COWICHAN VALLEY REGIONAL DISTRICT

CENTRAL SECTOR

LIQUID WASTE MANAGEMENT PLAN

AUGUST 1999

DAYTON & KNIGHT LTD.
Consulting Engineers

Amendment No. 1: Replacement of Cowichan Bay Treatment Plant
May 2001

Amendment No. 2: A modification of the language to allow for the consideration of options other than, or in addition to, water reclamation to reduce the phosphorus load to the Cowichan River by at least as much as is currently proposed in the Plan.
June 2001

COWICHAN VALLEY REGIONAL DISTRICT
CENTRAL SECTOR LIQUID WASTE MANAGEMENT PLAN

AMENDMENT NO. 2

CONTENTS

CONTENTS (cont'd.)

1.0 OBJECTIVE AND GUIDING PRINCIPLES

The objective of the Cowichan Valley Regional District (CVRD) Central Sector Liquid Waste Management Plan (LWMP) is the establishment of a intermediate term (10 to 20 years) strategy that will provide a comprehensive approach to managing liquid waste reduction, treatment, utilization and disposal within the Central Sector. The Central Sector comprises the City of Duncan, the southern part of the District of North Cowichan, parts of Electoral Areas (EA) D, E and F and part of the Cowichan Tribes land. The CVRD acknowledges that the Cowichan Tribes have jurisdiction/responsibility over all aspects of planning for Indian Reserves. Even though the Plan does not apply to Indian Reserves, as members of the community, the Cowichan Tribes were invited and participated in the development of this Plan.

Guiding principles used to develop the Plan include the following:

1. The goals of this LWMP are to protect human health and the environment through the provision of appropriate liquid waste facilities, with the strategies for achieving these goals being in accordance with the precautionary principle (action taken before hand to avoid negative impact or expensive remediation measures).

2. The liquid waste stream is reduced to the greatest extent possible, in accordance with the hierarchy of reduce, reuse and recycle, while considering local resources and the nature of the Central Sector's liquid waste stream.

3. The LWMP for the Central Sector is developed in concert with the Official Community Plans (OCP), adopted by the CVRD, the City of Duncan and the District of North Cowichan. The LWMP specifically recognizes and supports the OCP goals of urban containment, protecting rural integrity, protecting the Agricultural and Forest Land Reserves (by not allowing the provision of a sewer system to facilitate development),

efficient use and management of services and resources, and cooperation amongst jurisdictions.

4. Individuals, institutions and companies are enabled to make environmentally sound choices about consumption of resources and generation of liquid waste through provision of information and assistance with the development of codes of practices, policies and procedures. User-pay principles and market-based incentives will be used wherever possible to encourage participation.

5. Liquid waste policies and strategies are developed through an open and effective public consultation process in a cooperative manner between government, private enterprise and community stakeholders.

6. Sewage treatment facilities are located, designed and operated to minimize adverse impact on neighbouring development through provision of aesthetic and odour mitigation measures.

7. The evaluation of liquid waste management alternatives take into account technical, life cycle cost, environmental and social factors in order to provide decision makers with a balanced perspective on the alternatives for consideration.

8. The overall program is flexible and can be modified to meet changing conditions such as future demands, new environmental criteria and evolving technologies.

2.0 DEVELOPMENT OF THE PLAN

Preparation of a LWMP for the Central Sector was authorized by the CVRD Board in November, 1994.

The LWMP has been developed in three stages, consistent with the process outlined in Ministry of Environment, Lands and Parks (MELP) guidelines. Standards in the MELP new Municipal Sewage Regulation (MSR) have been used to determine the requirements for use of reclaimed water and for effluent discharges to the environment.

In this section, the MELP guidelines are highlighted, the Plan area is identified, a summary of the Stage 1 and Stage 2 work is presented and note is made of the public consultation report.

