a Master Plan.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
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PERMIT TO PRACTICE
ASSOCIATED ENGINEERING ALBERTA LTD.
Signature
Date Oct 12/2007
PERMIT NUMBER: P 3979
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

A Appendix A – Design Population and Wastewater Generation Tables

PIGEON LAKE REGIONALWASTEWATER STEERING COMMITTEE
TABLE A1 - EXISTING POPULATION DATA

	No. of Lots	Permanent Population		Percentage	Potential Growth
Municipality	**2006**	**1996**	**2001**	**Increase**	**Accumulative**
Leduc County					
Summer Village					
Sundance	174	35	37	1.12%	
Itaska	102	4	10	20.11%	
Golden Days	118	92	125	6.32%	
Hamlets					
Gilwood Beach/Fisher Home	41				
Mitchell Beach	26				
Mission Beach	87				
Kerr Cape	38				
Moonlight Bay	45				
Sandholm - Part of Golden Days??	139				
Johnsonia					
Vasa					
Provincial Park					
Zeiner Campground	110				
Church Camps					
Maskepetoon United Church Camp					
Rundles Mission					
County of Wetaskiwin					
Summer Village					
Argentia Beach	134	4	24	43.10%	
Silver Beach	115	47	39	-3.66%	
Ma-Me-O Beach	283	73	81	2.10%	283
Ma-Me-O Beach Campgroud	80				40
Norris Beach	116	23	29	4.75%	116
Crystal Springs	204	55	72	5.53%	237
Grandview	221	61	85	6.86%	259
Poplar Bay	203	66	84	4.94%	317
Hamlets					
Lakeland Estates	43				
Pigeon Lake Haven	27				
Mulhurst Bay incl. Cameron Highlands, Mulhurst Estates,	187				
Viola Beach	106				119
Westerose	53				84
Village of Pigeon Lake	73				73
Sunset Harbour	62				
Provincial Park					
Pigeon Lake Provincial Park	300				
Church Camps					
Covenant Bay Bible Camp	17				
Mulhurst Luthern Camp					
Pigeon Lake Indian Reserve No. 138 A	75				

PIGEON LAKE REGIONALWASTEWATER STEERING COMMITTEE
TABLE A2 - PEAK POPULATION PROJECTIONS

AREA	LOCATION	TOTAL LOTS #	DENSITY Persons/Lot	INITIAL CONNECTED POPULATION Persons	ULTIMATE CONNECTED POPULATION Persons
Existing Lots					
N.E.P.L.	Mulhurst Bay	187	3	561	561
	Argentia Beach	134	3	402	402
	Golden Days	257	3	771	771
	Itaska	102	3	306	306
	Silver Beach	115	3	345	345
	Lakeland Estates	43	3	129	129
	Pigeon Lake Haven	27	3	81	81
	Sub-Total	865		2595	2595
North Pigeon Lake	Moonlight Bay	45	3	135	135
	Kerr Cape	38	3	114	114
	Sundance	174	3	522	522
	Mission Beach	87	3	261	261
	Mitchell Beach	26	3	78	78
	Fisher Home	41	3	123	123
	Zeiner Park	110	2.5	275	275
	Camp Wohelo Maskeptoon	10	3	30	30
	Rundle's Mission	3		47	47
	Burnt Birch	175	3	525	525
	Mulhurst Luthern Camp				
	Sub-Total	709		2110	2110
South Pigeon Lake	Crystal Springs	204	3	612	612
	Norris Beach	116	3	348	348
	Viola Beach	106	3	318	318
	Village of Pigeon Lake	73	3	219	219
	Poplar Bay	203	3	609	609
	Grandview	259	3	777	777
	Ma Me-O Beach	283	3	849	849
	First Nations Campgrounds	80	2.5	200	200
	Sunset Harbour	62	3	186	186
	Westerose	53	3	159	159
	Pigeon Lake IR 138A	75	3	225	225
	Pigeon Lake Prov. Park	300	2.5	750	750
	Covenant Bay Bible Camp	17	3	51	51
	Sub-Total	1831		5303	5303
	Sub-Totals	3,405		10,008	10,008

New Lots Approved					
North Pigeon Lake	Staroba	10	3	30	30
	Sub-Total	10		30	30
South Pigeon Lake	Dorchester	30	3	90	90
	Village of Pigeon Lake	40	3	120	120
	Nilsson	4	3	12	12
	Howey	30	3	90	90
	Pigeon Lake Prov. Park	180	2.5	450	450

PIGEON LAKE REGIONALWASTEWATER STEERING COMMITTEE
TABLE A2 - PEAK POPULATION PROJECTIONS

AREA	LOCATION	TOTAL LOTS #	DENSITY Persons/Lot	INITIAL CONNECTED POPULATION Persons	ULTIMATE CONNECTED POPULATION Persons
	Sub-Total	284		762	762
New Lots Proposed					
North Pigeon Lake	Tizzard & Schwindt	148	3	—	444
	Suvan	200	3	—	600
	Thompson	12	3	—	36
	Gaetz (SVGD)	50	3	—	150
	Hilah Ayers	100	3	—	300
	Lavek	24	3	—	72
	SW 22-47-1 W5	23	3	—	69
	SE 28-47-1 W5	27	3	—	81
	SW 28-47-1 W5	7	3	—	21
	SE 29-47-1 W5	5	3	—	15
	NW 29-47-1 W5	27	3	—	81
	Mission Beach	19	3	—	57
	Mitchell Beach	5	3	—	15
	NE 24-47-2 W5	15	3	—	45
	NW 24-47-2 W5	27	3	—	81
	Sub-Total	689		—	2067
South Pigeon Lake	Dorchester	231	3	—	693
	Howey	12	3	—	36
	Coleman	9	3	—	27
	Viewland	74	3	—	222
	Silverwoods	150	3	—	450
	Vilage of Pigeon Lake	100	3	—	300
	Piddle	19	3	—	57
	Benvik Estates	100	3	—	300
	Quast	30	3	—	90
	Eco-Farm	20	3	—	60
	Harbour Bay	6	3	—	18
	Sub-Total	751		—	2253
	Sub-Totals	1,734		792	5,112
	TOTALS	5,139		10,800	15,120

Design Criteria
Population Density

Residents	3	people/lot
Recreational	2.5	people/lot

PIGEON LAKE REGIONALWASTEWATER STEERING COMMITTEE
TABLE A3 - AVERAGE DAY SEWAGE GENERATION

AREA	LOCATION	INITIAL			ULTIMATE		
		Connected Population	Per Capita WW Generation	Average Day Flows	Connected Population	Per Capita WW Generation	Average Day
		Persons	L/c/d/	m^3/d	Persons	L/c/d	m^3/d
Existing Lots							
N.E.P.L.	Mulhurst Bay	561	365	205	561	365	205
	Argentia Beach	402	365	147	402	365	147
	Golden Days	771	365	281	771	365	281
	Itaska	306	365	112	306	365	112
	Silver Beach	345	365	126	345	365	126
	Lakeland Estates	129	365	47	129	365	47
	Pigeon Lake Haven	81	365	30	81	365	30
	Sub-Total	2595		947	2595		947
North Pigeon Lake	Moonlight Bay	135	240	32	135	240	32
	Kerr Cape	114	240	27	114	240	27
	Sundance	522	240	125	522	240	125
	Mission Beach	261	240	63	261	240	63
	Mitchell Beach	78	240	19	78	240	19
	Fisher Home	123	240	30	123	240	30
	Zeiner Park	110	380	42	110	380	42
	Camp Wohelo Maskeptoon	30	240	7	30	240	7
	Rundle's Mission	47	240	11	47	240	11
	Burnt Church	525	240	126	525	240	126
	Mulhurst Luthern Camp	0	240	0	0	240	0
	Sub-Total	2110	240	482	2110	240	482
South Pigeon Lake	Crystal Springs	612	240	147	612	240	147
	Norris Beach	348	240	84	348	240	84
	Viola Beach	318	240	76	318	240	76
	Village of Pigeon Lake	219	240	53	219	240	53
	Poplar Bay	609	240	146	609	240	146
	Grandview	777	240	186	777	240	186
	Ma Me-O Beach	849	240	204	849	240	204
	First Nations Campgrounds	80	380	30	80	380	30
	Sunset Harbour	186	240	45	186	240	45
	Westerose	159	240	38	159	240	38
	Pigeon Lake IR 138A	225	240	54	225	240	54
	Pigeon Lake Prov. Park	300	380	114	300	380	114
	Covenant Bay Bible Camp	51	240	12	51	240	12
	Sub-Total	5303	100	1189	5303	240	1189
	Sub-Totals	**10008**		**2618**	**10,008**		**2618**
New Lots Approved							
North Pigeon Lake	Staroba	30	365	11	30	365	11
	Sub-Total	30	365	11	30	365	11
South Pigeon Lake	Dorchester	90	365	33	90	365	33
	Village of Pigeon Lake	120	365	44	120	365	44
	Nilsson	12	365	4	12	365	4
	Howey	90	365	33	90	365	33
	Pigeon Lake Prov. Park	180	380	68	180	380	68
	Sub-Total	492	-	182	492	-	182
New Lots Proposed						365	

PIGEON LAKE REGIONALWASTEWATER STEERING COMMITTEE
TABLE A3 - AVERAGE DAY SEWAGE GENERATION

AREA	LOCATION	INITIAL			ULTIMATE		
		Connected Population	Per Capita WW Generation	Average Day Flows	Connected Population	Per Capita WW Generation	Average Day
		Persons	L/c/d/	m^3/d	Persons	L/c/d	m^3/d
North Pigeon Lake	Tizzard & Schwindt	—		—	444	365	162
	Suvan	—		—	600	365	219
	Thompson	—		—	36	365	13
	Gaetz (SVGD)	—		—	150	365	55
	Hilah Ayers	—		—	300	365	110
	Lavek	—		—	72	365	26
	SW 22-47-1 W5	—		—	69	365	25
	SE 28-47-1 W5	—		—	81	365	30
	SW 28-47-1 W5	—		—	21	365	8
	SE 29-47-1 W5	—		—	15	365	5
	NW 29-47-1 W5	—		—	81	365	30
	Mission Beach	—		—	57	365	21
	Mitchell Beach	—		—	15	365	5
	NE 24-47-2 W5	—		—	45	365	16
	NW 24-47-2 W5	—		—	81	365	30
	Sub-Total				2067	365	754
South Pigeon Lake	Dorchester	—		—	693	365	253
	Howey	—		—	36	365	13
	Coleman	—		—	27	365	10
	Viewland	—		—	222	365	81
	Silverwoods	—		—	450	365	164
	Vilage of Pigeon Lake	—		—	300	365	110
	Piddle	—		—	57	365	21
	Benvik Estates	—		—	300	365	110
	Quast	—		—	90	365	33
	Eco-Farm	—		—	60	365	22
	Harbour Bay	—		—	18	365	7
	Sub-Total				2253	365	822
	Sub-Totals	**522**		**193**	**4,842**		**1770**
	TOTALS	**10,530**		**2812**	**14,850**		**4389**

Design Criteria

Resident (Existing)**	240	l/c/d	Low Pressure
Resident (NEPL)	365	l/c/d	Gravity
Resident (New Developme	365	l/c/d	(100%Gravity)
Campground*	380	l/s/d	

* Wastewater Engineering: Treatment and Reuse, Fouth Edition, Metcalf and Eddy, 2003

** 240 l/c/d based upon an infiltration rate of 245 l/c/d and a factor of safety of 2.0 (365 - 245 = 120 * 2.0 = 240 l/c/d)

*** Based upon the average of 365 l/c/d and 240 l/c/d

B Appendix B – Detailed Cost Analysis Tables

TABLE B1 - COLLECTION SYSTEM UNIT COSTS

Low Pressure

On-Site Costs - Private Residents

Supply Pump	4,100 /lot
Installation of piping and grinder pump station	10,900 /lot
Total On-site Costs	**15,000 /lot**

On-Site Costs - Campgrounds

Supply Pump	6,100 /ea
Installation of piping and grinder pump station	50,000 /ea
Total Onsite Costs	**56,100 /lot**

Off-Site Costs

Low Pressure Supply and Install Piping, Flush and Discharge Connections, Fittings, etc.	**350 /m**

Gravity

On-site Costs

Installation of piping	**9,000 /lot**

Off-Site Costs

Supply and Install Gravity System	**265 /m**
Supply and Install Lift Station	**400,000 /ea**
Supply and Install 100 mm Forcemain (Open cut)	**148 /m**

TABLE B2
PIGEON LAKE REGIONAL WASTEWATER GROUP
ON-SITE AND OFF-SITE COSTS

							Low Pressure			Low Pressure/Gravity		
Area		Existing Lots	Measured Length of Sewer Line	Average Length/lot	Calculated Sewer Line Length	Sewer Line Length	On-Site Costs	Off-Site Costs	Total Cost	On-Site Costs	Off-Site Costs	Total Cost
Existing Lots												
N.E.P.L.	Mulhurst Bay	187										
	Argentia Beach	134										
	Golden Days	257	Already Serviced		Already Serviced	Already Serviced	Already Serviced	Already Serviced	Already Serviced	Already Serviced	Already Serviced	Already Serviced
	Itaska	102										
	Silver Beach	115										
	Lakeland Estates	43	1940	45		1985	$ 645,000	$ 694,791	$ 1,339,791	$ 645,000	$ 694,791	$ 1,339,791
	Pigeon Lake Haven	27	2057	76		2133	$ 405,000	$ 746,615	$ 1,151,615	$ 405,000	$ 746,615	$ 1,151,615
	Sub-total	865					$ 1,050,000	$ 1,441,406	$ 2,491,406	$ 1,050,000	$ 1,441,406	$ 2,491,406
North Pigeon Lake	Moonlight Bay	45					$ 675,000		$ 1,312,590	$ 675,000	$ 637,590	$ 1,312,590
	Kerr Cape	38	1800	22		1822	$ 570,000	$ 637,590	$ 570,000	$ 570,000		$ 570,000
	Sundance	174	2930	17		2947	$ 2,610,000	$ 1,031,394	$ 3,641,394	$ 2,610,000	$ 1,031,394	$ 3,641,394
	Mission Beach	87	1630	19		1649	$ 1,305,000	$ 577,057	$ 1,882,057	$ 1,305,000	$ 577,057	$ 1,882,057
	Mitchell Beach	26	503	19		522	$ 390,000	$ 182,821	$ 572,821	$ 390,000	$ 182,821	$ 572,821
	Fisher Home	41	555	14		569	$ 615,000	$ 198,988	$ 813,988	$ 615,000	$ 198,988	$ 813,988
	Zeiner Park	4			105	800	$ 224,400	$ 280,000	$ 504,400	$ 224,400	$ 280,000	$ 504,400
	Camp Wohelo Maskeptoon	10			262	262	$ 150,000	$ 91,687	$ 241,687	$ 150,000	$ 91,687	$ 241,687
	Rundle's Mission	3			79	79	$ 45,000	$ 27,506	$ 72,506	$ 45,000	$ 27,506	$ 72,506
	Burnt Birch	175			4584	4584	$ 2,625,000	$ 1,604,514	$ 4,229,514	$ 2,625,000	$ 1,604,514	$ 4,229,514
	Mulhurst Luthern Camp											
	Sub-total	603					$ 9,209,400	$ 4,631,557	$ 13,840,957	$ 9,209,400	$ 4,631,557	$ 13,840,957
South Pigeon Lake	Crystal Springs	204	3100	15		3115	$ 3,060,000	$ 1,090,319	$ 4,150,319	$ 3,060,000	$ 1,090,319	$ 4,150,319
	Norris Beach	116	2410	21		2431	$ 1,740,000	$ 850,772	$ 2,590,772	$ 1,740,000	$ 850,772	$ 2,590,772
	Viola Beach	106	2443	23		2466	$ 1,590,000	$ 863,117	$ 2,453,117	$ 1,590,000	$ 863,117	$ 2,453,117
	Village of Pigeon Lake	73	1815	25		1840	$ 1,095,000	$ 643,952	$ 1,738,952	$ 1,095,000	$ 643,952	$ 1,738,952
	Poplar Bay	203	4550	22		4572	$ 3,045,000	$ 1,600,345	$ 4,645,345	$ 3,045,000	$ 1,600,345	$ 4,645,345
	Grandview	259	4200	16		4216	$ 3,885,000	$ 1,475,676	$ 5,360,676	$ 3,885,000	$ 1,475,676	$ 5,360,676
	Ma Me-O Beach	283	4817	17		4834	$ 4,245,000	$ 1,691,907	$ 5,936,907	$ 4,245,000	$ 1,691,907	$ 5,936,907
	First Nations Campgrounds	4			105	400	$ 224,400	$ 140,000	$ 364,400	$ 224,400	$ 140,000	$ 364,400
	Sunset Harbour	62	1230	20		1250	$ 930,000	$ 437,444	$ 1,367,444	$ 930,000	$ 437,444	$ 1,367,444
	Westerose	53	2561	48		2609	$ 795,000	$ 913,262	$ 1,708,262	$ 795,000	$ 913,262	$ 1,708,262
	Pigeon Lake IR 138A	75			1965	1965	$ 1,125,000	$ 687,649	$ 1,812,649	$ 1,125,000	$ 687,649	$ 1,812,649
	Pigeon Lake Prov. Park	10			262	1000	$ 561,000	$ 350,000	$ 911,000	$ 561,000	$ 350,000	$ 911,000
	Covenant Bay Bible Camp	17			445	445	$ 255,000	$ 155,867	$ 410,867	$ 255,000	$ 155,867	$ 410,867
	Sub-total	1465					$ 22,550,400	$ 10,900,309	$ 33,450,709	$ 22,550,400	$ 10,900,309	$ 33,450,709
	Total Private Residence	2120					$ 31,800,000	$ 16,203,272	**$ 48,003,272**	$ 31,800,000	$ 16,203,272	**$ 48,003,272**
	Total Campgrounds	18					$ 1,009,800	$ 770,000	**$ 1,779,800**	$ 1,009,800	$ 770,000	**$ 1,779,800**
	Total	2138					$ 32,809,800	$ 16,973,272	**$ 49,783,072**	$ 32,809,800	$ 16,973,272	**$ 49,783,072**

Pigeon Lake Regional Wastewater Project
TABLE B3 - TRANSMISSION UNIT COSTS

Horizontal Directional Drill

Pipe Diameter	Supply Costs	Installation	Fittings/Valves	CAVV Chambers	Total
75 mm	6	250	0.6	5	261.6
100 mm	10	250	1	5	266
150 mm	21.5	250	2.15	5	278.65
200 mm	36	250	3.6	5	294.6
250 mm	56	250	5.6	5	316.6
300 mm	78	300	7.8	5	390.8
350 mm	100	300	10	5	415
400 mm	123	300	12.3	5	440.3
450 mm	146	300	14.6	5	465.6

Open Cut Excavation

Pipe Diameter	Supply Costs	Installation	Fittings/Valves	Rehabilitation	Total
75 mm	6	125	0.6	12	143.6
100 mm	10	125	1	12	148
150 mm	21.5	125	2.15	12	160.65
200 mm	36	125	3.6	12	176.6
250 mm	56	125	5.6	12	198.6
300 mm	78	125	7.8	12	222.8
400 mm	123	140	12.3	12	287.3
450 mm	146	140	14.6	12	312.6

Air Release Valves and Chambers

Supply and Install	15000	ea
Assume 1 every	3000	m
	5	$/m

Sanitary Pumping Stations

Supply and Install	400000	ea

PIGEON LAKE REGIONAL WASTEWATER GROUP
SEWAGE TRANSMISSION COSTS

TABLE B4 - Option 1

Gravity

Item	Quanity	Unit	Price	Extension
Supply and Install New Forcemain				
1. HDD - 250 mm diameter forecemain from Poplar Bay to Eco-Farm	9685	m	316.6	$ 3,066,271
2. HDD - 450 mm diameter forecemain - Pigeon Lake Creek	200	m	465.6	$ 93,120
4. Open Cut - 450 mm diameter forecmain from N. Ma-Me-O to Mulhurst Lagoon	17632	m	312.6	$ 5,511,763
5. Open Cut - 150 mm diameter forcemain from Moonlight Bay to Lakeland Estates	3527	m	160.65	$ 566,613
6. Open Cut - 150 mm diameter forcemain from Lakeland Estates to Pigeon Lake Have	3195	m	160.65	$ 513,277
7. Open Cut - 300 mm diameter forcemain from Pigeon Lake Haven to Mulhust Lagoon	2913	m	222.8	$ 649,016
	37152			
Supply and Install Lift Station	6	ea	400000	$ 2,400,000
Upgrades to NEPL System				
1. Replace 150 mm diameter forcemain with 200 mm diameter forcemain from Mulhurst 2 to Mulhurst Lagoon	3230	m	294.6	$ 951,558
2. Tie-in to existing piping	2	ea	5000	$ 10,000
3. Pump upgrades	2	ea	50000	$ 100,000
Sub-total Construction				$ 13,861,618
Sub-total Engineering (12%)				$ 1,663,394
Sub-total Contingency (30%)				$ 4,657,504
Total				**$ 20,180,000**

PIGEON LAKE REGIONAL WASTEWATER GROUP
SEWAGE TRANSMISSION COSTS

TABLE B4 - Option 2

Low Pressure/Gravity

Item	Quanity	Unit	Price	Extension
Supply and Install New Forcemain				
1. HDD - 250 mm diameter forecemain from LS 1 Treatment Area A	9685	m	316.6	$ 3,066,271
2. Open Cut - 150 mm diameter forcemain from Moonlight Bay to Lakeland Est	3527	m	160.65	$ 566,613
3. Open Cut - 150 mm diameter forcemain from Lakeland Estates to Pigeon Lal	3195	m	160.65	$ 513,277
4. Open Cut - 300 mm diameter forcemain from Pigeon Lake Haven to Mulhust	2913	m	222.8	$ 649,016
	19320			
Supply and Install Lift Station	5	ea	400000	$ 2,000,000
Upgrades to NEPL System				
1. Replace 150 mm diameter forcemain with 200 mm diameter forcemain from Mulhurst 2 to Mulhurst Lagoon	3230	m	294.6	$ 951,558
2. Tie-in to existing piping	2	ea	5000	$ 10,000
3. Pump upgrades	2	ea	50000	$ 100,000
Sub-total Construction				$ 7,856,735
Sub-total Engineering (12%)				$ 942,808
Sub-total Contingency (30%)				$ 2,639,863
Total				**$ 11,440,000**

PIGEON LAKE REGIONAL WASTEWATER GROUP
SEWAGE TRANSMISSION COSTS

TABLE B5 - Option 3

Low Pressure/Gravity

Item	Quanity	Unit	Price	Extension
Supply and Install New Forcemain				
1. HDD - 200 mm diameter forecemain from Grandview to Treatment Area A	5857	m	294.6	$1,725,472
2. Open Cut - 200 mm diameter forcemain fro Sundance to Treatment Area B	5000	m	176.6	$ 883,000
3. Open Cut - 100 mm diameter forcemain from Provincial Campground to Treatment B	4900	m	148	$ 725,200
Supply and Install Lift Station	4	ea	400000	$1,600,000
Upgrades to NEPL System				
1. Replace 150 mm diameter forcemain with 200 mm diameter forcemain from Mulhurst 2 to Mulhurst Lagoon	3230	m	294.6	$951,558
2. Tie-in to existing piping	2	ea	5000	$10,000
3. Pump upgrades	2	ea	50000	$100,000
Sub-total Construction				$ 5,995,230
Sub-total Engineering (12%)				$ 719,428
Sub-total Contingency (30%)				$ 2,014,397
Total				**$ 8,730,000**

