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REPORT

CITY OF PORT ALBERNI

Liquid Waste Management Plan
Stage 1

ASSOCIATED
ENGINEERING

May
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EXECUTIVE SUMMARY

This document is the culmination of conducting Stage 1 of a Liquid Waste Management Plan (LWMP) for the City of Port Alberni. A LWMP is a three-stage review and development process used to select a long term (40 year) wastewater management strategy for a community. This management includes the municipal sewerage system, individual on-site systems, industrial discharges, and non-point pollution sources. Once approved by the Ministry of Environment, Lands, and Parks (MELP), a municipality or regional district is authorized to discharge waste in accordance with the plan.

1 THE LWMP PREPARATION PROCESS

The City of Port Alberni Council is the **Steering Committee** for the LWMP. This group will ultimately approve the plan and submit it to the provincial government. Input into the direction of the LWMP is provided by a **Technical Advisory Committee (TAC)**, composed of staff members of the local and senior government agencies, and members of local industry. Additional direction for the LWMP is provided by the **Public Advisory Committee (PAC)**.

The LWMP will be prepared in three stages:

- **Stage 1** includes assembling background data, identifying wastewater management issues, estimating future populations and waste generation, and developing a list of wastewater management options for consideration by the City of Port Alberni.
- **Stage 2** will conduct a detailed evaluation of the wastewater management options identified in Stage 1. Following completion of the evaluation, and selection of a preferred option, a recommended implementation strategy will be proposed for further evaluation in Stage 3.
- **Stage 3** will carry out further refinement of the proposed strategy with the emphasis on financial planning to allow implementation in an affordable manner.

2 STAGE 1 RESULTS

Stage 1 has included assembling background data, identifying wastewater management issues, estimating future service populations and waste generation rates, documentation of existing wastewater treatment and effluent disposal practices, identification and discussion of non-domestic wastewater discharges, discussion of source control issues, discussion of effluent and biosolids reuse options, discussion of wet-weather flow management options, development and description of wastewater management options, discussion of future storm water management options and documentation of the Stage 1 public involvement process.

Stage 1 was developed by investigating the issues, writing technical memoranda (TM's) that documented these issues, and reviewing these TM's with the members of the public and technical advisory committees (PAC and TAC). The specific conclusions from the TM's and the discussions with the PAC and TAC and a presentation to the Steering Committee (City council) include:

- The City of Port Alberni has significant areas that are still served combined sewers (mixed sanitary wastewater and storm water). The remaining areas are served by mostly by separate sanitary and storm sewer systems. Recent land expansion has resulted in the incorporation of approximate 100 homes (about 300 people) that are on septic tank (domestic on-site) wastewater treatment.

- Issues that needed to be addressed in the LWMP include:
  - existing and projected community development
  - wastewater treatment and effluent disposal
  - non-domestic (commercial/institutional) wastewater discharges
  - source control to protect the wastewater treatment facility from upsets
  - effluent and biosolids reuse possibilities
  - wet-weather flow management including the long-term need to eliminate combined sewer overflows (CSO's) and sanitary sewer overflows (SSO's)

- The population growth rate for LWMP purposes will be 1% per annum. Since this may be significantly changed (at least in the short run) by the influx of a large industrial development, such as a potential aluminum smelter, this situation should be monitored over the life of the plan.

- The existing wastewater treatment facility is an aerated lagoon with the treated effluent going into the Somass Estuary. The facility generally meets its current effluent discharge permit requirements. While, there are some incidents of excessive flows during the winter period, there is no evidence that there are any environmental impacts. Before decisions can be made regarding the need for improved treatment, it will be necessary to conduct some studies of the impact of the current facility and wastewater discharge flows to the environment.

- There are two non-domestic wastewaters that are or could cause significant impacts on the existing wastewater treatment facility. These include a high organic strength wastewater discharged by a fish processing plant and the high ammonia concentration wastewater (leachate) discharged from the Alberni Valley landfill. The current data based is limited and, as a result, more data will have to be gathered in Stage 2 to estimate treatment facility (lagoon) loading so that future lagoon performance can be estimated.

- Source control should be used to limit the loading on the City's wastewater treatment facility both now and in the future. This will require that the City revise its current source control bylaw to be more comprehensive and, potentially, more stringent. Any initiatives to create a "no discharge" in Alberni Inlet adjacent to Port Alberni will have to be co-ordinated with the Federal government by Provincial MELP staff.

- There are limited wastewater effluent and biosolids reuse opportunities. The only apparently viable effluent reuse possibility is silviculture (tree) irrigation. Biosolids might be reused in silviculture applications, gravel pit restoration and/or landfill closure and rehabilitation.

    - The most important part of the City of Port Alberni's LWMP will be the development of a strategy to eliminate combined sewer overflows (CSO's) and sanitary sewer overflows induced by wet-weather flows and/or infiltration and inflow. This strategy will include continuing the program to create separate sewers in existing combined sewer areas, modification of pumping and force main systems, and providing treatment of any remaining CSO's (SSO's will be totally eliminated). This strategy will be developed further in Stage 2 and will require

modelling of the sewer system so that specific problem areas can be targetted for improvement.

- Future wastewater management options assume that there will be continued sewer separation, SSO's will be eliminated, CSO's will be minimized in size and frequency, CSO's will be treated, and source control and water conservation programs will be in place. On this basis, there are three main options:

  - Option 1: the wastewater treatment facility remains where it is but with upgrades to treatment and/or disposal, potentially including shared use of the Pacifica Papers lagoons, as required

  - Option 2: The existing treatment facility would be abandoned and a new mechanical treatment plant would be developed either on the southern foreshore/dock area of the City or in the area adjacent to the Alberni Valley landfill

  - Option 3: The existing treatment lagoons would be kept but they would only service the northern half of Port Alberni. The southern half of Port Alberni would be serviced by a new mechanical treatment plant located on the southern foreshore/dock area.

- Over the long term, the City will develop an Urban Storm Water Control Plan (USWCP) based on the concepts developed as part of a new MELP-funded study in Nanaimo.

- Public participation in the Stage 1 open house and presentation process was minimal. However, it is anticipated that Stage 2 will garner more public interest because costs will be attached to the options.

- Stage 2 will require several companion studies, i.e., sewer system modelling and evaluation of any impacts of lagoon effluent discharge on the Somass Estuary.

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INTRODUCTION

SECTION 1

1.1 OBJECTIVES

The Waste Management Act, introduced in 1982 as a replacement for the Pollution Control Act, introduced the concept of the Liquid Waste Management Plan (LWMP). A LWMP contains provisions or requirements for collection, treatment, handling, storage, utilization and disposal of wastewater within the whole or a specified part of a municipality or regional district. Once approved by the British Columbia Ministry of Environment, Lands and Parks (MELP), a municipality or regional district is authorized to discharge waste in accordance with the LWMP.

A streamlined, cooperative process has been established by the Ministry to provide for efficient development, review and approval of LWMP's. Technical staff of various ministries, including MELP, Municipal Affairs, and Health are intended to work with local officials and their consultants throughout this process by participating in a series of workshops.

Associated Engineering (B.C.) Ltd. has been engaged by the City of Port Alberni to assist in the preparation of the Stage 1 component of a LWMP. Stage 1 will provide the foundation for the subsequent Stages (2 and 3) of the LWMP. The LWMP will lay the groundwork for wastewater management in the study area for the next 40 years. The specific objectives of the overall LWMP study are as follows:

- Identify all wastewater concerns in the LWMP area.
- Identify and review all the wastewater management alternatives available to the City and select technically feasible alternatives for detailed analysis.
- Review 1999 *Municipal Sewage Regulation* (MSR) (MELP, 1999) discharge criteria for those technically feasible wastewater management options that involve discharge of sewage treatment plant effluent to surface waters or land.
- Evaluate the capital and operating costs of these technically feasible wastewater management options, both from an overall cost point of view and on a cost per user per annum basis under alternate funding and cost-sharing formulas.

- Select the most appropriate wastewater management strategy that can be economically achieved and which can be implemented in phases to meet short and long-term environmental goals.

The LWMP will be prepared in three phases:

- **Stage 1** will assemble background data, identify wastewater management issues, estimate future populations, and develop a list of alternative wastewater management options for consideration by the City.

- **Stage 2** will involve a detailed evaluation of the wastewater management options identified in Stage 1. Following completion of the evaluation, and selection of a preferred option, a recommended implementation strategy will be proposed for further evaluation in Stage 3.

- **Stage 3** will include further refinement of the proposed strategy with the emphasis on financial planning to allow implementation in an affordable manner.

1.2 PUBLIC PARTICIPATION

The key to successful waste management planning is public participation during the preparation of the LWMP. Input from the public has been solicited on a number of occasions during the development of the Stage 1 LWMP. These include:

- Formation of a public advisory committee (PAC). The committee, encompassing a wide range of community interests and stakeholders, provides a mechanism to involve the public in the planning process as well as providing opportunities for direct consultation with appropriate provincial and federal officials.

- Public information meetings for input into the Stage 1 report.

- Public availability of the Stage 1 report and the opportunity throughout the preparation of the LWMP to discuss concerns and approaches with the City and MELP personnel.

1.3 STAGE 1 REPORT FORMAT

The structure of the Stage 1 report is as follows:

- *Section 1 - Introduction*

  This section identifies the objectives and scope of the study.

- *Section 2 - Identification of Wastewater Management Issues*

  A description of existing physical conditions and infrastructure is presented in this section. This chapter also includes identification of key wastewater management issues relevant to the City of Port Alberni.

- *Section 3 - Existing and Projected Community Development*

  This section presents projections of residential, industrial and commercial development and populations over the 40-year planning period.

- *Section 4 - Wastewater Treatment and Effluent Disposal*

  The current treatment and disposal technologies utilized by the City are discussed in this section, along with various related issues that will require further evaluation in the Stage 2 LWMP.

- *Section 5 - Non-Domestic Discharges*

  This section identifies the main non-domestic discharges that are received by the City wastewater collection, treatment and disposal system. The impacts of these discharges on the City system are also discussed.

- *Section 6 - Source Control*

  Options for source control, public education, wastewater minimization, the use of holding tanks, and dealing with septage waste and marine craft wastes are discussed in this section.

- *Section 7 - Effluent and Biosolids Reuse*

  This section discusses the potential for effluent and biosolids reuse within the LWMP study area.

- *Section 8 - Wet-Weather Flow Management*

  This section discusses issues surrounding combined and sanitary sewer system overflows, and overall wet-weather flow management.

- *Section 9 - Development of Wastewater Management Options*

  This section establishes the philosophy behind the development of the wastewater management options for the LWMP area. Two option series are introduced, with the major concepts of the individual options highlighted.

- *Section 10 - Storm Water Management*

  This section provides recommendations for a long-term storm water management strategy that would minimize the impact of non-point source discharges on receiving water quality.

- *Section 11 - Public Involvement*

  This section describes the incorporation of public involvement into the Stage 1 LWMP.

- *Section 12 - Summary*

  A summary of the Stage 1 LWMP is presented in this section.

1.4 ACKNOWLEDGMENTS

A number of individuals and interested groups have assisted in the preparation of the LWMP, either through direct input at the committee level or through public information meetings. In particular, the consultant team would like to thank the elected members and

staff of the City of Port Alberni, as well as the members of the Technical and Public Advisory Committees for their review and comments during the LWMP preparation.

IDENTIFICATION OF ISSUES

SECTION 2

2.1 PHYSICAL SETTING

The Liquid Waste Management Plant (LWMP) study area encompasses the City of Port Alberni as shown in Figure 2-1. The study area is located in south-central Vancouver Island, within the Alberni Valley. The City lies immediately east of Alberni Inlet where the Somass River enters the inlet.

Port Alberni is located about 48 km from Barclay Sound, situated on the west side of Vancouver Island, via the Alberni Inlet (OCP, 1993). Due to its location, the City has experienced past tsunami events. The LWMP area also receives significant annual precipitation due to the moderate coastal climate of the area.

2.2 EXISTING UTILITIES

The City obtains potable water from China Creek and Bainbridge Lake, where it is distributed throughout the city via five reservoirs and four pumping stations (OCP, 1993). Great Central Lake has been identified as an alternate water source to meet future demands (OCP, 1993).

The City provides solid waste collection, with waste transported to the Regionally operated Alberni Valley Landfill for disposal.

2.3 MUNICIPAL SEWERAGE SYSTEM

The LWMP uses the term *municipal sewerage system* to refer to the wastewater collection, treatment and disposal works currently owned and operated by the City of Port Alberni.

The Port Alberni municipal sewerage system has nine sewer catchment areas, comprised of almost 3000 pipes, that provide wastewater collection throughout the City. The area north of Roger Creek was originally developed with storm water ditches and sanitary wastewater-only sewers and, as a result, has evolved into a separate sanitary and storm sewer area. The area to the south of Roger Creek originally developed as a combined sanitary and storm sewer system which is slowly being converted to a separate sewer system. There is also at least one interconnection between the separate sanitary sewer system and the combined sewer system. The combined system utilizes three pumping

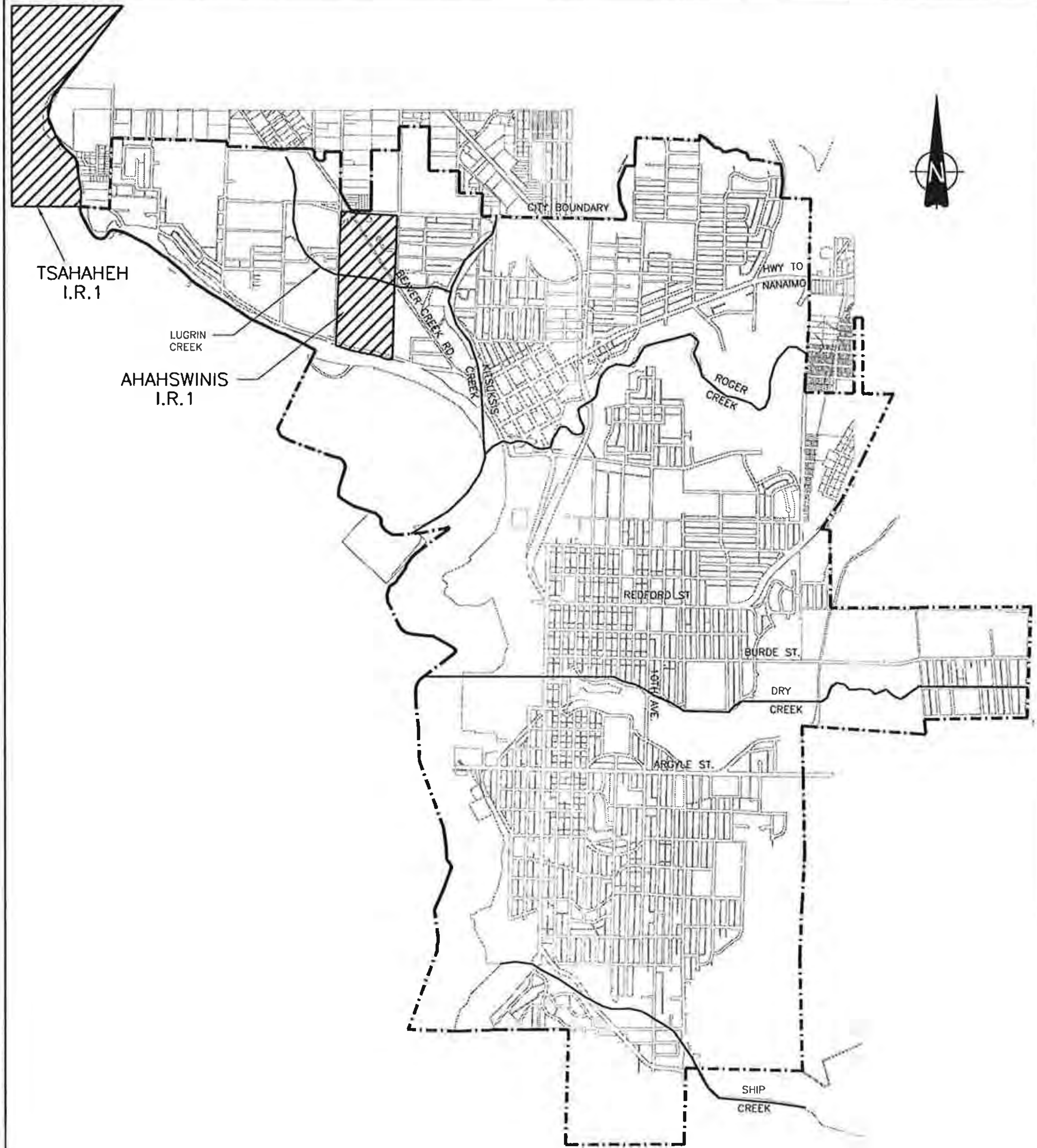

FIGURE 2-1
LWMP STUDY AREA

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stations, with two pumping stations serving the sanitary system. Details regarding the collection system will be discussed further in Chapter 8.

At the present time, one municipal wastewater treatment plant treats wastewater collected from the City, as well as the Tsahaheh and Ahahswinis First Nation lands. The wastewater treatment plant consists of an earthen lagoon that was originally constructed in 1955 to operate as a facultative system (NovaTec, 1995). Over the years, due to increasing wastewater flows and loads, the lagoon's treatment capacity has been increased by the addition of mechanical surface aerators to convert lagoon operations from a facultative system to a more completely aerobic system. The most recent upgrades also included partitioning the lagoon into several cells, using flexible plastic curtains, to enhance treatment efficiency, and the addition of two 75 hp floating aerators. In addition, the accumulated sludge within the lagoon has been removed and dewatered, and subsequently composted with wood waste at the Alberni Valley landfill.

Lagoon effluent currently exits the lagoon through an overflow structure, and proceeds to flow by gravity through a marsh and tidal watercourse. The wastewater eventually discharges into the Somass River estuary (NovaTec, 1995).

2.4 ON-SITE WASTEWATER MANAGEMENT

On-site wastewater management systems, defined in this LWMP, include individual septic tanks or mechanical treatment plants that discharge effluent to tile fields or marine outfalls, and serve residential dwellings, commercial establishments, and industrial operations.

2.4.1 Residential On-site Treatment

Residential on-site treatment usually implies septic tanks and disposal beds, (also known as "tile fields"). The septic tank usually has a minimum of two days hydraulic retention (HRT) and is used to provide pretreatment to remove large solids and floatables. The effluent from the septic tanks is discharged via a sub-surface, perforated-pipe, distribution system, i.e., the "tile field". The soil into which this septic tank effluent is discharged is used as a biological growth media and, as such, is used to further treat the septic tank effluent before it reaches the environment, e.g., the groundwater or, in some cases, surface waters. The size of the disposal bed, i.e., total length of perforated disposal piping and the pipe

Table 2 - 1. MOELP Permitted Industrial Discharges within LWMP Area

Operation	Maximum Permitted Effluent Discharge Rate (m^3/d)	Treatment Level and Disposal
Pacifica Papers - Alberni Specialties Paper Mill (PE-00266)	180,000	- secondary treatment - marine outfall into Alberni Inlet
Weyerhauser - Somass Division Sawmill (PE-03736)[1]	4,458	- oil skimming & solids removal - outfalls to Alberni Canal and unnamed watercourse
Weyerhauser - Alberni Pacific Division Sawmill (PE-03382)[1]	573	- oil skimming & solids removal - outfalls to Alberni Inlet and unnamed watercourse

Notes:

1. Currently under amendment.

spacing, is a function on the permeability of the soils, i.e., the less permeable the soils, the longer the disposal bed piping. At the other extreme, the soils can not be too permeable, e.g., too gravelly, otherwise the percolation time through the soils will be too short to provide sufficient treatment before the septic tank effluent reaches the environment.

These systems are almost always smaller than 22.7 m^3/day (5000 Imperial gallons/day) since a single family dwelling with three persons would likely only generate in the order of 1.2 m^3/day of wastewater. As a result, these systems fall under the jurisdiction of the Ministry of Health rather than the Ministry of Environment, Lands and Parks (MELP). Typically, the Ministry of Health requires that the lot size for a septic tank system must be large enough for the initial disposal bed plus one additional (future) bed. Since the resulting total area is not small, the required size of the property is usually more suited to non-urban areas, e.g., small acreages, or at least, lots that are much larger than the typical 18.3 m x 33.5 m new(er) subdivision lot.

The lots sizes and the need for septic-tank onsite treatment and disposal systems are a bit of a "chicken and the egg" situation. When the size of the lots are large, e.g., 2020 m^2 (0.5 acre) and larger, the cost of servicing the area with sewers can be very high. As a result, the developer/home owner usually must put in their own on-site system. On the other hand, a decision might be made to have septic tanks which, as explained above, drives the need for larger lots. This situation can be used as a means to control (limit) development by not providing sewers to given areas or to increase density by providing sewers to a previously unsewered areas which often leads to the subdivision of lots, i.e., the creation of smaller lots, once the need for the septic tank disposal beds has been removed.

Improving treatment beyond the typical septic tank effluent, e.g., by providing secondary treatment, usually decreases the disposal pipe length (bed area) requirements significantly, often by half. New/emerging treatment technologies using effluent filters after the septic tank can produce very clear, low strength, effluents which eventually may be permitted to be used as a toilet-flushing water (rather than using potable water for this purpose, as is the North American norm). This will change the current thinking and may lead to denser developments with on-site treatment within the 40-year span of the LWMP.

Until relatively recently, there are only a few (approximately 20) properties within the City that used septic tank/tile field wastewater systems. However, recent City boundary expansions have included three unsewered, formerly Regional District areas, Grandview Road, Sahara Heights and Arrowsmith Heights. These areas comprise approximately 100 homes and, perhaps, approximately 350 persons, all on septic tank systems. It is anticipated that, while there may be some similar future boundary expansions, over the long term, these unsewered areas will be sewered. Furthermore, it is anticipated that any new developments within the City will be required to have municipal sewer connections. This assumption should not necessarily preclude development of lots with emerging technology, on-site, systems. However, it may require a review of the Plan at some point in the future to re-examine the assumptions about minimal on-site treatment.

2.4.2 Non-residential On-Site Systems

MELP has issued waste management permits, for effluent discharges, to three industrial operations in Port Alberni (MELP, 2000b). Table 2-1 provides a summary of these operations. In all three cases, there is some on-site treatment ranging from as simple as oil skimming and solids removal to full secondary treatment. All three discharge either directly or indirectly into Alberni Inlet.

2.5 WASTEWATER MANAGEMENT ISSUES

Early identification of wastewater management issues in the LWMP process ensures the issues are adequately addressed in the various stages of the plan. The following sections describe several issues that have been identified during the project through discussions with the *Public Advisory* and *Technical Advisory Committees*.

2.5.1 Existing and Projected Community Development

A key part of any LWMP involves estimating the future population living in the LWMP study area and how this population would most likely be distributed throughout the study area. This information can then be used for future infrastructure planning in subsequent stages of the LWMP.

2.5.2 Wastewater Treatment and Effluent Disposal

The City has utilized its current method and location of wastewater treatment and effluent disposal for several decades, going back to 1955. Over this period, environmental regulations have changed, as well as understanding of environmental impacts due to effluent discharge. In addition, public attitudes with respect to treatment plant site locations have also changed. The LWMP considers these issues in the context of developing alternate long-term wastewater management strategies.

2.5.3 Non-Domestic Discharges

The City municipal sewerage system receives several non-domestic discharges that require co-treatment and disposal with domestic wastewater generated within the LWMP area. Two of the discharges have the potential to significantly impact treatment system operation and efficiency. The LWMP examines the significance of non-domestic discharges relative to all the wastewater generated within the LWMP area, and how the existing City treatment system may be impacted by these discharges.

2.5.4 Source Control

A major focus of the Ministry of Environment, Lands and Parks in the preparation of LWMP's is the issue of source control. Source control refers principally to the control of the quality and quantity of the inputs to the municipal sewer system.

The control of waste inputs into either a municipal, a local community or an on-site wastewater management system is a key factor in the long term operation of the system. With municipal or local community systems, controlling the "quality" of the wastes prevents downstream problems with the quality of the effluent or biosolids generated from any treatment process.