2.1 Plan Guidelines

Guidelines for developing a LWMP have been produced by B.C. Environment (BCE 1992). The guidelines require a three-stage process, each involving meaningful public consultation. Stage 1 identifies existing conditions, projects development and considers a range of treatment, reuse and disposal options. Those treatment, reuse and disposal options that have merit are advanced into Stage 2 for more detailed evaluation. Finally, the selected option is described and costed, the implementation schedule is developed and draft operational certificates are prepared in Stage 3. When the Stage 3 Plan (subject of this report) is approved by the Minister of Environment, Lands and Parks, the CVRD has the authority and a responsibility to implement the Plan.

To ensure broad representation in the LWMP process, the CVRD is required to inform the following agencies that a Plan is being undertaken and to solicit their input.

- Ministry of Agriculture, Fisheries and Food
- Ministry of Health (MOH)/Central Vancouver Island Health Region (CVIHR)
- Regional Districts and Municipalities adjacent to Plan Area
- Ministry of Municipal Affairs, Recreation and Housing
- Ministry of Tourism
- Ministry of Finance and Corporate Relations
- Regional Director of Parks
- Environment Canada

Advisory committees must also be established to represent community/stakeholder interests and technical interests. These committees may be combined, which is the approach taken for this Plan.

The LWMP was developed by the combined efforts of the Project Team, the Advisory Committee and the Public.

- Project Team: The Project Team is composed of CVRD staff, an MELP representative and consultants. The objective of the Project Team is to undertake the work required to prepare and produce the LWMP.

- Public and Technical Liquid Waste Advisory Committee: To facilitate communications between technical and public representatives, the technical and public Liquid Waste Advisory Committees were combined.

  The objective of the Advisory Committee is to provide public and technical input into the planning process. The Advisory Committee reports to a CVRD steering committee and is chaired by a Board Director. The Advisory Committee is composed of Board Members, representatives of various interest groups and geographic areas, stakeholders, municipal staff and senior government agencies. The Advisory Committee membership list is attached as Appendix 3.

- Public: The responsibility of the public is to become informed about the Liquid Waste Management Plan process and to provide input at the draft report stage.

The Stage 3 planning flow chart in Appendix 4 illustrates the study organization, summarizes the sequence of work tasks and outlines the public consultation process. Also shown on the chart is the relationship between the MELP, the District Board, the Project Team, the Advisory Committee and the public.

2.2 Background

The Central Sector comprises the City of Duncan, the southern part of the District of North Cowichan, parts of Electoral Areas (EA) D, E and F and part of the Cowichan Tribes land. Generally the Central Sector includes land that is tributary to the Cowichan River and that extends up the valley sides to the 200 m contour level. Upstream along the Cowichan River the Central Sector extends to just west of Paldi.

The Plan area is shown on Figure 1.

Approximately 35,000 people reside in the Central Sector. The projected year 2035 population is 79,000. The Joint Utilities Board (JUB) lagoon system and the Cowichan Bay treatment plant presently serve about 20,000 people within the urbanized areas. The remaining approximately 15,000 people rely primarily on individual septic tank and ground disposal systems. In the future it is projected the urbanized area requiring centralized treatment and disposal/reuse facilities will total about 67,000 people and about 12,000 people in rural areas will rely primarily on on-site systems.

2.3 Stage 1 and Stage 2

Work on Stage 1 of the LWMP commenced in November 1994. Existing sewage systems under MELP or Ministry of Health jurisdictions were evaluated, growth and development within the Plan area was projected to year 2035, source control and volume

reduction options were identified, the capacities of water and land to accept waste discharges were assessed, waste recycling and utilization alternatives were identified, treatment plant technologies were described, and options for treatment and disposal were developed and evaluated. The Stage 1 report (D&K 1995) was completed in October 1995 and was approved by the Regional Waste Manager of the Ministry of Environment, Lands and Parks on March 26, 1996.

A summary of the Stage 1 conclusions and recommendations for Stage 2 work are included in Appendix 5.

Stage 2 work commenced in November 1995. Initial work focused on drafting the source controls, volume reduction and stormwater management programs and on site selection for a new treatment plant. In summer 1996 the Advisory Committee put the work on hold while the terms of reference were reviewed to reflect initiatives by the Joint Utilities Board on upgrading the existing lagoon system and developing a source control bylaw. Revised terms of reference were finalized in February 1998 and the work recommended.