Alternative - Effluent pipe from NW Lagoon to Strawberry Creek (included in treatment costs)				
1. Open Cut - 300 mm diameter forcemain from NW Lagoon to Strawberry Creek	10000	m	222.8	2228000
Sub-total Construction				$ 2,228,000
Sub-total Engineering (12%)				$ 267,360
Sub-total Contingency (30%)				$ 748,608
Total				**$ 3,240,000**

PIGEON LAKE REGIONAL WASTEWATER GROUP
SEWAGE TRANSMISSION COSTS

TABLE B6 - Option 4

Low Pressure/Gravity

Item	Quanity	Unit	Price	Extension
Supply and Install New Forcemain				
1. HDD - 300 mm diameter forecemain from Eco-Farm to Poplar Bay	9685	m	390.8	3784898
2. HDD - 400 mm diameter forecemain from Poplar Bay to Treatment Area B	2430	m	440.3	1069929
3. Open Cut - 300 mm diameter forcemain for Poplar Bay to Treatment Area B	9285	m	222.8	$2,068,698
4. Open Cut - 200 mm diameter forcemain from Sundance to Treatment Area B	5000	m	176.6	$883,000
Supply and Install Lift Station	4	ea	400000	1600000
Upgrades to NEPL System				
1. Replace 150 mm diameter forcemain with 200 mm diameter forcemain from Mulhurst 2 to Mulhurst Lagoon	3230	m	294.6	951558
2. Tie-in to existing piping	2	ea	5000	10000
3. Pump upgrades	2	ea	50000	100000
Sub-total Construction				$10,468,083
Sub-total Engineering (12%)				$ 1,256,170
Sub-total Contingency (30%)				$ 3,517,276
Total				**$ 15,240,000**

Alternative - Effluent pipe from NW Lagoon to Strawberry Creek (included in treatment costs)				
1. Open Cut - 300 mm diameter forcemain from NW Lagoon to Strawberry Creek	10000	m	222.8	2228000
Sub-total Construction				$ 2,228,000
Sub-total Engineering (12%)				$ 267,360
Sub-total Contingency (30%)				$ 748,608
Total				**$ 3,240,000**

PIGEON LAKE REGIONAL WASTEWATER GROUP
SEWAGE TRANSMISSION COSTS

TABLE B7 - Option 5

Item	Quanity	Unit	Price	Extension
Supply and Install New Forcemain				
1. Open Cut - 200 mm diameter forcemain fro Sundance to Treatment Area B	5000	m	176.6	$ 883,000
2. Open Cut - 100 mm diameter forcemain from Provincial Campground to Treatment B	4900	m	148	$ 725,200
3. Open Cut - 300 mm diameter forcemain from Village of PL to Treatment Area A	2924	m	222.8	$ 651,467
				$ 2,259,667
Upgrades to NEPL System				
1. Replace 150 mm diameter forcemain with 200 mm diameter forcemain from Mulhurst 2 to Mulhurst Lagoon	3230	m	294.6	$951,558
2. Tie-in to existing piping	2	ea	5000	$10,000
3. Pump upgrades	2	ea	50000	$100,000
				$1,061,558
Supply and Install Lift Station	3	ea	400000	$1,200,000
Sub-total Construction				$4,521,225
Sub-total Engineering (12%)				$ 542,547
Sub-total Contingency (30%)				$ 1,519,132
Total				**$ 6,580,000**
Alternative - Effluent pipe from NW Lagoon to Strawberry Creek (included in treatment costs)				
1. Open Cut - 300 mm diameter forcemain from NW Lagoon to Strawberry Creek	10000	m	222.8	2228000
Sub-total Construction				$ 2,228,000
Sub-total Engineering (12%)				$ 267,360
Sub-total Contingency (30%)				$ 748,608
Total				**$ 3,240,000**

PIGEON LAKE REGIONAL WASTEWATER GROUP
SEWAGE TRANSMISSION COSTS

TABLE B8 - Falun Pipeline

	Quanity	Unit	Price	Extension
1. Install 450 mm diameter pipeline to Falun Lagoon from Eco-Management	10150	m	312.6	$3,172,890
Sub-total Construction				$3,172,890
Sub-total Engineering (12%)				$ 380,747
Sub-total Contingency (30%)				$ 1,066,091
Total				**$ 4,620,000**

PIGEON LAKE REGIONAL WASTEWATER GROUP
CAPITAL COST SUMMARY
TABLE B9

Option	System	Lots	On-Site Costs	Off-Site Costs	Transmission Costs		Treatment		Total Cost	Cost/lot
					Piping	Lift Stations	Facility	Effluent		
Option 1	Low Pressure/Gravity	0	$ -	$ -	$ 17,780,000	$ 2,400,000	$ 6,500,000	$ -	**$ 26,680,000**	#DIV/0!
Option 2	Low Pressure/Gravity	0	$ -	$ -	$ 9,440,000	$ 2,000,000	$ 9,700,000	$ -	**$ 21,140,000**	#DIV/0!
Option 3	Low Pressure/Gravity	0	$ -	$ -	$ 7,130,000	$ 1,600,000	$ 9,800,000	$ 3,200,000	**$ 21,730,000**	#DIV/0!
Option 4	Low Pressure/Gravity	0	$ -	$ -	$ 13,640,000	$ 1,600,000	$ 7,200,000	$ 3,200,000	**$ 25,640,000**	#DIV/0!
Option 5	Low Pressure/Gravity	0	$ -	$ -	$ 6,580,000	$ 1,200,000	$ 11,700,000	$ 5,600,000	**$ 25,080,000**	#DIV/0!

TABLE B10
Pigeon Lake WWTP, Storage, and Effluent Pipeline Costs

Option	WWTP Location	Intermediate (10 yr) Design Flows			Treatment Technology Options	WWTP Cost	Storage Cost *	Effluent Disposal Pipeline Cost or Wetland Cost **	Total Cost (Millions of Dollars)
		Ave. Day m^3/day	Peak Month m^3/day	Peak Day m^3/day					
1	Mulhurst	2,211	2,874	4,422	Aerated Lagoon -- Upgrade	$2.5	$4.0	$0.0	$6.5
					Conventional Mechanical WWTP	$18.4	$2.0	$0.0	$20.4
					Advanced Mechanical WWTP	$27.1	$2.0	$0.0	$29.1
2	Mulhurst	428	557	857	Conventional Stabilization Lagoons	X	X	X	X
					Aerated Lagoon -- Upgrade	$2.5	$0.5	$0.0	$3.0
					Advanced Mechanical WWTP	X	X	X	X
	SE WWTP	1,783	2,317	3,565	Conventional Stabilization Lagoons	X	X	X	X
					Aerated Lagoon	$3.6	$2.6	$0.5	$6.7
					Conventional Mechanical WWTP	$16.1	$2.6	$0.5	$19.2
					Advanced Mechanical WWTP	$24.2	$0.0	$1.5	$25.7
3	Mulhurst (NEPL Only)	1,389	1,806	2,778	Conventional Stabilization Lagoons	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group
					Aerated Lagoon				
					Advanced Mechanical WWTP				
	SE WWTP	1,556	2,022	3,111	Conventional Stabilization Lagoons	X	X	X	X
					Aerated Lagoon	$3.5	$2.5	$0.5	$6.5
					Conventional Mechanical WWTP	$15.0	$2.5	$0.5	$18.0
					Advanced Mechanical WWTP	$19.6	$0.0	$1.5	$21.1
	W WWTP	653	849	1,307	Conventional Stabilization Lagoons	$1.9	Incl.	$3.2	$5.1
					Aerated Lagoon	$2.4	$0.9	$3.2	$6.5
					Conventional Mechanical WWTP	$8.0	$0.9	$3.2	$12.1
					Advanced Mechanical WWTP	$10.9	$0.0	$1.5	$12.4
4	Mulhurst (NEPL Only)	1,389	1,806	2,778	Conventional Stabilization Lagoons	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group
					Aerated Lagoon				
					Advanced Mechanical WWTP				
	W WWTP	2,211	2,874	4,422	Conventional Stabilization Lagoons	$7.5	Incl.	$3.2	$10.7
					Aerated Lagoon	$4.0	$3.2	$3.2	$10.4
					Conventional Mechanical WWTP	$24.2	$3.2	$3.2	$30.6
					Advanced Mechanical WWTP	$29.9	$0.0	$1.5	$31.4
5	Mulhurst (NEPL Only)	1,389	1,806	2,778	Conventional Stabilization Lagoons	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group
					Aerated Lagoon				
					Advanced Mechanical WWTP				
	SE WWTP	886	1,152	1,772	Conventional Stabilization Lagoons	$3.6	Incl.	$0.5	$4.1
					Aerated Lagoon	$3.2	$1.6	X	X
					Conventional Mechanical WWTP	$12.1	$1.6	$0.5	$14.2
					Advanced Mechanical WWTP	$17.3	$0.0	$1.5	$18.8
	W WWTP	656	852	1,311	Conventional Stabilization Lagoons	$1.9	Incl.	$3.2	$5.1
					Aerated Lagoon	$2.4	$0.9	$3.2	$6.5
					Conventional Mechanical WWTP	$8.0	$0.9	$3.2	$12.1
					Advanced Mechanical WWTP	$10.9	$0.0	$1.5	$12.4
	S WWTP	530	689	1,061	Conventional Stabilization Lagoons	$1.9	Incl.	$2.4	$4.3
					Aerated Lagoon	$2.5	$0.9	$2.4	$5.8
					Conventional Mechanical WWTP	$7.0	$0.9	$2.4	$10.3
					Advanced Mechanical WWTP	X	X	X	X

* Assumes current upgrade of Mulhurst lagoon with 2 anaerobic cells (1300 m3 each) and 99,000 m3 of storage is completed.
** Rapid infiltration basins would be more expensive than wetlands.

TABLE B11
Pigeon Lake WWTP O&M Cost Estimates

Option	WWTP Location	Intermediate (10 yr) Design Flows			Treatment Technology Options	WWTP Cost	O & M Costs									
		Ave. Day	Peak Month	Peak Day			Operating Labour	Maintenance allowance	Chemicals	Power	Natural gas	Water	Telephone/internet	Sludge allowance	Laboratory analyses	Totals
		m^3/day	m^3/day	m^3/day												
1	Mulhurst	2,211	2,874	4,422	Aerated Lagoon -- Upgrade	$2.5	$10,000	$25,000	$0	$56,844	$10,000	$600	$600	$18,020	$10,000	$131,064
					Conventional Mechanical WWTP	$18.4	X	X	X	X	X	X	X	X	X	X
					Advanced Mechanical WWTP	$27.1	X	X	X	X	X	X	X	X	X	X
2	Mulhurst	428	557	857	Conventional Stabilization Lagoons	X	X	X	X	X	X	X	X	X	X	X
					Aerated Lagoon -- Upgrade	$2.5	$7,500	$25,000	$0	$11,016	$10,000	$600	$600	$3,492	$10,000	$68,208
					Advanced Mechanical WWTP	X	X	X	X	X	X	X	X	X	X	X
	SE WWTP	1,783	2,317	3,565	Conventional Stabilization Lagoons	X	X	X	X	X	X	X	X	X	X	X
					Aerated Lagoon	$3.6	$7,500	$36,000	$0	$45,828	$10,000	$600	$600	$14,528	$10,000	$125,056
					Conventional Mechanical WWTP	$16.1	$90,000	$160,960	$5,000	$124,245	$40,000	$1,800	$1,800	$72,639	$75,000	$571,445
					Advanced Mechanical WWTP	$24.2	X	X	X	X	X	X	X	X	X	X
3	Mulhurst (NEPL Only)	1,389	1,806	2,778	Conventional Stabilization Lagoons	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental	No Incremental Cost to	No Incremental	No Incremental	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental
					Aerated Lagoon	$3.5	$7,500	$35,000	$0	$35,712	$10,000	$600	$600	$11,321	$10,000	$110,733
					Advanced Mechanical WWTP	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental	No Incremental Cost to	No Incremental	No Incremental	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental
	SE WWTP	1,556	2,022	3,111	Conventional Stabilization Lagoons	X	X	X	X	X	X	X	X	X	X	X
					Aerated Lagoon	$3.5	$7,500	$35,000	$0	$39,991	$10,000	$600	$600	$12,678	$10,000	$116,369
					Conventional Mechanical WWTP	$15.0	$90,000	$149,760	$5,000	$108,421	$40,000	$1,800	$1,800	$63,388	$75,000	$535,168
					Advanced Mechanical WWTP	$19.6	X	X	X	X	X	X	X	X	X	X
	W WWTP	653	849	1,307	Conventional Stabilization Lagoons	$1.9	$7,500	$19,000	$0	$10,000	$10,000	$600	$600	$5,325	$10,000	$63,025
					Aerated Lagoon	$2.4	$7,500	$24,000	$0	$16,796	$10,000	$600	$600	$5,325	$10,000	$74,821
					Conventional Mechanical WWTP	$8.0	$90,000	$80,000	$5,000	$45,536	$40,000	$1,800	$1,800	$26,623	$75,000	$365,759
					Advanced Mechanical WWTP	$10.9	$90,000	$109,440	$15,000	$67,931	$40,000	$1,800	$1,800	$21,298	$100,000	$447,270
4	Mulhurst (NEPL Only)	1,389	1,806	2,778	Conventional Stabilization Lagoons Aerated Lagoon Advanced Mechanical WWTP	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group
	W WWTP	2,211	2,874	4,422	Conventional Stabilization Lagoons	$7.5	$10,000	$75,000	$0	$30,000	$10,000	$600	$600	$18,020	$10,000	$62,485
					Aerated Lagoon	$4.0	$10,000	$40,000	$0	$56,844	$10,000	$600	$600	$18,020	$10,000	$72,579
					Conventional Mechanical WWTP	$24.2	$120,000	$242,000	$5,000	$154,110	$40,000	$1,800	$1,800	$90,100	$75,000	$358,446
					Advanced Mechanical WWTP	$29.9	$120,000	$299,040	$15,000	$229,902	$40,000	$1,800	$1,800	$72,080	$100,000	$879,621
5	Mulhurst (NEPL Only)	1,389	1,806	2,778	Conventional Stabilization Lagoons Aerated Lagoon Advanced Mechanical WWTP	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group	No Incremental Cost to Regional Group
	SE WWTP	886	1,152	1,772	Conventional Stabilization Lagoons	$3.6	$7,500	$36,000	$0	$11,390	$10,000	$600	$600	$7,222	$10,000	$83,312
					Aerated Lagoon	X	X	X	X	X	X	X	X	X	X	X
					Conventional Mechanical WWTP	$12.1	$90,000	$120,960	$5,000	$61,762	$40,000	$1,800	$1,800	$36,109	$75,000	$432,430
					Advanced Mechanical WWTP	X	X	X	X	X	X	X	X	X	X	X
	W WWTP	656	852	1,311	Conventional Stabilization Lagoons	$1.9	$7,500	$19,000	$0	$10,000	$10,000	$600	$600	$4,785	$10,000	$62,485
					Aerated Lagoon	$2.4	$7,500	$24,000	$0	$15,094	$10,000	$600	$600	$4,785	$10,000	$72,579
					Conventional Mechanical WWTP	$8.0	$90,000	$80,000	$5,000	$40,922	$40,000	$1,800	$1,800	$23,925	$75,000	$358,446
					Advanced Mechanical WWTP	$10.9	$90,000	$109,440	$15,000	$68,159	$40,000	$1,800	$1,800	$21,370	$100,000	$447,569
	S WWTP	530	689	1,061	Conventional Stabilization Lagoons	$1.9	$7,500	$19,000	$0	$6,818	$10,000	$600	$600	$4,322	$10,000	$58,840
					Aerated Lagoon	X	X	X	X	X	X	X	X	X	X	X
					Conventional Mechanical WWTP	$7.0	$90,000	$69,760	$5,000	$36,966	$40,000	$1,800	$1,800	$21,612	$75,000	$341,938
					Advanced Mechanical WWTP	X	X	X	X	X	X	X	X	X	X	X

C Appendix C – Public Consultation Report

Appendix and Addenda

Summary of Stakeholder and Public Involvement Component

Pigeon Lake Regional Wastewater Strategy and Master Plan

Options, Costs, Governance Structure and Conceptual Design Project –

Summary of Stakeholder and Public Consultation Component

Executive Summary

Gray Scott Consulting Group Inc. was retained by Associated Engineering to undertake the stakeholder consultation and public involvement component of the Pigeon Lake Regional Wastewater Strategy and Master Plan study in December 2006.

The stakeholder consultation and public involvement component of the study was comprised of three distinct phases:

1. Profiling interviews which were a series of one-on-one interviews conducted primarily in January and February 2007 with two individual property owners from each of the six summer villages and the two counties that are members of the project Steering Committee. The persons who were interviewed were selected randomly from lists of prospective interviewees supplied by the municipalities involved in the study
2. Community Meetings which were a series of six meetings held over two weekends in late May and early June 2007. Almost 600 people attended the meetings and 23% of those that attended completed and submitted participant surveys.
3. An Information Session / Open House was held on July 29, 2007. This session was attended by approximately 575 people in total over the course of the day.

Compiled feedback from all three components of the public involvement process yielded a number of strong and consistent themes that have been considered by the study team in formulating its recommendations and should guide the Steering Committee in its decision making process:

a. A very strong message to proceed with ***implementation*** of the strategy and master plan as soon as possible. Many seemed to be instructing the Steering Committee to make the decisions required and to proceed. Many also voiced their frustration with the number of studies that had already been done and that a wastewater treatment system has been talked about and over-studied for many years. Now it is time to act.
b. Of those that expressed opinions about the options presented, Options #2 and #4 were preferred.
c. Relatively strong understanding and acceptance of the sequencing of the implementation with an early focus on treatment facilities, then regional transmission, then local collection.
d. Relatively strong understanding and acceptance overall system wide costs and of specific costs to the property owner stakeholders which was not the case at the beginning of the study and the public involvement process. Many will still need further detail as implementation proceeds but are comfortable at this point with the costs as presented.
e. User-pay and a fair and equitable distribution of capital costs and ongoing maintenance and upkeep fees has been a cornerstone assumption of a large number of the engaged participants.

f. Mistrust of the North East Pigeon Lake (NEPL) operations at the Mulhurst Lagoon and of becoming customers of the NEPL by a small concentrated, yet significant, group residing in two or three summer villages. The options presented at the community meetings and the information sessions that included NEPL involvement may be more acceptable to that group and to others if the NEPL governance structure could be revisited with the member municipalities of the Steering Committee.
g. Concern from a small but significant group of stakeholders that the First Nations people were not participating in the study.
h. A high level of satisfaction with the public involvement process and with the communication programs to actively engage and inform the stakeholders. The public involvement process and the outcomes more than met stakeholder expectations.

Each of the three components yielded common themes that the Associated Engineering project team incorporated into the development of options and recommendations.

The common themes resulting from the profiling interviews were:

a. Concern for the environmental health of the lake is clearly more important to every one than ever before.
b. Unprecedented growth and increasing density is a real problem and a threat to the health of the lake.
c. Wastewater treatment is more clearly tied to the water and lake quality than in the past.
d. The move by Alberta Environment to ban spreading of septic tank materials on the surrounding land has precipitated the real problem.
e. Many people around the lake are simply not maintaining their septic tanks (either getting them pumped out or routine maintenance to keep them in good shape)
f. There is a perception held by a significant number of stakeholders that the system on the north side of the lake is not working well.
g. Most are willing to pay some portion of a new system, but not everyone. Generally, they want to pay about the same as they would be paying in the cities - $20.00 - $30.00 per month.
h. Residents want to know the complete cost to them for the entire system including individual costs of putting in new tanks and hook-ups, costs and ongoing fees for the wastewater system maintenance and upkeep.
i. The Government of Alberta must be a willing financial partner, both in terms of grants and also in financing the balance of the cost of the system.
j. This project could be more successful in gaining consensus and support if the following suggestions were incorporated:
    i. communicate, communicate, communicate
    ii. provide all the answers; know the complete costs
k. Devise a funding solution that is fair to all - user pay proportionally
l. A single solution bought into by all is a necessity.
m. Most were concerned that all summer villages and the counties will not see eye to eye on a recommended solution
n. If a mutually agreed solution with 100% buy-in is not achieved, mandate it and make all stakeholders contribute – including the provincial government.

The common themes resulting from the community meetings were:

a. Significant concern was expressed regarding condition of the lake

b. Frustration expressed regarding “yet another” process.
c. Expectation is high for swift delivery of a solution. There is a strong desire to see aggressive timelines.
d. Many attendees called for this decision to be mandated, with no votes taken and no more study.
e. Concern expressed regarding the costs to the cottage owner and the proportionate amount for full time residents vs. summer residents and current owners vs. future development.
f. The need for more detailed information regarding the specific costs that will be assigned to the property owners – what is the cost to me as an individual home/cottage owner?
g. Concern regarding First Nations involvement. There is concern about compliance by the campgrounds and the ability to mandate compliance and participation by the First Nations and the Federal Government.
h. Many questions were raised as to the cause of the deterioration of the lake, and a need for facts and figures.
i. The provincial government must provide a plan and take action to stop further damage now.
j. Road repair costs and specific environmental issues must be taken into consideration when analyzing the truck haul costs.
k. Participants wanted a hard copy of the presentation, or for the presentation to be put on a web site for access to the public.

The common themes resulting from the information session / open house were:

a. Overwhelmingly, participants expressed concern regarding the protracted timeline. They feel there should be an aggressive timeline and work should begin as soon as possible.
b. There is an ongoing concern regarding the lack of involvement by the First Nations people.
c. Several participants expressed concern about maintaining control over the governance model for the system and not being a customer of the NEPL.
d. Options 2 and 4 were preferred by those who noted their preference
e. There is some concern expressed regarding calculations used to determine costs for seasonal vs. full time residents

Pigeon Lake Regional Wastewater Strategy and Master Plan

Options, Costs, Governance Structure and Conceptual Design Project –

Summary of Stakeholder and Public Consultation Component

Detailed Process Description

Introduction

Gray Scott Consulting Group was asked by Associated Engineering during the proposal stage of the project to join the project team and to undertake the public involvement and consultation component.

The overall objectives of the public consultation component of the project were;

1. To engage stakeholder individuals and groups in the planning process
2. To identify issues, concerns and suggestions with the stakeholders
3. To mitigate those concerns to the greatest extent possible through a cooperative and informed approach.

In order to achieve those objectives, the project team recommended a process as described below.

1. A series of profiling interviews with key stakeholders for the project, primarily to identify issues and preconceived notions and perceptions about the project. This phase will focus on collecting information and being good listeners to allow stakeholders to speak openly and honestly about their history and background leading up to this project. Key stakeholders will include representatives from the counties, the summer villages, Alberta government departments and First Nations representatives. We will also conduct interviews with engaged stakeholders other than the "official" representatives.
2. A series of up to 6 meetings with stakeholder groups such as the summer villages prior to the public meetings to seek input on the study progress to date and to present proposed recommendations. The purpose of these meetings to provide an opportunity for smaller groups of individuals to view the concepts and ideas from the study and to provide input in a localized setting where their individual issues and concerns can be addressed.
3. Two well-advertised public meetings, one that would introduce the draft recommendation and seek input from participants and a second that would be an information session to present the final recommendations of the study.

The balance of this report details each of three phases of the public consultation component.

Profiling Interviews Phase

Sixteen profiling interviews were completed at the beginning of the project as the first phase of the public involvement process. Interviewees were all from the 6 summer villages and the two counties that were represented on the project Steering Committee.

The purpose of the profiling interviews was to identify issues and preconceived notions and perceptions about the wastewater collection, transmission and treatment in the study area. The interviews focussed on collecting information and being good listeners to allow stakeholders to speak openly and honestly about their history and background with wastewater management leading up to this project.