2.5.5 Effluent and Biosolids Reuse

Reduction of waste generation, and reuse of effluent and biosolids, is a key mandate of the MELP. Effluent reuse has gained considerable acceptance in the southwest and southeast United States and the dryer areas of the British Columbia

interior. Similarly, biosolids reuse has seen increased acceptance throughout British Columbia and around the world. The LWMP reviews a variety of concepts for possible inclusion in the long term wastewater management planning for the area.

2.5.6 Wet-Weather Flow Management

Combined sewer systems currently service a large portion of the City. These systems experience overflows (CSOs) during certain precipitation events, with the overflowed water being discharged directly to the receiving environment without first receiving treatment. The LWMP process, beginning in Stage 1, investigates the most applicable schemes for managing these events.

EXISTING AND PROJECTED COMMUNITY DEVELOPMENT

SECTION 3

A key part of any Liquid Waste Management Plan (LWMP) involves estimating the future population living in the LWMP study area and how this population would most likely be distributed throughout the study area.

The data described above can then be used in future planning of the overall wastewater management system:

- Extensions of existing trunk sewer and/or force main pipes into future development areas.
- Introduction of trunk sewers into areas that are presently not serviced at all.
- Initial construction, upgrading and expansion of municipal wastewater treatment facilities.
- Reuse/disposal of effluent.
- Wastewater treatment plant biosolids (sludge) reuse and disposal.

This section focuses on the following objectives:

- Describe the existing community development within the City of Port Alberni (City) and Tsahaheh and Ahahswinis First Nation lands.
- Discuss the planning horizon of the LWMP.
- Present and discuss assumed long-term population growth rates for the study area, and estimated future populations.
- Identify potential areas of residential development within the LWMP study area that may accommodate the projected future populations.

3.1 EXISTING RESIDENTIAL POPULATIONS

3.1.1 City of Port Alberni

For this study, the LWMP has divided the City of Port Alberni into the same four sectors used in the Official Community Plan (OCP, 1993). These sectors are illustrated in Figure 3-1.

The City Planning Department (Port Alberni, 1999) has provided a 1996 estimate of the full-time residential population of 18,468 persons. We have estimated the

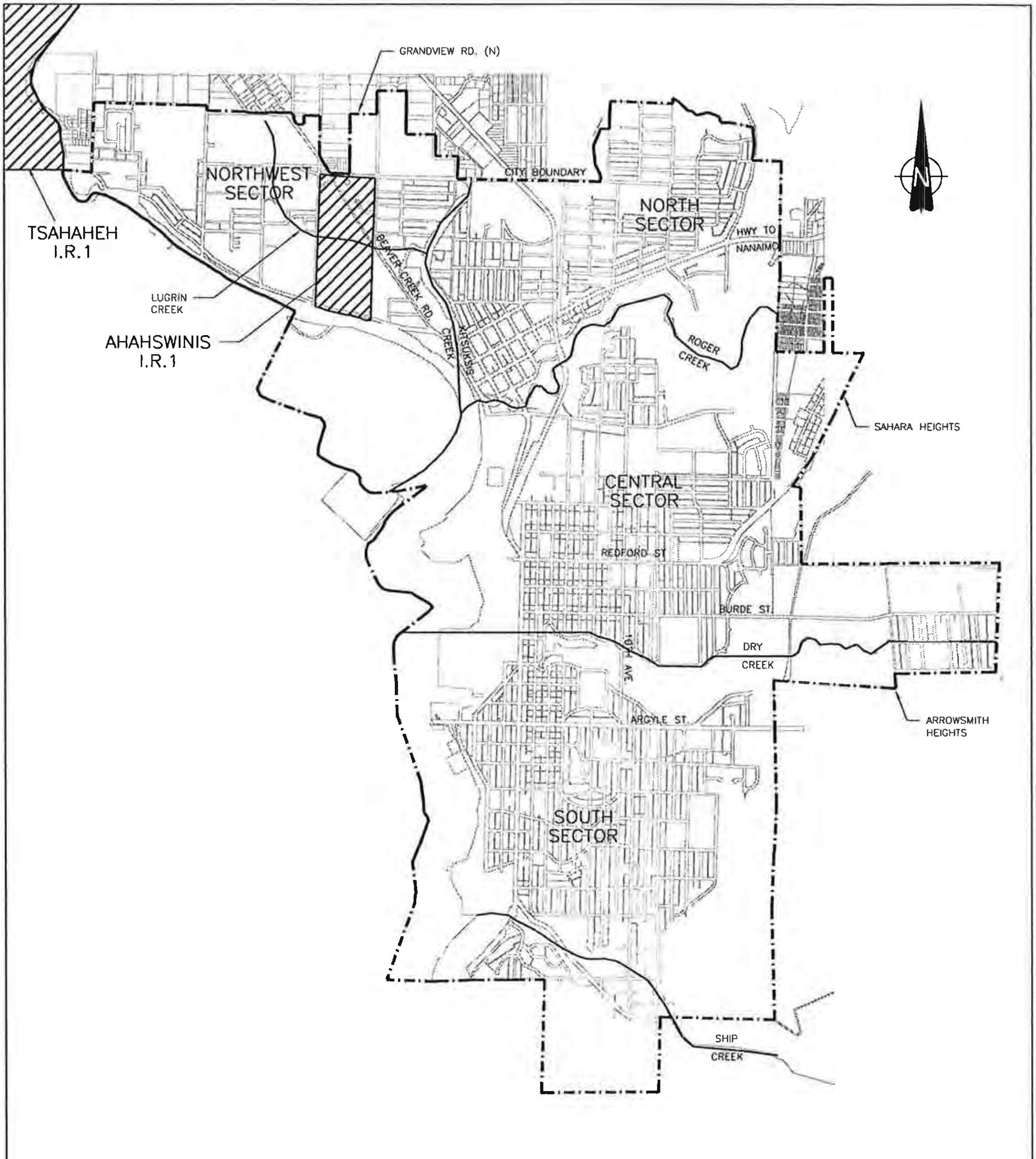

FIGURE 3-1
LWMP STUDY SECTORS

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1999 base population to be approximately 18,750 persons using the City supplied "modest growth" rate of 0.5% per year.

Table 3-1 summarizes the estimated population distribution, amongst the LWMP sectors, for the 18,750 persons. We have estimated the population distribution using City supplied water meter information. For the purposes of the LWMP, this method of population distribution provides an adequate degree of accuracy.

With the exception of residents living in approximately 120 properties (20 long term non-sewered properties and 100 non-sewered properties recently annexed into the City), that utilize on-site treatment and disposal systems, City residents occupy dwellings serviced by the municipal wastewater system.

3.1.2 First Nation Lands

As shown on Figure 3-1, the LWMP study area includes two First Nations and their associated lands:

- *Tseshaht First Nation:* Tsahaheh IR1
- *Hupacasath First Nation*: Ahahswinis IR1

These First Nations and their associated lands, have been included in the LWMP study because their wastewater collection systems discharge wastewater to the City system for treatment and disposal.

Approximately 630 persons reside on these two First Nations lands. Table 3-2 shows the distribution between the two lands, along with the distribution between sewered (i.e., connected to municipal wastewater system) and unsewered (i.e., on-site treatment systems) populations.

3.2 PLANNING HORIZON

In order to assess and plan the upgrading needs of the municipal wastewater system, the LWMP needs to consider future changes in the contributions to the system and increases in wastewater flows. Components of a sewerage system such as sewer pipes and building structures typically have a life of about 40 years. Mechanical and electrical works of pumping stations and treatment plants typically reach the end of their useful life in about

Table 3 - 1. City of Port Alberni Sectors and Residential Populations

Sector	Estimated 1999 Population	Percent of Total Population
Northwest	1,507	8%
North	4,565	24%
Central	5,480	29%
South	7,198	38%
Total	**18,750**	**100%**

Table 3 - 2. Port Alberni First Nations Lands Residential Populations[1]

First Nation Land	Estimated 1999 Population	
	Sewered Population	*Unsewered Population*
Tsahaheh IR1 (Tseshaht First Nation)	160	290
Ahahswinis IR1 (Hupacasath First Nation)	70	110
Total	**630**	

Notes:

1. Data supplied by the City of Port Alberni, and Tseshaht and Hupacasth First Nations.

20 years. In planning wastewater systems, it is thus common to plan pipelines and structures on a 40-year horizon while phasing the upgrading and/or replacement of the process and mechanical/electrical components over this time frame.

For the purposes of the LWMP, we have used a 40-year time frame, to the year 2041, for the planning horizon.

3.3 POPULATION GROWTH

3.3.1 City of Port Alberni

We have developed three growth scenarios for the LWMP: low growth, medium growth and high growth. These growth scenarios have been formulated using information provided by the City Planning Department (Port Alberni, 1999).

We have used low growth (0.5% per annum) and high growth (2.0% per annum) rates that bracket the medium growth (1.0% per annum) value in order to allow for some flexibility in planning. The high growth rate could reflect a scenario where a new major employer, such as an aluminum smelter, locates within the City, which could cause a short term increase in population of 5000 to 7000 people. As the timing of such massive increases cannot be defined, the effect on growth is averaged over the planning period. In addition, long-term (40 year) growth rates have also been used to project future populations. Given the low growth rates, we have used identical values for both the medium-term (i.e., years 1 to 20) and long-term (i.e., years 21 to 40) rates for all three growth scenarios. The long-term (40 year) planning horizon is used primarily to verify and plan for the overall wastewater management scheme. Since a large new industry, such as an aluminum smelter, may or may not locate in Port Alberni within this period, it will be prudent to monitor the actual effective growth rate, perhaps every five years, to determine whether the estimated wastewater collection and treatment infrastructure capacity is being reached quicker than otherwise anticipated.

Table 3-3 contains the growth rates used for projecting the future population within the City of Port Alberni. Table 3-5 presents the estimated future non-First Nations populations for the various growth rates.

Table 3 - 3. Population Growth Rates for the City of Port Alberni

Time Frame	Low Growth (per year)	Medium Growth (per year)	High Growth per year)
1999 to 2019	0.50%	1.00%	2.0%
2020 to 2039	0.50%	1.00%	2.0%

Table 3 - 4. Population Growth Rates for the Port Alberni-area First Nations

Time Frame	Low Growth (per year)	Medium Growth (per year)	High Growth per year)
1999 to 2019	1.00%	2.0%	4.0%
2020 to 2039	1.00%	2.0%	4.0%

Table 3 - 5. Residential Population Projections for the City of Port Alberni

	Low	Medium	High
Annual Growth Years 1 to 20:	0.50%	1.0%	2.0%
Annual Growth Years 21 to 40:	0.50%	1.0%	2.0%
1999	18,750	18,750	18,750
2000	18,844	18,938	19,125
2001	18,938	19,127	19,508
2002	19,033	19,318	19,898
2003	19,128	19,511	20,296
2004	19,223	19,706	20,702
2005	19,320	19,904	21,116
2006	19,416	20,103	21,538
2007	19,513	20,304	21,969
2008	19,611	20,507	22,408
2009	19,709	20,712	22,856
2010	19,807	20,919	23,313
2011	19,906	21,128	23,780
2012	20,006	21,339	24,255
2013	20,106	21,553	24,740
2014	20,207	21,768	25,235
2015	20,308	21,986	25,740
2016	20,409	22,206	26,255
2017	20,511	22,428	26,780
2018	20,614	22,652	27,315
2019	20,717	22,879	27,862
2020	20,820	23,107	28,419
2021	20,924	23,338	28,987
2022	21,029	23,572	29,567
2023	21,134	23,808	30,158
2024	21,240	24,046	30,761
2025	21,346	24,286	31,377
2026	21,453	24,529	32,004
2027	21,560	24,774	32,644
2028	21,668	25,022	33,297
2029	21,776	25,272	33,963
2030	21,885	25,525	34,642
2031	21,995	25,780	35,335
2032	22,105	26,038	36,042
2033	22,215	26,298	36,763
2034	22,326	26,561	37,498
2035	22,438	26,827	38,248
2036	22,550	27,095	39,013
2037	22,663	27,366	39,793
2038	22,776	27,640	40,589
2039	22,890	27,916	41,401

Table 3 - 6. Residential Population Projections for the Tseshaht First Nation

	Low	Medium	High
Annual Growth Years 1 to 20:	1.00%	2.0%	4.0%
Annual Growth Years 21 to 40:	1.00%	2.0%	4.0%
1999	450	450	450
2000	455	459	468
2001	459	468	487
2002	464	478	506
2003	468	487	526
2004	473	497	547
2005	478	507	569
2006	482	517	592
2007	487	527	616
2008	492	538	640
2009	497	549	666
2010	502	560	693
2011	507	571	720
2012	512	582	749
2013	517	594	779
2014	522	606	810
2015	528	618	843
2016	533	630	877
2017	538	643	912
2018	544	656	948
2019	549	669	986
2020	555	682	1,025
2021	560	696	1,066
2022	566	710	1,109
2023	571	724	1,153
2024	577	738	1,200
2025	583	753	1,248
2026	589	768	1,298
2027	595	783	1,349
2028	601	799	1,403
2029	607	815	1,460
2030	613	831	1,518
2031	619	848	1,579
2032	625	865	1,642
2033	631	882	1,707
2034	637	900	1,776
2035	644	918	1,847
2036	650	936	1,921
2037	657	955	1,997
2038	663	974	2,077
2039	670	994	2,160

Table 3 - 7. Residential Population Projections for the Hupacasath First Nation

	Low	Medium	High
Annual Growth Years 1 to 20:	1.00%	2.0%	4.0%
Annual Growth Years 21 to 40:	1.00%	2.0%	4.0%
1999	180	180	180
2000	182	184	187
2001	184	187	195
2002	185	191	202
2003	187	195	211
2004	189	199	219
2005	191	203	228
2006	193	207	237
2007	195	211	246
2008	197	215	256
2009	199	219	266
2010	201	224	277
2011	203	228	288
2012	205	233	300
2013	207	238	312
2014	209	242	324
2015	211	247	337
2016	213	252	351
2017	215	257	365
2018	217	262	379
2019	220	267	394
2020	222	273	410
2021	224	278	427
2022	226	284	444
2023	229	290	461
2024	231	295	480
2025	233	301	499
2026	235	307	519
2027	238	313	540
2028	240	320	561
2029	243	326	584
2030	245	333	607
2031	247	339	631
2032	250	346	657
2033	252	353	683
2034	255	360	710
2035	258	367	739
2036	260	375	768
2037	263	382	799
2038	265	390	831
2039	268	397	864

3.3.2 First Nations Lands

Future First Nations population growth rates have not been made available to the City (Port Alberni, 2000). For the purposes of the LWMP, we have assumed that the medium- and long-term growth rates, for all three growth scenarios, will be twice that of the City values. Tables 3- 4 contains the estimated population growth rates for the First Nation lands. Tables 3-6 and 3-7 present the estimated future populations for the Tsahaheh and Ahahswinis First Nation lands, respectively.

Table 3-8 and Figure 3-2 contain the total summation of estimated City and First Nation land future populations for the various growth rates.

3.4 POTENTIAL AREAS OF RESIDENTIAL DEVELOPMENT

Future residential development within the LWMP area can proceed in two ways: development of large new areas that are presently undeveloped, and the redevelopment or infill of smaller areas within or adjacent to existing developed areas. The City's OCP provides specific direction with respect to future development within the City. At this point, similar information has not been available from the First Nations.

This section outlines the potential areas of future residential development

3.4.1 City of Port Alberni

The current OCP indicates that there is limited land available within the City limits to accommodate future growth. Some largely undeveloped blocks of land are available adjacent to existing developments. There are also some areas that have infill development potential.

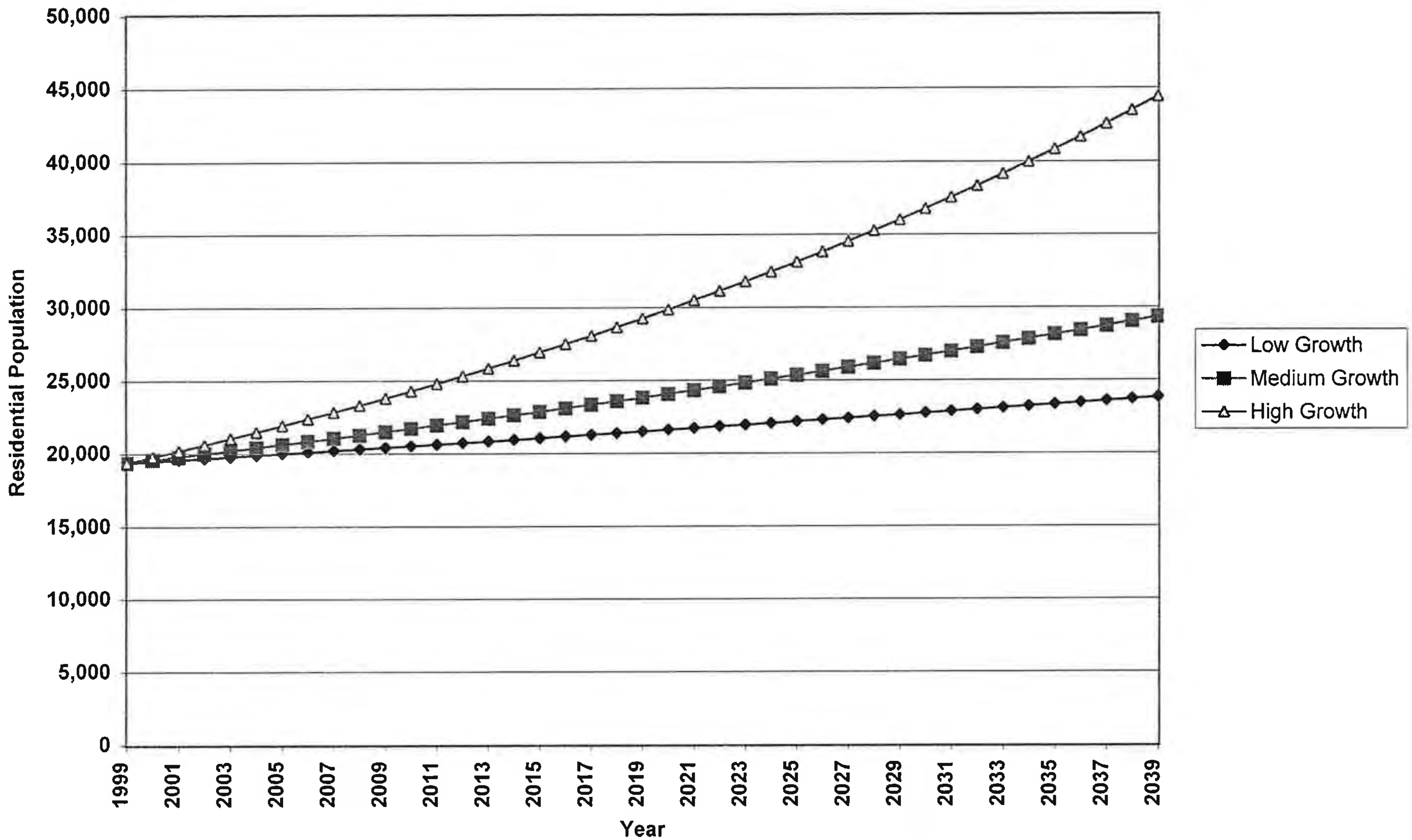
Larger-scale future residential development and growth will occur outside, but adjacent to, the existing City limit boundaries. This will require gradual expansion of the City boundaries, as development occurs.

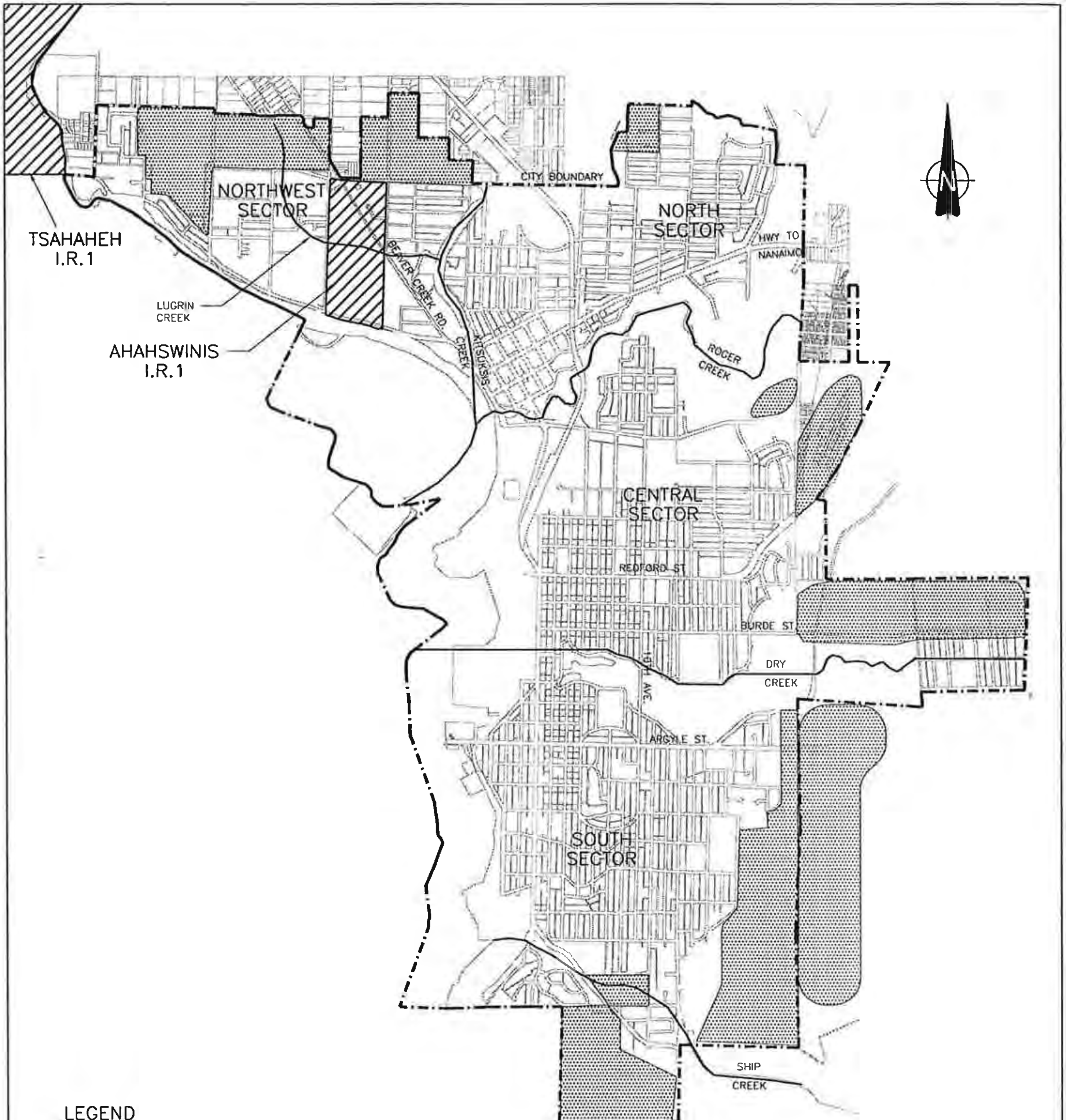
Figure 3-3 illustrates the potential residential development areas, as identified in the OCP.