The source control and volume reduction programs were outlined, stormwater management objectives were discussed, the Plan development criteria were noted, plans for expansion and upgrading the JUB lagoons and the Cowichan Bay plant were described, potential uses for reclaimed water and biosolids were identified, a procedure for assessing on-site systems in rural areas was provided, future servicing of Maple Bay was described and future plans for centralized treatment and an outfall discharge to Satellite Channel were discussed. The Stage 2 study concluded with a draft outline of the proposed LWMP.

The Stage 2 report (D&K 1998) was completed in August 1998 and was approved by the Regional Waste Manager on November 6, 1998.

2.4 Public Consultation Process

Public consultation is an essential element in the LWMP process. The importance of providing opportunities for public information and input into the LWMP is stressed in the Waste Management Act, requiring the Minister of Environment, Lands and Parks to be satisfied that there has been adequate public review and consultation prior to approving the Plan. To assist in developing, guiding and summarizing the public consultation process, the CVRD retained Sequoia Management for the Stage 1 work and Praxis Pacific for the Stage 2 and Stage 3 work.

The overall goal of the LWMP public consultation program was to foster support and acceptance of the Plan through meaningful public participation. The combined public/technical Advisory Committee played a key role in this process. The Advisory Committee's community, environmental and business representatives has direct input into development of the LWMP and the Plan's public consultation program.

The Stage 1 public consultation program focused on introducing liquid waste management issues, planning concepts and options to stakeholders and the broader community. Activities included news releases, information ads, and an open house. The public consultation report (SM 1995) formed a supplement to the Stage 1 LWMP report.

Stage 2 public consultation built on activities completed in Stage 1 and focused on the further development of the LWMP programs and projects. Stage 2 activities included news releases, newspaper ads and an open house. The report (Praxis 1998) formed a supplement to the Stage 2 report.

The Stage 3 public consultation program ensured that the views, opinions and advice of the public were considered in finalizing the Stage 3 report and engaged the public in preliminary discussion about future opportunities for beneficial reuse of treated effluent.

Stage 3 activities included newspaper ads and an open house. The report (Praxis 1999) forms a supplement to this report.

2.5 Amendment No. 1

During the Central Sector Liquid Waste Management Plan development process, the CVRD held preliminary discussions with a local landowner, who had proposed to build a new sewage treatment plant on his property in Cowichan Bay, which would, in turn, allow his proposed development to proceed. As a result of these discussions, provision was made in the Central Sector Liquid Waste Management Plan to upgrade or partially replace the existing sewage treatment plant, utilizing the new site. However, during the public consultation process, a number of concerns regarding the site came to light.

As a result of these problems and due to the fact that the proposed development did not appear to be proceeding, the Central Sector Liquid Waste Management Plan Steering Committee decided to conduct a study to consider alternative sewage treatment plant sites and a connection to the Joint Utilities Board lagoon system. However, it was also decided to complete the Central Sector Liquid Waste Management Plan process without changing the Cowichan Bay components to not hold up the other components of the plan, which are related to the Joint Utilities Board. The Minister of Environment, Lands, and Parks subsequently approved the Central Sector Liquid Waste Management Plan in a letter dated May 11, 2000, but the CVRD was directed to submit an amendment for Cowichan Bay by December 31, 2000.

Dayton & Knight Ltd., Consulting Engineers, was retained to carry out the study to investigate alternative sites for the sewage treatment plant and to consider a connection to the Joint Utilities Board facilities. Their resulting report provides recommendations for routing of connective piping, preliminary capital and operational cost estimates and a social and environmental assessment. The following three potential locations for a sewage treatment plant, together with a connection to the Joint Utilities Board lagoon system, were addressed:

– Hayes site (log dump 400 metres west of the existing treatment plant)
– Westcan Terminals
– Cherry Point

Overall, cost and environmental and social factors favoured the Joint Utilities Board lagoon connection option. Based on this assessment, Dayton & Knight recommended Option 4 – connection to the Joint Utilities Board lagoon system.