All interviews were conducted using a standard format that included a section that provided a background explanation of the project and a series of standard questions for interviewees to answer. A copy of the interview form is included as Addendum "A" to this report.

Interviewees were selected randomly from lists of prospective property owners or residents in the municipalities. At the request of the Steering Committee, the names of the persons interviewed have remained confidential.

Each interviewee was contacted to schedule the interview and in most cases, a copy of the profiling interview form was provided in advance. In order to comply with the *Freedom of Information and Privacy Act*, each interviewee was asked to sign a copy of a *"Permission to Disclose Information"* form, a copy of which is included as Addendum "B" to this report.

Interviews were completed primarily in January and February, 2007, with a few being done in the March – May period. Twelve interviews were conducted in person, three were done by phone, and one was completed by the interviewee and mailed in. A summary of each interview was compiled and can be made available upon request. However, all interviews are anonymous to protect the confidentiality of the interviewees. At the time the interviews were taking place, Gray Scott Consulting Group Inc. and Associated Engineering received a number of telephone calls from interested parties who wished to express their views about the study and the issues that they thought should be addressed. This ad hoc, tangential input was communicated and considered within the project team and was consistent with the input being received through the formal profiling interview phase.

There was surprisingly strong consistency of responses to the questions among the interviewees. The common themes that emerged were:

a. Concern for the environmental health of the lake is clearly more important to every one than ever before.
b. Unprecedented growth and increasing density is a real problem and a threat to the health of the lake.
c. Wastewater treatment is more clearly tied to the water and lake quality than in the past.
d. The move by Alberta Environment to ban spreading of septic tank materials on the surrounding land has precipitated the real problem.
e. Many people around the lake are simply not maintaining their septic tanks (either getting them pumped out or routine maintenance to keep them in good shape)
f. There is a perception held by a significant number of stakeholders that the system on the north side of the lake is not working well.
g. Most are willing to pay some portion of a new system, but not everyone. Generally, they want to pay about the same as they would be paying in the cities - $20.00 - $30.00 per month.
h. Residents want to know the complete cost to them for the entire system including individual costs of putting in new tanks and hook-ups, costs and ongoing fees for the wastewater system maintenance and upkeep.
i. The Government of Alberta must be a willing financial partner, both in terms of grants and also in financing the balance of the cost of the system.
j. This project could be more successful in gaining consensus and support if the following suggestions were incorporated:
    i. communicate, communicate, communicate
    ii. provide all the answers; know the complete costs
k. Devise a funding solution that is fair to all - user pay proportionally.

l. A single solution bought into by all is a necessity.
m. Most were concerned that all summer villages and the counties will not see eye to eye on a recommended solution
n. If a mutually agreed solution with 100% buy-in is not achieved, mandate it and make all stakeholders contribute – including the provincial government.

Results of the profiling interviews, to date, and a compilation of the common themes were presented to the Steering Committee at the March 16, 2007 meeting. The results also formed an integral and important part of the development of the options and for the content of the public presentations that were made at the community meetings held on May 26, June 2 and June 3, 2007.

Community Meetings Phase

Six very well attended community meetings (almost 600 people attended in total) were held as the second phrase of the public involvement component of the study.

The purpose of these community meetings was to provide an opportunity for smaller groups of individuals to view the initial set of options as developed as a part of the study and to provide and opportunity for input in a localized setting where individual issues and concerns could be addressed.

Meeting dates, times locations and approximate attendance at each are as listed:

Saturday, May 26 – 10:00 AM – 12:30 PM– Lakedell Agricultural Society Hall
(for Crystal Springs and Norris Beach property owners)
Attendance: 75

Saturday, May 26 – 2:00 PM – 4:30 PM - Lakedell Agricultural Society Hall
(for Poplar Bay and Grandview Beach property owners)
Attendance: 140

Saturday, June 2 – 10:00 AM – 12:30 PM – Ma-Me-O Beach Hall
(for Ma-Me-O Beach property owners)
Attendance: 140

Saturday, June 2 – 2:00 PM – 4:30 PM - Lakedell Agricultural Society Hall
(for County of Wetaskiwin property owners)
Attendance: 130

Sunday, June 3 – 10:00 AM – 12:30 PM – Sundance Community Hall
(for Sundance Beach property owners)
Attendance: 62

Sunday, June 3 – 2:00 PM – 4:30 PM – Sandholm Hall
(for Leduc County property owners)
Attendance: 40

These sessions were promoted by sending an announcement / news release to each of the summer village administrators and to all members of the Steering Committee. Also, copies were sent to the Administration offices of the Counties of Leduc and Wetaskiwin for inclusion in the regular sections of their respective newspapers *The Leduc Representative* and the *Pipestone Flyer.* A copy of the announcement is included as Addendum "C" to this report.

The format and the material presented at each community meeting were identical. Each meeting began with introductory remarks by a member of the Steering Committee and a brief overview of the format for the meeting as provided by the facilitator from Gray Scott Consulting Group. These introductions were followed by the presentation which was approximately 30 minutes in duration.

The presentation included a substantial introductory component intended to inform and educate participants on the basics and fundamentals of wastewater collection, transmission and treatment and to also help dispel some of the misunderstandings that were felt to be held by many of the people who would be attending the meetings. This information was added, in part, as a result of feedback received from the profiling interviews.

A copy of the presentation delivered at each of the meetings is included as Addendum "D" to this report.

A tightly facilitated question and answer period followed the presentation and at most of the meetings, 12-16 questions were asked by participants. Participants were also given the option of writing their questions on small question forms to be read out by the facilitator to seek responses. A summarized compilation of the questions and answers, as provided by the project team members and by members of the Steering Committee, when called upon, is included as Addendum "E" to this report.

As participants arrived for the meetings they were greeted by a member of the project team and were provided with a Participant Survey Form that they were asked to complete following the meeting. Although most completed the form at the meeting, approximately 10% completed the form at a later date and either mailed, e-mailed or faxed the form to Gray Scott Consulting Group Inc. A copy of the Participant Survey Form is included as Addendum "F" to this report.

Several common themes arose from the 136 surveys received following the community meetings:

a. Significant concern was expressed regarding condition of the lake
b. Frustration expressed regarding "yet another" process.
c. Expectation is high for swift delivery of a solution. There is a strong desire to see aggressive timelines.
d. Many attendees called for this decision to be mandated, with no votes taken and no more study.
e. Concern expressed regarding the costs to the cottage owner and the proportionate amount for full time residents vs. summer residents and current owners vs. future development.
f. The need for more detailed information regarding the specific costs that will be assigned to the property owners – what is the cost to me as an individual home/cottage owner?
g. Concern regarding First Nations involvement. There is concern about compliance by the campgrounds and the ability to mandate compliance and participation by the First Nations and the Federal Government.
h. Many questions were raised as to the cause of the deterioration of the lake, and a need for facts and figures.
i. The provincial government must provide a plan and take action to stop further damage now.
j. Road repair costs and specific environmental issues must be taken into consideration when analyzing the truck haul costs.
k. Participants wanted a hard copy of the presentation, or for the presentation to be put on a web site for access to the public.

A compiled summary of the feedback received from the survey forms and the question and answer sessions at each meeting are included as Addendum "G" to this report.

Information Session / Open House Phase

An Information Session and Open House was held on Sunday, July 29, 2007 to conclude the final phase of the public involvement component of the study. Approximately 360 people in total attended throughout the day. Approximately 275 people attended the morning sessions and approximately 80 attended in the afternoon.

The event was held at the Lakedell Community Center from 10:00 AM to 4:00 PM with planned identical presentations at 11:00 AM and at 2:00 PM. A series of display boards exhibiting much of the information contained in the presentations was also set up in the hall to allow participants to view the material prior to and after the presentation. The content of the display boards are included as Addendum "H" to this report.

Due to misinformation that circulated in some of the summer villages, many participants arrived expecting the first formal presentation at 10:00 AM. As a result, three presentations were made: one at 10:30 AM, one at 11:30 AM and the final one at 2:00 PM. Question and answer sessions followed each of the presentations.

Promotion of the open house was similar to the promotion for the earlier community meetings in that a news release / announcement was sent to all Steering Committee members, to the administrators for each of the summer villages and to the County Administration offices. A copy of the announcement is included as Addendum "I" to this report.

As participants arrived and were greeted, they were provided with a summary document titled *"Commonly Asked Questions and Answers"* that summarized the responses to many of the questions asked at the community meetings and in the responses to the Participant Survey Forms returned after the community meetings. This document is included as Addendum "J" to this report.

Also, consistent with the format of the previous community meetings, a Participant Survey Form was distributed to all attendees as they were greeted upon arriving at the door. A copy of the Participant Survey Form is included as Addendum "K" to this report.

Common themes garnered from the 86 responses received were:

a. Many responses expressed concern regarding the timeline. They felt that there should be an aggressive timeline and work should begin soon.
b. Several participants expressed concern about maintaining control over the governance model for the system and not being a customer of the NEPL.
c. Options 2 and 4 were preferred by those who noted their preference
d. There was some concern expressed regarding calculations used to determine costs for seasonal vs. full time residents
e. There is an ongoing concern regarding the lack of involvement by the First Nations people.

A more detailed summary of the responses to the Participant Survey Form are included in Addendum "L" to this report.

The format of the open house and information session included three formal presentations as alluded to earlier in this report. A copy of the presentation is included as Addendum "M" to this report.

A question and answer session was held following the 10:30 AM presentation and the 2:00 PM presentation. There were no discernable common themes arising other than those relating to further explanation and clarification of the material that had been presented.

Addendum "A"

Stakeholder Profiling Interview Form

Pigeon Lake Regional Wastewater Strategy and Master Plan

Options, Costs, Governance Structure and Conceptual Design Project –

Public Information and Community Consultation Process

January 2007

Name _____

Title _____

Contact Information _____

Representing _____

Date and Time of Scheduled Interview _____

Type of Interview _____

Duration _____

Section A – Background Explanation

The Pigeon Lake region is experiencing unprecedented growth in population and development.

The Pigeon Lake Regional Wastewater Strategy and Master Plan Steering Committee (the Committee) was established following a meeting of April 27, 2006 to address the significant needs for appropriate municipal wastewater treatment and disposal around Pigeon Lake due to this rapid growth. This committee consists of representatives from municipalities surrounding Pigeon Lake and from Alberta Environment and Alberta Infrastructure and Transportation:

County of Wetaskiwin (Frank Coutney and Nancy Watson);
County of Leduc (Des Mryglod, Ruth Harrison);
Summer Village of Sundance (Peter Pellatt);

Summer Village of Poplar Bay (Pat Sloan);
Summer Village of Norris Beach (Bruce Fowlie, Brian Keeler);
Summer Village of Crystal Springs (Roger McEachern);
Summer Village of Grandview (Leslie Ellis);
Summer Village of Ma-Me-O Beach (John Slater);
Alberta Environment (AENV) (Pervez Sunderani and David Helmer),
Alberta Infrastructure & Transportation (AIT) (Dave McIntyre); and
Alberta Community Development & Parks (CDP) (Grant Santo)
Pigeon Lake First Nation (Cathy Bull)

In order to manage growth in an environmentally sustainable manner into the future, the Committee is developing a plan that will ultimately lead to a long-term solution for wastewater treatment and disposal for the areas surrounding Pigeon Lake. A regional consideration for a wastewater system is also in keeping with *Water for Life: Alberta's Strategy for Sustainability*. This will offer increased protection to the Battle River Basin and overall greater watershed protection.

To this end, the Committee has engaged Associated Engineering Ltd. to undertake this planning project.

The purposes of the project are:

To develop a regional wastewater strategy and master plan for the Pigeon Lake watershed area as well as the Dorchester Development. The plan will be a feasibility level economically based assessment that:

- defines logical project boundaries;
- provides conceptual cost estimates for options;
- provides recommended project phases;
- considers community growth requirements; and
- provides recommendations for a viable governance model(s).

Gray Scott Consulting Group has been retained by Associated Engineering as part of the project team to provide public and individual stakeholder consulting services.

The objectives of the public involvement process for this project are:

- To identify and engage representatives of the key stakeholder individuals and groups in the areas that will be directly impacted by the study.

- To identify key issues that the individuals and communities wish to see addressed in the study.

- To communicate to the public the results of the study to date through a series of public meetings.

The consultation process will be comprised of three phases:

- A series of profiling interviews with key stakeholder individuals and representatives of stakeholder groups.
- A series of up to 6 meetings with stakeholder groups such as the summer villages prior to the public meetings to seek input on the study progress to date and to present proposed recommendations. The purpose of these meetings to provide an opportunity for smaller

groups of individuals to view the concepts and ideas from the study and to provide input in a localized setting where their individual issues and concerns can be addressed.

- Two well-advertised public meetings, one that would introduce the draft recommendation and seek input from participants and a second that would be an information session to present the final recommendations of the study

This interview is referred to as a profiling interview to get a sense from you, as a key stakeholder, of your understanding of the project at this point, what you see as the issues and your thoughts on the planned public involvement process

Each stakeholder has been selected because of their unique interest and their ability to express their own opinion, as well as to represent the broader interests of their constituents and the community. We ask that you keep these perspectives in mind as you answer the questions we have prepared.

Section B – Initial Key Stakeholder Profiling

Background Information

1. Please describe where you have your property. (Which Summer Village? or municipality?)
2. Are you a full-time resident on this property or do you use it as a "getaway" or recreational property?
3. If you are not a full time resident, how many days on a yearly average is your property used?
4. How many people will the house/ cottage accommodate on a "normal" basis?
5. How long have you owned and/or been using your property?
6. What type of wastewater disposal do you currently use?
7. What are your average monthly costs for wastewater disposal now?
8. Are you satisfied now with this arrangement?
9. What is your reasonable cost expectation for wastewater treatment in the future? How much more are you willing to pay for improved service?
10. What are the biggest overall changes you have witnessed since you have started coming to or living at Pigeon Lake?

Initial Level of Awareness and Knowledge of the Wastewater Treatment and Disposal Issues

1. What had you heard about this study being undertaken prior to this contact by the study team?
2. Why do you think that wastewater treatment and disposal has become such a pressing issue in the area?

3. What are the causes of the problems, as you see it?

4. Are you aware that there have been other attempts to address wastewater treatment and disposal around Pigeon Lake? If so, please explain your understanding of those.

5. Why do you think that the other studies have not been successful?

6. What do you think this study and recommendations needs to do and be to be successful in achieving its goals?

Issue Identification and Proposed Outcomes

7. What do you see as the major issues that the project team and the Committee will need to address in this study and why?

8. How are these issues impacting you at present?

9. Is the "status quo" (your current situation) an option for you? – Why or why not?

10. What do you see as the best solutions for wastewater treatment and disposal around Pigeon Lake fro you personally?

11. For the Pigeon Lake area more generally?

12. Any thoughts on how these solutions could be implemented?

13. Do you have any suggestions on how to finance the implementation of a new wastewater treatment and disposal system for the study area? What would you prefer?

The Public Involvement Process

14. What do you think of the proposed public involvement process? Any suggestions?

15. Are there other interested parties that you suggest we contact and continue to communicate with throughout the project?

Conclusions

Any other comments or questions at this time?

Thank you for your time and your comments.

Addendum "B"

Permission to Disclose Contact Information

Pigeon Lake Regional Wastewater Strategy and Master Plan

Further to our previous communication, I hereby grant my permission to my municipality to disclose my personal contact information, including *and limited to* my name, address, telephone and FAX number(s) and e-mail address to the project team of Associated Engineering in order that they may contact me to participate in a wastewater planning study.

This study will develop a regional wastewater strategy and master plan for the Pigeon Lake watershed area as well as the Dorchester Development The plan will be a feasibility level economically based assessment that:

- defines logical project boundaries;
- provides conceptual cost estimates for options;
- provides recommended project phases;
- considers community growth requirements; and
- provides recommendations for a viable governance model(s).

I understand that the study has been commissioned by The Pigeon Lake Regional Wastewater Strategy and Master Plan Steering Committee, comprised of many municipalities around the lake, including the municipality within which I am a ratepayer. I also understand that it is my municipality that will be providing the information to Gray Scott Consulting Group Inc., a member of the Associated Engineering project team.

I further understand and agree that Alan Parsons of Gray Scott Consulting Group Inc. will contact me with the information provided to conduct an interview with me regarding the study needs to collect stakeholder information.

All information collected will be strictly confidential, and only my unattributed information from the interview results will be utilized. No one else, other than the Associated Engineering project team has or will have access to my personal information.

Signature _____

Date _____

Witness _____

Addendum "C"

Notice of Public Meetings

Pigeon Lake Regional Wastewater Strategy and Master Plan

The Pigeon Lake Regional Wastewater Strategy and Master Plan Steering Committee is undertaking the Strategy and Master Plan Study.

The purpose of the project is to develop a strategy to implement a wastewater system for the Pigeon Lake watershed area as well as the Dorchester Development.
The plan will be a feasibility level economically based assessment that:

- defines logical project boundaries;
- provides conceptual cost estimates for options;
- provides recommended project phases;
- considers community growth requirements; and
- provides recommendations for a viable governance model(s).

Associated Engineering will be holding a series of public meetings to update those attending on the study progress to date and to present a series of draft options for discussion and further consideration. Each meeting is designated for property owners within each municipality indicated below in a localized setting where individual and local issues can be addressed.

Meeting Dates, Times and Locations

Saturday, May 26 – 10:00 AM – 12:30 PM– Lakedell Agricultural Society Hall
(for Crystal Beach and Norris Beach property owners)

Saturday, May 26 – 2:00 PM – 4:30 PM - Lakedell Agricultural Society Hall
(for Poplar Bay and Grandview Beach property owners)

Saturday, June 2 – 10:00 AM – 12:30 PM – Ma-Me-O Beach Hall
(for Ma-Me-O Beach property owners)

Saturday, June 2 – 2:00 PM – 4:30 PM - Lakedell Agricultural Society Hall
(for County of Wetaskiwin property owners)

Sunday, June 3 – 10:00 AM – 12:30 PM – Sundance Community Hall
(for Sundance Beach property owners)

Sunday, June 3 – 2:00 PM – 4:30 PM – Sandholm Hall
(for County of Leduc property owners)

All property owners are urged to attend one of these meetings.

For further information, please contact Al Parsons at (780) 434-9322

Addendum “D”

PowerPoint Presentation for May/June Community Meetings

Pigeon Lake Regional Wastewater Strategy and Master Plan

Welcome and Introduction of Steering Committee Members and Project Team

Meeting Purpose

1. To provide an opportunity for property owners from the summer villages and counties to view the progress of the study to date
2. To view and comment on the options under consideration.
3. To provide and opportunity for questions and answers in a localized setting where individual issues and concerns can be addressed.

Project Commencement

Steering Committee Introduction Remarks

Project Objectives

To develop a regional wastewater strategy and master plan for the Pigeon Lake watershed area as well as the Dorchester Development.

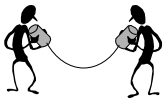
Complete a feasibility level economically based assessment that:

- defines logical project boundaries;
- provides conceptual cost estimates for options;
- provides recommended project phases;
- considers community growth requirements; and
- provides recommendations for a viable governance model(s).

Public Communications Overview

Overview and Summary of Common Themes (15 completed)

- Increasing concern for the environmental health of the lake
- Unprecedented growth and increasing density
- Status quo is not an option for most
- Complete cost for the entire system and ongoing fees for maintenance and upkeep are important



Public Communications Overview

Overview and Summary of Common Themes (con't)

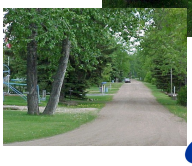
- Devise a funding solution that is fair to all – eg. user pay proportionally
- A recommended solution bought into by all is a necessity.
- If a mutually agreed solution with 100% buy-in is not achieved, mandate it and make all stakeholders contribute – including the provincial government.

Project Summary to Date

- Project Need
- Wastewater Management Options
- Funding Opportunities
- Planning Criteria
- Master Plan Options
- Next Steps and Input

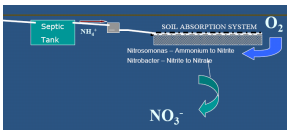
Project Need

- Urbanization of lakeshore areas
- Private sewage systems costly and risky
- Intensifying development
- Changing property use – Seasonal to Permanent
- Protect the lake
- Act now rather then react later



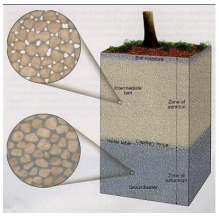
Existing On-Site Systems

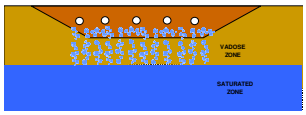
- Holding Tanks
  - Truck Haul
  - Need Disposal Facility
  - Leakage?
- Disposal Fields
  - Suitable Low Flow / Low Density
  - Requires Suitable Soil Conditions
  - Requires Maintenance
  - Difficult to Monitor
- Outhouses



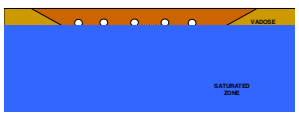
Disposal Field Operations

Soil Structure



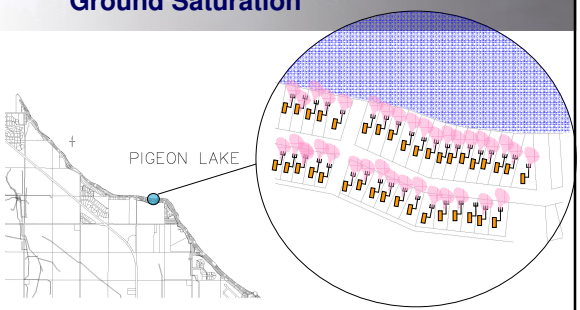


Operating Field



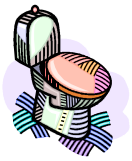
Failed Field

Ground Saturation



Beginning Assumption

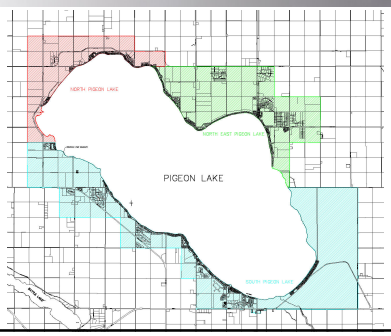
Some how we need to dispose of our wastewater. (We might even have to treat it!)