Table 3 - 8. Total LWMP Area Residential Population Projections

Year	Low Growth	Medium Growth	High Growth
1999	19,380	19,380	19,380
2000	19,480	19,580	19,780
2001	19,581	19,782	20,189
2002	19,682	19,987	20,606
2003	19,783	20,193	21,033
2004	19,886	20,402	21,468
2005	19,988	20,613	21,913
2006	20,092	20,826	22,367
2007	20,195	21,042	22,831
2008	20,300	21,260	23,305
2009	20,405	21,480	23,789
2010	20,510	21,702	24,283
2011	20,616	21,927	24,788
2012	20,723	22,154	25,304
2013	20,830	22,384	25,831
2014	20,938	22,616	26,370
2015	21,046	22,851	26,920
2016	21,155	23,088	27,482
2017	21,265	23,328	28,056
2018	21,375	23,570	28,643
2019	21,486	23,815	29,242
2020	21,597	24,062	29,854
2021	21,709	24,312	30,480
2022	21,821	24,565	31,120
2023	21,934	24,821	31,773
2024	22,048	25,079	32,441
2025	22,162	25,340	33,123
2026	22,277	25,604	33,821
2027	22,393	25,871	34,533
2028	22,509	26,141	35,262
2029	22,625	26,413	36,006
2030	22,743	26,689	36,767
2031	22,861	26,967	37,545
2032	22,979	27,249	38,340
2033	23,099	27,534	39,153
2034	23,219	27,821	39,984
2035	23,339	28,112	40,833
2036	23,460	28,406	41,702
2037	23,582	28,703	42,590
2038	23,705	29,004	43,497
2039	23,828	29,307	44,425

Figure 3 - 2. Total LWMP Area Residential Population Projections





LEGEND

FUTURE RESIDENTIAL DEVELOPMENT

FIGURE 3-3
POTENTIAL AREAS OF FUTURE RESIDENTIAL DEVELOPMENT

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Last Edit Date: 2001/05/08

3.4.2 First Nation Lands

Based on the assumed limited population increase on the First Nations lands, we expect future development will be within existing First Nations areas.

3.5 COMMERCIAL, INSTITUTIONAL AND INDUSTRIAL DEVELOPMENT

Commercial and institutional development within the City will continue to expand as the residential development and population in the study area continues to grow. As outlined in the OCP, future commercial development will be largely concentrated in the two main areas of current commercial development within the *North Sector* and *South Sector*. Smaller pockets of commercial development will occur in various sector locations. Future highway commercial development will largely be located on Johnston Road in the *North Sector*, and Redford Street in the *Central Sector*.

The City currently has 480 hotel/motel rooms (Chamber of Commerce, 2000). Assuming fully-booked, double occupancy, persons staying in hotel/motel units equate to only about 5% of the total residential population (i.e., 19,000 persons). Therefore, even during peak tourist periods, wastewater generated by these facilities will likely have a negligible impact on City wastewater infrastructure.

The City's existing industrial development occupies essentially the entire waterfront areas of the *South Sector* and *Central Sector*. The OCP has identified three main areas for future industrial development:

- Dundalk Industrial Park. This area is located approximately 3 km east of the *North Sector* eastern boundary.
- Unnamed Industrial Park, located in the southeastern corner of the *North Sector*.
- Devil's Den Industrial Park, located west of the City Boundary across Alberni Inlet. The area lies adjacent to Devil's Den Lake.

Future development and population growth directly impacts wastewater management requirements. To this end, development and growth assumptions made during the Stage 1 LWMP will be used to develop wastewater management options. The subsequent Stage 2 LWMP will include detailed technical and economic analyzes of the developed options.

As a result, these assumptions must accurately reflect the community vision, while recognizing future development opportunities and constraints. Since future industrial developments may significantly affect population growth rates and/or wastewater flows, should major new development occur during the life of the Stage 3 LWMP, it will be prudent to review the LWMP from time to time, perhaps every five years.

WASTEWATER TREATMENT AND EFFLUENT DISPOSAL

SECTION 4

The objective of wastewater treatment is to produce an effluent of acceptable quality for the effluent reuse and disposal strategies adopted in the LWMP. This treatment may be provided at either the municipal wastewater treatment plant, at local community treatment plants, or at individual on-site treatment systems. There are a wide variety of available wastewater treatment technologies. These range from "natural" lagoon-based systems to relatively complex technologies. Some processes are aimed at the individual home treatment system while other processes are designed for very large-scale municipal facilities.

At the present time, one municipal wastewater treatment plant treats wastewater collected from the City and Tsahaheh and Ahahswinis First Nation lands. This plant will continue to operate in the short term and, depending upon the LWMP option, may be upgraded and expanded to provide treatment over the 40-year planning horizon, or replaced entirely. This section briefly reviews the current performance of the municipal wastewater treatment plant, and discusses treatment and disposal issues that will be further examined in the Stage 2 LWMP.

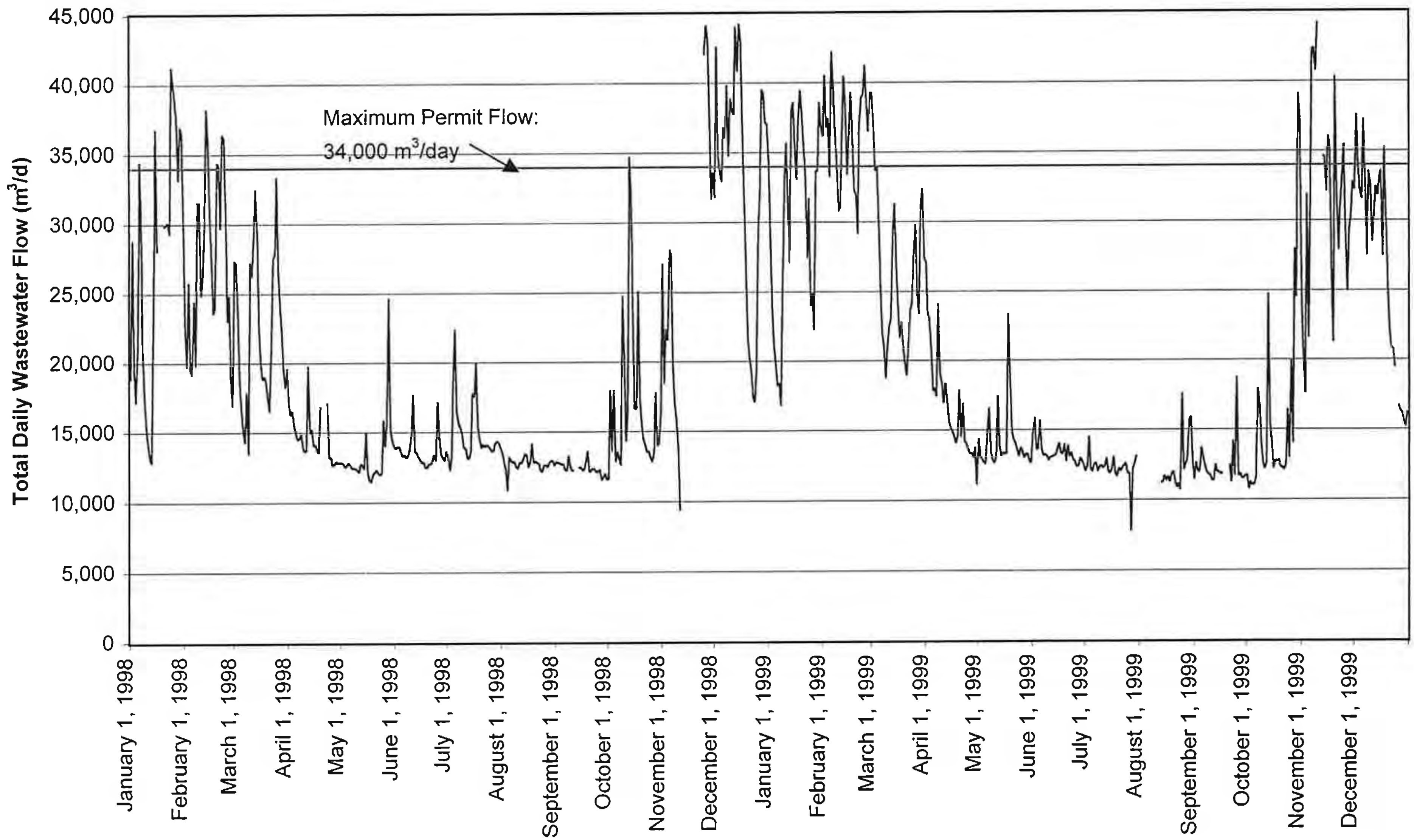
4.1 PORT ALBERNI WASTEWATER TREATMENT PLANT

The City wastewater treatment plant consists of an earthen lagoon that was originally constructed in 1955 to operate as a facultative system (NovaTec, 1995). Over the years, due to increasing wastewater flows and loads, the lagoon's treatment capacity has been increased by the addition of mechanical surface aerators to convert lagoon operations from a facultative system to a more completely aerobic system. The most recent upgrades also included partitioning the lagoon into several cells, using flexible plastic curtains, to enhance treatment efficiency. In addition, the accumulated sludge within the lagoon has been removed and dewatered, and subsequently composted with wood waste at the Regional District of Alberni Clayoquot landfill.

4.1.1 Flow Analysis

Figure 4-1 illustrates the total daily wastewater flow entering the lagoon for the years 1998 and 1999. Figure 4-2 shows the same data plotted in a cumulative frequency distribution. Table 4-1 summarizes the key flow parameters for 1998 and 1999. The data highlight a number of observations, as follows:

Figure 4 - 1. Lagoon Wastewater Flows: January 1998 to December 1999



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Flowdata, Fig 4- 1

Figure 4 - 2. Lagoon Wastewater Flows: January 1998 to December 1999
Cumulative Frequency Distribution

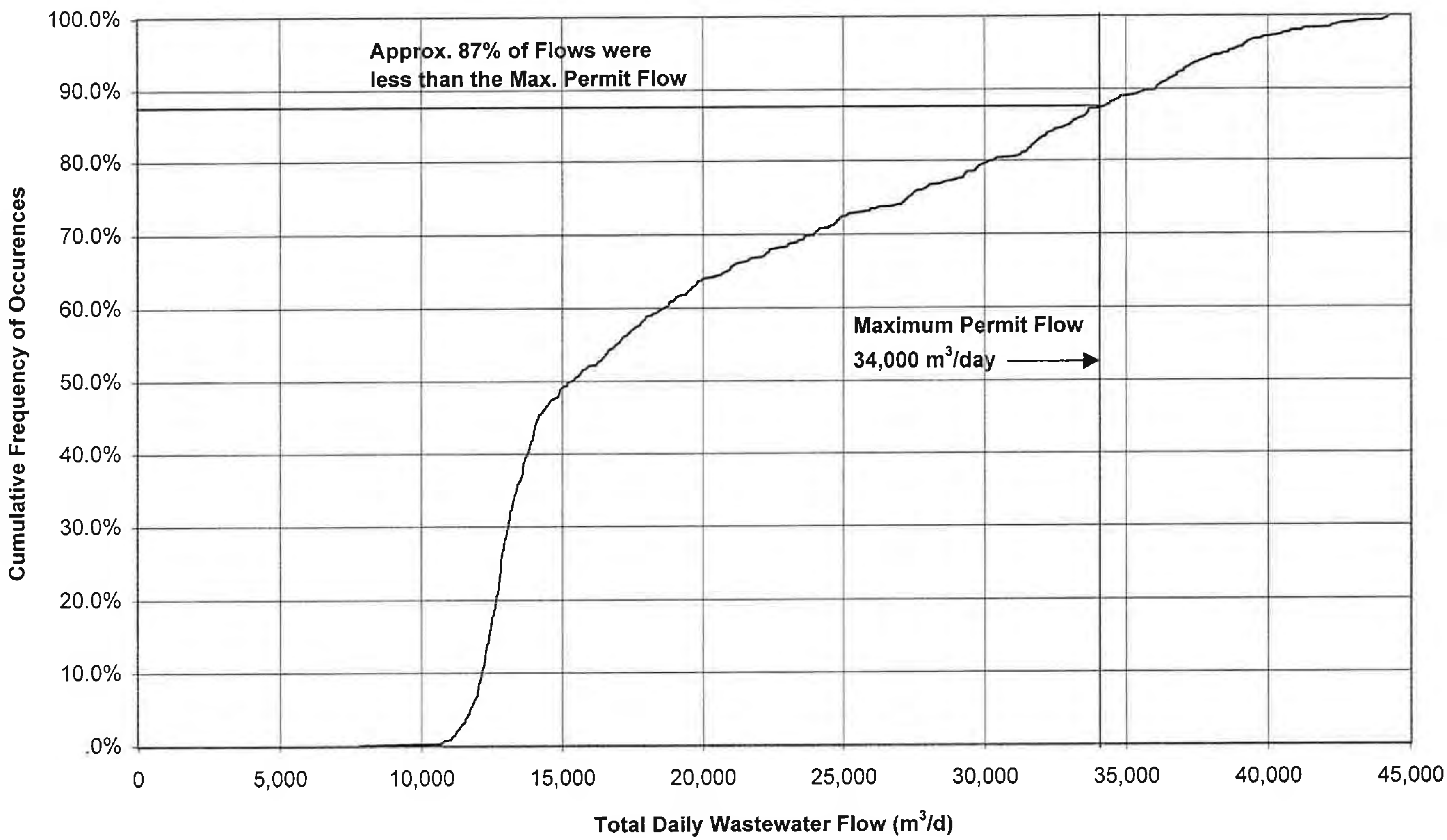


Table 4 - 1. Lagoon Wastewater Flows: January 1998 to December 1999

Parameter	Value
Average Annual Flow (AAF), m^3/d	20,142
Average Dry Weather Flow[1] (ADWF), m^3/d	13,068
Maximum Daily Flow (MDF), m^3/d	44,228
AAF/ADWF Ratio	1.54
MDF/ADWF Ratio	3.38
Average Annual Residential Generation Rate[2], L/d/person	1,039
Average Dry Weather Generation Rate[2], L/d/person	674

Notes:

1. Dry weather period defined as July 1 to August 31.
2. Estimated 1999 sewered residential population = 19,380

- The wastewater collection system is highly susceptible to allowing rainfall-induced inflow and infiltration (I&I) to enter the system, as illustrated by the high maximum daily flow (MDF) to average dry-weather flow (ADWF) ratio of 3.38.

  Some of the I&I can be attributed to the combined storm and sanitary sewer sections of the collection system. The remaining I&I will result from a combination of extraneous water entering the sanitary sewer collection system through structural and installation defects in the pipes, joints and connections, and leaking manhole lids and barrels.

- Based on a sewered residential population of approximately 19,380 persons (i.e., City = 18,750; First Nation Lands = 630), the average annual wastewater generation rate is approximately 1,070 L/d per person. The average dry-weather generation rate is 695 L/d/person. While these unit values include wastewater from commercial, institutional, and industrial sources, as well as the landfill leachate, the values are still very large in magnitude, particularly the dry-weather generation rate. Assuming the flow data are accurate, there appears to be significant infiltration entering the sewer system even during dry weather.

  Our discussions with Weyerhauser (Weyerhauser, 2000) and Pacific Paper (Pacifica Paper, 2000) staff revealed that only an insignificant amount of wastewater generated at their facilities is discharged to the City wastewater system.

- The current Ministry of Environment, Lands and Parks (MELP) waste management lagoon permit stipulates a maximum daily effluent discharge volume of 34,100 m^3/d. Approximately 12% of lagoon effluent flows, during 1998 and 1999, exceeded the permit value.

- Leachate from the Alberni Valley landfill contributes heavily to high winter wastewater flows, e.g., up to 15% of the total wet weather flow can come from leachate, which may contribute to the City's wastewater flows exceeding permit. A leachate surge pond at the landfill has recently helped to decrease excessive flows. Nevertheless, the flows

have apparently exceeded the permit value in the order of 8 to 12 times per year. This did not necessarily mean that the effluent quality exceed the permit value(s).

4.1.2 Lagoon Performance

The current MELP waste management permit (PE-297) stipulates the following performance criteria for the Port Alberni lagoon:

- Maximum effluent biochemical oxygen demand (BOD) concentration = 70 mg/L.
- Maximum effluent total suspended solids (TSS) concentration = 70 mg/L.

For the most part, the existing lagoon consistently meets the effluent BOD and TSS criteria. Figure 4-3 illustrates the effluent BOD data for 1998 and 1999. All 37 analyzed samples had BOD concentrations less than the permit criteria.

Figure 4-4 illustrates the 1998 and 1999 effluent TSS data. Only two of the 37 analyzed effluent samples had TSS concentrations that exceeded the permit criteria. Therefore, the lagoon effluent met permit criteria approximately 95% of the time.

Section 5 discusses the impacts of non-domestic wastewater discharges on lagoon operations and performance.

4.2 EFFLUENT DISPOSAL

Lagoon effluent currently exits the lagoon through an overflow structure, and proceeds to flow by gravity through a marsh and tidal watercourse. The wastewater eventually discharges to the Somass River estuary (NovaTec, 1995).

In terms of the performance of the effluent disposal system, it is not clear whether any improvements are needed. DelCan (1985) previously identified large beds of what they thought was wastewater sludge that had accumulated in the marsh area immediately downstream of the lagoon overflow structure. However, it is not clear how they distinguished "wastewater sludge" from normal inorganic and organic estuary sediments.

More recently, there is some anecdotal information that suggests that whatever the "sludge" beds were, they seem to have disappeared. This situation should be confirmed and, if there is an actual sludge bed problem, additional treatment or changes to the disposal system, e.g., use of constructed wetlands or a pipe diffuser system, may be warranted.

4.3 REGULATORY ISSUES

Provincial legislation provides municipalities with considerable flexibility when conducting wastewater planning under the structured LWMP process. However, the MELP will use the *Municipal Sewage Regulation* (MSR) as a guide when assessing proposed management approaches included in a LWMP. To this end, a number of criteria in the newly enacted regulation, related to wastewater treatment and effluent disposal, will require consideration in the Port Alberni LWMP. These criteria include:

- Secondary treatment effluent quality criteria (i.e., BOD, TSS, fecal coliform, nutrients).
- Effluent disposal.

4.3.1 BOD/TSS Criteria

The MELP MSR requires that lagoon-based secondary treatment systems provide maximum effluent biochemical oxygen demand (BOD) and total suspended solids (TSS) concentrations of 45 mg/L and 60 mg/L, respectively. Using these criteria, Figure 4-3 shows that the lagoon effluent met the 45 mg/L BOD criteria for approximately 83% of samples collected in 1998 and 1999. As previously discussed, under the existing permit, the plant has met the 70 mg/L BOD criteria for all samples collected over the past two years.

A reduction in effluent TSS criteria from 70 to 60 mg/L is a relatively small change. However, as the data shown in Figure 4-4 illustrate, a 60 mg/L TSS value encroaches on the typical range of Port Alberni effluent TSS values. This could result in a higher probability of criteria exceedence.

The addition of post-lagoon unit treatment processes are commonly used to reduce the concentration of suspended solids escaping in the effluent, thereby

Figure 4 - 3. Lagoon Effluent BOD Concentrations: January 1998 to December 1999 (grab sample data, n = 37)

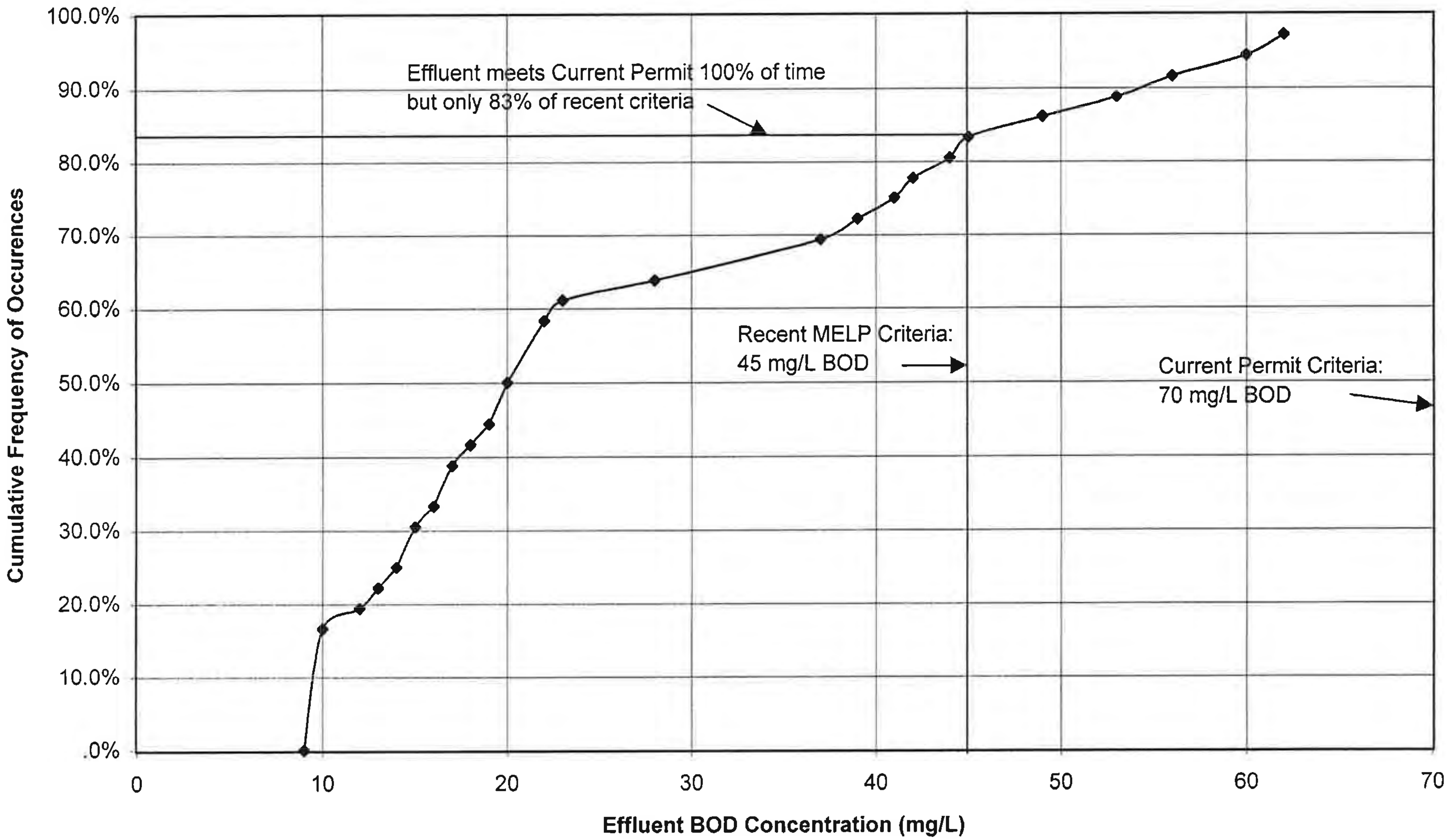
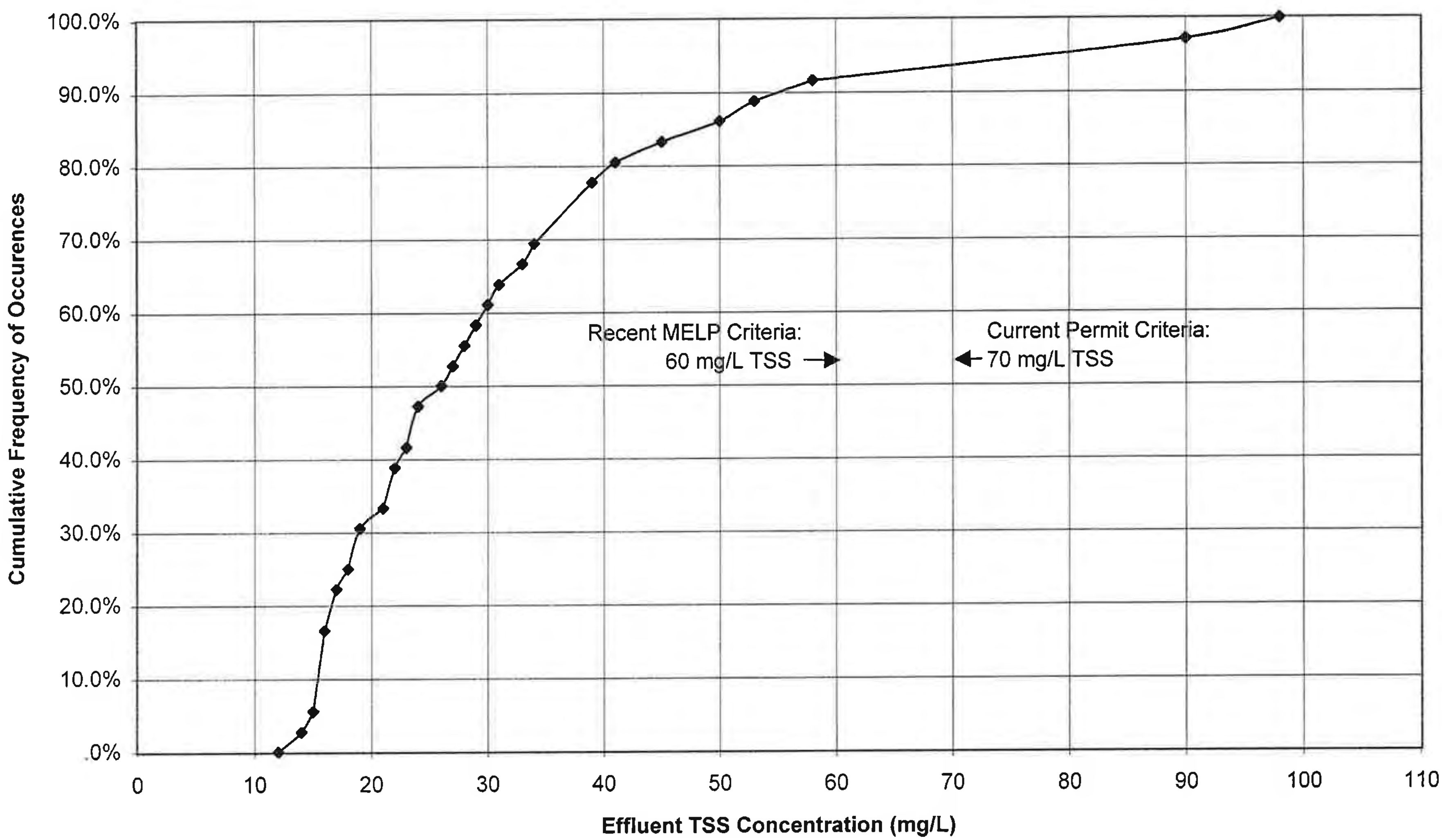


Figure 4 - 4. Lagoon Effluent TSS Concentrations: January 1998 to December 1999
(grab sample data, n = 37)



reducing effluent TSS and BOD concentrations. Sand filters and clarifiers are examples of these unit processes.