Consequently, at its regular meeting of June 28, 2000, the CVRD Board approved the following resolution:

> *"That the Cowichan Valley Regional District accept the concept of connecting the Cowichan Bay Sewer Specified Area to the Joint Utilities Board lagoon system by means of a forcemain generally in accordance with the Dayton & Knight Ltd. report entitled PRELIMINARY STUDY OF OPTIONS FOR COWICHAN BAY SEWAGE TREATMENT PLANT RELOCATION."*

While an approval in principle for the connection had already been obtained from the City of Duncan-District of North Cowichan Joint Utilities Board in October 1999, discussions continued regarding the "buy-in" cost. A tentative figure of $550,000 for seven hundred and fifty residential equivalents has been determined.

Due to delays in determining the buy-in fee from the Joint Utilities Board, it became apparent that the December 31, 2000 deadline would not be achieved. In response to a request by the CVRD, the Minister of Environment, Lands and Parks, in a letter dated February 15, 2001, approved an extension to July 1, 2001.

The consultant's findings, together with updated buy-in and user cost information from the Joint Utilities Board were presented to the public through a consultation process held in late April – May 2001. Feedback was received through questionnaires and written comment forms distributed at open houses and made available on a special web site. Overall, support for the Cowichan Valley Regional District's proposals was strong at the

well-attended events. Details of the consultation process are presented in a report entitled, "Public Consultation Report for the Central Sector Liquid Waste Management Plan Amendment No. 1 – Replacement of the Cowichan Bay Sewage Treatment Plant", prepared by the Public and Technical Advisory Committee, which serves as companion report to the Central Sector Liquid Waste Management Plan document.

As a result, at its regular meeting of June 27, 2001, the Cowichan Valley Regional District Board ratified the following resolution:

> "That the Cowichan Valley Regional District accept the Central Sector Liquid Waste Management Plan - Amendment No. 1 Replacement of the Cowichan Bay Sewage Treatment Plant, and forward the amended plan document, together with the Public Consultation Report, to the Minister of Environment, Lands and Parks for approval."

2.6 Amendment No. 2

Stage 3 of the Central Sector Liquid Waste Management Plan process required that the JUB implement a water reclamation program to divert effluent out of the Cowichan River to reduce the phosphorus load to the Cowichan River to control an algae bloom downstream of the lagoon's outfall. On that basis, the Operating Certificate for the JUB Lagoons required that by 2005, no more than 4000 m^3/d of effluent would be discharged to the Cowichan River. This would require that approximately 8000 m^3/d of effluent be redirected to water reclamation sites by 2018.

A review of the feasibility study to determine potential uses for reclaimed water and infrastructure costs, prepared by Dayton & Knight (D&K 1999), indicated that there was insufficient restricted access land available to utilize all of the treated effluent to be diverted out of the river. Unrestricted access lands could be developed to allow for the reclamation of all of the effluent to be diverted out of the river, but at significant cost. In a separate investigation, undertaken by the Joint Utilities Board, it was also determined that additional

monies, above what was previously stated in the plan, would be required to provide off-site effluent storage ponds, off-site effluent disinfection, and additional pumping facilities to re-pressurize the irrigation system downstream of the effluent storage ponds. Without including the additional monies that would be required to implement the said water reclamation program, the average cost per connected unit to cover the capital cost of a effluent spray irrigation system is estimated to be $780. The average annual operating and maintenance costs would be $3.70 per connected unit. This would be the cost to implement Phase 1 and Phase 2 of the spray irrigation program as per the feasibility study prepared by Dayton & Knight (D&K 1999).