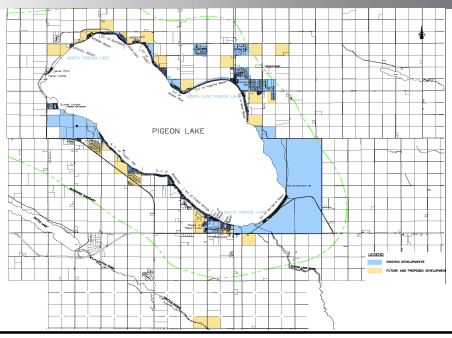
Wastewater Planning

- Good assessment of the need (what are the real problems? What are the treatment objectives)
- Good information regarding various alternatives.
- Good community involvement
  - Buying into the need
  - Address the problems to select an alternative

Study Area



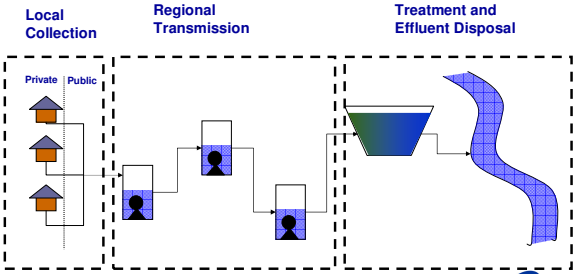
Existing and Future Development



Background Data Sources

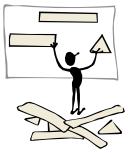
- Previous Studies
  - Subject Area
  - Similar Areas
  - Various Guidelines
- Data Collection Forms
- Environmental Standards
- Public Communications

Wastewater Management System



Option Pre-Screening

- Critical initial step
- Consider all options
- Gain stakeholder support of decisions
- Shortlist for analysis

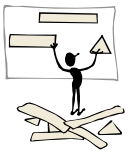


Pre-Screening - Options

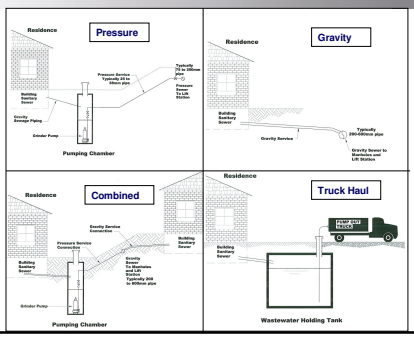
- Local Collection
- Transmission - WWTF Location
- Treatment Process
- Effluent Management

Pre-Screening – Local Collection

- ~~None~~
- Haulage
- Pressure Sewer – Grinder
- Pressure Sewer – Effluent Pump
- ~~Small Diameter~~ Gravity
- Conventional Gravity
- Combined Systems



Local Collection Options

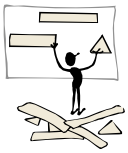


Pre-Screening – Transmission

- ~~Status Quo~~
- One Treatment Facility
- Two Treatment Facilities
- Decentralized Facilities
- Outside ~~Pigeon~~ Lake Area
- Combinations

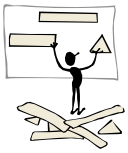
Pre-Screening – Treatment Process

- ~~Status Quo~~
- Stabilization Lagoons
- Aerated Lagoons
- Conventional Mechanical Plants
- Advanced Mechanical Plants
- ~~Natural Systems~~
- ~~Large Scale~~ Regional Treatment



Pre-Screening – Effluent Management

- ~~Status Quo~~
- Pigeon Lake Creek and/or Pipestone Creek
- Battle River
- ~~Irrigation~~
- ~~Infiltration Basins~~
- Constructed Wetlands - Indirect lake Discharge
- ~~At-grade Forest~~ Dispersion
- ~~Snowfluent~~
- ~~Deep Well Injection~~



Wastewater Management Options

Local Collection	Regional Transmission	Treatment	Effluent Mngmt.
• Haulage	• One Treatment Facility	• Stabilization Lagoons	• Pigeon Lake Creek and/or Pipestone Creek
• Pressure Sewer – Grinder	• Two Treatment Facilities	• Aerated Lagoons	• Battle River
• Pressure Sewer – Effluent Pump	• Decentralized Facilities	• Conventional Mechanical Plants	• Constructed Wetlands - Indirect lake Discharge
• Conventional Gravity	• Combinations	• Advanced Mechanical Plants	
• Combined Systems			

Funding Opportunities

Local Collection - Private Systems

- No Available Funding

Local Collection – Public Systems

- Federal/Provincal CAMRIF (0 to 66%)

Regional Treatment and Transmission

- Provincial Water for Life and Water/Wastewater Partnership Programs (75% to 90%)

Planning Criteria

- Service Population
- Wastewater Generation
- Treatment Criteria
- Regional Transmission
- Collection Hydraulics

Wastewater Generation

Service Population

- Existing Development
- 25 Year Projection
- 3 Persons per lot
- Seasonal Variance
  - 25% Permanent vs. 75% Seasonal (2007)
  - 50% Permanent vs. 50 % Seasonal (2032)
  - Transition Period (Spring and Fall)

Collection Criteria

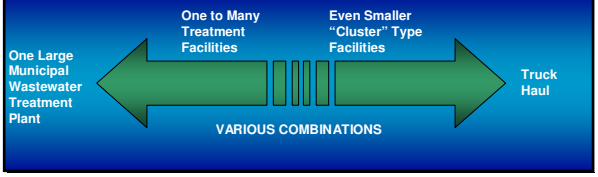
- Pipe and Pump Station Sized for Peak Flow
- Existing Development
  - 100% Low Pressure Sewer
- Future Development
  - Low Pressure
  - Gravity
- Haulage – Interim or Long-term

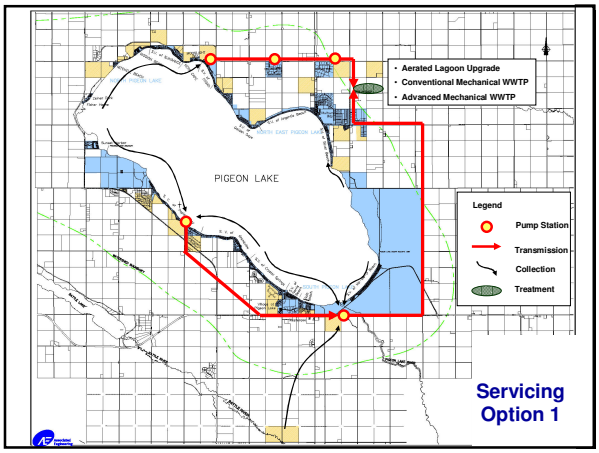
Treatment Criteria

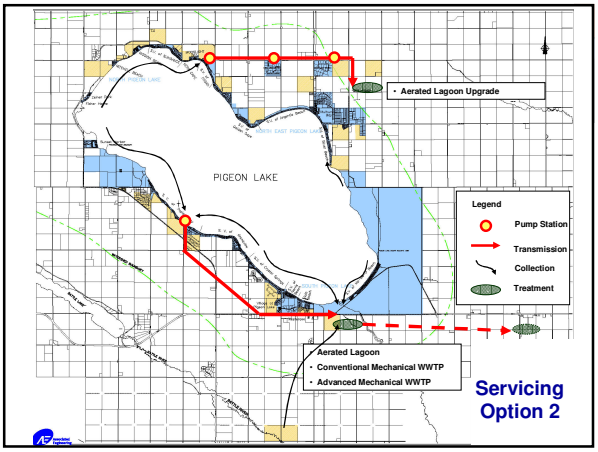
- Existing and Future Flows
- Design Horizon – 10 Year
- Treatment Objectives – Based on Receiving Environment

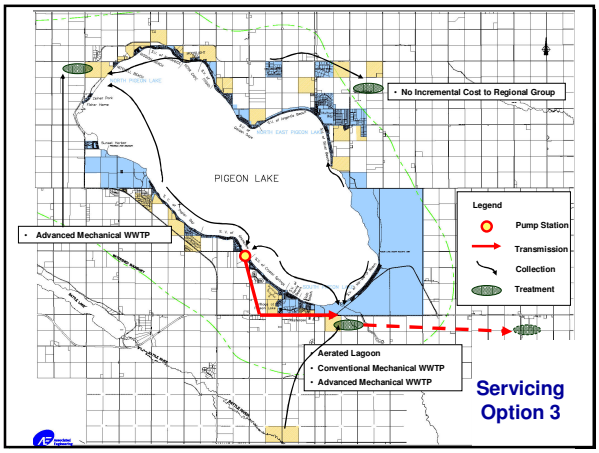
System Option Summary

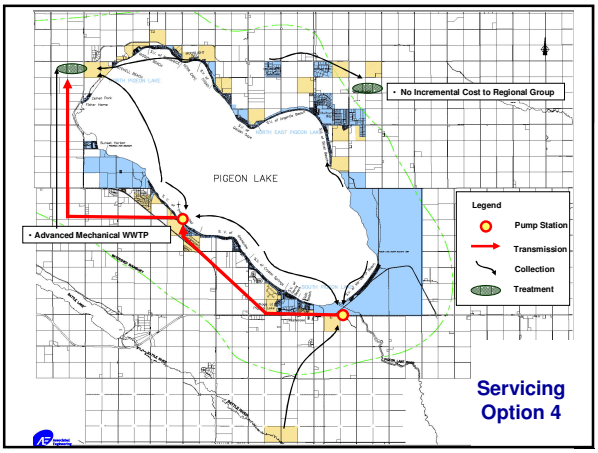
- Five Options Considered
- From Large Scale to Medium
- Option 1 – Extensive Regional Pipeline
- Option 5 – Least Regional Piping

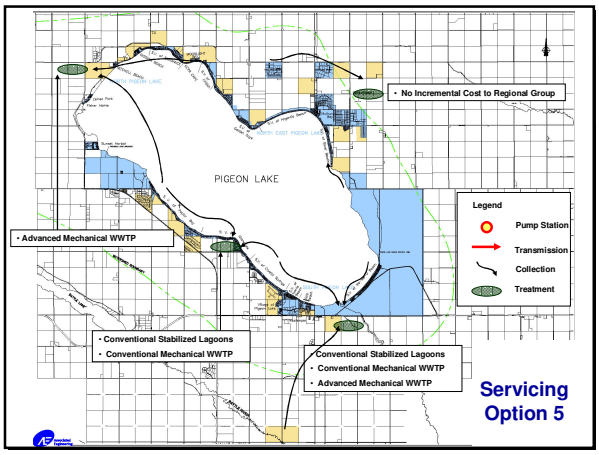












Servicing Option 5

Summary of Required Infrastructure

Option	Length of Collection and Transmission Pipe	Number of Lift Stations	No. of WWTF
Option 1	80,500 m	5	1
Option 2	67,800 m	4	2
Option 3	54,400 m	1	3
Option 4	66,900 m	2	2
Option 5	48,400 m	0	4

Summary of Regional Capital Costs

Option	Treatment ($million)	Transmission ($million)	Total Regional Costs ($million)
Option 1	$6.5	$19.6	$26.1
Option 2	$9.7	$10.8	$20.5
Option 3	$18.9	$4.7	$23.6
Option 4	$31.4	$9.8	$41.2
Option 5	$23.5	$1.6	$25.1

Option 2, 3 and 5 – Add $4,500,000 for Pipeline to Falun

Operating Costs

Labour
Materials
Power
Equipment

→

Treatment
Regional Transmission
Local Collection
On-site

Life-Cycle Cost Comparison

	Treatment ($000,000)	Transmission ($000,000)	Local – Public ($000,000)	Local - Private ($000,000)	Total ($000,000)
Truck Haul	11.3	80.2			**91.5**
Option 1	11.1	27.6	15.5	48.5	**102.7**
Option 2	16.5	15.7	15.5	48.5	**96.2**
Option 3	38.3	7.0	15.5	48.5	**109.3**
Option 4	61.0	14.0	15.5	48.5	**139.0**
Option 5	45.7	2.6	15.5	48.5	**112.3**

Summary

- On-Site disposal is no longer acceptable.
- New wastewater treatment solutions are required.
- A long-term plan is needed to work towards.
- There are a number of feasible options.
- Option 2 and 4 look favourable.
- Truck haul is feasible interim solution
- Phasing and governance preferences?

Next Steps

- Determine Preferred Alternative(s)
- Provide Staging Plan(s)
- Discuss Governance Options
- Implementation Timeline
- Rate Implications
- Municipal Decisions

QUESTIONS?

Addendum "E"

Summary of Questions and Answers
From Community Meetings, May - June 2007

May 26th – 10:00 AM
For Crystal Beach and Norris Beach Property Owners
Approximately 75 people attended

Questions from Participants	Answers Provided by Resources Team and Steering Committee Members
Will there be hard copies of the presentation?	No
What is "Dorchester Development"?	The area is south east of the lake in the County of Wetaskiwin. It is not on the lake but was asked to be included
Where is the system Jeff referred to where the discharge went through wet land and was cleaner than lake water?	South side of Lesser Slave Lake
To Environment people – are septic systems and outhouses currently legal?	Single systems with flow of 25cubic meters/day don't trigger environmental concerns but when put together as a collective – Alberta Environment gets involved. The Province is working with Summer Villages towards a phased approach to implement changes. 1 cubic meter/day for 3 people is a normal/average amount of wastewater generation.
Please explain Advanced Mechanical plants as referred on slide 26?	Jeff provided a more detailed technical explanation
Is there a plan to clean the lake as we take care of the effluent?	A number of initiatives are underway. The first phase of clean up is to study what is going into the lake. There are watershed stewardship groups in action that are supporting this approach
Is government heading toward regional treatment and transmission (re slide 27)? They appear to be committing more funding to that area	There are economies of scale associated with cooperating with various smaller groups on a collective solution
When the government representative indicated there were a significant number of applications for funding and if the government programs are oversubscribed what funding is available?	Summer villages can get 75% funding for public systems, there is no funding available for private systems. The Government representative was unable to advise what funding is available for this project.
On the options diagram – are the pipelines buried?	Yes
Are there any pipelines on the bottom of the lake?	No
If we don't have regional pipelines is there funding?	Yes, the treatment phase is funded
Which option has the most funding?	This will be explained later in the presentation

Have you talked to the First Nations people?	They were invited to join but chose not to
Are the campgrounds included?	Yes
Do the truck costs include wear and tear on the roads?	No
Do the cost estimates include growth and development?	Yes
Can you explain what is included in each category on slide 41 re lifecycle costs?	Jeff explained the offsite and on site categories
Have you chosen a treatment centre site for the south?	No – somewhere between Pipestone Creek to Falun, along Highway 13
If everyone is on board what is the timeline?	3 – 5 years if all goes well
Question to local government officials – are "we" in support or are you prepared to mandate?	The Steering committee is fully supportive Inspections of existing systems to get data and current status are being planned for this Fall. This is a municipal decision not provincial. The Steering Committee is working towards full cooperation and buy-in so there will be no need to mandate.
When the study is done will you take action?	Yes – status quo is not an option
Cost of Study?	$75,000 - $80,000 funded by the province
How much was spent last time?	No definitive answer
Will the property owners be given a vote on options or given one choice?	This will be a Steering Committee decision The project team will hold public meetings to show recommended preferred option
Next Steps?	Finalize report; get municipal support, get organized and work out governance issues, start implementation
Will we hear back in 2007?	Yes July – August
Is Falun lagoon an acceptable site to qualify for provincial funding? Can it be funded at a higher level due to proximity of schools?	It would be funded as regional and would not likely qualify for more funding if the schools were involved.
Which option would Alberta Environment and Alberta Infrastructure departments be best aligned with?	Environment just wants to protect the environment and doesn't care which option as long as protection is achieved. Infrastructure cares about costs. They don't want waste; most economical is preferred but not always possible. Incremental funding favors expansion of existing over building new Steering committee is communicating with provincial ministers through the Association of Pigeon Lake Municipalities and have support

May 26th Meeting – 2:00 PM
For Poplar Bay and Grandview Beach Property Owners
Approximately 140 people attended

Questions from Participants	Answers Provided by Resources Team and Steering Committee Members
Are there industrial users pumping water from the lake?	Imperial Oil is the only one, at Bonnyglen plant. Province will not allow this in the future Could look at piping cleaned water out to industry in the future
Why was the deep well injection option eliminated?	Not accepted by the province
Who or what is driving this. It sounds like it is a given.	The community and necessity. (*An asked for 'straw vote" show of hands indicated strong majority support)*
Who paid for this study?	Alberta Infrastructure
2000 study said "run off" was the biggest issue. Can we do something about it?	Watershed planning is underway on various levels. Watershed Stewardship Committee in place
Is the reserve (First Nations) involved?	Reserve campgrounds are in. Reserves were asked but chose not to participate
What is the current quality of the lake?	It is sampled regularly. There are concerns about continued deterioration due to west/sewage effluents and septic fields. That is why the government department is a part of this project and the steering committee
Is the pipeline to Falun included in the summary of capital costs?	No
Is there any other lagoon presently on the south side other than Falun? If not costs should be included for Falun as it is the only other option	No other lagoon presently. Costs for new location are included.
Are provincial parks included in the plan?	Yes
There is a lagoon being built at Dorchester	We believe this to be a collection system to tank only. Dorchester is included in this plan.
Are road repairs included in the operating costs of the truck haul option?	No
Could we consider using abandoned pipeline on the north side?	An interesting option – have not looked at that detail during this conceptual phase
Every year of delay increases the costs by how much?	Cannot measure. Project costs in general are increasing 10% - 15% /year
Environmental concerns in mind, if we wait do you believe government will mandate this?	Yes
Will there be much down time of the existing lagoon during construction?	Yes but work-arounds will be done
Commendation to the steering committee and Project Team – "much better process this time"	
What are the nutrient sources to the lake and what percentages for each of run off, air, residential?	Further study is necessary to answer this.
Do you anticipate having problems attaining land for lagoons?	It is an attainable hurdle, but not easy
Will municipal government make effluent dumping	As soon as an alternative is in place. This project

illegal	will provide alternatives. Current and existing systems are not illegal at this time
The lake is being impacted now, are there concerns about our ground water supply?	Deep wells are okay. Shallow (40' or less) can be affected by surface water and should be treated. Most wells on the lake are deeper – about 134'. It will be specific to each property and we cannot generalize.
Septic ground fields need to be banned – when will we have the solution in place?	Decision to go ahead should come in August. Actual construction will take 1 – 3 years
Elected officials should go ahead – don't go to the public again	
Should our existing system need replacing is there a system compatible with the new proposed system?	There are options. The new system will depend on each summer village's decision. There are tanks with several attachments which could allow for conversion
What area will every cottage owner be expected to finance? Is the government going to pay the total cost of installation and cottage owners the cost of management or is it too soon to judge?	Private lot costs will not be funded. Some government funding is available for other components of the system but this funding will be based upon grant program criteria.
It will be important to ensure future developers pay their share. Current owners should not bear the full burden	We are focused on the system itself presently. The funding model has not yet been determined. May use Mulhurst lagoon governance model or take advice from them. All options will be considered..
Watershed Management committee needs to look at fertilizing and all other environmental issues too	
Will this be put to a vote?	This is an election year. If current councils are reelected they support this plan and will take it forward.
What if each government has a different response?	That is what the steering committee is for – consensus building.
Do you expect upfront costs plus a tax increase?	Next phase will look at the costing models and specific to the preferred option. The plan will have 1 option and full plans. We will have information sessions for that plan July 28 and 29.
Would the committee like to have a straw vote on the options right now	No

June 2nd -10:00 AM
For Ma-Me-O Beach Property Owners
Approximately 140 people

Questions from Participants	Answers Provided by Resources Team and Steering Committee Members
What type of system is the Mulhurst Lagoon	Stabilization lagoon
Does the scope include the campgrounds	Yes
Is there a way to mandate compliance by the campground?	Depends on the amount of waste water generated. Less that 25 cubic meters per day not treated onto

	the site, is not regulated
Are the federal campgrounds at Ma Me O included?	Are included in the study. Regulatory body is more complicated due to involvement with First Nation and Indian Affairs dept. Best solution is to include them as partners in the study
Is industry involved?	No – they take care of themselves
Do you need grinder pumps in each residence?	Yes if you choose a collection system but gravity sewer retrofit may be possible in some areas. At this level of planning, we assume there will be a pump of some sort in each residence.
Are collection stations underground?	Yes
Any costs built in for additional road maintenance for trucking option?	No
Prices for truck haul are constantly going up – can we control that in the short and long term?	This is a regional issue and handled through governance. Controls on the rates would be critical both short and long term
Pigeon Lake Creek does not always flow which I understand is necessary for effluent management	We would store the effluent until flow resumed
Is there any provincial funding if we choose truck haul?	No government participation
Is the upgrade to pump out, on individual property, paid by grant?	No
What is the timeline until sewers are running?	Determined in our next steps. 1- 3 years immediate plan. Extensive plan and piping longer
How did you determine 3 person/lot figure	Data came from previous studies and personal data collected on this project
Does the fact that Ma-Me-O is surrounded by First Nation property create problems	The province has one road out of Ma-Me-O for which they hold the right of way. We'd use that to build the pipeline
It is easier for me to understand my annual costs right now – I know how many times I get a truck in and how much it costs. You haven't given me a comparison cost for this plan	Next phase is to prepare costing comparison
How do we fund long term to operate and how do we pay for ongoing improvements and maintenance	Operating costs shown have factored maintenance, upgrade and replacement. Governance models need to be worked out and there are many options and models to choose from
The options are great and all seem feasible. Who will make the decision on the option and when will that decision be made and when will the job get done?	Steering Committee will decide on plan. No public vote. Various councils will support. If all goes well the solution would be in place in 2 – 3 years
I think your ratio of permanent to summer use residents is wrong. At Ma-Me-O it is likely 10% permanent not 25%	It doesn't affect the study at this time.
If the solution is 3 years away when will the Provincial government provide information and action to help protect the lake now? Can we get rid of outhouses now?	John Slater answered that there is a desire to put in by-laws but the problem is without an alternative it is difficult to legislate
Will the level of the lake change if discharge goes	Not really

back into the lake through the NW advanced mechanical system	
Do you take into consideration the benefit to wildlife and plant life by using the wetland and could they be used by the public?	This is out of scope for our project but the Wetland Stewardship Association could look at that option.
Is the wetland option only associated with the Advance Treatment?	Yes
Is there a risk of the pipelines leaking?	We don't find that a problem with pressurized pipes
Short term, can we eliminate outhouses and maintain our holding tanks and then move into new system?	Can retrofit holding tanks once we know which way we are going
What is the current condition of the lake	AB Government Environment department tests regularly. Nutrient levels are increasing and that is why Government is supportive of this project
Have you chosen the SE location for the treatment centre?	This is conceptual only – next phase
Heard about smaller treatment centers on small lots etc. There is one in Nisku. How much land would they take and why don't we go that route so each summer village could have their own?	They are available. Waste needs to be cleaner coming into those stations and then still need to be discharged somewhere. Also need a higher level of operator certification.
Is there a source to get a list of biodegradable products we should use now?	Suggest a web site search

June 2nd - 2:00 PM
For County of Wetaskiwin Property Owners
Approximately 130 people attended

Questions from Participants	Answers Provided by Resources Team and Steering Committee Members
Have recent water samples shown deterioration in lake quality and if so are current systems in use having a negative impact on the lake?	Yes. 5 spots in the lake have higher than acceptable levels
Can you explain the difference between Conventional Mechanical and Advanced Mechanical?	Jeff gave a detailed explanation
How does a constructed wetland work?	It is a polishing step after initial cleaning
Are you considering the affect agriculture and fertilizer use on lawns has on the lake?	That is out of our scope but the Watershed Stewardship Association is looking at this
Are there other technologies being considered?	Each category has several different technological options
Is the reserve included?	Campground is but not the rural areas
Isn't it cheaper to run more pipe than build a second facility?	The following slides will give you the break down.
Will everyone have to follow the chosen option – including the campground and Dorchester?	The status quo will not be an option. They will have an option to truck or go with the alternative option
Where will the pipelines run?	This is still at the conceptual level, we have not determined exact paths
Is the Provincial campground included?	Yes

Where does the effluent flow in option 3 if only the Advance Mechanical plant discharges to the lake?	Pigeon Lake and Pipestone Creeks
Have you included environmental costs of using trucks?	No
Will the province say that the status quo is no longer acceptable?	This is up to the Municipalities and Municipal Affairs. There is a movement in that direction and there will be steps taken to end further deterioration of the lake.
Is there an impact on fish habitat in the NW in Option 3?	That would be a hurdle for sure. Need to define the current environment and then ensure output is higher or better
What is the realistic time line and what is the funding for the project?	1 – 3 years for completion. The study is funded by the province. Study will be done by the end of August. Steering Committee will take it from there to determine next steps.
Will the government mandate if some groups don't agree?	Nutrient Levels are going up and government cannot allow further deterioration but we prefer to work cooperatively. Local government's creation of local by-laws preferable to mandates.
Will there be more options coming?	General sense now is that one of these options will be chosen
Do residents outside the study area have to buy in?	No
Can you run pipes across the bottom of the lake and take everything to a new bigger plant at Mulhurst	*Reply not noted*
Prevailing winds come from the NW – will we get an odor from the treatment plant?	Advanced Mechanical plants are set back 300 meters and must have odor control.
We'd like to see actual facts on the amount of pollution from agriculture vs. cottages.	Government rep committed to getting those numbers
Why is Winfield not included on the maps?	They are in the study. We'll correct the maps
I heard Mulhurst Lagoon is already at capacity – what's the plan?	Immediate future is to expand and upgrade Mulhurst. Expansion includes capacity for truck haul from some villages.
When will that expansion take place?	RFP has gone out. When tender is accepted work will begin.
If there is no funding for trucking why would we consider it?	You are correct; funding is higher for regional systems. This is done for comparison to existing.
How do we handle growth?	New developers will have to put in pipes for future system. Short term, tanks are being installed and trucks will haul.
Last plan was stopped by resident's refusal to buy in. Can we have assurance that that won't happen again?	Better process this time. Steering Committee has support of councils and government is at the table
I am concerned about the escalation of costs to connect to our homes.	Unfortunately we cannot guarantee prices – costs are escalating
It is critical to understand the implications. Property	Next steps will include costs to property owners

owners must know, within a reasonable variation, what the implication is to them.	
Are there any grants available for the homeowners?	No
How do you dig through sand?	The technology does exist
If the largest part of pollution comes from sources other than cottages how are you going to stop that?	That is out of the scope of this project but the Watershed Stewardship Association is looking at the bigger picture.