4.3.2 Fecal Coliform Criteria

The need for effluent disinfection is driven by the use of the effluent receiving waters. More specifically, effluent discharged to shellfish-bearing receiving waters, and those used for recreational purposes, must be of sufficient quality such that waters outside the initial effluent/receiving water dilution zone meet specified fecal coliform criteria. This may not be true under the existing treatment system, requiring the addition of an effluent disinfection system. However, the nearest shellfish area is likely several kilometers to the south, in the China Creek beach area. In addition, if there was a problem, the use of a constructed wetland could be an alternative to disinfection for the reduction of fecal coliform bacteria.

4.3.3 Nutrient Criteria

The MSR has effluent criteria values for total phosphorus and orthophosphate. However, MELP may waive these criteria if the municipality demonstrates that the receiving waters would not be negatively impacted by the phosphorus loading.

Under the MSR, maximum allowable effluent ammonia concentrations are to be calculated based on the characteristics of the receiving water and known water quality guidelines. Once these calculations have been made, the treatment system can be evaluated for its ability to meet the maximum allowable ammonia concentration.

4.3.4 Effluent Disposal

The current method of effluent disposal, using a non-engineered natural wetland, could possibly be defined as an "Environmental - Restricted Public Access" method of effluent reuse under the current MSR. The MSR indirectly defines effluent disposal as direct discharge of effluent to streams, rivers, estuaries, marine waters, or to engineered, infiltration-based land disposal systems.

As the previous sections have shown, effluent disposal issues are closely linked to wastewater treatment issues. As a result, the existing method of effluent disposal

must first be defined prior to assessing effluent quality requirements. In addition, the need for an alternate disposal method (i.e., marine discharge via an outfall) also requires assessment.

4.4 SITE LOCATION

The existing wastewater treatment system is located in a relatively confined, estuary area. The ability of the current site location to accommodate treatment works to process future wastewater flows may be limited by a number of factors:

- Site expansion onto adjacent lands may be limited due to physical constraints in land area. In addition, due to its low elevation, the system is susceptible to flooding.

- Regulatory constraints may preclude long-term site tenure given its location in an estuary area.

Regardless of the actual treatment system site location, the City should consider providing buffer zones around treatment plant sites. This will ensure future development does not encroach on the sites to an extent where odour and aesthetic issues become excessively difficult to mitigate.

The long-term viability of the current lagoon and effluent disposal system will be dependent on the ability of the system to provide adequate environmental protection through a combination of meeting MELP Regulation site-specific and non-site-specific criteria and requirements. These requirements will be developed in consultation with the MELP during the Stage 2 LWMP. This may require the City to conduct a study, early in the Stage 2 LWMP, to assess the impacts that the current method of wastewater treatment and effluent disposal have on the receiving environment. This would include determining which assessment criteria should be used, e.g., BOD, dissolved oxygen, ammonia-nitrogen, metals, etc., as well as, determining the point of release into the environment, e.g., at the discharge point from the lagoons or after the existing natural wetland.

The Stage 2 LWMP will further examine the capacity of the existing lagoon system, and identify modifications that may be necessary to provide a higher level of wastewater treatment. At that time, concepts for providing wastewater treatment at an alternate

site(s) will also be developed. One of the key Stage 2 activities will be integrating wastewater treatment requirements with wet-weather flow management.

NON-DOMESTIC DISCHARGES

SECTION 5

Domestic wastewater generated within a community contains wastewater originating primarily from residences. A smaller fraction of the wastewater comes from commercial and institutional facilities. The characteristics of commercial/institutional wastewater are similar to that of residential wastewater.

Domestic wastewater can also contain some fraction of wastewater generated by *non-domestic* sources such as industrial processes and landfills. Depending on the relative magnitude of the non-domestic sources to the residential and commercial/institutional fraction of the wastewater stream, the non-domestic sources may have little impact on the volume or characteristics of the combined "domestic" wastewater. Alternatively, the non-domestic sources can significantly impact the overall wastewater stream, both in terms of volume and/or characteristics.

The City of Port Alberni has two significant types of non-domestic wastewater entering the municipal wastewater collection, treatment and disposal system. The wastewater types include those generated by fish processing operations (i.e., Port Fish, Smokehouse Fish Plant) and a municipal landfill (i.e., Alberni-Clayoquot Regional Landfill). This section describes these sources and their impacts on the City wastewater system.

5.1 FISH PROCESSING OPERATIONS - PORT FISH

The Port Fish Company opened a surimi processing operation in Port Alberni in 1995, and operated the facility from 1995 to 1997. New owners, Port Fish (P.A.) Ltd., have operated the facility since 1997. The facility operates seasonally, with operations typically extending from March to November.

Wastewater generated by the facility undergoes on-site pretreatment prior to discharge to the City wastewater collection system. The pretreatment system utilizes the following unit operations and processes:

- Rotating drum screen - course solids removal
- Dissolved air flotation (DAF) - oil & grease, and finer solids removal

5.1.1 Wastewater Flows

Port Fish wastewater enters the section of the City wastewater collection system that is served by the Argyle/4th Avenue pumping station. Wastewater flows from Port Fish average 450 m^3/d (Port Alberni, 2000), and can reach 700 m^3/d during days of 24 hour processing. In comparison, the total daily flow from the Argyle/4th Avenue pumping station, including the Port Fish wastewater contribution, varies between approximately 6000 and 21,000 m^3/d, depending on the time of year. Therefore, Port Fish wastewater flows account for between 2% and 12% of the total wastewater flow generated in the catchment area served by the Argyle/4th Avenue pumping station.

5.1.2 Pre-Treated Wastewater Quality

The most significant contaminants in the Port Fish pre-treated wastewater include total suspended solids (TSS) and biochemical oxygen demand (BOD). Figures 5-1 and 5-2 illustrate the cumulative frequency distributions for TSS and BOD concentrations for wastewater samples collected in 1999. The average TSS and BOD concentrations for this data set are 864 mg/L and 4008 mg/L, respectively.

The current Port Fish wastewater discharge permit, issued by the City, sets wastewater quality "objectives" that are equal to the TSS and BOD concentration limits set forth in the City Source Control Bylaw No. 3224. The stipulated TSS and BOD concentrations are 500 and 300 mg/L, respectively. For samples collected in 1999, these values were exceeded 65% of the time for TSS, and 99% of the time for BOD.

Figure 5-3 illustrates the relationship between BOD and TSS concentrations. While the correlation between these two parameters can be shown to be statistically significant, the large residual error between the data and model line generated by least squares regression shows the large amount of variability in BOD levels regardless of TSS concentrations. Particulate TSS matter can contribute to BOD concentrations; however, soluble material (i.e., blood) can significantly contribute to BOD levels while not increasing TSS concentrations.

Fish processing wastewater can also contain elevated ammonia and oil & grease concentrations compared to typical domestic wastewater. During 1999, Port Fish

Figure 5 - 1. Port Fish Pre-treated Wastewater: March 1999 to November 1999
TSS Concentrations
(daily composite sample data, n = 178)

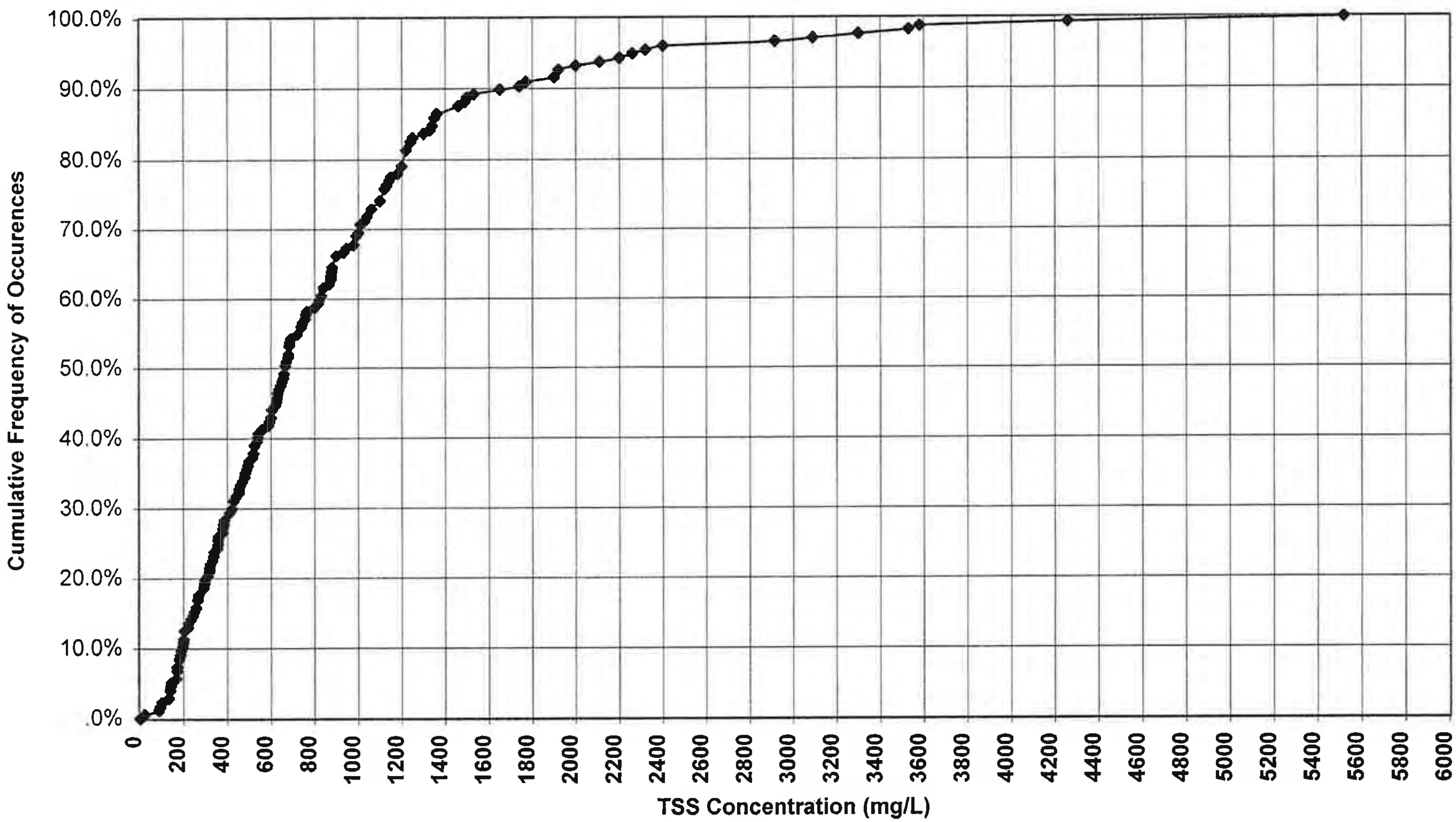


Figure 5 - 2. Port Fish Pre-treated Wastewater: March 1999 to November 1999
BOD Concentrations
(daily composite sample data, n = 178)

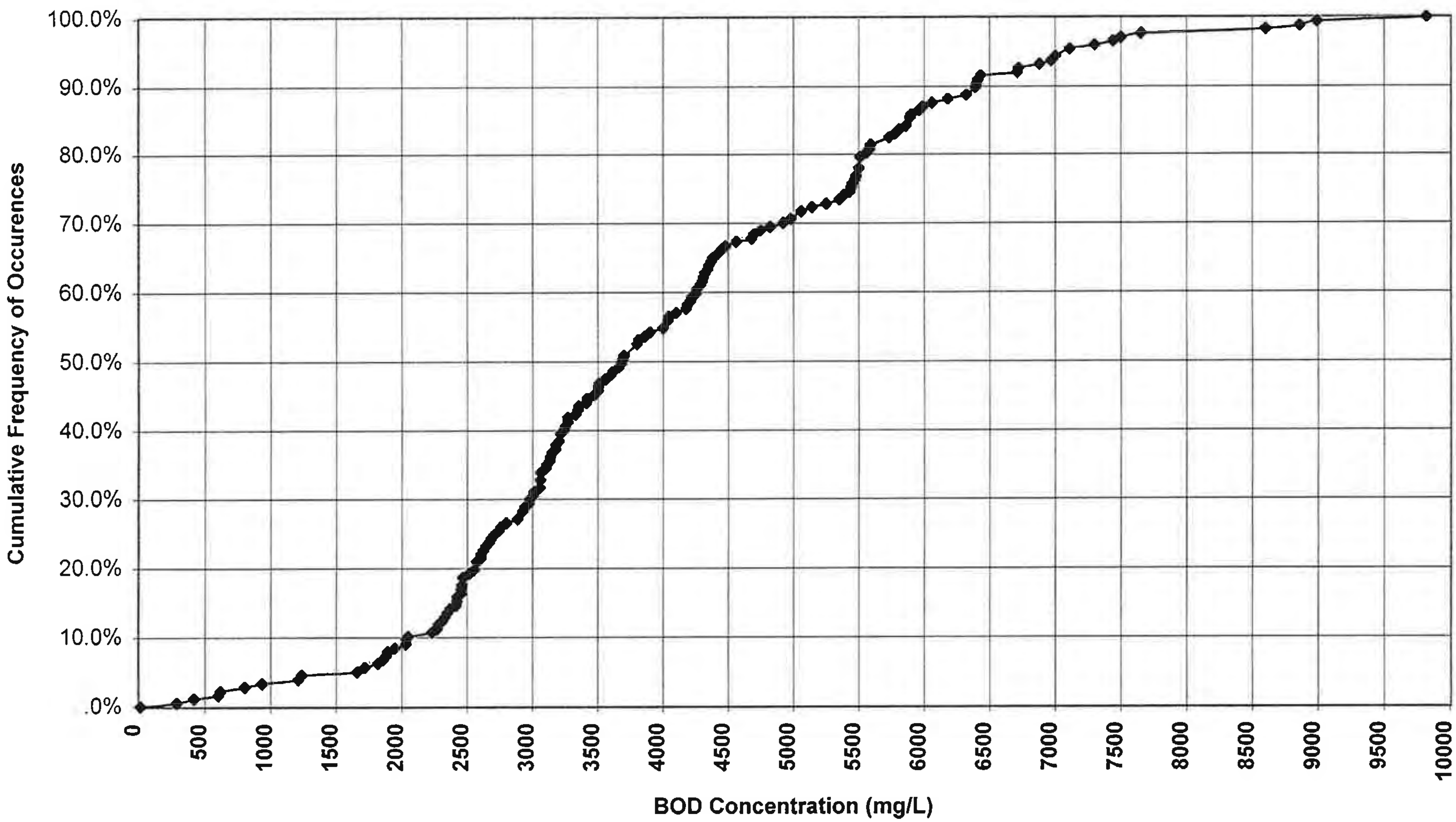
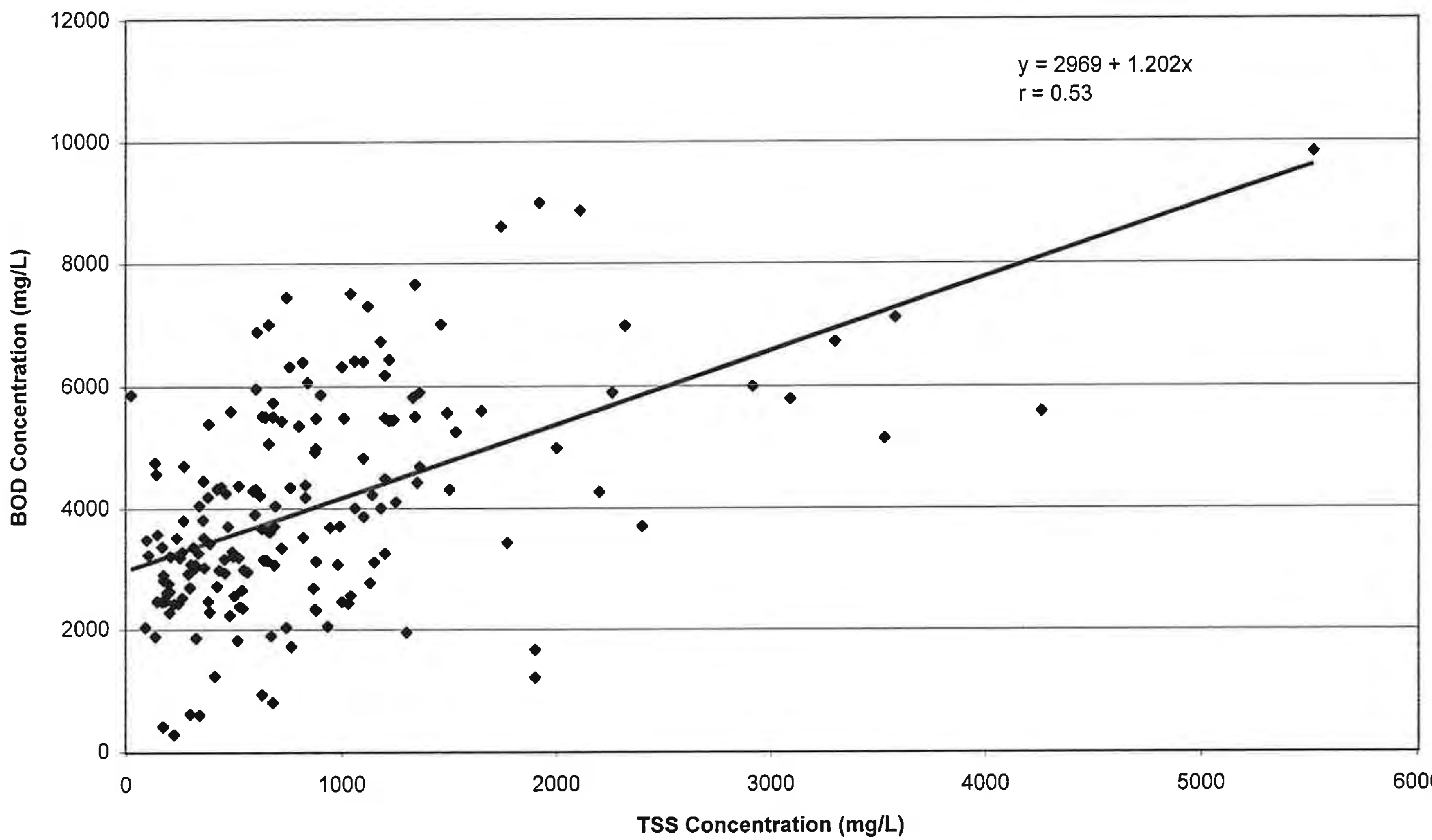


Figure 5 - 3. Port Fish Pre-treated Wastewater: March 1999 to November 1999
TSS vs. BOD Concentrations



pre-treated wastewater contained ammonia concentrations that ranged from 7 mg/L to over 1,100 mg/L, with an average value of 159 mg/L for the 15 samples analyzed in 1999.

The Port Fish discharge permit currently does not have a limit for ammonia. Given the large amount of protein contained in the wastewater, the City should consider adding a Total Kjeldahl Nitrogen (TKN) criteria to the Port Fish discharge permit. The TKN test provides a measure of both the organically-bound nitrogen, contained in compounds such as proteins, as well as free ammonia and ammonium ions. Microorganisms will convert the organically bound nitrogen to ammonia, within the lagoon, by protein hydrolysis. As a result, the mass of ammonia requiring oxidation will increase, and can further elevate lagoon effluent ammonia concentrations.

Pre-treated wastewater had oil & grease concentrations that ranged from 7 mg/L to 460 mg/L, with an average value of 93 mg/L for the 14 analyzed samples. The Port Fish discharge permit stipulates a maximum concentration of 100 mg/L. Therefore, 29% of collected samples had oil & grease concentrations in excess of permit criteria.

5.1.3 Impacts on Lagoon Loadings and Treatment Performance

Table 5-1 contains the estimated average daily lagoon loadings during the March to November 1999 period of Port Fish operations. The Port Fish loading data have been estimated using BOD and TSS data obtained from composite samples collected on each day of operation. Therefore, we expect the estimated average daily Port Fish TSS and BOD loadings to be fairly representative and reliable data.

However, the data obtained for the various pumping stations (PS) are limited and, as a result, may not accurately reflect reality. For example, the estimated average daily BOD load contributed by the Argyle/4th PS to the lagoon is shown to be 1,063 kg/d. This pumping station ultimately receives the Port Fish wastewater, yet the average BOD load contributed by Port Fish has been estimated at 1803 kg/d. Therefore, the BOD load contributed by the Argyle/4th PS should be something greater than 1,803 kg/d, to account for the BOD load contributed by other sources (i.e., residential, commercial). We suspect that the Argyle/4th PS

Table 5 - 1. Average Daily Lagoon Loadings - March 13 to November 15, 1999

Source	ADF	Average TSS		Average BOD		Average Ammonia	
	(m^3/d)	(mg/L)	(kg/d)	(mg/L)	(kg/d)	(mg N/L)	(kg N/d)
Josephine PS[1]	518	102	53	99	51	25	13
Wallace/Marg PS[1]	6,532	150	982	89	580	16	105
Argyle/4th PS[1]	8,564	111	951	124	1,063	10	88
Landfill Leachate	388	6	2	11	4	24	9
Totals	16,002		1,988		1,698		215
Port Fish[2]	450	864	389	4,008	1,803	159	72

Notes:

1. Parameter data are from wastewater and leachate grab samples typically collected once per month.
2. BOD and TSS data are from daily composite samples collected on each day of operation.
   Samples for ammonia analysis collected at most once a week.

wastewater grab samples are collected early in the day when the Port Fish wastewater had yet to reach the sampling location.