A conceptual analysis of alternatives for reducing the phosphorus load to the Cowichan River, carried out by District of North Cowichan engineering staff (DNC 2000), indicated that the re-direction of 8000 m^3/d of treated effluent would not be sufficient to adequately reduce phosphorus load to the Cowichan River to control the algae bloom downstream of the outfall. This is reflected in the lagoon's Operating Certificate, which stipulates that, subject to environmental monitoring of the Cowichan River, it may be necessary to reduce the phosphorus load to the Cowichan River by limiting the quantity of effluent discharged to the river further. As a result the said study investigated alternative means of reducing the phosphorus load to the Cowichan River. It was concluded that it may be possible to reduce the phosphorus load to the Cowichan River by at least as much as currently proposed in the plan by advanced treatment (chemical coagulation) for significantly less cost. The conceptual cost estimate is $35 per connected unit and the average annual operating and maintenance costs would be $5.70 per connected unit. These costs are based on a conceptual analysis and are subject to change based on the results of field testing for the advanced treatment process.

Consequently, it was concluded that the Central Sector Liquid Waste Management Plan should be modified to allow for the consideration of other options to reduce the phosphorus load to the Cowichan River. This would allow for more flexibility in implementing the most appropriate technology, or combinations of technologies, to achieve the required

phosphorus load reduction to the Cowichan River at a reasonable cost to the ratepayers. With the current language in the plan, the only option allowed is water reclamation.

Consequently, at its regular meeting of July 25, 2001, the CVRD Board approved the following resolution:

> ***"That the Cowichan Valley Regional District accept the Central Sector Liquid Waste Management Plan Amendment No. 2 - a modification of the language to allow for the consideration of options other than, or in addition to, water reclamation to reduce the phosphorus load to the Cowichan River by at least as much as is currently proposed in the Plan, and forward the plan document, together with the Public Consultation Report, to the Minister of Water, Lands and Air Protection for approval."***

3.0 LIQUID WASTE MANAGEMENT PLAN

Actions that will be taken by the CVRD, its member municipalities, the private sector and community organizations in partnering to implement the Central Sector LWMP are outlined in this section.

3.1 Source Control Program

The source control program will include both regulatory and educational elements to prevent the discharge of wastes to a sewage system that may degrade the quality of the environment or hinder the effectiveness of the treatment processes or facilities. Tasks to be undertaken include:

- The CVRD will amend its Bylaw No. 1044 for the Eagle Heights, Allenby Road, Koksilah Specified Area and Bylaw No. 1130 for the Cowichan Bay Specified Area to be consistent with the source control bylaws for the District of North Cowichan and the City of Duncan (currently underway).

- The CVRD, in co-operation with the District of North Cowichan, the City of Duncan and the Cowichan Tribes will develop an education program to inform domestic and non-domestic dischargers about the need for source controls, and what specific groups can do to ensure that the program results in reduced contaminant loadings to receiving waters and land within the District.

- The CVRD, in co-operation with the District of North Cowichan, the City of Duncan and the Cowichan Tribes, will in the intermediate future initiate planning for possible additional source control program elements that may include an inventory of non-

domestic discharges and monitoring of influent and effluent quality at the treatment plants.

3.2 Volume Reduction Program

This program, aimed at reducing the quantity of flow that enters the sewage system, will include both inflow and infiltration control measures and a supporting educational program.

- The CVRD, in conjunction with the District of North Cowichan, the City of Duncan and the Cowichan Tribes, will co-ordinate the development of an education program for volume reduction within the Central Sector.

- The CVRD, the City of Duncan, the District of North Cowichan and the Cowichan Tribes will continue/initiate I & I control programs in their respective jurisdictions.

- The CVRD, the City of Duncan, the District of North Cowichan and the Cowichan Tribes will prepare a sanitary sewer overflow management procedure, including evaluation of standby generation needs.

3.3 Stormwater Management Program

The need to undertake stormwater management planning on a regional scale watershed basis is acknowledged in this LWMP. Implementation of regional policies, controls and enforcement will remain the responsibility of local jurisdictions. Initiatives that will be addressed include:

- The CVRD, in co-operation with the District of North Cowichan, the City of Duncan and the Cowichan Tribes, will develop an education program to inform domestic and non-domestic dischargers to the storm drainage system about the need for source

controls, and what specific groups can do to ensure that the program results in reduced contaminant loadings to receiving waters within the Central Sector.