June 3rd – 10:00 AM
For Sundance Beach Property Owners
Approximately 62 people attended

Questions from Participants	Answers Provided by Resources Team and Steering Committee Members
Are current systems in the NE gravity?	Yes – plus pump stations
What happens when the power goes out	With a gravity system, waste water still flows. Without stand by power the pump station stops.
Would you have a check or backflow valve installed?	Not usually needed in a gravity system
What is the difference in quality of discharge in each treatment process?	Each meets the standard for effluent quality. Lagoon systems have more algae. Conventional Mechanical systems do a better job and Advanced Mechanic just that much better
Aren't the wetlands seasonal?	Yes – you have to have storage in the wetlands
Is there land available for treatment plants?	There is land for the expansion of the Mulhurst station. New locations would have to acquire land.
Are other things draining into the lake currently? Other effluents?	Beyond scope- Watershed Stewardship Association looking at that. Millet uses the Pipestone Creek and several others use the Battle River.
Why can't we run the pipe through the reserve land?	Acquisition of the land would be too difficult.
Are the First Nations a part of this?	They are on the Steering Committee but have not been participating.
Can you build collection sites and then truck to them rather than pipe?	You could do this as a phased approach. Build collection sites and haul to them before going to pipe.
Do we have control over Reserve waste water?	Controlled by the federal government so collection would have to be negotiated.
If the reserve hasn't participated to date how will be get unanimous approval and move ahead?	Summer communities can go ahead while negotiation with First Nations continues.
What consideration is being given to commercial applications and what about the farms?	There is minimal domestic waste water associated with farming – more an issue of run off. Watershed Stewardship Association looking at that
In option 5 where does the effluent flow?	Lake in NW and creeks and rivers on the others
How can you get a realistic truck haul estimate when costs are escalating so much?	Difficult for sure. At this conceptual phase we have based on past costs and inflation.
What is included in the $48.5 million in the life cycle costs for Local Private?	Pressure system retrofit for each home, operating pump and replacing pump periodically. Upfront capital costs should be equitable for lot owners.

	Operating costs may vary.
Is there funding for local private?	No
In the local private cost life-cycle comparison do you use existing tanks?	In this broad concept we factor a new tank for everyone. That wouldn't be realistic if you just installed a new tank.
Can we assume that the local private and the transmission portion of your costs will have some level of owner costs depending on the available funding?	Yes
In your summary you say Option 2 and 4 look favorable. How did you get there? Is that what you recommend?	We based that on cost, governance considerations, most feasible. Think relying on one treatment plant is riskier. Public opinion from the previous sessions indicates those are the best options.
Why don't you like option 3?	More cost, more facilities, more capital and more operating
Why does option 4 appeal to you?	We actually have gotten more information on option 4 that we've not fully indicated here. Perhaps we should call it option 4.1 as there may be alternate effluent discharge locations and lower advance treatment possibilities.
How can you move forward if there has been no input from the First Nations?	*Steering Committee representative answered* – if we get hung up on that we will get stalled. We will move ahead and negotiate with them at the same time. The campgrounds are the biggest user and they are a part of this.
What happens to their waste water when we go ahead?	We hope to have their wastewater go through Ma-Me-O
If they don't participate, will their waste go into the lake?	Yes – though they do have a lagoon for the school and some homes. The campgrounds are the biggest issue.
Are there any other lakes in the province facing this and what have they done?	Sylvan is expanding their existing system. Buffalo Lake has done a study and funding is pending. Lesser Slave Lake recently built an extension.
How did Associated Engineering get involved and who is paying?	Steering Committee started one year ago. Realized that a study was needed. Sent out an RFP in November '06. Hired Associated. Funding is 100% from Alberta Infrastructure.
Hope that we don't stall. Think it is important that cottagers show leadership and lead the way. Hopefully agriculture and those not already on board will do their part and do the right thing.	Watershed Stewardship Association are working at a grass root level starting at your homes and going through everyone who works or plays on the lake. Education is the key.
Are there options on the size of the treatment facilities?	Yes – for our cost analysis figures here we used what we felt was most logical.
Would it be compulsory for everyone to hook up to the new system?	Each municipality or county will decide. There is a drive for consistent by-laws and disposal structure.
Can you clarify what the July meetings will be for?	Summary of recommendations and implementation plan. Our study will be ended and the Steering

	Committee will have approved the Master Plan.
Will that give us a time line?	It will give an idea. Funding and municipal issues will factor into the timeline.
Is the best case scenario 3 years and the worst 7?	Yes
I am confused – who is "in" and who is "out"? I thought only the First Nations was not on board?	You are correct. All summer villages and counties are in and supportive.
If this goes through will each property have a tank that attaches to a sewer?	Yes
Will it be a new or an existing tank?	Depends on the condition. Must have man access. Pembina Tanks and Tanks-A-Lot are two suppliers.
Is this presentation available?	Working with local administrators to make it available

June 3rd – 2:00 PM
For Leduc County Property Owners
Approximately 40 people attended

Questions from Participants	Answers Provided by Resources Team and Steering Committee Members
We did not get informed about this meeting until we read it in the Edmonton Journal last week. The County should send us a notification for important events like this	Apologized for confusion – committed to discussing this with the County representatives on the Steering Committee and ensuring participants would get notified for future events.
Is this a continuation of the last study?	No – then background provided.
What started this study?	Damage to the lake, Need for environmental clean up. AB Environment encouraging this work.
Where is Dorchester development?	South of Black Bull Golf Course. Sizeable development which impacts waste treatment.
On the slide summarizing initial questions asked – how do you assess "user pays proportionally"?	My interpretation of that comment is that cost would be proportional to generation of waste water not size of property.
What do you know about the affect this will have on lake level?	Minimal affect – 1/2 "/year perhaps
What is the population breakdown north vs south side of the lake?	Cannot provide exact numbers but there is higher use on the south.
Where will the NW location be, as is indicated in option 3?	Conceptual right now no precise location selected.
How widely used are Advanced Mechanical Systems?	One in AB at Lesser Slave Lake, several in B.C, Ontario and the U.S. Gold Bar plant in Edmonton has AMS for a part only.
Any idea how large a wetland area would be needed?	In Lesser Slave Lake they use a ¼ section.
How do you collect waste water from residences?	Ultimately pipeline. Interim trucks haul from holding tanks.
How do you mandate removal of outhouses and other pollutants?	Must start the process. Municipalities will look to enact bylaws and the Watershed Stewardship Assoc will look at the whole issue.
Do new developments have to put in collection systems?	Yes – currently they would truck from holding tanks

What percentage of the problem comes from cottagers vs. farm and agriculture?	We don't have exact figures. Cottage portion may be smaller but is seen as bigger health issue. Farm and Agriculture less risky. Again Watershed Stewardship Assoc will look at the whole issue.
Several of your premises in this study are incorrect. I don't think you are correct in saying private systems are more costly; more residents full time in the future; current population 25% permanent.	From our research we believe these figures are reasonable when considering the entire lake.
You don't mention disposal of gray water in this project – why?	Gray water is easier to treat when combined with one set of pipes and treatment centers.
Does the provincial park have its own lagoon and is it leaking?	The Provincial Park is represented on the Steering Committee and they plan to abandon the existing lagoon and join the regional system.
Option 2 and 4 might be favorable but with the Falun option they might be increased by $4.5 mill. Option 1 looks like more available funding. Why didn't you pick option 1?	Our biggest concern is governance with everything going to one location.
Can the government enforce municipal clean up?	We don't have the regulatory tools to take care of smaller systems so we are participating with the regional plan.
Has the government got a track record to show that this negotiation and cooperative approach will work?	Frankly we don't have a very good track record at Pigeon Lake but still believe that cooperation and regional approach will be the most effective. Believe the steering committee approach is the best approach.
What is the advantage to going outside the watershed to provide service (i.e. Dorchester)?	No benefit to the other users, just another user who could pay their portion. It would be short sighted not to include them.
You don't indicate what you are thinking for governance models. What are you considering?	There are several proven models but we have not had in-depth discussion with the Steering Committee. We will do so in the next steps.
The Edmonton Journal article indicated percentages of funding available. Is it accurate?	A member of the Steering Committee was quoted accurately. Dave from AB Infrastructure provided details.
Can we have a copy of this presentation posted somewhere?	Working with local administrators to do that.
Who is representing the non-summer village properties?	There are two representatives for Leduc County
Do you show any funding in your calculations?	No – everything is at gross cost

Addendum "F"

Sample Participant Survey Form

This survey form may be completed and submitted after today's meeting, or, if you prefer, complete it later and send it by mail to Gray Scott Consulting Group Inc., P.O. Box 4060, Edmonton, AB T6E 4S8 or FAX it to 780-986-6759.

1. **How did you hear about the information sessions?**

   _____

2. **Were resource people helpful in answering questions?**

   ☐ **Yes** ☐ **No**

   Comments:

   _____

   _____

   _____

3. **The information provided at the information session was:**

   ☐ **Not what I wanted** ☐ **Too much** ☐ **Too little**
   ☐ **Too technical** ☐ **Too conceptual** ☐ **Exactly what I wanted**

   Comments?

   _____

   _____

   _____

   _____

4. **At Pigeon Lake, what Summer Village or County do you live in, or visit for recreational use.**

   _____

5. **I have the following comments regarding the options presented at today's meeting. (If you require additional space, please fill out another form and ask that it be attached to this initial form.)**

   _____

   _____

   _____

The personal information on this form is collected under the authority of Section 32 (c) of the Alberta Freedom Of Information And Protection Of Privacy Act. The information will be used to account(s) and your name and address may be included on reports that are available to the public. If you have any questions on the collection and use of this information, please contact the FOIP Coordinator at (780) 352-3321.

_____

_____

6. Has the project team overlooked any options or considerations to date?

_____

_____

_____

_____

_____

7. Other Comments?

_____

_____

_____

_____

_____

_____

_____

_____

_____

(Please fill in if you wish to receive a copy of this survey response summary)

Name _____

Mailing Address _____*Postal Code* _____

E Mail Address _____

Thank you for your responses

If you require follow-up to this survey, please call

Gray Scott Consulting Group Inc.	**434-9322**
or email to	**jags@telusplanet.net**
or FAX to	**(780) 986-6759**

The personal information on this form is collected under the authority of Section 32 (c) of the Alberta Freedom Of Information And Protection Of Privacy Act. The information will be used to account(s) and your name and address may be included on reports that are available to the public. If you have any questions on the collection and use of this information, please contact the FOIP Coordinator at (780) 352-3321.

Addendum "G"

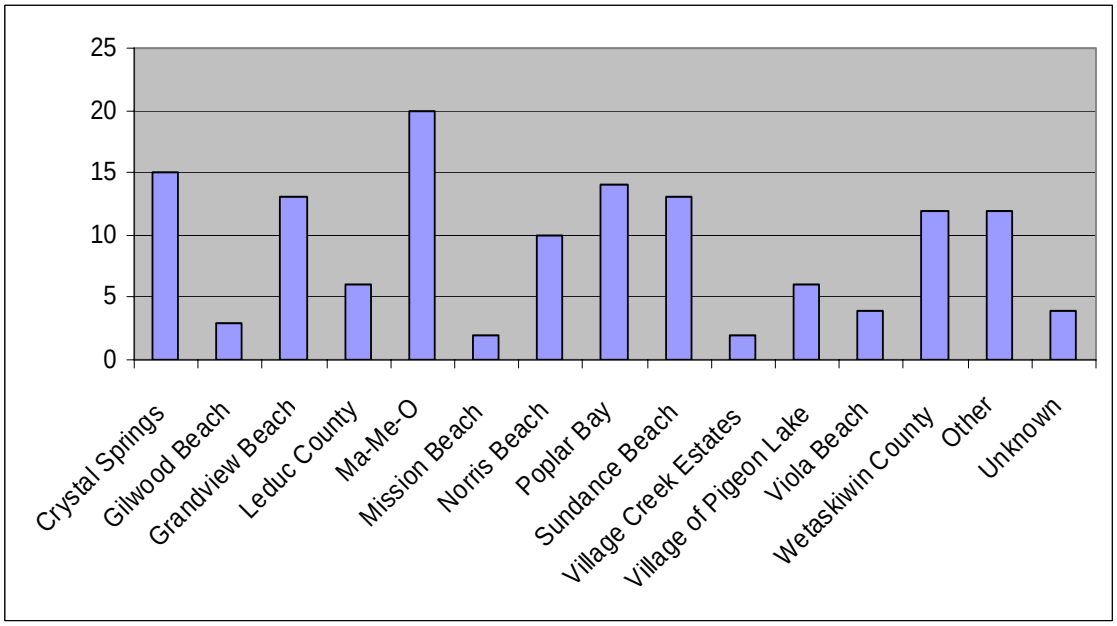
Summary of Survey Responses
Community Meetings, May - June, 2007

Pigeon Lake Regional Wastewater Strategy and Master Plan Project

1. Statistical Summary

- Six Sessions held: 2 each on May 26, June 2 and June 3, 2007
- Average length of each session – 1 3/4 hours
- Number of Participants (total) – 587
- Survey responses received – 136 or 23%

The following graph indicates the residency breakdown for the survey respondents



2. Beach by Beach Summary of Responses

Crystal Springs – 15 respondents

- All 15 respondents felt the resource staff was helpful in answering questions.
- 12 respondents felt the information provided was "exactly what they wanted". The remaining 3 respondents did not answer the question.
- Comments included:
  - Let's get going - we want a sewer system.
  - Appreciate being advised of options rather than being presented with plan as a "done deal".

- Helpful to have all levels present (AB, steering committee and municipalities) and a clearly presented engineering plan.
- Very informative, information is power. Very well delivered for buy in.

Gilwood Beach – 3 respondents

- All 3 respondents felt the resource staff was helpful in answering questions and the session was helpful or "exactly what they wanted".
- They wished to be kept informed on progress.
- 1 of the 3 respondents liked option 3 best.
- Comments included:
  - Supportive of a comprehensive sewer system and make it mandatory. We are willing to spend money to get this going.

Grandview Beach – 13 respondents

- All 13 respondents felt the resource staff was helpful in answering questions and felt the information provided was "exactly what they wanted".
- Comments included:
  - We must go forward with this as soon as possible.
  - We can wait no longer. We must deal with a solution now.
  - This is the 3rd approach that I have been through - it is clearly much more professional than the previous attempts. Time is of the essence. Please get on with this.
  - You need to recommend best, most flexible options so we can move ahead.
  - I like option 2. I don't want Mulhurst to be able to hold us hostage for a second time. Developers should be charged upfront before new developments are approved and using the new system. Should not be a choice.
  - Well done, congratulations to the steering committee. Good organization and structure. Giddy up and get it done.

Leduc County – 6 respondents

- All 6 respondents felt the resource staff was helpful in answering questions.
- 5 of the 6 respondents felt the session was "fine" or "exactly what they wanted. 1 respondent felt it was too little and needed more detail on treatment and collection.
- 1 respondent chose option 1 and 1 chose option 2. The others did not indicate a preference.
- Comments included:
  - Sewage system needs to be implemented immediately with no chance for public to argue.

Ma-Me-O Beach – 20 respondents

- All respondents felt the resource staff was helpful in answering questions and 7 felt the information provided was "exactly what they wanted".
- 2 respondents felt it was too conceptual, 1 felt it was too little and 1 did not answer the question.
- 2 respondents have concerns regarding lack of participation by the First Nations.
- There were questions regarding costs for individual property owners and a recommendation to build a treatment centre just for Ma-Me-O.
- Comments included:
  - Need to know what we are going to before I can upgrade my system so that I am compatible.
  - Time line too long. Need a seamless system to prevent frequent repair or replacement.

- Don't spend too much time on consensus nor have a vote. Would like to see time line. First Nations need to be on steering committee.
- Need to move now. Trucking is the most viable solution. Why does this take so long? Need to look at full environmental issue for the lake.
- We know that it must be done but how much will it cost me? How long do I have to budget and am I going bankrupt over it?

Norris Beach – 10 respondents

- All 10 respondents felt the resource staff was helpful in answering questions and felt the information provided was "exactly what they wanted".
- Comments included:
  - Good introduction, look forward to more info and moving forward.
  - Glad there was representation from government. This issue has been going on for too long without their visible presence. This is too important for them to ignore.
  - Excellent job, very informative. Would have been helpful to have amount per lot for hook up for a global perspective.
  - I prefer a high level of treatment - option 4 as sounds better long term.
  - Personally like 2 plan option to ensure future of our water treatment is first grade.

Poplar Bay – 14 respondents

- 12 respondents felt the resource staff was helpful in answering questions and felt the information provided was "exactly what they wanted".
- 2 respondents felt responses from Government representatives were not detailed enough and the government representatives not well enough informed.
- Those same 2 respondents also felt there should have been more detail on landowner costs and more clarity on options.
- Comments included:
  - We say "just get on with it". Pleased, but want action as quickly as possible.
  - We need to get on with this project to preserve the quality of our lake.
  - Very helpful. Is it possible to get copies of the presented information to share with individuals that could not attend today's session?

Sundance Beach – 13 respondents

- All 13 respondents felt resource staff was helpful in answering questions.
- 11 respondents felt it was "exactly what they wanted", "appropriate" or a "good review".
- 2 respondents felt there should have been handouts in order to follow the presentation.
- 1 respondent felt option 4 was best and another felt 2 or 4. The others did not indicate a preference.
- Comments included:
  - Need more handouts with options. Can't be informed by slides only.
  - We need to work together to protect the lake and health and welfare.
  - Big concern is the lack of participation from First Nations.

Village Creek Estates – 2 respondents

- Both respondents felt resource staff was helpful in answering questions and the information provided was "good" or "exactly what I wanted".
- Comments included:

- Pipeline would be best due to funding available. Less trucking which causes other problems with noise, pollutions etc.
- Would like to see costs with funding applied.

Village of Pigeon Lake – 6 respondents

- 5 respondents felt staff was helpful in answering questions; the other did not answer the question.
- 3 respondents felt the material presented was "exactly what they wanted"; 2 respondents didn't answer the question.
- 1 respondent indicated that "at the start it was adequate" but did not indicate anything further.
- Comments included:
  - Good information on the way systems can work.
  - A repeat of previous studies, when do the studies end?
  - Need to improve constraints on fertilizer use and other green ways to operate.
  - Provide stats on what is going into the lake at the next session.
  - Need further clarification on plans for Options 2&4 as the suggested best options. Measure impact on roads due to volume.

Viola Beach – 4 respondents

- All respondents either felt resource staff was helpful in answering questions and felt information provided was "exactly what they wanted" or they did not respond to the question.
- Comments included:
  - Too early to get the conclusions but it is comforting to know the depth of the alternatives being considered. This is the first year that the run off has increased the lake level. If the higher quality effluent options were considered the treated water could be part of the solution to keep the lake at a considerable depth. Last year the lake was getting so low that it was a concern.
  - Copies of slides. Don't have agreement to proceed with solution. Should mandate it. Appreciated the high level analysis - would like more details on funding and financing. Presentation was in plain language with a good level of detail.
  - Very good, well presented easy to understand. No mention of subdivision south of Norris Beach - 56 Acres (156 lots). Also, subdivision close to Dorchester 1/4 section complete division into lots.
  - Concern that short-term / part-time users may have to pay the same monthly fee as year round users. That doesn't seem fair.

Wetaskiwin County – 12 respondents

- 10 respondents felt the resource staff was helpful in answering questions and 6 felt the information provided was "exactly what they wanted.
- 4 respondents felt the material covered was either "too little", "too conceptual", "not what I wanted" or "somewhat helpful".
- 1 respondent felt the answers on the current lake condition were "weak".
- Comments included:
  - Support option 3. Very good meeting let's get started.
  - More facts at the next meeting.
  - Will taxes be affected? Are the grants the same no matter which plan you use.
  - Chemical Treatment and Incineration. Used in remote northern communities equally effective and lower capital costs.
  - Build it large enough so that we are not discussing again in 10 - 20 years.

- First Nations and Reserve must be a part of it
- Why was natural solution eliminated? Usage based funding model is preferred.
- Would like a copy of the presentation. Need more detail on funding. Let's make the decision - fast decision.
- Let's get a mandate and get it done.

Other or Location Not Provided – 16 respondents

- 13 respondents felt the resource staff was helpful in answering questions and 9 felt the information provided was "exactly what they wanted" or "a good start".
- 1 respondent felt the presentation was too technical and another felt it was too conceptual.
- 2 respondents felt the information was "not what they wanted".
- Comments included:
    - Meeting turnout was mainly by people who support the sewage project. Perhaps majority who did not attend oppose this project. Forced solution is not fair to seasonal dwelling - costs need to be allocated on usage. Permanent residents contribute to the problem at far greater magnitude. Is there a cost sharing model recognizing the 75% seasonal users? Why should they pay as much as the large permanent residents? (Aspen Acres)
    - They did not show any consideration to weekend cottage users. This project is driven by a vocal self-interested group - "pie in the sky" until real costs come in. (Aspen Acres)
    - They had their agendas that they wanted to present. Would like to know how this study originated. We were forced to put in a sewer at our expense and now we have to contribute to the regional system. Does Associated Engineering not realize that Johnsonia Beach is already on a sewer system? (Johnsonia)
    - This is a municipal or provincial decision just mandate it and soon. No different than any other public works project. (Mulhurst)

3. Common Themes Expressed in Surveys

Several participants wanted a hard copy of the presentation, or for the presentation to be put on a web site for access to the public.

Significant concern was expressed regarding condition of the lake as well as some frustration expressed regarding "yet another" process. Expectation is high for swift delivery of a solution. There is a strong desire to see aggressive timelines. Many attendees called for this decision to be mandated, with no vote and no more study.

Concern expressed regarding the costs to the cottage owner and the proportionate amount for full time residents vs. summer residents and current owners vs. future development.

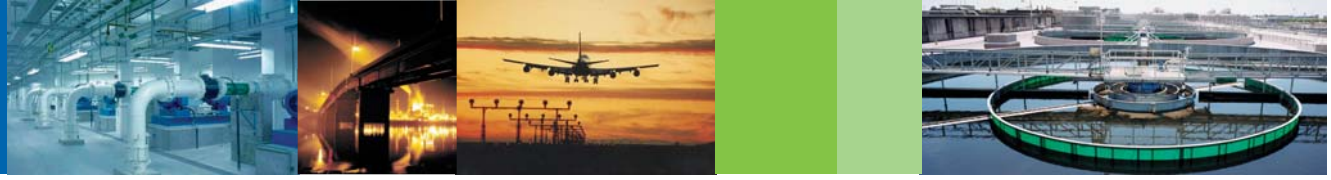
There was concern regarding First Nations involvement. There is concern about compliance by the campgrounds and the ability to mandate compliance and participation by the First Nations and the Federal Government.