NovaTec (1999) has noted the significance of Port Fish wastewater loading on the lagoon, and the potential for decreased lagoon effluent quality. During a more extensive lagoon effluent sampling program conducted by the City in June 1999, data were obtained that showed consistently elevated BOD and ammonia concentrations. In particular, effluent ammonia concentrations remained above 40 mg N/L during this period, compared to less than 20 mg N/L during other portions of 1998 and 1999. Port Fish wastewater consistently had ammonia wastewater concentrations around 200 mg/L during this period, and likely contributed to the high lagoon effluent ammonia levels.

Due to the high-strength of fish processing wastewater, the City has created Bylaw No. 4425 as an amendment to Bylaw No. 3224. Bylaw No. 4425 restricts TSS and BOD daily mass loadings that are discharged to the municipal sewer system, to 2.6 tonne/d and 1.6 tonne/d, respectively. The data shown in Table 5-1 indicate average Port Fish TSS and BOD loadings, during 1999, of 0.86 tonne/d and 1.8 tonne/d, respectively. Therefore, Port Fish wastewater BOD discharges likely exceed the Bylaw criteria a significant amount of the time.

Clearly, the Port Fish wastewater contributes significant contaminant loads to the lagoon system, in excess of allowed quantities, and has the potential to significantly impact lagoon effluent quality. However, the current City data set limits the analysis of Port Fish impacts on the lagoon. The City data collection program requires improvements to ensure future collected data provide more useful information.

5.2 FISH PROCESSING OPERATIONS - SMOKEHOUSE FISH PLANT

The Tseshaht First Nation owns and operates the Smokehouse Fish plant. The plant is small, and operates three days per week, extending from the beginning of June to the end of October (Port Alberni, 2000).

The City has not issued a waste discharge permit for the operation. Wastewater data for the plant are not available (Alberni, 2000).

5.3 ALBERNI VALLEY LANDFILL

All landfills generate leachate, a potentially strong wastewater which contains both organic compounds and inorganic compounds, including metals and ammonia nitrogen. The Alberni Valley landfill is no exception. The leachate from this landfill is collected via perforated pipes and is partially treated in an aeration pond. Since November 1998, the contents of this pre-treatment aeration pond flow by gravity through a pipe system to the City of Port Alberni wastewater treatment lagoons for further treatment.

The leachate aeration pond at the landfill has been presumably designed to primarily provide iron removal, accomplished using mechanical aerators to provide oxygen for oxidation, with subsequent removal of the oxidized iron precipitates from the leachate by settlement in a quiescent section of the pond. Similar processes also likely result in some removal of other reduced metals from the leachate. The aeration pond likely provides stripping of hydrogen sulfide gas from the leachate, minimizing corrosion potential in downstream infrastructure.

5.3.1 Leachate Flows

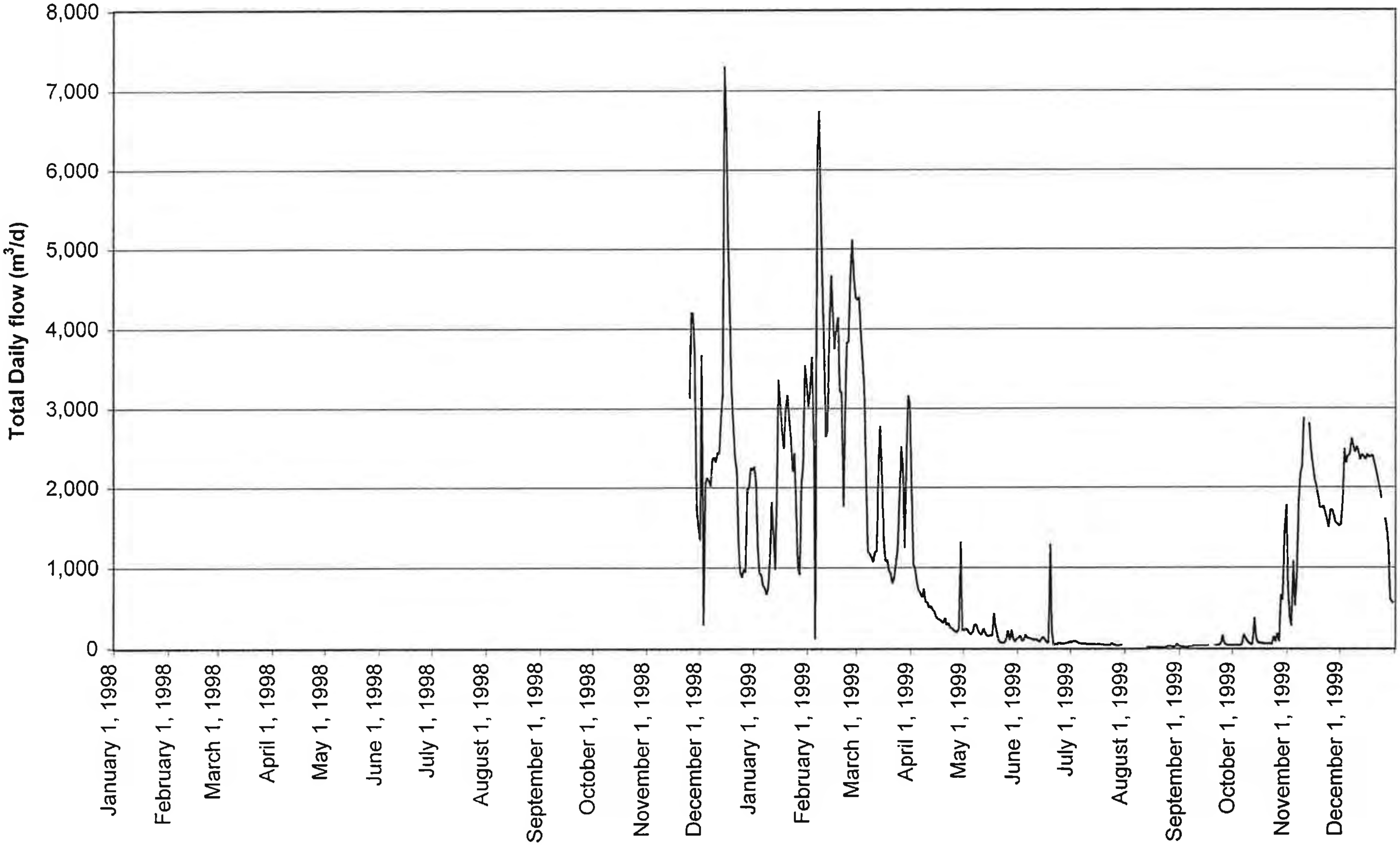
Leachate flows are generally comprised of the following two elements:

- Infiltration of precipitation into the landfill that is subsequently collected and removed from the landfill. This water is most correctly termed "leachate".
- Surface runoff of precipitation from the lagoon surface that is subsequently collected and removed from the landfill area.

Both of these elements are usually combined into the water commonly called leachate.

Figure 5-4 illustrates the daily leachate flow to the City lagoon system, beginning in November 1998. The data shown extreme variance in the leachate flow, an expected phenomenon given that leachate generation results from precipitation events. In the summer, during dry-weather periods, the leachate flow makes up less than 1% of the total daily wastewater flow reaching the lagoon. However, during wet-weather periods, leachate flows can contribute up to approximately

Figure 5 - 4. Landfill Leachate Flows: November 25, 1998 to December 31, 1999



15% of the total wet weather flow entering the lagoon. Leachate made up approximately 6% of the average annual flow to the lagoon for these years.

5.3.2 Pre-Treated Leachate Quality

The available 1998 and 1999 data indicate that the leachate contains low concentrations of BOD and ammonia, particulary in terms of typical leachate parameter concentrations. Throughout the period that leachate has been pumped to the City lagoon, BOD concentrations of leachate samples (n = 13) have averaged 15 mg/L, and have not exceeded 51 mg/L. Similarly, ammonia concentrations averaged 25 mg N/L, and remained below 43 mg N/L.

Leachate pH levels are slightly basic, and range from about 7.3 to 8.0.

5.3.3 Impacts on Lagoon Treatment Performance

Using the available 1998 and 1999 wastewater flow and quality data, the landfill leachate contributes only 1% of the average annual BOD load to the lagoon. However, the leachate contributes about 10% of the average annual ammonia load to the lagoon, while the leachate flow makes up only 6% of the average annual flow. These values must be viewed with caution due to the nature of the data, but they indicate the magnitude of the leachate in terms of ammonia loading to the landfill.

Based on the available data, we expect that the impact of leachate ammonia loading to the Port Alberni lagoon, in terms of lagoon effluent quality, may be relatively insignificant.

Non-domestic wastewater discharged by Port Fish contributes significant contaminants loads to the City lagoon system, and has the potential to negatively impact lagoon effluent quality. Due to a current lack of data, impacts of the Smokehouse Fish Plant on lagoon performance is unknown. Landfill leachate loadings to the lagoon are relatively small, and only the ammonia loadings could potentially impact lagoon effluent quality

The current City wastewater database is limited, and constrains the analysis of lagoon loading and subsequent evaluation of lagoon performance. During the

beginning of the Stage 2 LWMP, the City should collect additional data, as required, for use in detailed evaluations that will be conducted as part of a Stage 2 LWMP.

SOURCE CONTROL

SECTION 6

A major focus of the MELP in the preparation of LWMPs is the issue of source control. Source control refers principally to the control of the quality and quantity of the inputs to the municipal sewer system.

The control of waste inputs into either a municipal, a local community or an on-site wastewater management system is a key factor in the long term operation of the system. With municipal or local community systems, controlling the "quality" of the wastes prevents downstream problems with the quality of the effluent or biosolids generated from the treatment process. Key elements of a source control program are described below.

6.1 SOURCE CONTROL BYLAW

The principal means of controlling the input of waste into a community sewerage system is through a source control bylaw adopted by the municipality. The intent of the bylaw is to prevent the input of wastes into the sewer system that would have a detrimental impact on the wastewater treatment plant effluent or biosolids quality. The objective of the bylaw is to limit the incoming wastes to essentially "domestic" wastes that can be treated by the plant. Domestic wastewaters are considered to be wastewaters produced in residential, institutional, and commercial facilities from bathrooms, kitchens, and laundry facilities. Non-domestic wastewaters, to which a source control bylaw may be applicable, can include wastewater generated by hospitals/clinics, dentist offices, metal plating operations, petroleum tank farms, photo processors, and restaurants.

Wastes with a high organic strength (e.g., high BOD), excessive oil or grease, or high metals content from commercial or industrial operations would have to be pre-treated at the source prior to discharge to the sewer system. Pre-treatment of these wastes at source is less expensive and more effective in treating the wastes than after they have been diluted in the municipal wastewater stream. Wastes such as solvents, gasoline, paints, etc. would not be allowed into the sewer system. The intent of a source control bylaw is primarily as an education tool. Although it is necessary to establish penalties and fines under the bylaw, it is anticipated that knowledge of the bylaw in most cases will be sufficient to ensure that illegal discharges do not occur. In the case where chronic violations do occur, the bylaw gives the sewer authority a recourse in dealing with the situation.

Implementation of source control bylaw is not without its cost. Monitoring of the influent to the plant and possibly spot checks on commercial and industrial connections are required. Municipal staff time and expenses for laboratory analysis must be set aside on an annual basis. However, controlling the waste input at source is far more effective than dealing with the environmental consequences at the effluent reuse or disposal stage.

The City does have an existing source control bylaw. The bylaw has been updated to specifically consider fish processing operations. However, the City should consider revising the bylaw to be more comprehensive, and in particular, consider the expansion of specified wastewater contaminants and concentrations.

6.2 PUBLIC EDUCATION

Although the source control bylaw discussed above can be an effective tool in source control, it is necessary to ensure that the users of the sewerage system are aware of its contents and the general objectives of source control. This can be accomplished in a number of ways, including the following:

- Mailing out a brochure with the sewer service billing or tax notice.
- Public information meetings such as under the LWMP.
- Media notices or press releases.
- Public school programs.

Of the above, the public school programs probably have the greatest long term effect. These can take the form of provision of information packets to the schools, presentations by interested members of the sewer utility, and/or tours of the wastewater system.

6.3 WASTEWATER MINIMIZATION

The reduction of the volume of wastewater to be treated reduces both the capital and the annual operating and maintenance costs of the system. Facilities such as pumps, piping, and concrete tankage can be made smaller if peak and average flows can be reduced. In terms of operating and maintenance costs, reduced flows translate to reduced power consumption and chemical usage. The two targets for wastewater reduction are:

- wastewater generation
- infiltration/inflow

The wastewater generated in the home or commercial establishment can be reduced through water saving devices such as pressure reducing valves, low-flush toilets, reduced-flow shower heads, and water-saving appliances. This type of program obviously benefits not only the wastewater collection and treatment system but also has direct benefits to the water supply and distribution system. Implementation may require changes to building bylaws. Opportunities for public involvement should also be incorporated into decision making processes.

Infiltration refers to the entrance of groundwater into the gravity sewer system through leaks in the sewer joints or into the manhole barrels. Inflow is rainfall or snow-melt that enters the sewer system primarily through the manhole frames and covers. Both of these inputs, termed I&I, increase the average amount of flow to be treated but more importantly increase the peak flow that must be delivered to the plant. With high I&I, the collection system, treatment plant, and disposal system must all be increased in size to accommodate the higher flow. The weaker influent wastewater and the high short-term peak flow can also cause problems with the treatment process.

As documented in Section 4, total daily wastewater flows entering the treatment lagoon during wet-weather periods have been as high as 3.4 times the average dry weather flow during 1998 and 1999. Actual sewer system flows were likely higher than this value, but the additional flows may not have been conveyed by the sewer system and resulted in overflows. Section 8 further discusses overflow issues.

Some of the I&I can be attributed to the combined storm and sanitary sewer sections of the collection system. The remaining I&I results from extraneous water entering the sanitary collection system through structural and installation defects in the infrastructure.

6.4 MARINE CRAFT

The discharge of wastewater from pleasure and non-pleasure craft currently falls under the Federal *Pleasure and Non-Pleasure Craft Sewage Pollution Prevention Regulations* (Government of Canada, 1991a, b). Under this regulation, specific marine and inland waters can be designated as no discharge areas and boats must be equipped with holding tanks. Although Alberni Inlet is not currently designated as a "no discharge" water body

(MELP 2000a), this could change over the planning horizon. It is possible, within the framework of the LWMP, that this area could be designated as no discharge water body. This would require partnership with the Regional District and the Port Alberni Port Authority (PAPA)/Harbour Commission.

Even without a "no discharge zone" designation, marinas could be encouraged to provide pump-out facilities for marine craft to prevent the uncontrolled discharge of untreated wastewater in Alberni Inlet, particularly if the LWMP designates the area as a no discharge zone. The collected wastewater would then be discharged to the municipal sewerage system.

Richard Hardigan, Harbour Master with PAPA was contacted regarding their policy on holding tank dumping. He suggested that they were going to be looking at something at the new marina but they were waiting for new regulations. Currently, there were approximately six live-aboard boats in the area. Mr. Hardigan suggested that, in Nanaimo, this situation was/is handled with a $150,000 tank-equipped barge that is towed from marina to marina to collect holding tank wastewater. Something similar could eventually be developed for Port Alberni, if there was the need and desire.

Should the City wish to pursue the "no discharge zone" issue with Federal authorities, a member of MELP staff in Victoria has been designated as the liaison for any such initiatives.

Source control measures are a pro-active and key element of wastewater planning and contribute to the protection of human health and the aquatic ecosystem. In the case of Port Alberni, due to the present use of combined storm/sanitary collection systems, wastewater minimization is a key source control issue. The City should also revise its current source control bylaw to be more comprehensive, and possibly, more stringent.

The City may also want to pursue the creation of a "no discharge zone" to minimize ship and boat wastewater discharges in the Alberni Inlet area adjacent to the City. Such initiatives would have to be coordinated with both the Federal and Provincial governments.

EFFLUENT AND BIOSOLIDS REUSE

Effluent reuse is defined as the use of treated effluent in a beneficial manner. Of particular interest are applications where effluent could be used to offset the use of treated domestic water. This type of reuse can often lead to more efficient utilization of the domestic water resources and deferring the need to increase domestic water supplies to handle future urban growth.

The concept behind effluent reuse is that treated wastewater, or effluent, should be considered as a resource and not as a problem. In many community situations, there are water uses where the water does not have to be treated to the same quality as for potable consumption. If effluent, treated to an appropriate degree, can be substituted for potable water from the municipal system, there is a potential reduction in the delivery capacity requirement for the water system. In actual practice, the water supply system capacity may not be reduced but rather capacity is freed up for additional potable water use thus deferring expenditures to expand the water supply system. Other areas of effluent reuse that do not necessarily offset potable water use may also be available. These theoretically include supplementing stream flows during low flow periods or the development of wetlands habitat, given the right circumstances.

In this LWMP, the term *effluent reuse* has a different meaning than the term *land disposal*. As described above, effluent reuse is where there is a net benefit in the end use of the effluent. Land disposal on the other hand refers to simply the disposal of effluent by applying it to land at as high an application rate as possible.

Biosolids reuse involves using the sludge, termed biosolids, generated by wastewater treatment processes, in a beneficial manner. In this sense, biosolids are viewed as a potential resource rather than a waste byproduct. In the Port Alberni situation, the current source of biosolids are the materials that settle out of the wastewater in the treatment lagoon.

7.1 EFFLUENT QUALITY CRITERIA

The MELP has defined two types of reclaimed water categories, in the MSR, for effluent reuse: unrestricted public access and restricted public access. The MSR also identifies permitted uses within these categories. Some examples of permitted uses are as follows:

Unrestricted Public Access

- parks
- golf courses (may fall under restricted public access for certain situations)
- residential lawns and landscaping
- toilet flushing
- food crops eaten raw
- stream augmentation

Restricted Public Access

- commercially processed food crops
- silviculture
- nurseries
- landscape waterfalls
- aggregate washing
- industrial process water
- boiler feed

The MSR requires a minimum of secondary treatment and disinfection for effluent used in both unrestricted and restricted public access applications. For unrestricted public access applications, filtration is also required to permit enhanced disinfection to provide lower fecal coliform concentrations. At the present time, the Port Alberni wastewater treatment plant has neither filtration or disinfection facilities.

7.2 EFFLUENT REUSE OPPORTUNITIES

As shown in the previous section, effluent, when treated to an appropriate degree, can be used for applications ranging from agricultural irrigation to irrigation of residential lawns. However, the major question is, "What is realistically and economically achievable?". The use of treated effluent requires that a distribution system similar to the municipal water supply system be implemented to transport the effluent to the end users at the required pressure and delivery rate. Additional levels of treatment such as filtration and increased disinfection are often required depending upon the end use. The capital and annual operating and maintenance costs for distribution and additional treatment can be

significant. In general, the economics of a major reuse system can only be justified where there is an offsetting revenue due to the high cost of domestic water supply.

Presently, there are two potential types of effluent reuse applications within the LWMP area:

- ***Golf Course Irrigation*** - The Alberni Golf Club is situated approximately 5 km from the City wastewater treatment plant, and lies outside the City boundary. Hollies Executive Golf Course is also located outside the City boundary, and is about 3 km from the treatment from the treatment plant. Effluent irrigation would require management to prevent impacts to adjacent creeks. As a result of the above, golf course irrigation would not be a first choice for effluent reuse for Port Alberni.

- ***Silviculture*** - Pacifica Papers operates a hybrid poplar tree farm adjacent to the City wastewater treatment lagoon system. This option has some merit and should be pursued further in Stage 2.

Beyond these applications, the opportunities for effluent reuse within the City are limited due to the following:

- Port Alberni experiences significant annual precipitation. As a result, the demand for irrigation water for residential lawns and District parks and green areas is relatively low. In addition, construction and operation costs of a distribution system to supply water to individual, and scattered, locations would be prohibitive.

- Existing high water-use industries are limited to paper and sawmill operations. Pacifica Papers has their own major water supply system. Given the nature of these operations and their water quality requirements, effluent reuse potential would be limited or non-existent.

- The OCP (1993) indicates the City's encouragement of future food processing industries to the area. While food processing operations are high water-use industries, given the nature of these operations and their water quality requirements, effluent reuse would not be feasible.

7.3 BIOSOLIDS PROCESSING

Biosolids, or the sludges produced from wastewater treatment process, are composed primarily of organic material, and when suitably processed, can be utilized in a beneficial manner as a soil conditioner. Under current proposed Organic Matter Recycling regulations (MELP, 2000c), end use of biosolids can range from a Class B "agricultural - low grade" to a Class A "retail - high grade"- the difference in the grades lies in the degree of stabilization, pathogenic destruction, metals content, and moisture content. In general, the Class B quality is the lowest quality and would require restricted handling and site applications. On the other hand, Class A is the highest quality and could be used directly by the public in bulk or bagged form.

In lagoon systems used for wastewater treatment, such as that operated by the City, biosolids accumulate within the lagoons until the material is mechanically removed from the cells, usually after several decades of operation. In 1997, the City retained a specialist contractor to dredge and dewater the lagoon biosolids. The dewatered biosolids were composted with wood waste at the Alberni Valley landfill. The final product is being used for landfill cover material, with the Regional District accepting the City biosolids at no charge.

The Port Alberni sewer system currently receives little in the way of industrial waste inputs beyond the organic wastes discharged by fish processing operations. This fact, coupled with an effective Source Control Bylaw, should reduce the level of metal concentrations in the sludge that could interfere with utilization opportunities. However, the City sewer system receives leachate generated at the regional district landfill. At present, the City has no leachate metal concentration data. The City should initiate a monitoring program to evaluate leachate metals levels and identify any negative impacts the leachate may have on biosolids quality.

In the short-term, as the City continues to use a lagoon system for wastewater treatment, periodic removal and dewatering of accumulated biosolids would result in a low-grade product that likely meets agricultural application requirements. Composting the dewatered biosolids could be used to increase product quality to a retail level suitable for unrestricted use.

In the long-term, the City could replace/augment the lagoon system with a mechanical treatment plant, and if so, sludge digestion and dewatering facilities could be incorporated

into the new plant design. At a minimum, the produced biosolids should meet agricultural-low grade requirements. Depending on the type of sludge digestion process, composting may or may not be needed to product retail-high grade biosolids.

7.4 BIOSOLIDS UTILIZATION OPPORTUNITIES

The opportunities for biosolids utilization within the City include:

- landfill cover
- soil conditioner for landscaping applications
- Pacifica Papers tree farm

Biosolids use at the regional district landfill as a final cover will be an ongoing potential use. Due to the local geology, the City area does not have unlimited quantities of top soil suitable for landscaping, gardening or silviculture applications. The use of biosolids to stimulate tree growth has been demonstrated under Greater Vancouver Regional District (GVRD) biosolids programs. As a result, biosolids could be used on any hybrid popular or other tree farm in the area. Hence, the use of biosolids for these applications provides a very broad potential use over the long term.

A number of potential effluent reuse applications are available to the City. However, the feasibility of the applications will largely depend on economic issues. The Stage 2 LWMP will further investigate the concepts and costs of effluent reuse via silviculture applications.

In arriving at a strategy for biosolids management, it is necessary to balance the economics of processing the biosolids with the end use. Such a program could see different grades of biosolids produced for different end uses. The Stage 2 LMWP will develop a conceptual biosolids management strategy.

WET-WEATHER FLOW MANAGEMENT

SECTION 8

Most sewer systems constructed by municipalities in the past several decades utilize separate systems for collection and conveyance of sanitary wastewater and storm water. Sanitary wastewater, commonly referred to as sewage, refers to wastewater generated primarily by residential, commercial and institutional facilities, with some input from industrial facilities. Storm water refers to surface run-off generated by precipitation events. The advantages of separate systems include preventing collected storm water from being contaminated with sanitary wastewater. In addition, keeping storm water separate from sanitary wastewater reduces the volume of water requiring treatment at wastewater treatment facilities, and subsequent disposal. The main disadvantage of separate systems are the costs associated with having two collection systems instead of just one system.

Alternatively, older areas often use combined sewer systems where the collected wastewater and storm water is conveyed in one system. The advantages and disadvantages of combined sewer systems are the opposite of those for separate systems. Furthermore, the use of combined systems can result in combined sewer overflows (CSO). A CSO results when the combined sewer system cannot hydraulically convey the volume of sanitary wastewater/storm water as fast as it enters the system. As a result, a portion of the storm water/sanitary wastewater mixture overflows the system and is discharged to the receiving environment without receiving any form of treatment to remove contaminants.