- In the future, the CVRD will apply to amend its Letters Patent to provide authority to address stormwater management issues within the Regional District.

- Following amendment to its Letters Patent, the CVRD will approach the City of Duncan, the District of North Cowichan, the Cowichan Tribes and federal and provincial agencies to discuss the formation a committee to coordinate stormwater management issues.

3.4 Joint Utilities Board Lagoon System

For the immediate future (minimum 10 years) the JUB lagoon system and its effluent discharge to the Cowichan River will be the treatment and disposal facilities to serve the urbanized areas within the Central Sector.

The JUB will reduce the phosphorus load to the Cowichan River during the summer months to reduce the amount of algae growing downstream of the outlet pipe. By 2005, the Ministry of Water, Land and Air Protection requires that maximum mass of phosphorus discharged from the lagoons, to the Cowichan River, be equivalent to the amount that would be discharged to the river in 4000 m^3 of effluent per day. This corresponds to mass of no more than 18 kg/d based on an average effluent phosphorus concentration of 4.5 mg/L.

The JUB will work with the Ministry of Water, Land and Air Protection to develop a sampling program to monitor the Cowichan River to determine the impact of the decreased phosphorus load.

The CVRD and JUB will develop a biosolids management plan that will involve identifying potential sites for the beneficial use of biosolids and developing a public education program to support the beneficial use of biosolids.

3.5 Cowichan Bay Treatment Plant

In Cowichan Bay, the CVRD will expand the sewer local service area to include new development in the general village area in accordance with the Cowichan Bay OCP, and to tie-in existing properties with poorly functioning on site sewage disposal systems. To accommodate this development, the CVRD will replace the existing treatment plant with a forcemain connection to the Joint Utilities Board lagoon system for treatment and disposal at an estimated capital cost of $1,764,000.

In addition, a buy-in fee, estimated at $550,000. will be charged by the Joint Utilities Board to provide service for 750 residential equivalents. The agreement between the Cowichan Bay sewer system and the Joint Utilities Board will be on a "fee for service" basis.

The existing treatment plant will be dismantled and replaced with a sewage pump station.

In the long term, Cowichan Bay will be a partner in a new replacement central treatment plant and outfall.

3.6 Maple Bay Servicing

The District of North Cowichan will plan for the future provision of collector sewers within Maple Bay that will include a pumped connection to the existing sewer system along Maple Bay Road. Further public consultation will be undertaken by the District of North Cowichan before proceeding with this sewer connection.

3.7 Rural Area Servicing

Rural areas will be protected from urban type development and problems with on-site sewage disposal systems in existing development will be addressed through implementation of the following initiatives:

- New sewage systems within rural areas will continue to be assessed and authorized under Ministry of Health (MOH) regulations (flows up to 22.75 m^3/d) or MELP regulations (flows that exceed 22.75 m^3/d).

- The Central Vancouver Island Health Region (CVIHR), or member municipality, will work co-operatively with CVIHR and/or MELP to assess sewage system needs for:

  a) problem areas in existing development;
  b) future Village centres that may be established under updated OCPs;
  c) existing MELP permitted discharges that require upgrading or expansion.

- The CVRD, or member municipality will consider being the registered discharger under the Municipal Sewage Regulation and will be prepared to take over an existing Permit, when in the public interest, and with the consent of the private sector, when applicable.

- Sewer local service areas may be established for all new community sewage systems to enable financing and operation on a user pay basis.
- The CVRD will develop a regulation, in co-operation with the Capital Regional District (CRD) and Regional District of Nanaimo (RDN), to regulate private sector management of septage within the CVRD.

- The CVRD, in co-operation with the District of North Cowichan, the City of Duncan and the Cowichan Tribes, will develop a brochure for on-site sewage system management.

- The CVRD will plan for the future need to accept boat pump out discharge at the Cowichan Bay wharf.

3.8 Future New Treatment Plant and Outfall

The CVRD, in co-operation with the District of North Cowichan, the City of Duncan and the Cowichan Tribes, will in the intermediate future continue efforts to locate a new site for a central treatment plant that can service a minimum 70,000 people.