Many questions were raised as to the cause of the deterioration of the lake. In addition to wanting facts and figures they called on the Provincial Government to provide a plan to stop further damage now.

Several participants asked that road repair costs and environmental issues be taken into consideration when analyzing the truck haul costs.

Addendum “H”

Display Boards for July 29, Open House and Information Session



Pigeon Lake

Regional Wastewater Strategy and Master Plan

Public Open House and Information Session

WELCOME

Gray Scott Consulting Group Inc.

Associated Engineering

Common Themes Expressed at May 26, June 2 and 3 Meetings

(WHAT WE HEARD)

- **Approximately 600 people attended the 6 meetings; almost 150 surveys and comments returned.**
- **Significant concern was expressed regarding the condition of the lake.**
- **Frustration expressed regarding “yet another” process.**
- **Expectation is high for swift delivery of a solution with a strong desire to see aggressive timelines.**
- **Many attendees called for this decision to be mandated, with no vote and no more study.**
- **Concern was expressed regarding the costs to the cottage owner.**
- **Proportionate sharing of costs by full time residents and summer residents needs to be considered.**
- **Current owners should not have to bear the entire cost of the system - Future development must also contribute to both capital and ongoing maintenance costs.**
- **Concern regarding First Nations involvement; particularly, about compliance by the campgrounds, the ability to mandate compliance, as well as participation by the First Nations and the Federal Government.**
- **Road repair costs and environmental issues must be taken into consideration when analyzing the truck haul costs and comparing them to other options.**

PROJECT OBJECTIVES

To develop a Regional Wastewater Strategy and Master Plan for the Pigeon Lake Watershed Area as well as the Dorchester Development.

Complete a feasibility level economically based assessment that:

- defines logical project boundaries;
- provides conceptual cost estimates for options;
- considers community growth requirements; and
- provides recommendations for a viable governance model(s).

MEETING PURPOSE

1. The purpose of this open house event is to build upon the information communicated to ratepayers at the series of neighbourhood meetings in late May and early June.

2. To communicate detailed information about which options are going to be recommended to the steering committee and rationale for why those options were chosen.

3. To communicate the overall total costs of those recommended options and the breakdown of those costs so that each individual rate payer has information on what it will cost him or her (including available and accessible government funding and probabilities of securing that funding.)

4. To communicate a detailed forecast of the time line for implementation of the strategy.

5. To seek final input from those in attendance on the material presented.

STUDY AREA

EXISTING AND FUTURE DEVELOPMENT

PIGEON LAKE

NORTH PIGEON LAKE

NORTH EAST PIGEON LAKE

SOUTH PIGEON LAKE

MISSION BEACH

MITCHELL BEACH

MOONLIGHT BAY

S.V. of SUNDANCE

KEOH COVE

S.V. of ITASKA

Zeiner Park

Fisher Home

Sunset Harbor

S.V. of Argentia Beach

S.V. of Golden Days

Mulhurst Bay

S.V. of Silver Beach

S.V. of Poplar Bay

S.V. of Grandview

S.V. of Crystal Springs

S.V. of Sunset Beach

S.V. of Ma-Me-O Beach

Village at Pigeon Lake

Westerose

WATERSHED BOUNDARY

BATTLE LAKE

BATTLE RIVER

PIGEON LAKE RIVER

LEGEND

EXISTING DEVELOPMENTS

FUTURE AND PROPOSED DEVELOPMEN

PIGEON LAKE REGIONAL WASTEWATER STEERING COMMITTEE

STRATEGY AND MASTER PLAN
FUTURE DEVELOPMENT

SCALE : NOT TO SCALE
JANUARY, 2007

FIGURE 3.0

Associated Engineering

PROJECT NEED

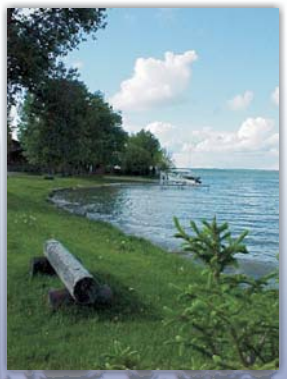
- Urbanization of lakeshore areas
- Private sewage systems costly and risky
- Intensifying development
- Changing property use – Seasonal to Permanent
- Protect the lake
- Act now rather than react later

STATUS OF EXISTING SYSTEMS

- Existing on-site disposal is no longer suitable
  - disposal field
  - out houses

- Truck haul from holding tanks is acceptable; however, still requires disposal, and existing treatment systems do not have capacity to service the entire region

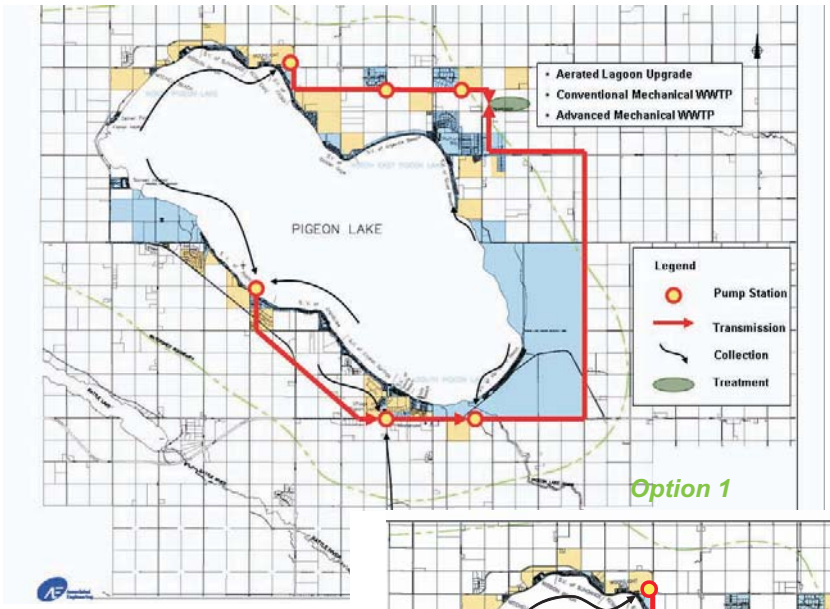
- A new or upgraded treatment system is required consistent with a feasible long term collection strategy



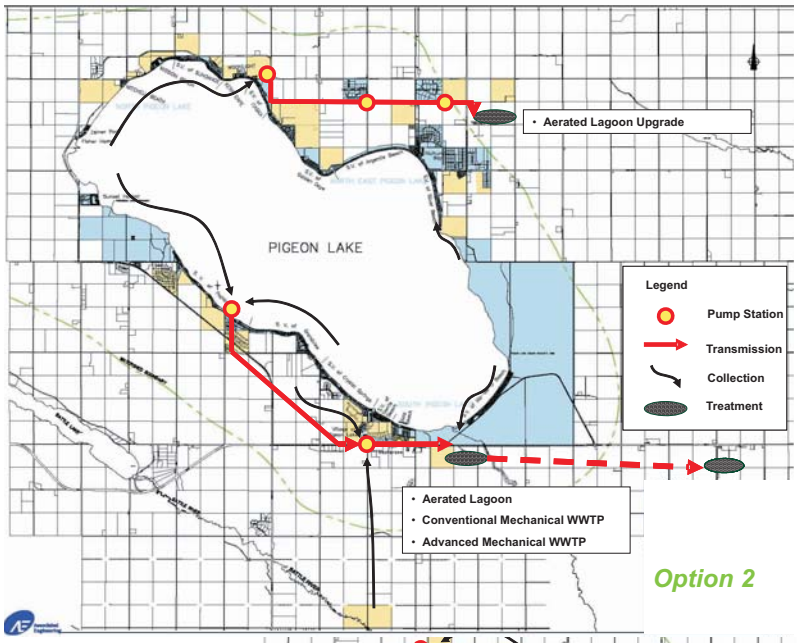
PREFERRED OPTIONS

SUMMARY OF REQUIRED INFRASTRUCTURE

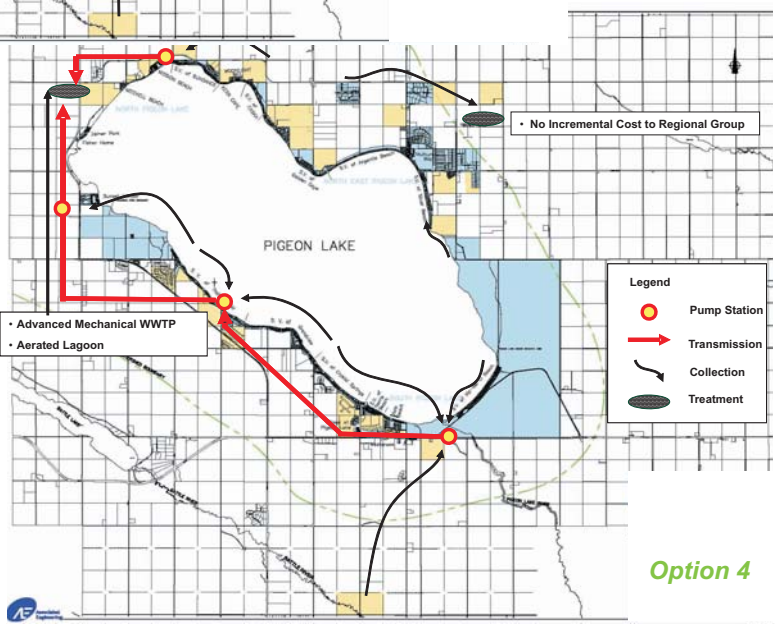
Option	Length of Collection and Transmission Pipe	Number of Lift Stations	No. of WWTF
Option 1	88,800 m	6	1
Option 2	70,950 m	5	2
Option 3	67,400 m	4	3
Option 4	78,000 m	4	2
Option 5	64,500 m	3	4



Option 1

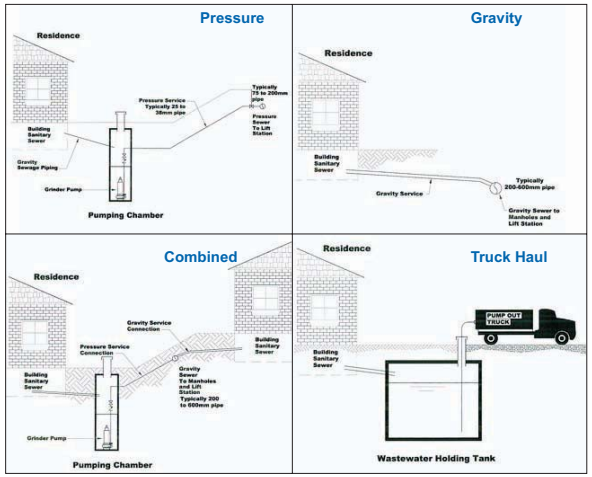


Option 2

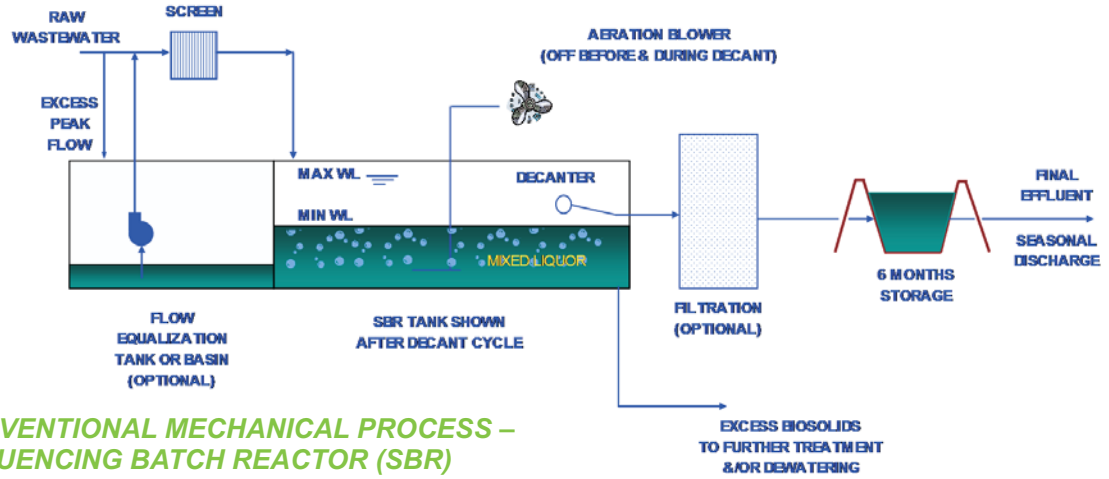


Option 4

LOCAL COLLECTION OPTIONS

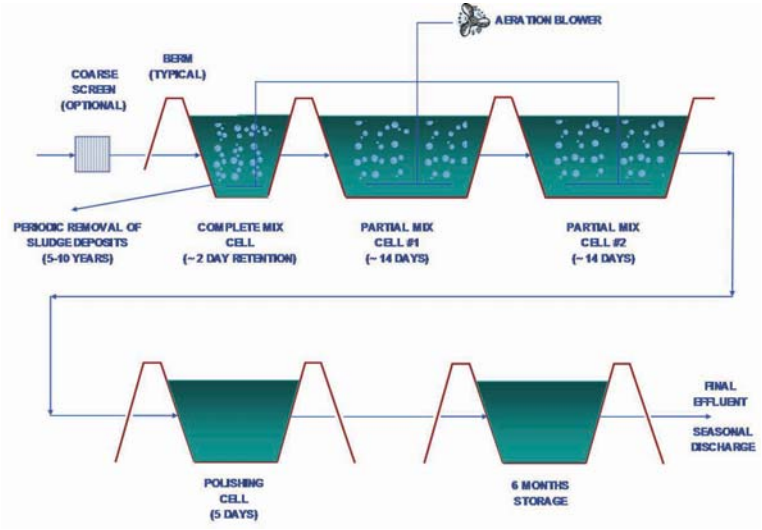


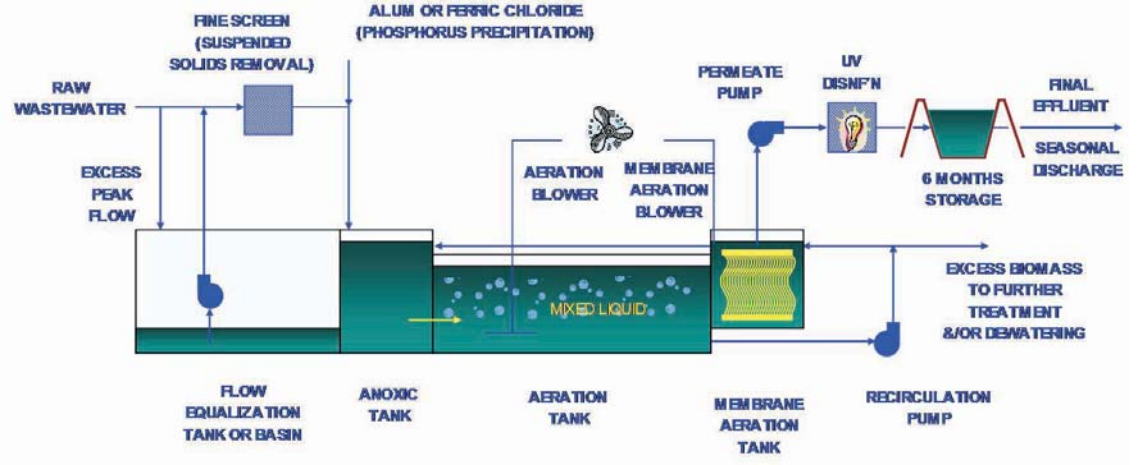
WASTEWATER TREATMENT TECHNOLOGY OPTIONS



CONVENTIONAL MECHANICAL PROCESS – SEQUENCING BATCH REACTOR (SBR) EXAMPLE

AERATED LAGOON PROCESS





ADVANCED MECHANICAL PROCESS – MEMBRANE BIOREACTOR (MBR) PROCESS

WASTEWATER MANAGEMENT SYSTEM OPTIONS AND CAPITAL COSTS

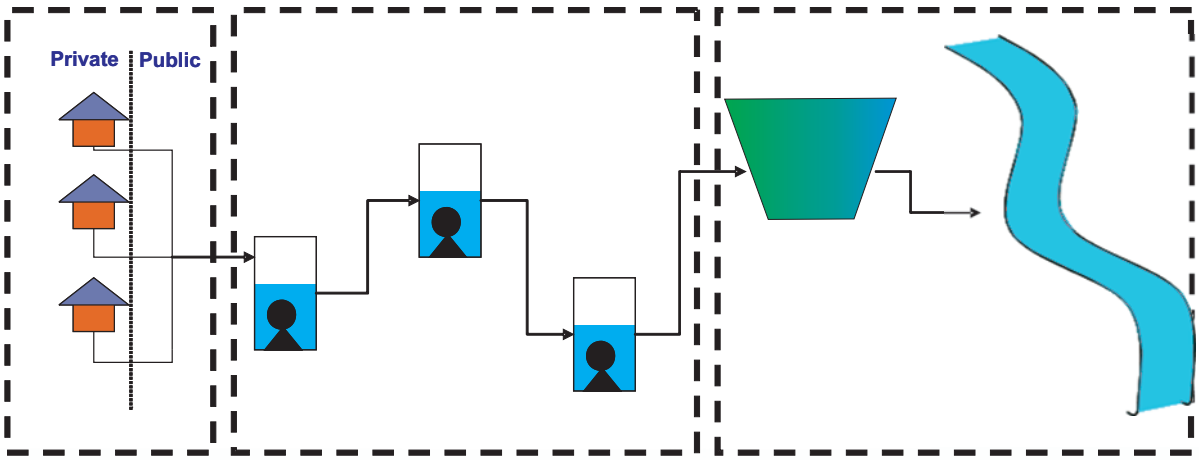
Local Collection → **Regional Transmission** → **Treatment** → **Effluent Mngmt.**

- Haulage
- Pressure Sewer – Grinder
- Pressure Sewer – Effluent Pump
- Conventional Gravity
- Combined Systems

- One Treatment Facility
- Two Treatment Facilities
- Decentralized Facilities
- Combinations

- Stabilization Lagoons
- Aerated Lagoons
- Conventional Mechanical Plants
- Advanced Mechanical Plants

- Pigeon Lake Creek and/or Pipestone Creek
- Battle River
- Constructed Wetlands - Indirect lake Discharge
- Strawberry Creek



Local Collection		Regional		
Private	Public	Transmission	Treatment	
32.0	11.4	15.2 - 20.2	6.5 - 10.4	Gross Cost
none	0 - 66%	50 - 90%	50 - 100%	Funding Potential
32.0	4.6 - 11.4	1.2 - 7.7	0 - 5.2	Net Municipal Cost

Cost shown in $ 000,000

RATE IMPLICATIONS ($/YR/LOT)

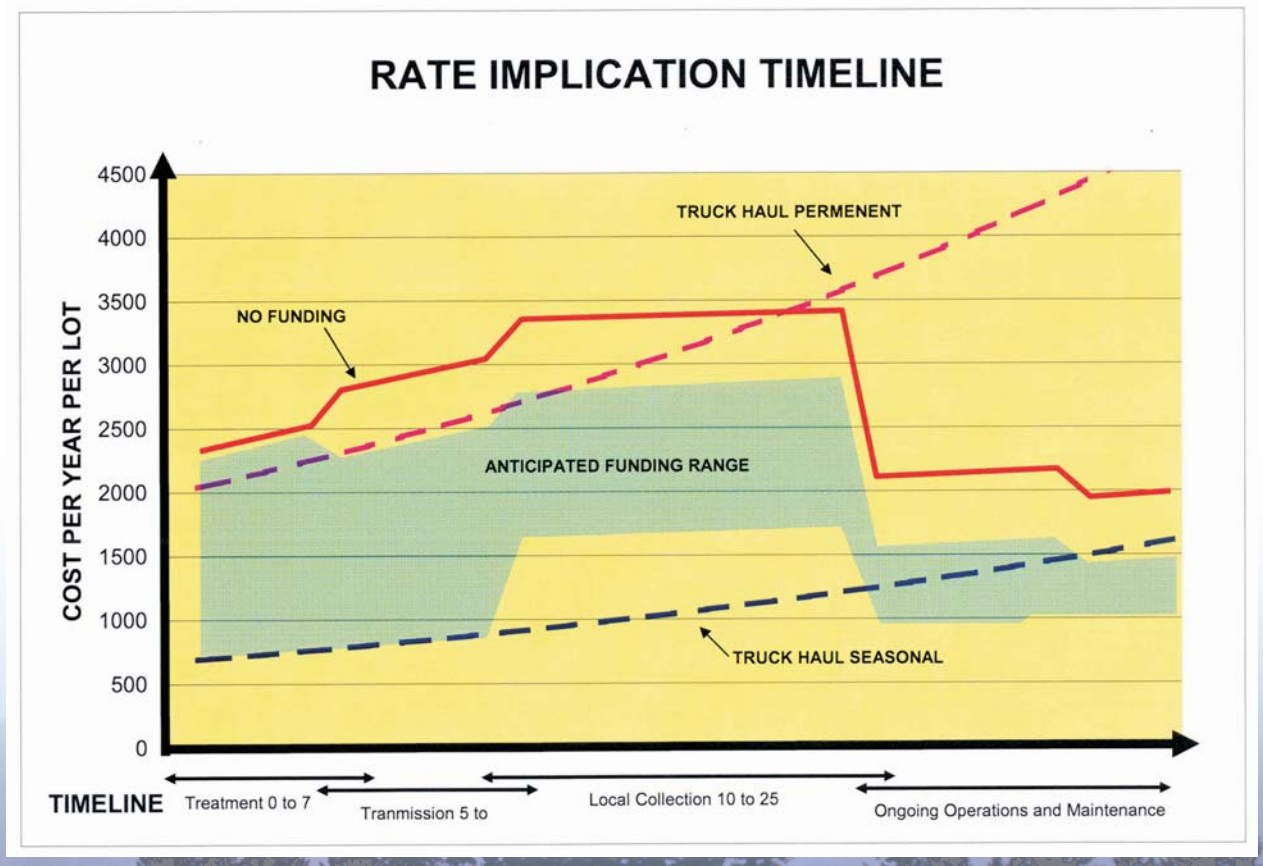
Component	Treatment	Transmission	Local Collection Public	Regional Operations	Total Municipal
Option 1	0 - 60	80 - 230	170 - 420	240	490 - 950
Option 2	90 - 180	50 - 220	170 - 420	150	450 - 960
Option 4	100 - 200	60 - 290	170 - 420	175	500 - 1070

Based on 2120 Lots, 25 Yr Debenture at 6% Interest

Component	Local Collection Private
Option 1	1030 - 1550
Option 2	1030 - 1550
Option 4	1030 - 1550

Total Initial Annual Cost
1520 - 2490
1480 - 2510
1530 - 2620

Based on 15 Yr Debenture at 6% Interest



NEXT STEPS

- **Meet with steering Committee to review stakeholder input and preferred options - August 24th**
- **Submit report to Committee - September 7th**
- **Committee approves the Plan**
- **Letters of Municipal Support**
- **Funding Application Submission**
- **Implementation - 2 to 5 years**

Gray Scott Consulting Group Inc.

Associated Engineering

Addendum "I"

Open House Announcement

Pigeon Lake Regional Wastewater Strategy and Master Plan

Sunday, July 29, 2007 10:00 AM to 4:00 PM
Lakedell Agricultural Society Community Hall

As many of you may know, the Pigeon Lake Regional Wastewater Strategy and Master Plan Steering Committee is undertaking the Strategy and Master Plan Study. The purpose of the project is to develop a strategy to implement a wastewater system for the Pigeon Lake watershed area as well as the Dorchester Development

The Associated Engineering project team in cooperation with the Steering Committee held a series of six meetings in late May and early June to present the results of the study to date. Participants at these very well attended meetings were provided with information of the components of a wastewater collection, transmission and treatment system and a series of five options for a complete wastewater system for the study area.