Sanitary sewer systems can also experience overflows (i.e., sanitary sewer overflows - SSOs) when extraneous water enters the sanitary collection system. The extraneous water originates from rainfall and groundwater. Termed inflow and infiltration (I&I), this water enters the sanitary sewer collection system through structural and installation defects in the pipes, joints and connections, and leaking manhole lids and barrels.

The following sections discuss CSO, SSO and wet-weather flow management issues relative to the City of Port Alberni situation.

8.1 SYSTEM DESCRIPTION

Port Alberni has nine sewer catchment areas comprised of almost 3000 pipes. Some areas have separate sanitary wastewater and storm sewer systems. The remaining areas are combined sewer systems. There is also at least one interconnection between the

separate sanitary sewer systems and the combined sewer system. The combined system utilizes three pumping stations, with two pumping stations serving the sanitary system.

Figure 8-1 illustrates the general sewer catchment areas.

8.2 COMBINED SEWER OVERFLOWS

The MELP has issued CSO discharge permits for the following discharge points, as shown in Figure 8-1:

- Argyle Street Pumping Station (PE-332)
- Bruce Street (PE-331)
- Harbour Commission/Tahsis Street (PE-333)
- Maitland Street (PE-334)

The pumping stations have capacities of approximately three times the average dry weather flow. Excess flows are discharged as a CSO, either at the pumping station itself, or upstream in the collection system.

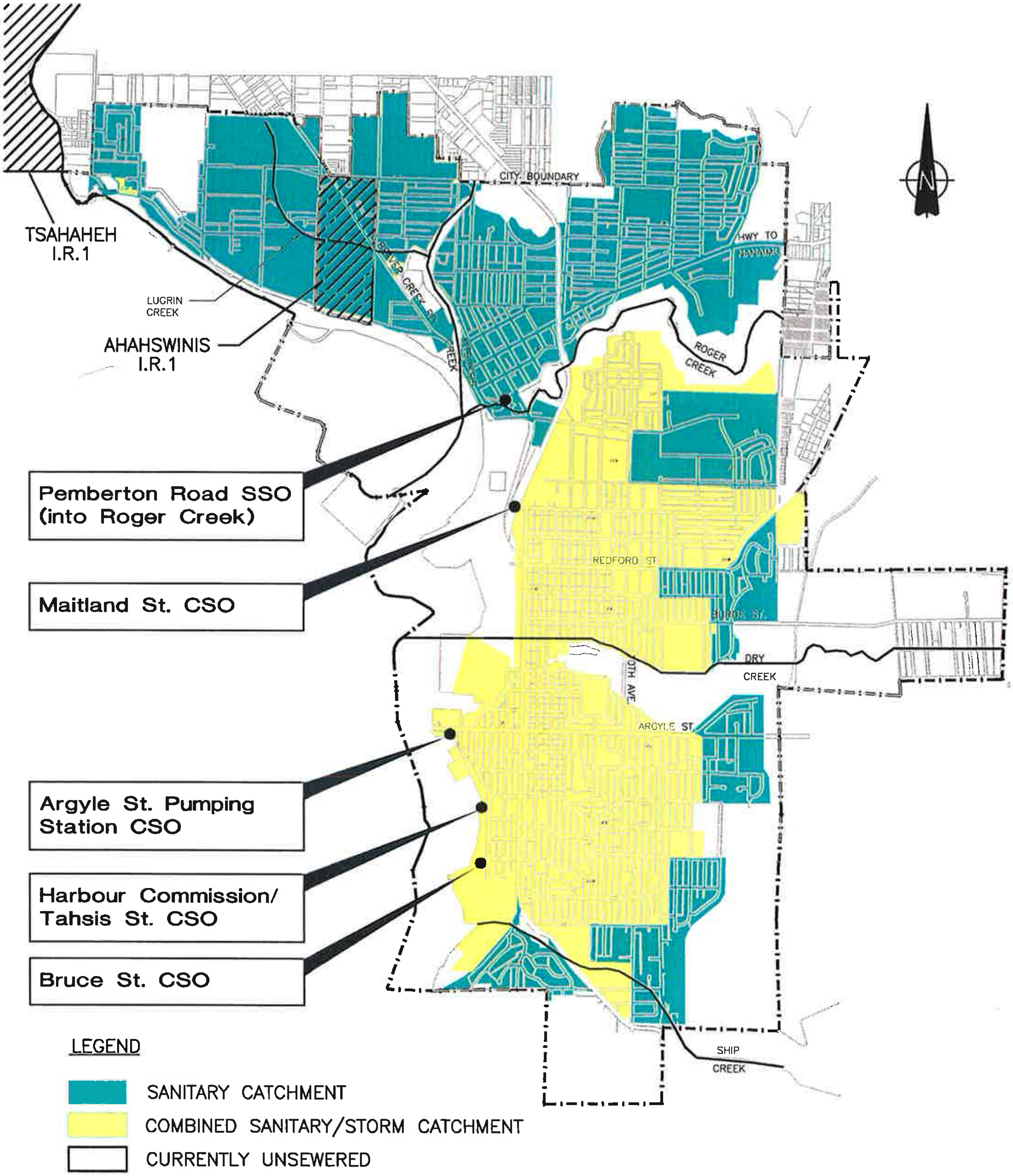
The current MELP discharge permits stipulate the following criteria for the CSO discharges:

- BOD < 20 mg/L
- TSS < 135 mg/L

Table 8-1 summarizes collected CSO water quality data for the years 1995 to 1999. The data are for grab samples collected during normal working hours, and do not represent the actual frequency of CSO events. Twenty-two of ninety samples collected during this period had BOD concentrations exceeding the MELP criteria. None of the collected CSO samples had TSS concentrations exceeding the MELP criteria.

8.3 SANITARY SEWER OVERFLOWS

Figure 8-1 shows the Pemberton Road SSO location. The MELP has not issued and, most likely, will never issue a permit for the Pemberton Road SSO on the basis that they do not want any SSO's to exist.



AutoCAD File : Q:\992993\STAGE1\REPORT\FIG8-1
Last Edit Date: 2001/05/08

FIGURE 8-1
SEWER CATCHMENT AREAS

Table 8 - 1. CSO and SSO Water Quality Summary - 1995 to 1999

ARGYLE ST. PUMPING STATION CSO
(PE-332)

		01/18/95	02/17/95	06/13/95	10/17/95	11/08/95	01/08/96	02/05/96	04/15/96	10/18/96	12/02/96	01/30/97	03/19/97	05/06/97	06/04/97	10/29/97	01/14/98	02/12/98	03/24/98	11/17/98	12/07/98	01/14/99	02/12/99	06/01/99	12/15/99	AVERAGE
TSS		67	43	92	24	18	23	56	100	19	50	75	17	50	17	37	49	27	15	33	30	13	28	42	28	40
Nitrate	N	0.39	0.44	0.04	2.20	1.30	0.41	0.54	0.15	1.20	0.39	0.69	0.69	0.27	0.32	0.95	0.24	0.44	0.57	1.30	0.73	0.73	0.31	0.54	0.45	0.64
Nitrite	N	0.011	0.016	0.072	0.024	0.024	0.015	0.013	0.061	0.078	0.023	0.011	0.038	0.012	0.039	0.028	0.008	0.008	0.025	0.071	0.009	0.012	0.013	0.048	0.011	0.028
Total BOD		9	9	16	11	9	14	19	36	11	27	9	17	18	14	43	12	48		20	9	14	9	26	9	18
Ammonia Nitogen	N	0.23	0.27	0.91	0.48	0.37	0.41	0.32	1.40	0.80	0.50	0.41	0.47	0.27	1.00	1.70	0.19	0.16	0.54	1.80	0.26	0.33	0.40	1.80	0.36	0.64
Total Phosphorus	P	0.35	0.31	0.85	0.38	0.33	0.36	0.13	1.10	0.40	0.43	0.34	0.52	0.27	0.58	0.41	0.22	0.23	0.50	1.10	0.25	0.24	0.41	1.10	0.30	0.46
Total Coliform																									240000	240000
Fecal Coliform																									5400	5400

BRUCE ST. CSO
(PE-331)

		01/18/95	02/17/95	06/13/95	10/17/95	11/08/95	01/08/96	02/05/96	04/15/96	10/18/96	12/02/96	01/30/97	03/19/97	05/06/97	06/04/97	10/29/97	01/14/98	02/12/98	03/24/98		12/07/98	01/14/99	02/12/99	06/01/99	12/15/99	AVERAGE
TSS		30	31	97	26	26		92		44	27	22	38	57	15	30	34	17	68		66	31	63	72	54	45
Nitrate	N	0.43	0.40	0.04	2.00	1.30		0.43		0.93	0.35	0.76	0.52	0.39	0.05	0.59	0.36	0.52	0.55		0.19	0.61	0.31	0.30	0.40	0.54
Nitrite	N	0.015	0.035	0.001	0.067	0.027		0.025		0.014	0.044	0.022	0.058	0.025	0.002	0.039	0.018	0.015	0.046		0.004	0.025	0.030	0.002	0.025	0.026
Total BOD		9	9	9	13	11		22		10	32	29	27	21	10	20	9	9			9	32	18	9	17	16
Ammonia Nitogen	N	0.50	0.63	0.05	1.10	0.91		2.30		0.66	1.50	2.10	0.64	1.10	0.06	2.60	0.61	0.23	4.10		0.07	1.50	1.40	0.08	1.80	1.14
Total Phosphorus	P	0.39	0.33	0.35	0.52	0.55		0.98		0.27	0.72	0.76	0.47	0.55	0.18	0.83	0.32	0.18	1.80		0.18	0.83	0.76	0.16	1.20	0.59
Total Coliform																									920000	920000
Fecal Coliform																									35000	35000

HARBOUR COMMISSION/TAHSIS ST. CSO
(PE-333)

		01/18/95	02/17/95	06/13/95	10/17/95	11/08/95	01/08/96	02/05/96	04/15/96	10/18/96	12/02/96	01/30/97	03/19/97	05/06/97	06/04/97	10/29/97	01/14/98	02/12/98	03/24/98	11/17/98	12/07/98	01/14/99	02/12/99	06/01/99	12/15/99	AVERAGE
TSS		27	17	123	18	27	21	32	25	24	30	12	12	33	63	20	26	16	23	20	22	10	18		14	28
Nitrate	N	0.52	0.57	0.04	2.50	1.50	0.63	0.71	0.6	2.10	0.70	0.78	0.79	0.45	0.54	1.20	0.38	0.49	0.69	1.70	0.65	0.77	0.49		0.51	0.84
Nitrite	N	0.007	0.014	0.340	0.029	0.019	0.025	0.014	0.058	0.063	0.024	0.011	0.028	0.013	0.069	0.029	0.008	0.006	0.031	0.048	0.007	0.010	0.016		0.009	0.038
Total BOD		9	9	15	13	10	15	14	19	10	29	9	14	19	26	27	9	47		10	9	16	9		9	16
Ammonia Nitogen	N	0.15	0.31	0.5	0.25	0.29	0.41	0.26	0.89	0.89	0.33	0.32	0.20	1.90	4.10	0.49	0.16	0.08	0.68	0.83	0.14	0.19	0.39		0.22	0.61
Total Phosphorus	P	0.22	0.25	1.4	0.27	0.38	0.44	0.23	0.63	0.49	0.36	0.22	0.19	0.19	1.50	0.39	0.20	0.14	0.56	0.62	0.19	0.18	0.31		0.28	0.42
Total Coliform																									160000	160000
Fecal Coliform																									70000	70000

MAITLAND ST. CSO
(PE-334)

		01/18/95	02/17/95	06/13/95	10/17/95	11/08/95	01/08/96	02/05/96	04/15/96	10/18/96	12/02/96	01/30/97	03/19/97	05/06/97	06/04/97	10/29/97	01/14/98	02/12/98	03/24/98	11/17/98	12/07/98	01/14/99	02/12/99	06/01/99	12/15/99	AVERAGE
TSS		46	32	32	18	63	29	42	33	48	53	14	12	34	70	12	25	30	27	40	20	16	41	46	24	34
Nitrate	N	0.33	0.43	0.15	1.80	1.30	0.49	0.57	0.33	1.20	0.48	0.59	0.61	0.28	0.26	0.89	0.24	0.33	0.58	1.10	0.60	0.64	0.32	0.13	0.40	0.59
Nitrite	N	0.006	0.014	0.210	0.025	0.033	0.026	0.014	0.065	0.086	0.014	0.008	0.016	0.012	0.071	0.025	0.006	0.005	0.035	0.072	0.004	0.014	0.012	0.420	0.007	0.050
Total BOD		9	9	21	11	17	26	17	23	10	35	9	15	40	26	16	9	9		15	9	17	9	36	10	17
Ammonia Nitogen	N	0.17	0.31	1.10	0.49	0.68	0.79	0.46	1.80	1.30	0.62	0.32	0.34	0.37	5.10	0.73	0.19	0.12	0.99	2.20	0.09	0.35	0.29	3.80	0.44	0.96
Total Phosphorus	P	0.25	0.33	1.10	0.44	0.49	0.62	0.37	0.73	0.61	0.41	0.25	0.57	0.27	1.60	0.37	0.16	0.17	0.72	1.10	0.08	0.36	0.34	1.40	0.43	0.55
Total Coliform																									350000	350000
Fecal Coliform																									240000	240000

PEMBERTON RD. SSO

		01/18/95	02/17/95	06/13/95	10/17/95	11/08/95	01/08/96	02/05/96	04/15/96	10/18/96	12/02/96	01/30/97	03/19/97	05/06/97	06/04/97	10/29/97	01/14/98	02/12/98	03/24/98		12/07/98	01/14/99	02/12/99		12/15/99	AVERAGE
TSS		66	62		77	92	82	103		88	77	81	66	126	160	72	111	36	132		56	119	73		64	87
Nitrate	N	0.21	0.04		0.21	0.18	0.16	0.05		0.05	0.05	0.48	0.05	0.05	0.04	0.04	0.08	0.38	0.04		0.62	0.29	0.28		0.04	0.17
Nitrite	N	0.033	0.001		0.170	0.230	0.041	0.002		0.002	0.148	0.024	0.002	0.028	0.001	0.290	0.020	0.017	0.001		0.038	0.008	0.021		0.015	0.055
Total BOD		11	19		23	39	70	50		25	62	42	61	91	103	35	31	31			17	19	9		38	41
Ammonia Nitogen	N	1.90	2.60		4.30	4.30	4.10	5.20		18.10	1.60	4.30	3.00	3.70	14.50	5.80	2.50	0.92	8.30		2.40	1.10	2.70		4.30	4.78
Total Phosphorus	P	0.92	1.80		2.50	2.80	2.60	2.50		1.80	1.90	2.20	1.20	1.50	4.64	1.70	1.30	0.69	2.90		1.10	0.61	1.30		2.50	1.92
Total Coliform																									16000000	16000000
Fecal Coliform																									950000	950000

Notes:
1. Parameter concentrations are in mg/L, except coliforms are in number/100 ml.
2. Data are for single, grab samples collected at random during an overflow event.
3. Only CSO and SSO occurences during "normal working hours" were sampled.

Available Pemberton Road SSO water quality data are also summarized in Table 8-1. The data are for grab samples collected during normal working hours, and do not represent the actual frequency of SSO events. On average, the Pemberton Road SSO BOD and TSS concentrations are about twice the levels of the CSO discharges in Port Alberni, reflecting less dilution of raw sewage compared to the CSOs.

8.4 REGULATORY ISSUES

The MSR identifies a number of specific criteria related to combined and sanitary sewer overflows. More specifically, the MSR requires the elimination of unpermitted CSO and SSO occurrences, for precipitation events with less than a five-year return period, by year 2004. For larger precipitation events, the MSR requires a specified reduction in annual overflow volumes over a ten year reporting period. Port Alberni's four CSO's are permitted and, therefore, may not fall within the 2004 criteria.

The MSR criteria will require consideration in the Port Alberni LMWP. However, the LWMP process does provide flexibility with respect to allowing development of site-specific programs for dealing with key issues such as CSOs and SSOs, and could lead to a strategy of phased elimination of these overflows.

8.5 WET-WEATHER FLOW MANAGEMENT STRATEGY

A wet-weather flow management strategy has the ultimate goal of eliminating the discharge of contaminated waters that negatively impact the receiving environment. In essence, this implies elimination of CSO and SSO events. The following list identifies potential elements that may be included in a wet-weather flow management strategy:

- A program to separate sanitary and storm sewers over time.
- Increasing the hydraulic capacity of gravity interceptors and pumping stations.
- Provision of facilities to provide temporary on-line or off-line wastewater storage.

The above elements all result in the conveyance of all collected wastewater to the treatment plant.

The wet-weather flow management strategy may also allow CSO and SSO occurrences during extreme precipitation events, but provide treatment of the overflows at their source of discharge. The treatment may include solids separation and disinfection unit processes.

The City's wastewater collection infrastructure results in wet-weather flow management being a key issue that needs to be addressed in the LWMP process when developing overall wastewater management strategies. To this end, the City should conduct a thorough study to assess CSO and SSO frequency and magnitude, characterize the overflows, and evaluate the hydraulic capacity of various elements of the collection system. This could include a computer model of the sewer systems, calibrated with real flow data. The study objectives would also include development of a strategy for reducing/eliminating overflow events. This study should be undertaken early in the Stage 2 LWMP, with the findings incorporated into the Stage 2 LWMP document.

DEVELOPMENT OF WASTEWATER MANAGEMENT OPTIONS

SECTION 9

The goal of this Stage 1 LWMP is to present a limited number of comprehensive yet understandable wastewater management options that will encompass the various issues facing the City of Port Alberni. These options will ultimately allow elected officials, technical groups and the public to select a direction in which to proceed during Stages 2 and 3 of the LWMP. Given the multitude of technologies available and the different growth scenarios, a vast number of options and sub-options could be developed for analysis. However, this approach often results in confusion due to the magnitude of presented information, particularly for members of the public who do not have the benefit of the technical background or the LWMP workshops.

9.1 APPROACH TO OPTION DEVELOPMENT

The objective of the LWMP is to develop a strategy and direction for wastewater management planning over the next four decades given the desired or anticipated development and growth of the community. In developing the range of options to be considered, input and direction was obtained from the previous engineering studies, the OCP, and from the Technical and Public Advisory Committees on the LWMP.

In formulating the various options, the LWMP must recognize that changes may occur in the development of the community and in the technology of wastewater management over the 40-year planning period. Therefore, it is important that the plan provide flexibility to accommodate these changes. In practice, the LWMP should be reviewed every five to ten years, in a similar manner to the OCP, to ensure that the strategy selected is still the best course of action.

Finally, the LWMP is an *engineering planning* document. It is not intended as a predesign report for the design and implementation of required components. In a number of instances, the technical analysis required to confirm assumptions needs to be conducted. In general, the LWMP goal is to provide direction and not make specific decisions on treatment plant details or equipment selection. This phase of work will come after the LWMP has been approved by the community and by the MELP. Elements of the LWMP that require further engineering investigation are noted in the options presented.

9.2 OPTION ASSUMPTIONS

In developing the various wastewater management options, we have identified the following basic assumptions that are common to all options:

- All options utilize a 40-year planning horizon. Wastewater system components such as concrete tankage and piping will have a service life of about 40 years. Mechanical and electrical components will require replacement or upgrading at about 20 year intervals. The selection of a 40-year planning and economic analysis period thus allows an optimum time frame for the development of a wastewater management strategy.

- The medium growth community development scenario (1% growth rate), presented in Section 3, will be used for all wastewater management options. This scenario assumes moderate growth in the local economy with no new major employment creating initiatives being implemented in or near the LWMP study area. The scenario assumes a 1.0% annual growth rate in the City residential population for the first twenty years of the planning period, with the 1.0% annual growth rate also used in the latter twenty years. For the First Nation Land populations, we have used the medium annual growth rate of 2.0% for the entire 40 year planning period. In addition, we have assumed a 1.0% annual growth rate in the "equivalent populations" associated with commercial, institutional and industrial operations.

- All future development within the City and First Nation Lands will be serviced by extension of the existing wastewater collection system and with separate sewer systems, wherever possible.

- Source control and waste reduction is a common element to all the options for wastewater management. Limiting or eliminating the entry of materials such as oils and grease, paints, solvents, and metals is the best approach to ensuring that problems with the collection system, treatment system, septic tank, or the final effluent or biosolids do not occur. The strategy of the LWMP should be to provide this control through a source control bylaw, combined with an education program.

- The management approach for non-domestic discharges, and effluent and biosolids reuse, will be common to all options. The Stage 2 LWMP will evaluate each of these topics separately, and incorporate the evaluation recommendations into each of the developed wastewater management options.

9.3 PROPOSED STAGE 2 OPTIONS

The developed wastewater management options, described in this section, focus on two key issues: wastewater treatment and wet-weather flow management. We have formulated two main option series for the LWMP.

9.3.1 Option Series 1

Option Series 1 (Figure 9-1) would utilize the existing site for long-term wastewater treatment and effluent disposal. In this respect, this is a status-quo option. However, the lagoon treatment system would be modified to provide additional capacity needed to treat future wastewater flows and meet regulatory requirements for effluent quality. These modifications could include:

- Pretreatment with a mechanical wastewater treatment plant prior to the existing aerated wastewater lagoons in order to decrease the loading on lagoons.
- Post-treatment in a mechanical wastewater treatment plant following the aerated lagoons to provide additional removal of BOD-inducing organics and/or increased removal of ammonia nitrogen through nitrification/denitrification in order to decrease the (potential) impact on the environment.
- Post-treatment using the existing Pacifica Papers lagoon system (and outfall) to provide further treatment and/or meet future capacity requirements. (NOTE: This option would require significant discussions with Pacifica Papers since they normally do not want domestic wastewater in their industrial wood waste effluent.)
- A combination of the above.

The effluent disposal system would be modified, if necessary, based on the recommended Stage 2 study on effluent disposal.