In conjunction with treatment plant site selection the CVRD, in co-operation with the District of North Cowichan, the City of Duncan and the Cowichan Tribes, will in the intermediate future undertake pre-design, environmental and cost benefit study work to evaluate outfall routing options for discharge of effluent to Satellite Channel.

Pre-discharge outfall environmental monitoring work will be undertaken in conjunction with the outfall pre-design work.

A public education and consultation process will be undertaken to support the treatment plant site selection and the outfall study work.

LEGEND

PLAN AREA BOUNDARY

POLITICAL BOUNDARY

(F) ELECTORAL AREA

FIRST NATIONS LANDS

(F) (E) (D) (C) (B) (A)

DUNCAN

INDIAN RESERVE

SATELLITE CHANNEL

SAANICH

DAYTON & KNIGHT LTD.
Consulting Engineers
DWG. No. 260-3-3

0 1000 2000 5000 METRES

COWICHAN VALLEY REGIONAL DISTRICT
CENTRAL SECTOR
LIQUID WASTE MANAGEMENT PLAN
PLAN AREA

FIGURE 1

4.0 IMPLEMENTATION SCHEDULE, COSTS AND FINANCING

The proposed implementation schedule, the estimated costs and the proposed financing and cost recovery measures are presented in this section.

4.1 Implementation Schedule and Costs

Preliminary cost estimates for LWMP program elements along with the preliminary implementation schedule are summarized in Table 4.1.

TABLE 4.1
PRELIMINARY COST ESTIMATES AND IMPLEMENTATION SCHEDULE

Program or Project	Estimated Cost (1999 $)	Schedule
1. Source Control Program		
- Education	$40,000	1999 to 2004
- CVRD Bylaw	$5,000	1998 to 1999
2. Volume Reduction		
- Education	$20,000	1999 to 2004
- I&I Investigation	$250,000	1998 to 2003
- Sanitary Sewer Overflows	$20,000	1999 to 2000
3. Stormwater Management		
- Education	$25,000	1999 to 2004
- Authority for Function	$5,000	2000 to 2001
- Co-ordinating Committee	--	2001 and continuing
4. JUB Lagoon System		
- River Monitoring	$75,000	2001 to 2005
- Education Program (biosolids)	$10,000	2001 to 2005
- Biosolids Site Investigation and Management Plan	$50,000	1999 to 2004
- Phosphorus Load Reduction Study	$50,000	2001
- Advanced Treatment (Phosphorus Reduction)	$325,000	2002

Program or Project	Estimated Cost (1999 $)	Schedule
5. Cowichan Bay Treatment Plant		
- Forcemain connection to JUB	$2,300,000	2001 to 2002
6. Maple Bay Servicing Study	$50,000	2005 to 2010
7. Rural Area Servicing		
- Develop Brochure	$25,000	1999 to 2000
- Develop Septage Regulation	$20,000	1999 to 2001
8. Central Plant and Outfall Siting Studies		
- Plant Site Investigations	$100,000	2005 to 2010
- Outfall Pre-design Studies	$105,000	2005 to 2010
- Outfall Baseline Monitoring	$85,000	2005 to 2010
TOTAL	$3,560,000	

The LWMP program and project costs total $3,560,000 (1999 dollars) and the implementation schedule spans years 1998 through year 2015.

4.2 Proposed Financing

If the LWMP program and project costs, except for the capital items in Sections 4 and 5 above, are financed over a 15-year period at 8% and assuming on average 25,000 people (10,000 connections) served by the sewer systems, the annual cost per connection will be about $12.

Some program elements will be financed under annual operating budgets of the JUB and CVRD. Actual annual costs will be a combination of user rates for operating costs and assessments for new debt repayment for major capital expenditures.

It is anticipated that total user costs for Cowichan Bay sewer system users will increase by approximately $270 per year per residential equivalent for the forcemain connection to the Joint Utilities Board lagoons for treatment and disposal of sewage.