Participants provided strong feedback that a wastewater strategy must be developed and implemented as soon as possible and that they required much more detailed information on the overall costs and impacts of the system and how much it would them as individuals.

The final phase of the public consultation for the study will be an open house on Sunday, July 29, 2007 from 10:00 AM to 4:00 PM at Lakedell Agricultural Society Community Hall. Identical presentations, followed by short question and answer periods, will be held at 11:00 AM and again at 2:00 PM.

The objectives of the open house will be:

- To communicate detailed information about which options are going to be recommended to the steering committee and rationale for why those options were chosen.
- To communicate the overall total costs of those recommended options and the breakdown of those costs so that each individual rate payer has information on what it will cost him or her.
- To seek final input from those in attendance on the recommendations and other material presented.

Addendum “J”

Frequently Asked Questions Handout
July 29, Open House and Information Session

Pigeon Lake Regional Wastewater Strategy and Master Plan Project

Information Session (10:00 AM – 4:00 PM, JULY 29, 2007)
LAKEDELL AGRICULTURAL SOCIETY COMMUNITY HALL

Commonly Asked Questions and Answers

1. How much is the recommended system going to cost me personally – including that portion of my taxes that is going to go to the construction and ongoing maintenance of the system?

   The total initial cost of the entire system is estimated to cost between $1,500 and $2,500 per lot per year depending the eventual level of funding and the cost of work or your property.

2. What will I get for my individual portion?

   The cost estimates account for the complete supply and tie-in of a pressure sewer onto each lot. This would include piping, tie-in to your external sewer system, a pump station, electrical hook ups, alarms and tie-in from the pump station to the municipal service at your property line.

   Cost of work on each lot will vary depending on specific site conditions such as; length of pipe required, surface obstacles, available work space and conditions of existing systems.

3. What if I, or my neighbour, do not want to be part of this and want to opt out?

   Each Municipality will have to deal with these issues under local Bylaws when the time comes. Most residents and Municipalities have indicated once a municipal system is available tie-in will be mandatory.

4. Will my municipality (Summer Village or County) tell me or help me with purchasing and installing my hook-up to the collection and transmission system?

   Once local collection systems are designed and under development a standard specification and guideline for supply and installation of hook-ups will be provided.

5. Is it really realistic to expect grant money from the various Province of Alberta funding assistance programs for wastewater treatment?

   Yes, the treatment system is eligible and the Province funds these types of projects on a priority basis. The actual timing of grant contributions would depend on the project priority and available grants funds.

6. Tell me again, what Provincial and Federal funding is available and accessible for a wastewater system around Pigeon Lake?

   Provincial - Municipal Water and Wastewater Partnership (up to 75%)
   Water for Life (up to 90% for regional systems)

   Federal - Canada-Alberta Municipal Rural Infrastructure Fund (66%)

7. What are the next steps? When will we have a safe, secure, efficient and affordable system in our municipality?

   The next step is to support the recommended Master Plan and start implementation of the chosen system (treatment- transmission-collection). The implementation timeline will depend on stakeholder preferences.

8. Why should just the current property owners be paying the whole cost of the system? How are you going to set things up so that people new to the lake and those that will buy property in new developments have to pay too?

   The eventual cost recovery process will depend on the chosen organizational structure and Municipal preferences. The intent is not for the current users to fund future users. Each Municipality would be responsible for their share of the capacity. Typically new connections are then charged a connection fee (or levy) by the Municipality, during the development process.

9. Will we get a chance to vote again within our summer villages or counties or will the Steering Committee and the elected officials vote to proceed on our behalf?

   This will be up to each Municipality; however, most indicate that no public vote is planned.

10. I prefer not to use the NEPL wastewater treatment facility. What alternatives are there?

    Development of a new treatment facility, which is explored in the study.

11. Why are the First Nations not a part of the study?

    The First Nation areas that generate significant wastewater within the Pigeon lake watershed are considered in the study. The First Nations have been informed of the study and were invited to participate.

12. Will the construction of the collection and transmission system tear up our roads and properties and permanently damage our lakefront and our properties?

    The majority of the collection and transmission system within roadways would be installed by horizontal directional drills requiring minimal road disruption. Localized excavations will be required.

    Road and landscaping restoration would be completed and is typically unnoticed after a year or two.

13. Why and how did you pick the preferred options presented at the information session today?

    The preferred options reviewed today were chosen based on lowest initial capital and long-term (25-yr) operating costs.

COPIES OF TODAY'S AND THE PREVIOUS PRESENTATIONS WILL BE AVAILABLE ON THE FOLLOWING INTERNET SITES.

www.goldendays.ca

www.sundancebeach.org

http://groups.google.com/group/svnb

http://plrg.resco.ca/wordpress/

Addendum "K"

Participant Survey Form

This survey form may be completed and submitted after today's open house, or, if you prefer, complete it later and send it by mail to Gray Scott Consulting Group Inc., P.O. Box 4060, Edmonton, AB T6E 4S8 or FAX it to (780) 986-6759.

1. How did you hear about the information sessions?

_____

2. Did you attend one of the information sessions in May or June?

☐ **Yes** ☐ **No**

☐

3. At Pigeon Lake, what Summer Village or County do you live in or visit for recreational use.

☐ **Crystal Springs /** ☐ **Ma-Me-O Beach**

☐ **Norris Beach** ☐ **Grandview Beach**

☐ **Poplar Bay** ☐ **County of Wetaskiwin**

☐ **Sundance Beach** ☐ **County of Leduc**

☐ **Other (Please Specify)** _____

4. The information provided at the information session was:

☐ **Not what I wanted** ☐ **Too much** ☐ **Too little**
☐ **Too technical** ☐ **Too conceptual** ☐ **Exactly what I wanted**

Comments:

_____
_____
_____

5. Were resource people helpful in answering questions today? ☐ **Yes** ☐ **No**

Comments:

_____
_____

The personal information on this form is collected under the authority of Section 32 (c) of the Alberta Freedom Of Information And Protection Of Privacy Act. The information will be used to account(s) and your name and address may be included on reports that are available to the public. If you have any questions on the collection and use of this information, please contact the FOIP Coordinator at (780) 352-3321.

6. **I have the following comments regarding the information presented at today's meeting. (If you require additional space, please fill out another form and ask that it be attached to this initial form.)**

7. **My direction to the Steering Committee and the elected officials in my Summer Village or County is:**

8. **Other Comments?**

Thank you for your responses

If you require follow-up to this survey, please call

Gray Scott Consulting Group Inc. **(780) 434-9322**
or email to **jags@telusplanet.net**
or FAX to **(780) 986-6759**

Addendum "L"

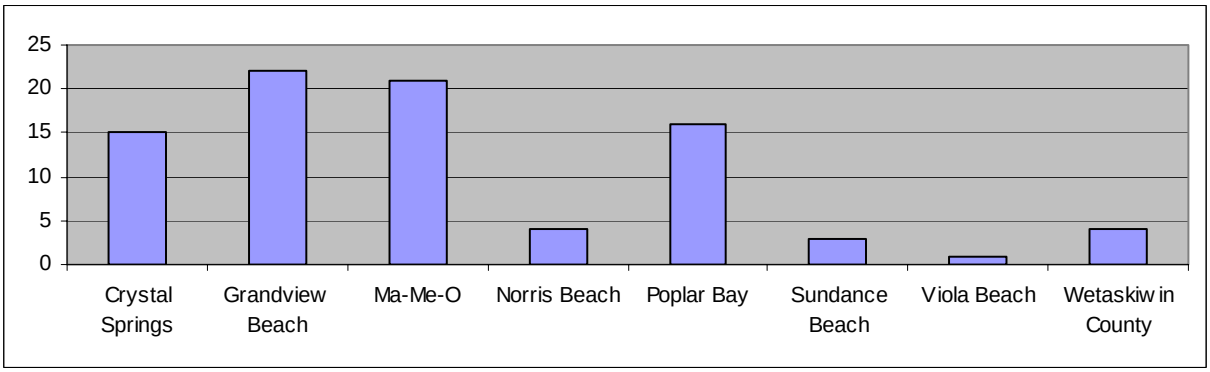
Summary of Survey Responses
Open House July 29, 2007

Pigeon Lake Regional Wastewater Strategy and Master Plan Project

1. Statistical Summary

- Open House from 10:00 am – 4:00 pm, July 29, 2007
- Three presentations given 10:30 am, 11:30 am and 2:00 pm
- Number of Participants (total) - approximately 360
- Total survey responses received 86 or 23.9%

The following graph indicates the residency breakdown for the survey respondents:



2. Preferred Option

The following chart summarizes the preferred options chosen in the survey responses:

Total responses	Summer Village	Option 1	Option 2	Option 4	# of responses with multiple choices	# of responses with no preference indicated
4	Norris Beach		2		0	2
15	Crystal Springs	1*	3*	4*	3	10
16	Poplar Bay	1	2*	3*	1	11
22	Grandview Beach		7*	6*	5	15
21	Ma-Me-O	3*	8*	4*	3	9
4	County of Wetaskiwin			1	0	3
1	Viola Beach				0	1
3	Sundance Beach			2	0	1
86		4	16	13	12	52
* indicates that some responses noted in the total, indicated more than one preference						

3. Common Themes

- Several participants expressed concern regarding the timeline. They feel there should be an aggressive timeline and work should begin soon.
- There is an ongoing concern regarding the lack of involvement by the First Nations people.
- Several participants expressed concern about maintaining control over the governance model for the system and not being a customer of the NEPL.
- Options 2 and 4 were preferred by those who noted their preference
- There is some concern expressed regarding calculations used to determine costs for seasonal vs. full time residents

4. Beach by Beach Responses to Question 6 which read "*I have the following comments regarding the information presented at today's meeting.*"

Crystal Springs – 2 people responded to this question

- Seems to me that the various recommended options are technically and financially a wash. The decisions remaining are political in nature.
- I will review the information on the web site as I wasn't able to write it down.

Grandview Beach – 7 people responded to this question

- Need to build a "first class" facility to demonstrate our commitment to the lake and the environment. Full speed ahead.
- Need to have this done and completed before 10 years. Fast track 3 - 5 years and make it go now before it is too late for the lake.
- Very clear and concise information.
- I would like to see the 3 - 5 year plan in place.
- Presentation had a lot of info on various options. Unfortunately the lighting on the screen from my position made the drawing and info difficult to read and follow along with the presentation.
- Not convinced that pressure system is the best answer. Grinder pumps at each home costly, smelly, not attractive and high maintenance. NEPL and most communities are using gravity systems.
- The process is proceeding along intelligent lines however update bulletins are required. You quote $1000 - $1500 as annual cost per lot and quotes it as double the present as a summer user any costs used to be $150 per year currently $225 per year.

Ma-Me-O Beach – 9 people responded to this question

- Pipestone Creek load must be looked at because Option 1 may not be viable.
- I am wondering how we will insure campground participation in master plan.
- Strongly support option 2. Mandate all septic fields and outhouses be eliminated immediately - no more grandfather clauses.
- Believe County of Wetaskiwin will not support your position (no rep at meeting) - has not in past. Grinder pumps need power on all year. Most cabin owners turn power of in winter. What happens to pump? 3 - 5 life span and you replace every 10 years - redo for 5 years.
- Let's "git er done".
- Good presentation.
- Great presentation. Excellent info "dumbed down" enough for lay people but still with excellent info and presentation.
- Please consider the quicker option.
- I am not clear about operation / maintenance cost of the pipeline vs. the lagoon. Which would be more efficient or economical over time?

Norris Beach – 3 people responded to this question

- I support the recommended master plan and we need to start the implementation of the chosen plan as soon as possible.
- The study did not address "Road Construction and Maintenance costs" for trucking wastewater.
- Individual sewer pumps apparently have a fairly short life span and are expensive to replace.

Poplar Bay – 5 people responded to the question

- Congratulations to the Steering Committee in getting the matter this far. Good consultation process.
- Option 4
- Very professional and prepared.
- We are in favor of moving ahead quickly with this s project. Completion should be within 3 -4 years.
- We think regardless of which option is used, the discharge must be very clean as not to impact anyone downstream.

Sundance Beach – 2 people responded to the question

- Option 4
- Possibly a more aggressive time line. 5 - 7 rather than 10 years.

Viola Beach - no response to this question

County of Wetaskiwin – 2 responses to this question

- Second time at a meeting - very good information with added information from earlier meetings. It is very important to include First Nations properties in any sewage treatment proposal to protect the water quality of the lake.
- The meeting was good and very informative. You presented options that if taken would spread out the downstream to at least three creeks / rivers and therefore spread out any damage after the lagoon stage in process.

5. Beach by Beach Responses to Question 7 which read *"My Direction to the Steering Committee and the Elected Officials in my Summer Village or County is.."*

Crystal Springs – 12 people responded to this question

- Let's get on with the project. There is evidence that the lake is getting to a crisis. There are too many nutrients getting into the lake now. I do not think we can wait for 2 - 5 years.
- Proceed, I like #4. Try adding on freshwater and fire hydrants.
- Proceed right away.
- Proceed with full system ASAP.
- Option 1 or 2 not Option 4. Do not start private property work until the rest of the system is in place. That gives owners of cottages time to save money for that big cost. Operating costs should be less for seasonal vs. permanent residents.
- Please rush
- Approval
- My preference would be for a stand alone system for the south side of the lake (costs being equal) i.e. options 2 or 4. Let's keep going and get it done as soon as possible.
- Wastewater management is inevitable. Proceed before costs become more expensive. However there should be some mechanism in place for proportionate sharing of costs among full time and summer residents.

- Please proceed (rush) as quickly as possible. Septic tanks are dangerous to our children and very damaging to our roads.
- Move forward as quickly as possible. If it is not possible to get a reasonable, long term agreement with the NE Lagoon then proceed with the next alternative.
- Do what you have to do to move the 5- 6 south side summer villages to a combined municipal structure. We need to have ONE summer village.

Grandview Beach – 16 people responded to this question

- Get phase 1 and 2 done as quick as possible. Secure the land. Get the government funding. Timeline for eliminating septic fields.
- Very expeditiously support the study recommendations and get the service implemented.
- Option 2 - expedite as quickly as possible.
- Option 4
- Whichever option is chosen, be sure it is am environmentally safe option (let's not Mickey Mouse the solution). Anticipate extreme weather patterns and build a facility which will not flood. Why so slow? We need to finish this project sooner.
- Establish and maintain control of our own system. Hurry the timeline. Keep the costs down.
- Get on with it.
- The 3 options are virtually the same cost, well with in tolerance of user. For the same cost option 2 and 4 give us ownership. Option 1 leaves us as a customer of a monopoly. It's a slam dunk for me - Option 2 or 4 - Option 1 is out.
- Select option 2 or 4. Do not want to truck to Mulhurst.
- Sooner than later. Don't use lagoon in Mulhurst.
- Any system but #1
- Get on with the system.
- 3 - 5 years and a treatment plant on the south side of Pigeon Lake as soon as possible. The sewage plant would be able to be used for pump outs.
- Do not use the NEPL Treatment Facility. Do not use a 2" pipe line or will cause problems. Build the treatment facility and transmissions line to handle future development.
- Move ahead with lagoons as soon as possible. Reconsider using gravity systems. Simpler and more fool proof could prove to be the best in the long run. Please rework the numbers for long run considerations.
- For south side villages, the best option would seem to be a new south-side treatment facility. The County of Wetaskiwin and NEPL may try to create obstacles to this option. Please resist political pressures driven by a hidden agenda and choose the best solution not the most politically expedient one.
- Keep communities informed. Did not appreciate the autocratic comments of the Mayor of Ma-Me- O Beach - "no vote - no choices". Positive thing is an asset. Dictatorship is not acceptable.

Ma-Me-O Beach – 16 people responded to this question

- Not to use Option 2
- Option 2
- Do not put it under NEPL control. Do not use Option #1. Costs must be paid by both fulltime and seasonal.
- Ongoing management and participation in that management in future is very important.
- The sooner the better. Option 2 is my first choice and #1 is my second choice.

- I support Option #1. It has the most aggressive timeline. All options seem to be relatively equal in terms of capital from the individual stakeholders.
- Let's start now - Option 2 and get a lagoon in place.
- Option 2
- We must move quickly.
- My choice is Option #2 with the Pigeon Creek Treatment plant not Falun. If we are defeated on land acquisition only then consider Falun.
- Move to implementing a solution quickly 2 - 3 years. In the mean time eliminate field and earth houses and require tanks. Move to ban fertilizer use on lawns now. This is about preserving the lake and we need to deal with issues, other than or rather in addition to, wastewater.
- Continue with option #4. Fast track if possible. Would labor be available for construction in the near future? Labor market is tight.
- Secure long terms dumping agreement with Falun. Initiate action to eliminate outdoor toilets and fields. This should be done immediately after the pumping agreement is signed. Proceed with a local collection system.
- Option 1 is OUT. Am leaning to option 4 as it removes our waste water from the Pigeon Lake watershed.
- Proceed with all haste. My preference is Option 2 but recognize that people on the north may well not want to deal with NEPL. There seems to be considerable distrust of NEPL. The second choice would be Option #4. Option #2 with Falun option is my real preference.
- Let's get going.

Norris Beach – 4 people responded to this question

- Pick some option and run with it as soon as possible. Tired of looking at it. Southside lagoon preferred. Option 2.
- Let's get on with it. We need to preserve the quality of the lake. Any of the 3 options would be fine with me.
- Preference would be #2 first and #4 second. NOT option #1. This was voted on before however government financing to be considered in each option. We need to have a voice in addition to our pay cheque.
- Build suitable lagoon and continue using holding tanks.

Poplar Bay – 15 people responded to the question

- Full speed ahead. My preference is to use the Mulhurst Lagoon if governance was shared. If the County is not prepared to share governance then we should build a south side lagoon.
- Proceed with making a final decision based on all the factual data, taking into consideration the ability of landholders to pay for the project through their taxes. Final choice should try to maximize the amount of government grants.
- Let's move ahead as soon as possible.
- Choose option 4. Provide funding arrangements; accelerate the implementation.
- Let's get it done now.
- Avoid NEPL. Prefer option 2 or 4
- Separate system from NEPL may be best option.
- Move forward aggressively.
- I prefer Option 2.
- to the best of our knowledge #4 option is the best choice.

- Just get it done. With the costs almost the same you might as well go for the water treatment, 10 years is way too long to wait for sewer. Our lake will be done by then.
- Hopefully the project will over ahead fairly quickly. Also that the cost of the project and the estimates will be fairly close to what has need stated. The sewer system when completed will be of sufficient size and capacity to accept the anticipated demand and growth for the future.
- Proceed with planning process. Mail out summary of proceedings periodically as we are not able to attend all meetings.
- Please proceed as quickly as possible
- Get the final option decided quickly and start building. Option 1, 2 and 4 are all good but we think option 1 is best.

Sundance Beach – 3 people responded to the question

- Option 4
- Option 4 seems to me to be the most viable. t would get us away from NEPL at little extra cost.
- Start something sooner than later.

Viola Beach - 1 response to this question

- Please proceed as quickly as possible with the implementation of the recommended solutions. The costs are not prohibitive. The health of the watershed and the cost to the environment (including truck haul) is too important to delay any longer.

County of Wetaskiwin – 3 people responded to this question

- Good luck
- There cannot be a difference in cost of implementing for permanent and seasonal occupants. Compared to the value of properties, it is a trivial cost. A proper sewage system can only increase property values.
- Your option #4 which I feel would not add proportional problems in the downstream and lessen the smell.

6. Beach by Beach Responses to Question 8 which provided space for *Additional Comments.*

Crystal Springs – 5 people responded to this question

- Consider adding fresh drinking water to cottages.
- The sooner the better.
- No to being a customer. Need to be a member of any operating board.
- I recently spent $12,000 on a well, plumbing and new septic tank system. We are summer residents and require 1 to 2 pump outs per year. $200 for pump outs plus associated monthly costs levied for lagoon use are a far cry from $2500/year as proposed costs for the length of the debenture. Proportionate cost sharing needs to be considered.
- The issue is whether to pipe to a lagoon or let the lake become a lagoon.

Grandview Beach – 11 people responded to this question

- Look at potable water delivery.
- Sooner the better.
- Good work.
- Thanks for your work.
- I would like to know what the critical assumptions are behind the short list options. What are the sensitivities given they may be wrong and what are the risks. For instance if the population is 25% higher, which option is best. If the cost of steel is 25% higher which is best?
- Good job pulling this together.
- As soon as possible.
- No representation from First Nations.
- It would be helpful to have an 8 1/2" x 11" copy of the drawings used with the various option costs as you folks see it or put it on the internet.
- Build the lagoons, treatment facilities, and transmissions line and have the infrastructure in place before hooking up the local properties. The current truck hauling is inefficient and bad for the environment and roads. Current monthly fees charged by NEPL are just ridiculous and a money grab not based on usage.
- 5 year life span and operation of pressure grinders is scary. We really appreciated your thoughtfulness in making an early presentation for the 10:00 am people and then presenting it again for those who came later.

Ma-Me-O Beach – 8people responded to this question

- I have been attending meetings for over 15 years with nothing new save Strawberry Creek. Redo costs and locate land.
- Minimize voting - maybe even none. Maximize inter community co-operation.
- On my property is one grand old tree. Can I have some input during directional drilling to try to save it?
- Given history with the County of Wetaskiwin and NEPL over the past few years it would seem risky to enter into upgrades and reliance on NEPL. Given that First Nations have not chosen to be involved to date, why risk pipeline construction on the border of their land to NEPL.
- Move quickly.
- Costs of piping to / using Falun Lagoon would be appreciated.
- We need to do something now to show the stakeholders that we are serious about a long term solution. We need to show the special interest groups (those opposed to the sewer system) that we will move ahead, with our without them.
- I would like water roughed in at the same time as sewer mains are being provided. I like the Falun solution. Session I was at was well run.

Norris Beach – One response to this question

- Very good presentation we look forward to hearing about the implementation of the plan very soon.

Poplar Bay – 4 people responded to the question

- Consider adding potable water pipeline now for future use. Including it now would save cost and disruption later.
- Property owners adjacent to the lake are only one part of the problem of pollution going into the lake. Need to limit or restrict cattle operations in the watershed areas around the lake.

- Work at the earliest possible completion date.
- This process of planning to encompass all lake communities is the only way to go. It appears that almost all are on side with this concept. No community is pitted against another.

Sundance Beach – 2 people responded to the question

- Good presentation. A good attempt at cohesiveness among the varied groups and stakeholders. Keep it going.
- I would like to see the NEPL kept out of any new options.

Viola Beach - 1 response to this question

- The Province, the Association of Pigeon Lake Municipalities and the Steering Committee should be complimented for this initiative.

County of Wetaskiwin – No responses to this question

Addendum “M”

PowerPoint Presentation for July 29, Open House and Information Session

GLOBAL PERSPECTIVE.
LOCAL FOCUS.