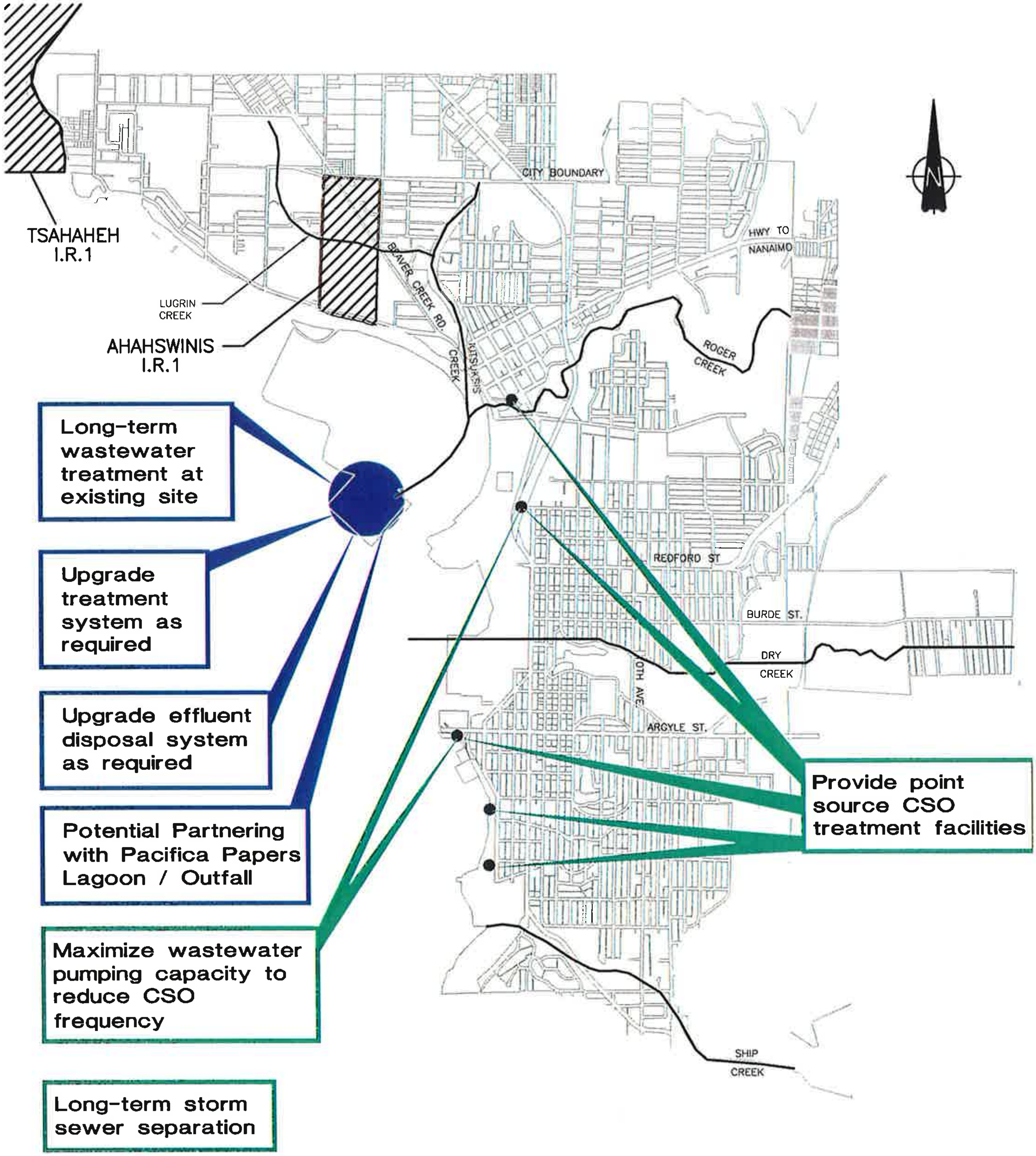


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FIGURE 9-1
OPTION SERIES 1

In terms of wet-weather flow management, Option Series 1 would continue to use the lagoon to provide storage, equalization and treatment of all wastewater pumped to the plant. The wet-weather flow management strategy would be to maximize the amount of wastewater pumped to the treatment plant to minimize the frequency and volume of CSO and SSO occurrences. Option Series 1 will include point source treatment facilities at CSO and SSO locations to treat overflows during these extreme precipitation events. Option Series 1 would also include long-term sewer separation as part of collection system infrastructure management.

9.3.2 Option Series 2

Option Series 2 (Figure 9-2) would see long-term wastewater treatment and effluent disposal at an alternate site, with a mechanical treatment plant using concrete tankage. The existing lagoon system would most likely be abandoned. A marine outfall would be used for effluent disposal. Depending on the treatment plant location effluent reuse possibilities, e.g., silviculture applications, may not be possible.

The location of this new treatment plant has not been selected at this time. However, there are three possibilities:

- South, along the foreshore/dock area, adjacent to Alberni inlet.
- West of the existing lagoons, on high ground, in the area adjacent to the Alberni Valley landfill.
- On the west side of Alberni Inlet, south of the existing lagoon system (this option has the most logistics problems and, therefore, a lower probability of being selected, relative to the other two options above).

The existing collection system experiences very high wastewater flow peaking factors during periods of wet weather, even before CSO and SSO events occur. The wet-weather flow management strategy would be to route up to two or three times the average dry weather flow through the secondary portion of the treatment plant, with equivalent primary treatment provided for the surplus flows. This would be provided either at the treatment plant site or the CSO/SSO discharge

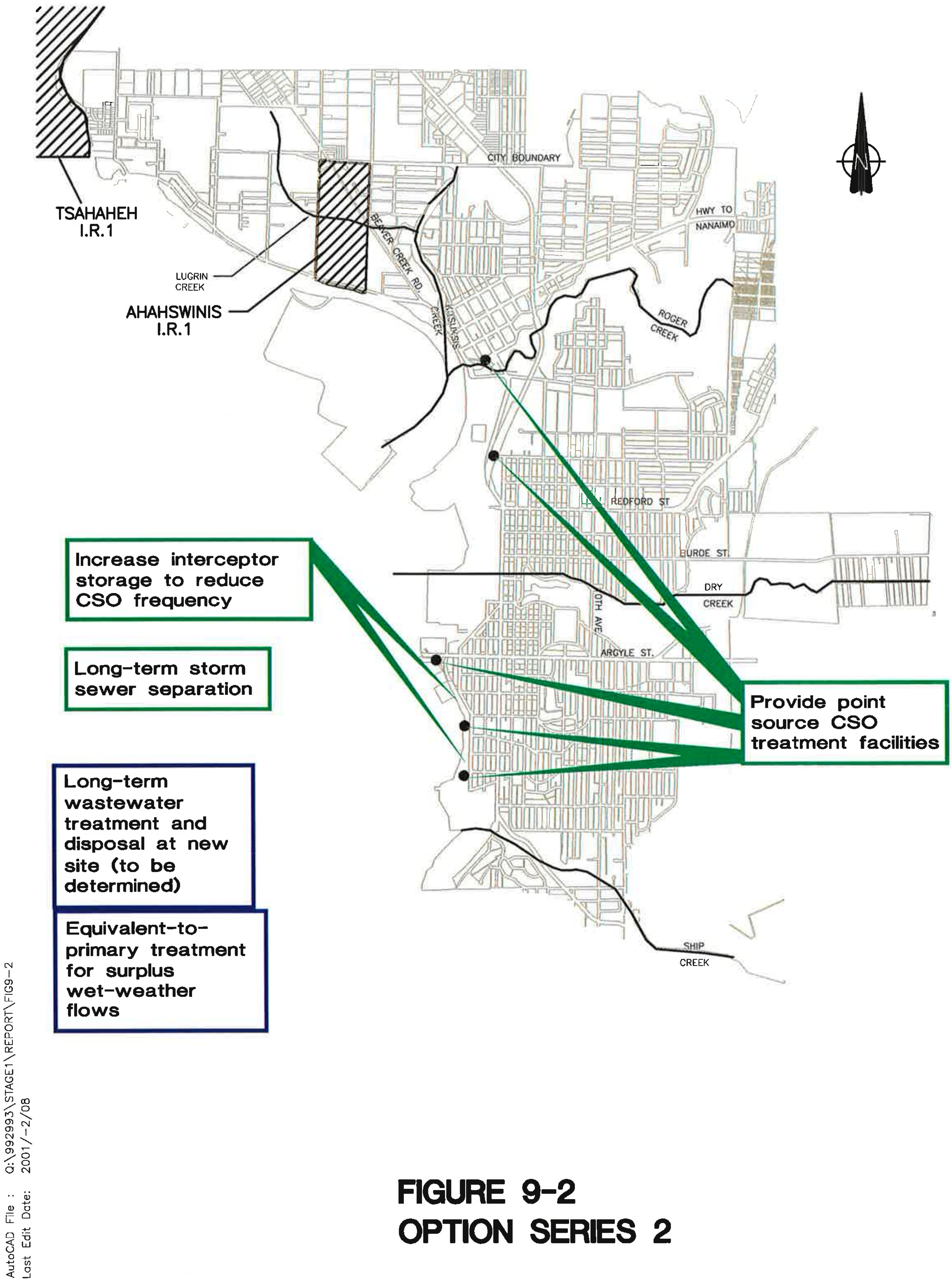

FIGURE 9-2
OPTION SERIES 2

locations. The option of providing additional interceptor system storage to reduce CSO/SSO occurrences would be evaluated. Option Series 2 would also include long-term sewer separation as part of collection system infrastructure management.

9.3.3 Option Series 3

Option Series 3 (Figure 9-3) would be a hybrid combination of Option Series 1 and Series 2 and would include both continued use of the existing lagoon system and the development of a new mechanical treatment facility. The exact split of which parts of Port Alberni would be served by these two plants has not be decided. However, in general, the northern portion of Port Alberni would be served by the lagoon system and the southern portion would be serviced by a new treatment plant located south, along the foreshore/dock area. It is possible that, by splitting the flows in this way, the lagoon system would not have to be upgraded and the new mechanical treatment plant won't have to be as large as in Option 2. The obvious downside to this option would be the need to operate and maintain two plants.

The steps to improve the CSO and SSO situation would be similar to those outlined for Options 1 and 2.

Stage 2 will involve the evaluation of these three options in the context of the results of any additional studies on the impact of the current treatment system on the environment.

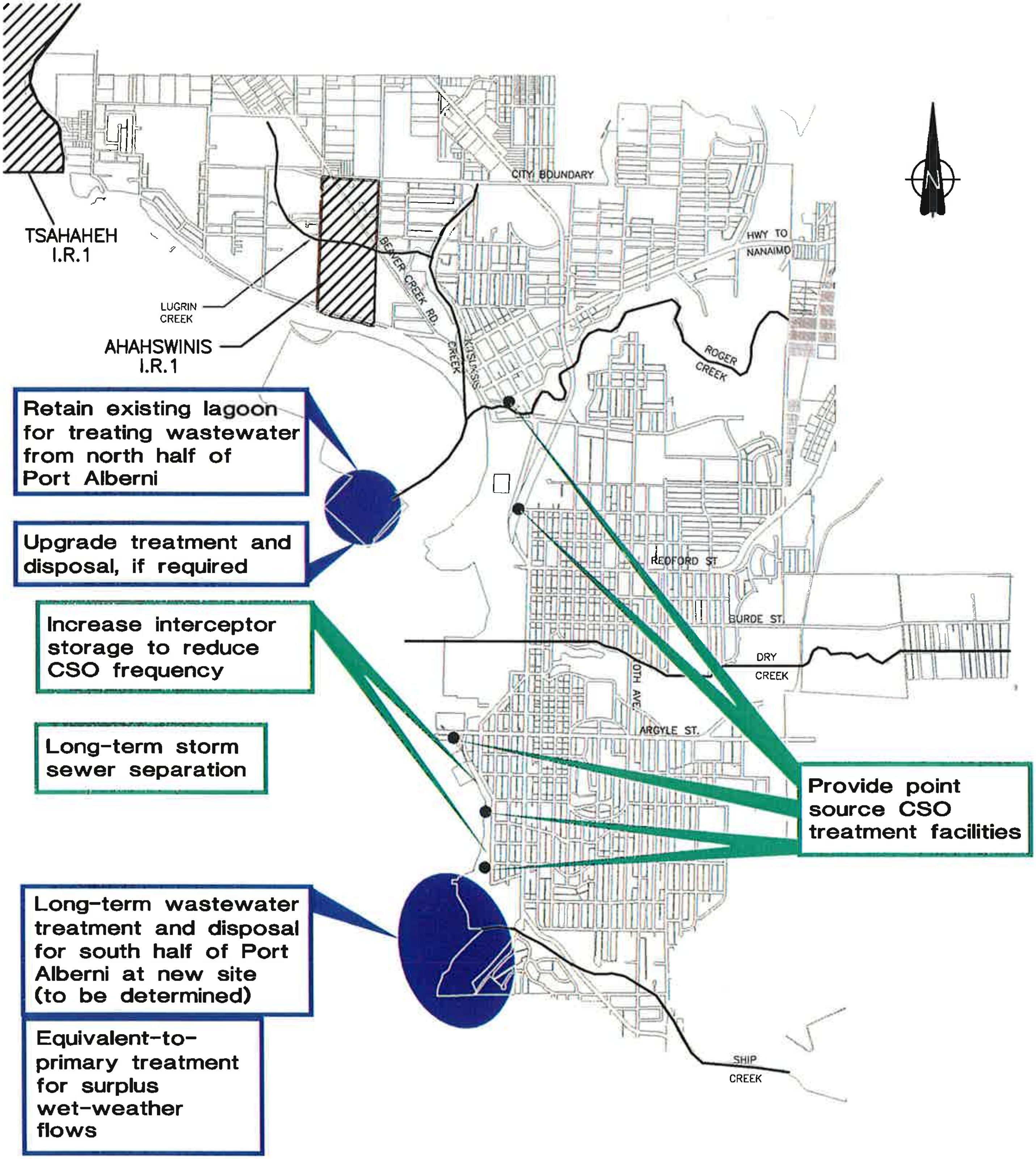

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FIGURE 9-3
OPTION SERIES 3

STORM WATER MANAGEMENT

SECTION 10

Storm water management, in terms of environmental protection, has traditionally been in the context of hydraulically protecting riparian and aquatic habitats from uncontrolled runoff originating in developed urban areas. More recently, urban storm water runoff has been identified as a potentially significant non-point source of pollution to receiving waters. For the purpose of the Port Alberni LWMP, storm water explicitly refers to water collected in dedicated storm water systems.

10.1 OVERVIEW

Pollutants in urban storm water can originate from a wide variety of sources including, but not limited to, the following (Roberge and Wetter, 1995):

- fertilizers and pesticides used in gardening
- industrial activities
- accidental chemical spills
- intentional dumping of hazardous materials (e.g., used motor oil) into storm drains
- atmospheric deposition of materials originating from the use of automobiles

Storm water contaminants, originating from many sources, can be separated into the following general categories (Schueler, 1987):

- sediment
- nutrient
- bacteria (e.g., faecal coliforms)
- oxygen demanding material (e.g., BOD source)
- oil and grease
- trace metals
- toxic chemicals
- chlorides
- thermal pollutants

The environmental and receiving water impacts associated with storm water contaminants are as varied as the sources and the contaminants themselves. Impacts may include lethal stress to aquatic organisms due to the depletion of dissolved oxygen levels, taste and appearance problems in public drinking water supplies caused by turbidity/sediment, and health concerns associated with recreational activities (i.e., swimming, shellfish harvesting) in waters contaminated by fecal coliform bacteria (B.C. Environment, 1992).

The potential environmental impact of storm water, generated from a given urban area, is a function of the contaminant loading from the area, the amount of storm water that reaches a receiving water (versus the volume that enters the groundwater regime), and the environmental "sensitivity" of the receiving water. Therefore, areas experiencing the most growth and/or discharging to sensitive receiving waters are the most important in terms of storm water management planning.

10.2 DESCRIPTION OF EXISTING FACILITIES

Since combined sanitary/storm water collection systems are used throughout the majority of the City, the extent of the "dedicated" storm water system is limited. The *North Sector* of the City contains an extensive piped storm water system that services the entire area. A limited number of areas at the edges of the *Central* and *South Sectors* do have some piped separate storm water systems.

10.3 STORM WATER MANAGEMENT STRATEGY

The MELP has recognized the significance of non-point sources of pollution on receiving water quality, and considers storm water a valuable resource that should be conserved for use by aquatic life (Roberge and Wetter, 1995). To meet this objective, the MELP's approach is to maximize contaminant removal from storm water via source controls and education. More specifically, the source control methods would involve:

- seeking ways to minimize the production of pollutants
- attempting to prevent contact of storm water with pollutants

The realities of storm water runoff dictate that, regardless of source control measures, some degree of storm water contamination will occur. These situations would require the application of Best Management Practices (BMP's) that are essentially storm water treatment technologies (B.C. Environment, 1992):

- Physical treatment BMP's:
  - oil/water separators
  - swirl concentrators

  - helical bend flow regulators
  - dry ponds
  - extended detention dry ponds

- Physical-chemical treatment BMP's:
  - alum-based coagulation
  - ferric chloride-base coagulation
  - lime (calcium hydroxide)-based coagulation
  - chlorine disinfection

- Biologically-enhanced treatment BMP's:
  - wet ponds
  - constructed wetlands
  - biofiltration, including vegetated swales, filter strips and small wetlands
  - infiltration practices, including infiltration basins, infiltration trenches, porous pavements, concrete grid and modular pavements

- Development of wooded urban forests to increase storm water retention and/or decrease flows.

- Treatment BMP's for highway runoff:
  - eliminate curbs to permit more storm water infiltration
  - strengthen litter enforcement
  - control pesticides and herbicides
  - avoid direct discharge
  - reduce runoff velocities to minimize sediment erosion and transport
  - utilize grassed swales to facilitate infiltration, particularly during the "first flush" of a precipitation event
  - filter strips
  - vegetated rights of way

Other considerations include long term maintenance and the long term fate of pollutants captured in the BMP's.

10.4 IMPLEMENTATION

The Ministry of Environment, Lands and Parks (MELP) have advocated the development of long term Urban Storm Water Control Plans (USWCP's). The intent would be that a comprehensive, long term, USWCP, formulated under the direction of the MELP, would provide a framework to identify storm water issues, information requirements and an overall strategy for storm water planning. The USWCP could then be used for identifying specific storm water management requirements for new and existing developments. To foster the development of USWCP's across the Province, MELP has recently funded a project in Nanaimo that will culminate with the development of the first USWCP. It is anticipated that the concepts in this first USWCP will be used by the City of Port Alberni in its own storm water management planning activities.

The following discussion provides a summary of topics, suggested by MELP, that should be addressed as part of a USWCP (Roberge and Wetter, 1995).

The USWCP would define environmental goals, and the methods and strategy used to achieve them. This would include priorizing areas with respect to environmental protection needs and formulating an evaluation strategy for monitoring the effectiveness of the plan. An important part of the plan would be providing education to both the public and private sectors, and allowing them to participate in the planning process. The USWCP would also seek to obtain statements of concurrence from cooperating agencies.

In keeping with the overall philosophy of storm water management, proposed source controls for industrial, commercial and construction activities would be identified that could minimize the contaminant loading in storm water. By-laws would be one method of implementing source control; inspection and enforcement procedures would have to be developed in conjunction with proposed bylaws. Areas, where land use restrictions would enhance BMP's, should be identified. The plan should also identify ways to deal with potentially contaminated sediments collected from treatment BMP's.

In order to provide comprehensive management of non-point source discharges within the LMWP study area, the City should develop an USWCP based on the concepts developed in a recently started MELP-funded study in Nanaimo. Key goals of the USWCP will include development of source control bylaws and identification of BMP's that would be suitable for the City.

PUBLIC INVOLVEMENT

SECTION 11

Public Involvement for the Liquid Waste Management Plan (LWMP) process is provided through two mechanisms. The first is through the Public Advisory Committee (PAC) which is made up of interested residents of the City of Port Alberni and two local First Nations groups. The PAC provides review and feedback through the complete LWMP process including Stages 1, 2 and 3. In Stage 1, this included several meetings and the review of technical memoranda and the draft of the Stage 1 report. PAC input culminated in Stage 1 with a recommendation that the draft Stage 1 document be presented to the general public for its comment. This recommendation (and an identical recommendation from the Technical Advisory Committee) was taken to a meeting of the LWMP Steering Committee, i.e., City of Port Alberni Council, on February 12, 2001. A forty-minute presentation was made to the Steering Committee by Associated Engineering staff and, after a 35 minute question and answer period, the Steering Committee approved a motion to proceed with the Stage 1 LWMP public presentation.

On this basis, a venue for a public presentation was discussed and the Echo Park Field House was selected. The date was selected as approximately one month from the Steering committee meeting date, i.e., March 13, 2001. This event was subsequently advertised in the local newspaper on at least two dates prior to the meeting (a copy of the advertisement is provided in Appendix A).

The public presentation was provided in two parts: an Open House from 3:30 p.m. to 6:00 p.m. and a more formal presentation from 7:00 p.m. to 9:00 p.m. Foam board posters that outlined some of the salient details of the Stage 1 LWMP were set up in the Field House meeting room. Two handouts were also provided: one which was basically the executive summary of the Stage 1 report and another which was a copy of the computer presentation slides. In addition, a questionnaire was also provided. Copies of this information can be found in Appendix A.

The intent of the Open House was to permit the public to drop in and discuss the Plan or any other related issues with members of the consulting team, City Staff and/or members of the TAC and PAC committees and, if possible, MELP staff. Despite the good advertising and the good weather, there were a total of seven attendees for the Open House. Of these, one person was from the Federal Dept. of Fisheries and Oceans (DFO), one was from Public Health, one was from City Council and one was from the TAC committee. Nevertheless, there was good discussion between these attendees and with member of the consulting team and the two members of City Engineering department staff who attended. In general, all of the comments about the LWMP process were positive in that everyone agreed that the Plan would lead to positive changes and improvements in the manner in which the City manages its wastewater and minimizes the impact of this management on the environment.

The evening presentation was intended to be somewhat more formal than the afternoon Open House. The evening meeting began at approximately 7:10 p.m. with a formal computer slide presentation made by Associated Engineering staff. The audience included three members of the public and two members of City Engineering department staff. A copy of the slides was provided as notes for those in attendance. This material can be found in Appendix A of this report.

The presentation outlined the purpose of the LWMP process, the findings of Stage 1 and the direction for Stage 2. The presentation lasted approximately 1 hour and included some questions and answers. There was also a short question and answer period following the presentation. In general, responses were positive. At least one member of the public felt that the current level of wastewater treatment was very unsophisticated and advocated higher levels of treatment. Associated Engineering staff suggested that, while there are more sophisticated means of wastewater treatment, e.g., the membrane bioreactors at the Mount Washington ski resort, the cost of such plants for the City's size was very high and the need for such increased levels of treatment had not yet been established. It was anticipated that additional studies associated with Stage 2 of the plan would clarify some of these treatment issues.

While the turn-out for both the afternoon Open House and the evening presentation were disappointing, the level of advertising had been adequate and the material prepared and provided and the presentations were high quality. Based on past experiences with these planning processes (both liquid waste and solid waste management planning), it is typical that Stage 1 meetings are not well attended. It is believed that one of the prime reasons for this apparent lack of interest by the public is the fact that Stage 1 is mostly about gathering data and identifying issues and not about the costs. The public is very interested in the costs. Unfortunately, the costs are not developed until Stage 2. As a result, turn out for the Stage 2 public meetings is usually much better than for Stage 1. Nevertheless, consideration may be given to changing the venue for subsequent, e.g., Stage 2, public meetings in the event that the Field House was deemed to be inconvenient for many of the public.

SUMMARY

This report is the culmination of the City of Port Alberni's Stage 1 Liquid Waste Management Plan (LWMP) activities. Stage 1 has included assembling background data, identifying wastewater management issues, estimating future service populations and waste generation rates, documentation of existing wastewater treatment and effluent disposal practices, identification and discussion of non-domestic wastewater discharges, discussion of source control issues, discussion of effluent and biosolids reuse options, discussion of wet-weather flow management options, development and description of wastewater management options, discussion of future storm water management options and documentation of the Stage 1 public involvement process. The specific conclusions from each of these sections include:

- The City of Port Alberni has significant areas that are still served combined sewers (mixed sanitary wastewater and storm water). The remaining areas are served by mostly by separate sanitary and storm sewer systems. Recent land expansion has resulted in the incorporation of approximate 100 homes (about 300 people) that are on septic tank (domestic on-site) wastewater treatment.

- Issues that needed to be addressed in the LWMP include:
  - existing and projected community development
  - wastewater treatment and effluent disposal
  - non-domestic (commercial/institutional) wastewater discharges
  - source control to protect the wastewater treatment facility from upsets
  - effluent and biosolids reuse possibilities
  - wet-weather flow management including the long-term need to eliminate combined sewer overflows (CSO's) and sanitary sewer overflows (SSO's)

- The population growth rate for LWMP purposes will be 1% per annum. Since this may be significantly changed (at least in the short run) by the influx of a large industrial development, such as a potential aluminum smelter, this situation should be monitored over the life of the plan.

- The existing wastewater treatment facility is an aerated lagoon with the treated effluent going into the Somass Estuary. The facility generally meets its current effluent discharge permit requirements. While, there are some incidents of excessive flows during the winter period, there is no evidence that there are any environmental impacts. Before decisions can be made regarding the need for improved treatment, it will be necessary to conduct some studies of the impact of the current facility and wastewater discharge flows to the environment.

- There are two non-domestic wastewaters that are or could cause significant impacts on the existing wastewater treatment facility. These include a high organic strength wastewater discharged by a fish processing plant and the high ammonia concentration wastewater (leachate) discharged from the Alberni Valley landfill. The current data based is limited and, as a result, more data will have to be gathered in Stage 2 to estimate treatment facility (lagoon) loading so that future lagoon performance can be estimated.

- Source control should be used to limit the loading on the City's wastewater treatment facility both now and in the future. This will require that the City revise its current source control bylaw to be more comprehensive and, potentially, more stringent. Any initiatives to create a "no discharge" in Alberni Inlet adjacent to Port Alberni will have to be co-ordinated with the Federal government by Provincial MELP staff.

- There are limited wastewater effluent and biosolids reuse opportunities. The only apparently viable effluent reuse possibility is silviculture (tree) irrigation. Biosolids might be reused in silviculture applications, gravel pit restoration and/or landfill closure and rehabilitation.

- The most important part of the City of Port Alberni's LWMP will be the development of a strategy to eliminate combined sewer overflows (CSO's) and sanitary sewer overflows induced by wet-weather flows and/or infiltration and inflow. This strategy will include continuing the program to create separate sewers in existing combined sewer areas, modification of pumping and force main systems, and providing treatment of any remaining CSO's (SSO's will be totally eliminated). This strategy will be developed further in Stage 2 and will require modelling of the sewer system so that specific problem areas can be targetted for improvement.

- Future wastewater management options assume that there will be continued sewer separation, that SSO's will be eliminated, that CSO's will be minimized in size and frequency, CSO's will be treated and source control and water conservation programs will be in place. On this basis, there are three main options:

- Option 1: the wastewater treatment facility remains where it is but with upgrades to treatment and/or disposal, potentially including shared use of the Pacifica Papers lagoons, as required

- Option 2: The existing treatment facility would be abandoned and a new mechanical treatment plant would be developed either on the southern foreshore/dock area of the City or in the area adjacent to the Alberni Valley landfill

- Option 3: The existing treatment lagoons would be kept but they would only service the northern half of Port Alberni. The southern half of Port Alberni would be serviced by a new mechanical treatment plant located on the southern foreshore/dock area.

- Over the long term, the City will develop an Urban Storm Water Control Plan (USWCP) based on the concepts developed as part of a new MELP-funded study in Nanaimo.

- Public participation in the Stage 1 open house and presentation process was minimal. However, it is anticipated that Stage 2 will garner more public interest because costs will be attached to the options.

- Stage 2 will require several companion studies, i.e., sewer system modelling and evaluation of any impacts of lagoon effluent discharge on the Somass Estuary.

REFERENCES

B.C. Environment (1992). Urban Runoff Quality Control Guidelines for the Province of British Columbia, June 1992.

Chamber of Commerce (2000). Telephone correspondence between the Port Alberni Chamber of Commerce and Associated Engineering, May 4, 2000.

DeLCan (1985). Sewage Lagoon Status Report: City of Port Alberni, Willis, July 1985.

Government of Canada (1991a). Canada Shipping Act: Pleasure Craft Sewage Pollution Prevention Regulations, November 1991.

Government of Canada (1991b). Canada Shipping Act: Non-Pleasure Craft Sewage Pollution Prevention Regulations, November 1991.

MELP (2000a). Voice mail from Ministry of Environment, Lands and Parks to Associated Engineering, June 20, 2000.

MELP (2000b). Facsimile correspondence from Ministry of Environment, Lands and Parks to Associated Engineering, November 9, 2000.

MELP (2000c). Ministry of Environment, Lands and Parks, Draft 3.0 Organic Matter Recycling Regulation (OMRR), October 12, 2000.

MELP (1999). Waste Management Act - *Municipal Sewage Regulation*, July 15, 1999, Ministry of Environment, Lands and Parks.

NovaTec (1995). Sewage Lagoon Upgrading and Impact of Additional Loading from Leachate and Surimi Effluent: City of Port Alberni, NovaTec Consultants Inc., August 1995.

OCP (1993). Official Community Plan, City of Port Alberni, October 1993.

Pacifica Papers (2000). E-mail correspondence from Pacifica Papers to Associated Engineering, March 8, 2000.

Port Alberni (2000). Telephone correspondence between City of Port Alberni and Associated Engineering, February 8, 2000.

Port Alberni (1999). Facsimile correspondence from the City of Port Alberni to Associated Engineering, December 1999.

Roberge, H. and Wetter, D. (1995). Proposed Storm water Guidelines and Management Strategies for British Columbia, Ministry of Environment, Lands and Parks, CSCE Conference, Sidney, B.C., September 29, 1995.

Schueler, T.R. (1987). Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs, Washington Metropolitan Water Resources Planning Board, July 1987.

Weyerhauser (2000). Telephone correspondence between Weyerhauser and Associated Engineering, July 18, 2000.

PUBLIC INFORMATION MEETING INFORMATION

APPENDIX A

Stage 1 - Liquid Waste Management Plan

Public Information Open House and Meeting

Echo Park Field House

4200 Wood Avenue
Tuesday, March 13, 2001

Open House: 3:30 PM to 6:00 PM
Presentation and Meeting: 7:00 PM to 9:00 PM

The City of Port Alberni is in the process of developing a Liquid Waste Management Plan (LWMP) which will form the basis for future wastewater (sewage) collection, treatment and disposal for the next 40 years. The LWMP is a three-stage process. During Stage 1, the focus has been on assembling background information, identifying wastewater management issues and developing a list of alternative wastewater management options. Detailed evaluation of these options and developing an implementation plan will be conducted during Stages 2 and 3, respectively.

Stage 1 has identified the areas of future growth in the City, the associated growth in wastewater flows, impacts of wastewater from the fish processing industries, issues related to combined sewers and combined sewer overflows (CSO's), potential for impacts on the estuary, upgrading of the current wastewater treatment lagoons and the potential of relocating the treatment facility.

Stage 1 has been conducted by Associated Engineering (BC) Ltd., an engineering consulting firm, with the assistance of a Technical Advisory Committee (TAC) and Public Advisory Committee (PAC). A draft Stage 1 report developed by Associated Engineering has been reviewed by the TAC and PAC members, the Ministry of Environment and City Council members. It is now time to further involve the public via an open house and a public information meeting. The feedback from this meeting will help to chart the course for Stages 2 and 3.

The agenda for **Tuesday, March 13, 2001** will be as follows:

3:30 PM to 6:00 PM An **Open House** to allow members of the public to talk one-on-one with City staff, LWMP committee members, BC Environment staff and the consultant team

7:00 PM to 9:00 PM **Formal presentation of Stage 1** by the consultant team followed by a question and answer period with City Staff, Ministry of Environment and the consultant team.

If you have any questions regarding this meeting, please call Ken Watson, City Engineer, 720-2838.

CITY OF PORT ALBERNI
LIQUID WASTE MANAGEMENT PLAN

STAGE 1
PUBLIC INFORMATION MEETING - MARCH 13, 2001

INFORMATION HANDOUT

WHAT IS A LWMP?

A Liquid Waste Management Plan (LWMP) is a three stage review and development process to select a wastewater management strategy for a community. This management includes the municipal sewerage system, individual on-site systems, industrial discharges, and non-point pollution sources. Once approved by the Ministry of Environment, Lands, and Parks (MELP), a municipality or regional district is authorized to discharge waste in accordance with the plan.

THE LWMP PREPARATION PROCESS

The City of Port Alberni Council is the **Steering Committee** for the LWMP. This group will ultimately approve the plan and submit it to the provincial government. Input into the direction of the LWMP is provided by a **Technical Advisory Committee (TAC)**, composed of staff members of the local and senior government agencies, and members of local industry. Additional direction for the LWMP is provided by the **Public Advisory Committee (PAC)**.

The LWMP will be prepared in three stages:

- **Stage 1** includes assembling background data, identifying wastewater management issues, estimating future populations and waste generation, and developing a list of wastewater management options for consideration by the City of Port Alberni.

- **Stage 2** will conduct a detailed evaluation of the wastewater management options identified in Stage 1. Following completion of the evaluation, and selection of a preferred option, a recommended implementation strategy will be proposed for further evaluation in Stage 3.

- **Stage 3** will carry out further refinement of the proposed strategy with the emphasis on financial planning to allow implementation in an affordable manner.

THE PURPOSE OF THE CITY OF PORT ALBERNI PUBLIC INFORMATION MEETING

The Committees consider the LWMP to be at an appropriate stage to obtain input from the public at large on the plan direction and on specific issues. The purpose of tonight's public information meeting is to convey the work and discussion on the plan to date and to discuss the issues where the committees are looking for input from the public.

The forum for the contribution of ideas is through one on one discussion with the LWMP consultants and members of the committees prior to the presentation by the consultant team, by the question and answer period following the presentation, and by submission of a questionnaire at the end of the meeting.

WASTEWATER MANAGEMENT ISSUES

Over the course of several meetings with the *Public and Technical Advisory Committees,* and public information meetings, several key wastewater issues were identified for inclusion in the LWMP. The issues were wide ranging, and included topics such as provision of sewers to new areas, elimination of combined sewer overflows (CSO's) , elimination of sanitary sewer overflows (SSO's), source control, non-domestic discharges, wastewater treatment and disposal, biosolids reuse, and stormwater management. Protection of the marine environment was identified as a major issue, with environmental impacts related to CSO's, SSO's and discharge of treated wastewater major points of discussion.

POPULATION GROWTH

In order to plan wastewater management initiatives to accommodate demands by future populations, the LWMP must estimate the expected future populations located in the study area over the next 40 years. Low growth, medium growth and high growth scenarios are presented in the report. The low growth scenario assumes an annual growth rate of 0.5% for the entire planning period. The high growth scenario assumes an annual growth rate of 2%. The most likely scenario, the medium growth rate, assumes an annual growth rate of 1%. One of the major unknowns is the possibility of a major new industry, e.g. an aluminum smelter, being developed in the area.

FUTURE WASTEWATER MANAGEMENT DIRECTION

To date, the committees have identified three wastewater management options that will be evaluated in detail in Stage 2. All options are based on the medium growth scenario, with the flexibility to accommodate higher growth rates if necessary. All options assume that the City would continue to separate sewers in areas served by combined sewers and there would be some moves to decrease infiltration and inflow into the sewers. All scenarios also assume that efforts will be made to eliminate sanitary sewer overflows (SSO's) and reduce the size and frequency of combined sewer overflows (CSO's). Furthermore, in all scenario's, there will be point source treatment of the remaining CSO's in order to minimize their impact.

Given the above common components, three main option series have been formulated for further evaluation in Stage 2 of the LWMP:

Option 1 • Wastewater treatment facility remains at the current site but with upgrades to treatment and/or disposal, as required.

Option 2 • The existing treatment facility would be abandoned and a new facility developed at a new site (perhaps along the southern foreshore or near the Alberni Valley landfill). Flows up to two times average dry weather flow (ADWF) would receive secondary treatment and flows above that, only primary treatment.

Option 3 • This is a hybrid option. The existing wastewater treatment facility would be kept in service to treat wastewater from the north half of Port Alberni. A new treatment facility would be developed along the southern foreshore to treat the wastewater from the south half of Port Alberni.

Based on the discussion at the public information meeting, the draft Stage 1 report will be revised as necessary and submitted to the MELP for approval. Following approval, the work will commence on Stage 2 of the LWMP. At the end of Stage 2, there will be a similar meeting at which the costs of the above options will be presented for comment and discussion.

CITY OF PORT ALBERNI

STAGE 1 LIQUID WASTE MANAGEMENT PLAN

PUBLIC INFORMATION MEETING - MARCH 13, 2001

QUESTIONNAIRE

---

1 BACKGROUND DATA **YES** **NO**

Are you a resident of the City of Port Alberni? ____ ____

If so, what area do you live in? ____

2 WHAT ARE THE IMPORTANT ISSUES?

What do you think are the most significant issues that the LWMP has to deal with**Please rate them from 1 to 5, with "1" being not important and "5" being very important.**

- Protection of public health ________
- Protection of the marine environment ________
- Preservation of environmental and cultural values ________
- Accommodation of future growth ________
- Management of industrial development ________
- Affordability ________

3 COMMENTS OF PROPOSED OPTIONS TO BE LOOKED AT IN STAGE 2

Is the LWMP going in the right direction?

____

____

Do you have specific comments on the options at this time?

____

____

____

____

City of Port Alberni

Stage 1
Liquid Waste Management Plan
Public Information Meeting
March 13, 2001

Associated Engineering (BC) Ltd.

1

Purpose of this presentation

- To Review what a LWMP is and how it will be developed
- To Review the findings of the draft Stage 1 report
- To seek input and feedback

2

What is a Liquid Waste Management Plan (LWMP)?

- It is a Planning Document
- It is Interlinked to the Official Community Plan (OCP)
- It Provides Regulatory Approval
- It is <u>not</u> the BC Municipal Sewage Reg's (MSR) but it is related to them

3

What are the LWMP Objectives?

- To develop a strategy that will ensure that the City's wastewater management practises:
  - Protect public health
  - Protect the marine environment
  - Are affordable and sustainable

4

How does the LWMP process work?

- Three stage process:
  - Stage 1 - identifying issues, developing options
  - Stage 2 - detailed investigation of options
  - Stage 3 - implementation and financing plan

(Each Stage requires public input)

5

How does the LWMP process work?

- Developed by a knowledgeable Consultant in consultation with the Client and review committees:
  - Technical Advisory committee
  - Public Advisory committee
  - Steering Committee (City Council)
- Input from the Public

6

Issues that need to be addressed

- Provision of wastewater infrastructure to accommodate present and future growth and/or expansion
- Elimination of combined sewer overflows (CSO's)
- Elimination of sanitary sewer overflows (SSO's)

7

Issues (continued)

- Source control
- Non-domestic Discharges
- Wastewater treatment and disposal
- Biosolids reuse
- Stormwater management

8

Infrastructure Requirements

- Infrastructure includes sanitary sewage and stormwater collection pipes
- Some areas within Port Alberni are on Combined Sewers; some are on separate sewer systems
- Most expansion will be through acquisition of areas outside the City (which do not have sewers)

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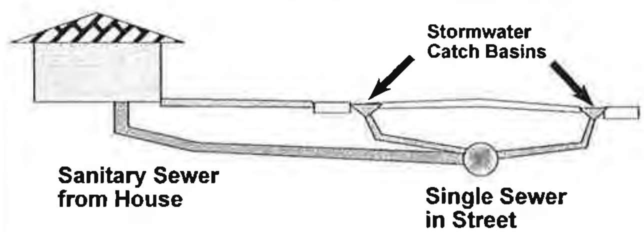
Combined Sewer System



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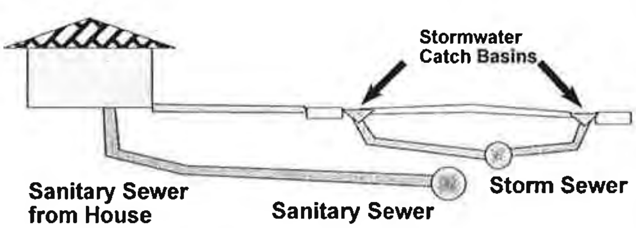
Separated Sewer System



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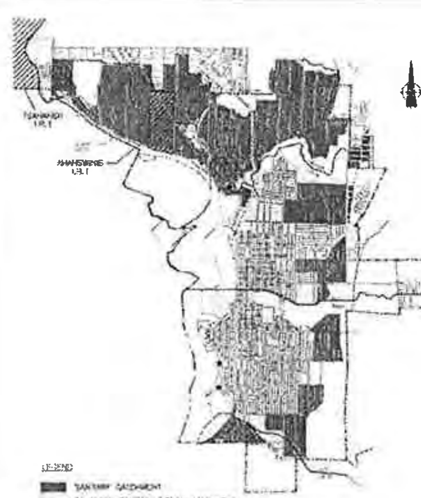


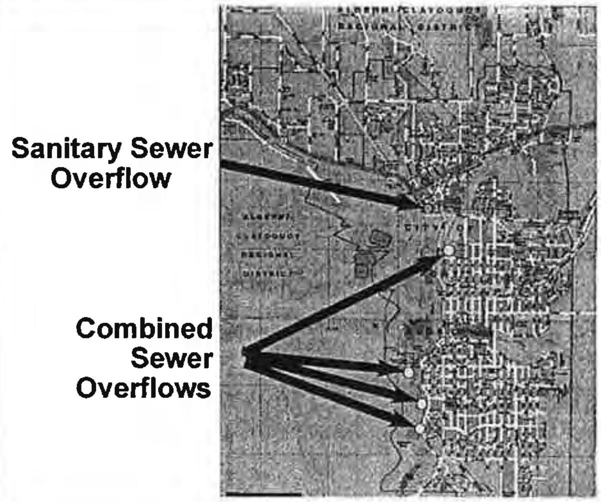
Sewered areas within the City of Port Alberni

12

Elimination of CSO's and SSO's

- Port Alberni has four MELP-permitted Combined Sewer Overflows (CSO's):
  - Argyle Street Pumping Station
  - Bruce Street
  - Harbour Commission/Tahsis St.
  - Maitland St.
- Port Alberni has one Sanitary Sewer Overflow (SSO):
  - Margaret St. and Pemberton Road (discharges into Roger Creek)

13



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Elimination of CSO's and SSO's

- CSO's result in the discharge of (diluted) raw sewage to the receiving environment
- 22 of 99 CSO samples exceeded MELP criteria
- Impacts are unknown

15

Elimination of CSO's and SSO's

- The Pemberton Road SSO results from transfer of sanitary wastewater from a separate system to a combined sewer system
- SSO's result in the discharge of undiluted raw sewage to the receiving environment
- MELP will not issue a permit for SSO's
- Federal Dept. of Fisheries (DFO) could prosecute under Fisheries Act

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Elimination of CSO's and SSO's

- Continue the program of separation of sanitary and storm sewers
- Eliminate discharge of sanitary sewer wastewater to combined sewer system
- Increase capacity of interceptor sewers and pumping stations (requires modelling)
- Provide treatment of CSO's that can not be economically eliminated

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Source Control

- Source control is necessary to protect the wastewater treatment facility and effluent quality
- Source control is concerned with the quality and quantity of collected sewage
- Existing bylaw was modified to deal with fish processing plants
- Bylaw needs to be revised to be more comprehensive and specific

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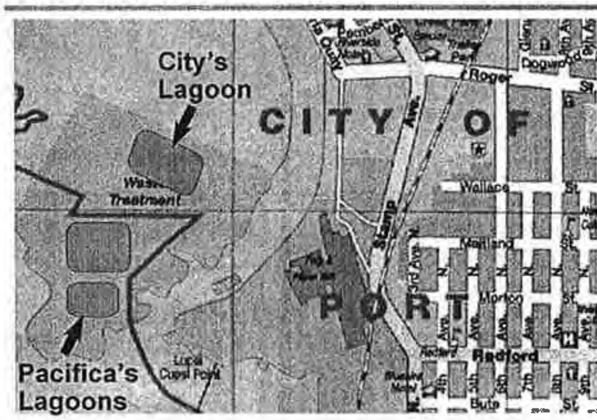
Non-Domestic Discharges

- Non-domestic discharges can have an effect on the treatment plant performance
- Main non-domestic wastewater sources:
  - Fish processing plants (which can discharge high flows and high strength wastewater) - a source of treatment problems
  - The Alberni Valley Landfill leachate - a source of ammonia and dissolved metals which may cause treatment problems

Wastewater Treatment and Disposal

- The existing wastewater treatment facility is a two cell, aerated lagoon:

Existing Two Cell Aerated Lagoon

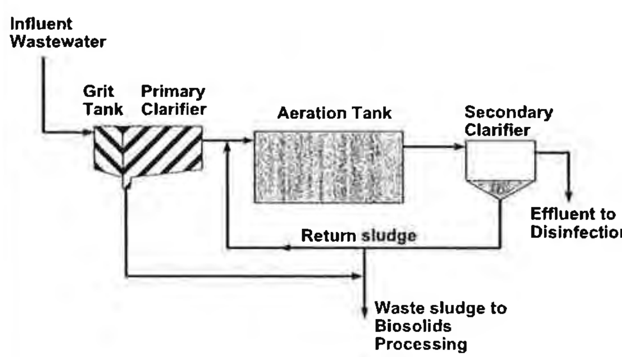


Wastewater Treatment and Disposal

- There have been some problems with flows exceeding the permit value during winter conditions (infiltration and inflow)
- Existing permit effluent is 70 mg/L BOD and 70 mg/L TSS (or "70/70")
- Municipal Sewage Reg's would be "45/60"
- Some problems meeting existing permit for TSS

Wastewater Treatment (continued)

- The existing facility would not consistently meet the MSR "45/60" criteria
- Meeting the MSR criteria would require additional treatment (either before or after the lagoons)
- Currently, there is no nutrient removal
- Currently, there is no effluent disinfection



Mechanical/Biological Secondary Treatment Process

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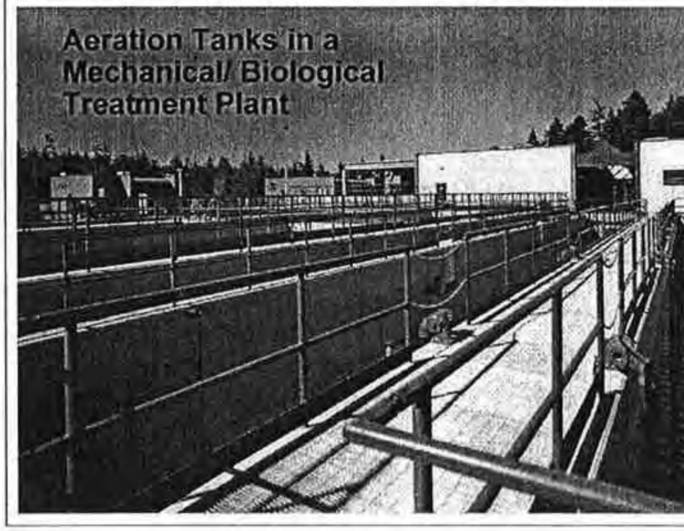

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Wastewater Disposal

- Existing effluent disposal is to a non-engineered (natural) wetland
- Impacts on this wetland and/or the estuary are not known
- Assessment of impacts is necessary
- Investigation of alternative disposal methods and/or treatment plant locations is necessary

27

Wastewater Treatment Plant Location

- The current location is in the estuary area, adjacent to the Pacifica Papers' lagoons
- There are some concerns about the present location regarding:
  - Environmental impacts
  - Vunerability during a Tsunami
- Alternative locations could be near the Alberni Valley landfill or along the foreshore

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Effluent and Biosolids Reuse

- Limited Effluent Reuse possibilities:
  - Silviculture irrigation (Pacifica Paper's tree farm adjacent to the City's lagoon)
- Some Biosolids (sludge) reuse possibilities:
  - Landfill cover
  - Soil conditioners for landscaping
  - Pacifica Papers tree farm

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Wastewater Management Options

- Option Assumptions:
  - 40 year planning horizon
  - Medium (1%) growth rate
  - All future developments and expansions will be sewered (eventually)
  - Source control will be in place
  - Water conservation will be promoted

30

Option Series 1: Improved Status Quo

- Treatment Facility remains at current site
- Upgrades to treatment and disposal (if necessary)
- Long-term storm sewer separation
- Upgrade pumping capacity to reduce frequency of CSO's and SSO's
- Provide point source treatment at CSO and SSO locations

Option Series 2: New Treatment Plant

- A new treatment facility is developed at a new site (foreshore, landfill area, etc.)
- Long-term storm sewer separation
- Increase interceptor storage to reduce CSO frequency
- Treat surplus wet weather flows (>2x's ADWF) to primary treatment quality
- Provide point source treatment at CSO and SSO locations

Option Series 3: Hybrid System

- The existing lagoon facility would be used to treat wastewater from north Port Alberni
- A new treatment facility would be developed at a new site (foreshore, etc) to treat wastewater from south Port Alberni
- Long-term storm sewer separation
- Measures to reduce CSO's
- Provide point source treatment at CSO locations

What are the Next Steps?

- Receive your input at this meeting
- Finalize Stage 1 report and submit to MELP
- Complete studies on sewer system performance and effluent disposal
- Complete Stage 2 including a comparison of costs and benefits of the three main options