Associated Engineering

Pigeon Lake Wastewater Strategy and Master Plan

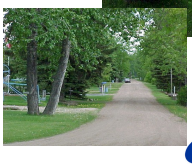
July 29, 2007
Public Open House

Project Summary to Date

- Project Need
- Master Plan Options
- Funding Opportunities
- Cost Analysis
- Cost Implications

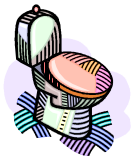
Project Need

- Urbanization of lakeshore areas
- Private sewage systems costly and risky
- Intensifying development
- Changing property use – Seasonal to Permanent
- Protect the lake
- Act now rather then react later

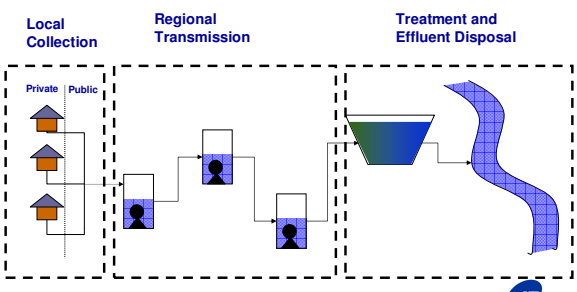


Beginning Assumption

Some how we need to dispose of our wastewater. (We might even have to treat it!)

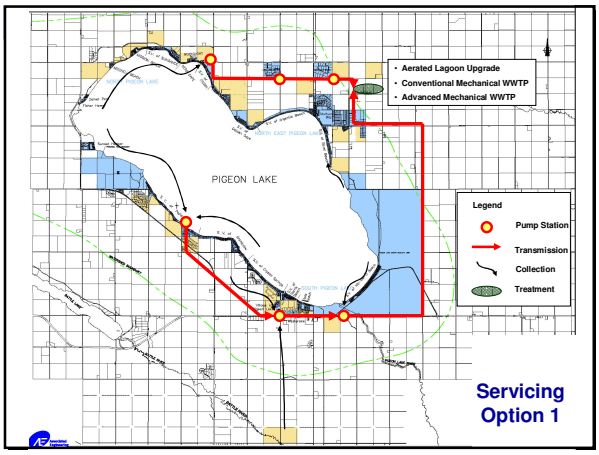


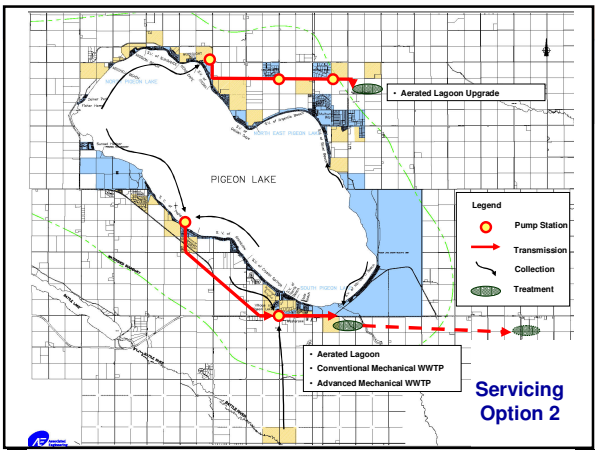
Wastewater Management System

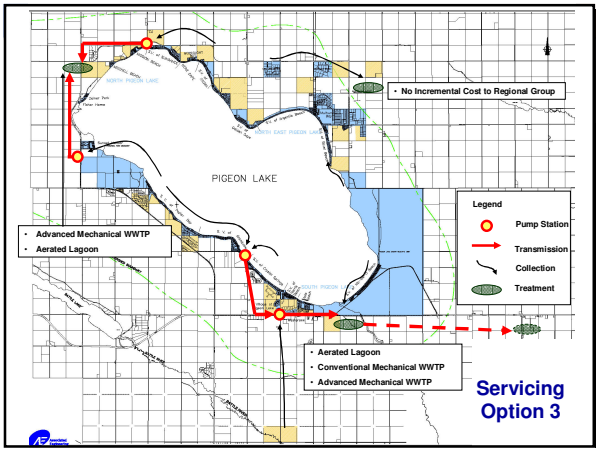


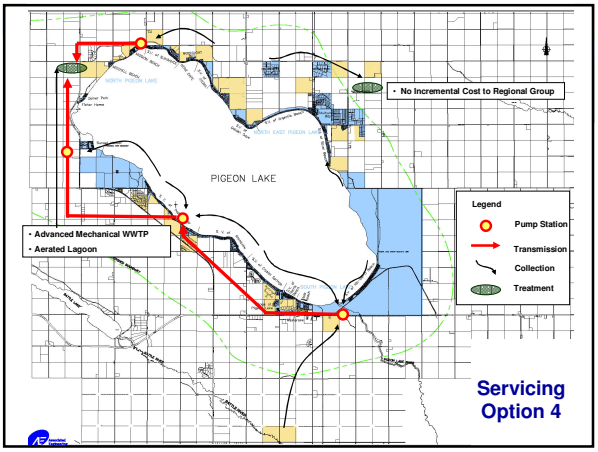
Wastewater Management Options

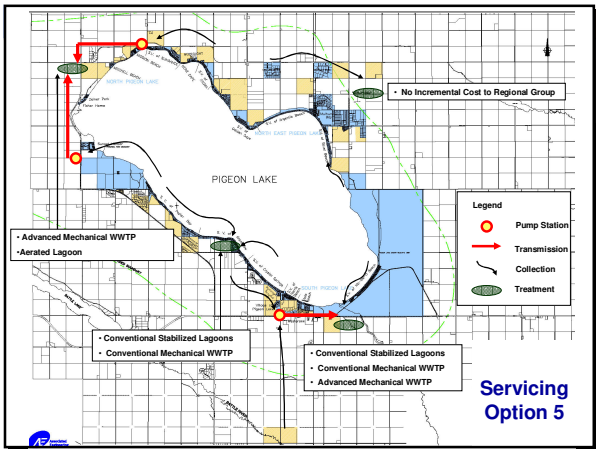
Local Collection	Regional Transmission	Treatment	Effluent Mngmt.
• Haulage	• One Treatment Facility	• Stabilization Lagoons	• Pigeon Lake Creek and/or Pipestone Creek
• Pressure Sewer – Grinder	• Two Treatment Facilities	• Aerated Lagoons	• Battle River
• Pressure Sewer – Effluent Pump	• Decentralized Facilities	• Conventional Mechanical Plants	• Constructed Wetlands - Indirect lake Discharge
• Conventional Gravity	• Combinations	• Advanced Mechanical Plants	• Strawberry Creek
• Combined Systems			











Summary of Required Infrastructure

Option	Length of Collection and Transmission Pipe	Number of Lift Stations	No. of WWTF
Option 1 (NEPL)	88,800 m	6	1
Option 2 (SE)	70,950 m	5	2
Option 3 (SE-NW)	67,400 m	4	3
Option 4 (NW)	78,000 m	4	2
Option 5 (SE-NW-S)	64,500 m	3	4

Summary of Regional Capital Costs

Option	Treatment ($million)	Transmission ($million)	Total Regional Costs ($million)
Option 1 (NEPL)	$6.5	$20.2	$26.7
Option 2 (SE)	$9.7	$11.4	$21.1
~~Option 3 (SE-NW)~~	~~$18.9~~	~~$8.7~~	~~$27.6~~
Option 4 (NW)	$31.4 (10.4)	$15.2	$41.2 (25.6)
~~Option 5 (SE-NW-S)~~	~~$23.5~~	~~$6.6~~	~~$30.1~~

Option 2, 3 and 5 – Add $5,000,000 for Pipeline to Falun

Operating Costs

Labour
Materials
Power
Equipment

→

Treatment
Regional Transmission
Local Collection
On-site

Life-Cycle Cost Comparison

	Treatment ($000,000)	Transmission ($000,000)	Local – Public ($000,000)	Local - Private ($000,000)	Total ($000,000)
Truck Haul	11.3	80.2			91.5
Option 1 (NEPL)	11.1	30.3	15.5	48.5	105.4
Option 2 (SE)	16.5	18.0	15.5	48.5	98.5
~~Option 3 (SE-NW)~~	38.3	14.0	15.5	48.5	116.3
Option 4 (NW)	61.0 (19.3)	23.1	15.5	48.5	148.1 (106.4)
~~Option 5 (SE-NW-S)~~	~~45.7~~	~~12.3~~	~~15.5~~	~~48.5~~	~~122.0~~

Funding Opportunities

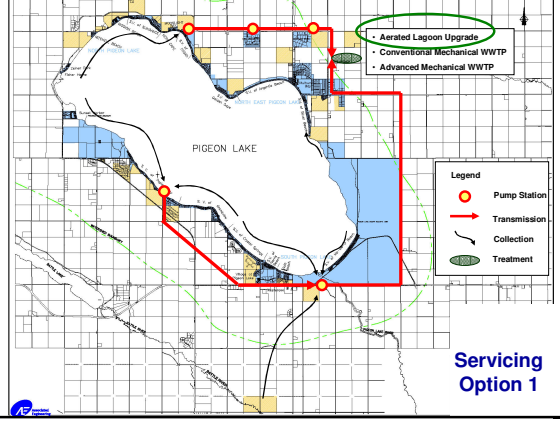
Local Collection - Private Systems
- No Available Funding

Local Collection – Public Systems
- Federal/Provincal CAMRIF (0 to 66%)

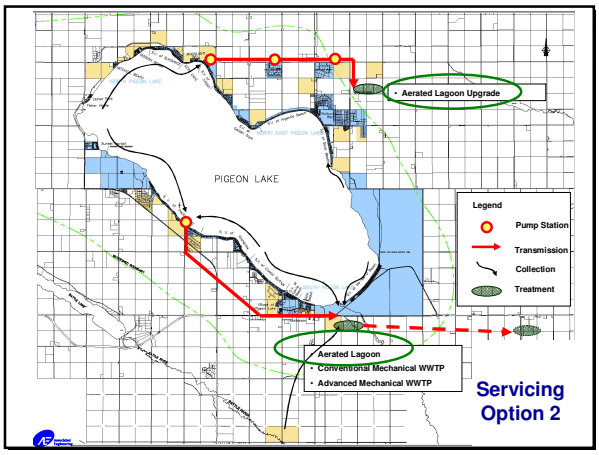
Regional Treatment and Transmission
- Provincial Water for Life and Water/Wastewater Partnership Programs (75% to 90%)
- Some County Residents and Development not Eligible

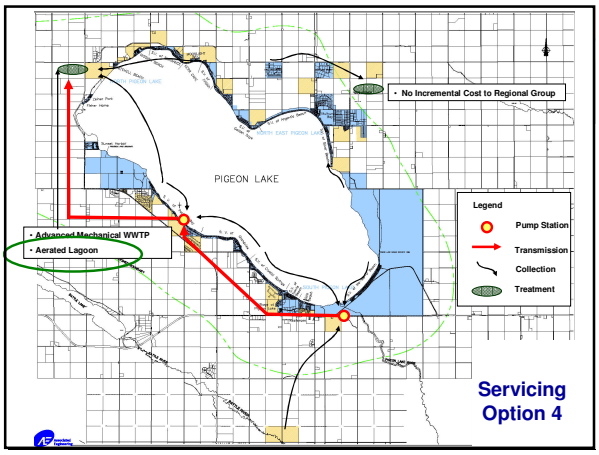
Net Municipal Life-Cycle Cost Comparison

	Treatment ($000,000)	Transmission ($000,000)	Local – Public ($000,000)	Local - Private ($000,000)	Total ($000,000)
~~Truck Haul~~	~~3.0~~	~~80.2~~			~~83.2~~
Option 1 (NEPL)	2.6	5.2	15.5	48.5	71.8
Option 2 (SE)	6.1	3.4	15.5	48.5	73.5
~~Option 3 (SE-NW)~~	~~10.8~~	~~2.6~~	~~15.5~~	~~48.5~~	~~77.4~~
Option 4 (NW)	9.1	3.7	15.5	48.5	76.8
~~Option 5 (SE-NE-S)~~	~~13.0~~	~~2.5~~	~~15.5~~	~~48.5~~	~~79.4~~



Servicing Option 1





Capital Cost Summary

Capital Costs					
	Treatment	Transmission	Local Collection Public	Local Collection Private	Total
Component	$000,000	$000,000	$000,000	$000,000	$000,000
Option 1 (NEPL)	6.5	20.2	11.4	31.8	69.9
Option 2 (SE)	9.7	11.4	11.4	31.8	64.3
Option 4 (NW)	10.4	15.2	11.4	31.8	68.8
Net Municipal Capital					
Option 1 (NEPL)	0 - 1.7	2.1 – 6.1	4.6 - 11.4	31.8	38.4 - 50.9
Option 2 (SE)	2.5 - 4.9	1.2 - 5.8	4.6 - 11.4	31.8	40 - 53.8
Option 4 (NW)	2.6 - 5.2	1.6 – 7.7	4.6 - 11.4	31.8	40.5 - 56

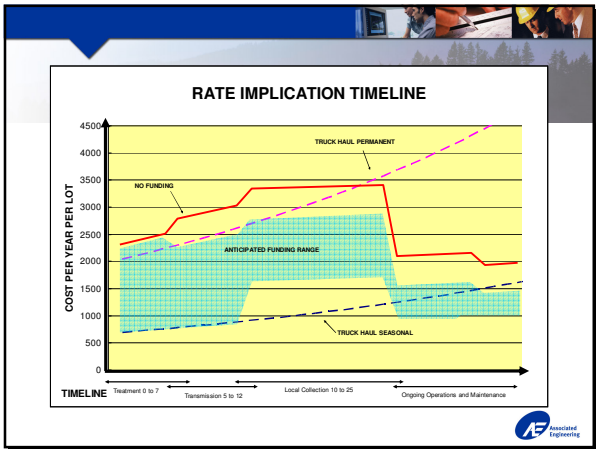
Rate Implications ($/Yr/Lot)

Component	Treatment	Transmission	Local Collection Public	Regional Operations	Total Municipal
Option 1 (NEPL)	0 - 60	80 - 230	170 - 420	240	490 - 950
Option 2 (SE)	90 - 180	50 - 220	170 - 420	150	450 - 960
Option 4 (NW)	100 - 200	60 - 290	170 - 420	175	500 - 1070

*** Based on; 2120 Lots, 25 Yr Debenture at 6% Interest**

Component	Local Collection Private	Total Initial Annual Cost
Option 1	1030 - 1550	1520 - 2490
Option 2	1030 - 1550	1480 - 2510
Option 4	1030 - 1550	1530 - 2620

*** Based on 15 Yr Debenture at 6% Interest**



Summary

- Aerated lagoon treatment suitable with discharge to local creeks
- Regional transmission required
  - Phase 1 lower truck haul
  - Phase 2 collection tie-ins
- Local collection likely pressure sewer (STEP or Grinder)
- Three feasible options have comparable cost impacts
- Cost implications in range of existing costs
- Major Decision Issues:
  - Land Availability
  - Timing
  - Organizational / Governance Preferences

Next Steps

- Meet with steering Committee to review stakeholder input and preferred options – August 24th
- Submit report to Committee – September 7th
- Committee approves the Plan
- Letters of Municipal Support
- Funding Application
- Implementation - 2 to 5 years

QUESTIONS?

Addendum "N"

Summary of Questions and Answers
From Open House, July 29, 2007

July 29, 2007 - 10:30 and 11:30 sessions
Approximately 275 people attended

Questions	Answers
In Option 4 how does the waste water get from north to west – do you truck?	Jeff advised that all the options provide for a local collection system.
Do you assume that local collections systems will be built right away or later?	Jeff replied that we anticipate all local collection systems in place within 7 years. Theoretically everything could be done in parallel and therefore faster.
How does the Dorchester Development fit it?	Jeff advised that Dorchester and all future developments are considered in our capacity calculations. They will have to pay to get to this system likely either up front or through a levy
In option 2 an upgrade is needed for the existing Mulhurst Lagoon. Why would everyone have to pay for that?	Jeff advised that in that option all of the north east will flow to Mulhurst not just the current users.
Why have you recommended grinder pumps instead of a gravity system and how long do grinder pumps last?	Jeff advised that Pressure systems will be easier, less costly and less disruptive to install due to the terrain around the lake. High ground water also is a factor in our choice. There are varying opinions on grinder pump use. For our calculations we anticipated a replacement every 10 years.
Have the First Nations participated in this project?	Jeff replied that they were invited to participate but have chosen not to. We are keeping them informed.
In Option 2 have you included the costs of going to Falun or just to Pigeon Lake Creek?	Jeff advised that in both Option 2 and 4 the costs do not include the extension to Falun.
If we use Mulhurst Lagoon, will we have control or are we just a customer and how does that affect us and our control over the system? Have they said they'd accept our waste water?	Jeff advised that the NEPL has indicated that they would accept new users and that they are not interested in a new governance model. As customers you would not have a say in or control over any upgrades or policy.
Can construction along the roadways be done by directional drilling? What about into my property?	Jeff advised that we are recommending directional drilling for both roadway and onto personal properties.
How do you anticipate this working given the number of communities and councils involved?	Jeff advised that the Steering Committee will be meeting to determine the governance model once the master plan is accepted. There have been several discussions at the Steering Committee level. There are definite benefits to operating as one entity including the ability to borrow necessary funds.

Can we combine into one summer village?	Jeff replied that you can no longer form a summer village so that would not be feasible. There are some very good examples of governance models which work and we are confident the Steering Committee will come to an agreement.
Is the NEPL regulated?	Jeff advised that they are regulated provincially as a utility.
Most of your options have similar cost options. What is your confidence level in the model and what are the inflation issues? Could you save money by building faster?	Jeff replied that we have factored in a 3% inflation rate per year for the model. These are our best estimates and have a good level of confidence. Given the current building issues in the province, building sooner would likely be less costly.
It is clear to me that the County of Wetaskiwin wants us to tie into the NEPL. The County withheld approval of the purchase of land for a south lagoon a few years ago. Why do we think they would agree now?	Jeff responded that The County of Wetaskiwin is represented on the Steering Committee and they want a lake wide solution and will support the Committee's decision. They have indicated that they prefer the Falun site.
Why does the County of Wetaskiwin favor Falun?	Jeff responded that they feel that because the Falun site is an existing lagoon which we would upgrade, the support from the community would be greater than the alternative location.
Did I understand your presentation to say that the earliest our cottages would be tied in is 10 years?	Jeff responded that based on a non-aggressive timeline, all cottages would be on the system in 10 years. It could be done as soon as 3 – 5 years with a more aggressive timeline.
Is anything being done now to improve lake quality?	Jeff advised that this is outside the scope of this project however the Watershed Stewardship Association is looking at the larger picture.
On the Rate Implication slide, why is there such a range in costs?	Jeff responded that there are various levels of funding available for various options which will affect the rates significantly. Also there may be complications on individual lots which affect costs.
What happens if Sundance Beach refuses to support option 2?	Jeff advised that the support for the master plan by each community is a political decision. The Steering Committee and the various councils will have to unite over the chosen option.
Is the NEPL privately run and can they just increase prices?	Jeff replied that they are regulated under the Provincial Utilities Act.
How did the NEPL become their own entity and such a problem?	Jeff advised that the NEPL formed a Utility Commission when they began. Why they are a problem is more of a political issue.
Could someone change the NEPL structure and make it more palatable?	Jeff replied that this could be done but presumably would be a long drawn out process.

July 29, 2007 – 2:00 PM Presentation
Approximately 85 people attended

Question	Answer
Why have you eliminated the First Nation land from this process? Would it not be cheaper to go through their land than around it in option 1?	Jeff advised that we have included the First Nations land in our capacity calculations. They were invited to participate in the Steering Committee and have chosen not to. There may be an option to go through their land.
I feel it is important to be proactive and not reactive. What happens to land downstream from the lagoon discharge? I am by the Mulhurst Lagoon and the weed growth in Pipestone Creek is significantly higher now than years ago. I think it is going to choke out the creek.	Jeff responded and got confirmation from the Alberta Environment staff present, that the Mulhurst Lagoon discharge is monitored annually and meets both provincial and federal standards.
Do they monitor for Phosphorous? Isn't that what causes weed growth?	Jeff responded, and got confirmation from the Alberta Environment staff present, that the province does not currently monitor phosphorous levels. This should be taken into consideration in the future.
How often does Mulhurst discharge?	Jeff advised that traditionally they discharge once per year but there have been occasions when this has increased to twice per year. There are upgrades planned now and our plan would require those upgrades to be completed.
Have you chosen locations for the waste treatment sites?	Jeff replied that we have not specifically chosen locations but have assurance that there is land available in the general areas we are recommending.
Where does Strawberry Creek empty?	Jeff advised that the Strawberry Creek empties into the North Saskatchewan River.
Given we are 2 – 3 years away from implementation, can the current Falun Lagoon take truck haul in the interim?	Jeff responded that no, the current lagoon capacity is taken up by existing users and could not take additional inflow.
I am concerned that part-time cottagers are going to have to pay the same amount as permanent residents. How will this be resolved?	Jeff responded that ongoing operational costs would have to be calculated by a formula created by each summer village, presumably based on use. We assume capital costs would be spread over all users.
When you give a 2 – 5 year timeline, is that just to get started?	Jeff advised that we estimate that phase one – the Treatment and Transmission phase -will take 2 – 5 years to be in place. The timing for implementation of the Local Collection phase will be decided by each summer village.
Do you have any concern about affecting the water balance and ground water around the lake with your plan?	Jeff indicated that studies have shown that there is no significant connection between lake level and ground water, so no we are not concerned.
Can you explain the timelines for fees? When will we expect to start being billed? I have already been billed $2,000 for some development I am doing on my property. What will this look like in the future?	Jeff advised that you could expect to see costs for the capital costs for the Treatment and Transmission phase within 2 – 5 years. Local collection costs would depend on the local summer village timelines.

	A member of the public then advised that The County of Wetaskiwin is currently charging for the Mulhurst upgrade and that the $2,000 bill was likely for that. This would obviously change once our new plan is approved.
Can you give me more information on aerated lagoons? Are there restrictions on location? Do they smell?	Pat responded that the Province does regulate location and there is a set back allowance. Typically they are smaller than stabilization lagoons. Pat then explained the operation of an aerated lagoon in some detail. Pat advised that there is minimal odor associated with the lagoons and that many municipalities have them.
How big an area is required for an aerated lagoon?	Jeff estimated that they would be one half the size of the existing Mulhurst site or about 40 acres.
What assurance do I have that I won't have a lagoon in my backyard?	Jeff advised that the province regulates the choice of location.
I would think establishing a new lagoon location will be an onerous task and that expansion of existing sites would be easier and less costly. Do you agree?	Jeff advised that there is no question that expansion is easier and less time consuming.
Have you made provision for fresh water pipes? I am concerned that well water will become scarce and that within a short time we will need to pipe water into our homes.	Jeff advised that it would be smart to consider this option in the planning process and take some preemptive steps to minimize disruption at a later date. That however is outside the scope of this project.
Does your plan take into consideration grey vs. black water?	Jeff advised that there is no cost advantage to splitting out grey water. This plan calls for collection of both.
I would think is would be very foolish to dig up the roads twice – once for sewer and later for water.	Jeff agreed that the stakeholders should consider this in their plans but further noted that those plans are outside of the scope of this project.
I am very concerned about the lack of participation by the First Nations.	Jeff advised that all capacity calculations do include the First Nations land. He further advised that the Steering Committee felt it necessary to move ahead without their direct participation but to continue to negotiate and keep them informed
We've been through this process a few times. Who is giving the Steering Committee their approval to go forward and will it succeed and/or will the province mandate something?	Roger MacEachern advised that every member of the Steering Coming in on board and has the support of their councils. There will be no vote and this project will move ahead.
Will the costs be based on lot or property?	Jeff answered that costs are usually based on lot as per the tax roll.
If we proceed as fast as reasonably possible when we will be finished with truck haul, local collection in place and connection to our homes?	Jeff advised that we can anticipate the Treatment and Transmission phase to be in place within 2 – 5 years and 3 – 7 years for the remainder of the project.
Can the lake survive until then?	Jeff advised yes.
What is the affect of the extra discharge from one treatment plant vs shared over several?	Jeff advised that our study addresses the benefits of dividing outflow over a few sites vs. only one.