The expected cost, of approximately $35 per connected unit for 1 year only, to reduce the phosphorus load to the Cowichan River from the JUB Lagoon outfall, are currently based on advanced treatment, but may have to be adjusted based on the outcome of the phosphorus load reduction study.

5.0 APPROVAL, MONITORING AND AMENDMENTS

5.1 Board Approval of Plan

This Central Sector LWMP was approved by the Cowichan Valley Regional District Board of Directors on August 25, 1999.

The list of Directors was:

• City of Duncan	- M. Coleman
• District of North Cowichan	- A. Murray
	- G. Ridgway
	- T. Walker
• Town of Ladysmith	- R. Hutchins
• Town of Lake Cowichan	- J. Brown
• Electoral Area 'A'	- C. Boas
• Electoral Area 'B'	- W. Davies
• Electoral Area 'C'	- R. Hughes
• Electoral Area 'D'	- D. Robinson
• Electoral Area 'E'	- J. Clarkson
• Electoral Area 'F'	- J. Allan
• Electoral Area 'G'	- G. Maddin
• Electoral Area 'H'	- M. Marcotte
• Electoral Area 'I'	- J. Waite

The resolution of the Board was:

"That the COWICHAN VALLEY REGIONAL DISTRICT, CENTRAL SECTOR, LIQUID WASTE MANAGEMENT PLAN, (STAGE 3 REPORT), prepared by Dayton & Knight Ltd, revised August 1999, be adopted and forwarded to the Minister of Environment, Lands and Parks for approval."

5.2 Monitoring and Reporting

The CVRD will track the implementation of this Plan by preparing a brief annual report summarizing the progress made and effectiveness of its source control, volume reduction and stormwater management programs. Progress reports on expansion and upgrading of treatment, reuse and disposal facilities at the JUB Lagoon System and at the Cowichan Bay Treatment Plant will also be provided. These progress reports will compare connected populations with design populations, will compare effluent quality and quantity with permitted or operational certificate limits, will quantify the phosphorus load reduction to the Cowichan River and the beneficial use of biosolids and will indicate the extent of I&I at the treatment plants.

A Plan Monitoring Committee, incorporating members from the general public, representatives of governmental and non-governmental agencies, and staff personnel, will be formed by the CVRD to monitor progress in implementing the Plan. The Committee will report its findings to the CVRD Board.

5.3 Amendment Process

Factors such as liquid waste quantity or composition variations, demographic changes, technology improvements, private-public partnerships may make deviation from the approved Liquid Waste Management Plan desirable and/or necessary.

Failure to open or premature closing of major facilities, or the cancellation of entire programs may require major plan amendments. Schedule delays or lesser deviations will

require only minor amendments. The MELP will determine whether a particular deviation requires a major or minor amendment, or any amendments at all.

Major Plan Amendments. The CVRD will make major amendments to the Plan by documenting the changes and proposed amendment, including financial implications. CVRD staff will provide all information to the following groups and give opportunity for input and comments before finalizing the proposed amendments for submission to the CVRD Board for approval.

- Appropriate stakeholders
- Member Municipalities and adjacent Regional Districts
- The Plan Monitoring Committee
- The general public
- The Ministry of Environment, Lands and Parks
- Ministry of Health/Central Vancouver Island Health Region
- Ministry of Agriculture, Fisheries and Food
- Ministry of Municipal Affairs, Recreation and Housing
- Ministry of Tourism
- Ministry of Finance and Corporate Relations
- Regional Director of Parks
- Environment Canada

Minor Plan Amendments: The CVRD will make minor amendments to the Plan by documenting the changes and proposed amendments, including financial implications. CVRD staff will provide all information to the following groups and give opportunity for input and comments before finalizing the proposed amendments for submission to the CVRD Board for approval.

- Appropriate Stakeholders
- Member Municipalities
- The Plan Monitoring Committee

- The Ministry of Environment, Lands and Parks
- Ministry of Health/Central Vancouver Island Health Region

The final documented and Board approved amendment would then be submitted to the Ministry of Environment, Lands and Parks for consideration and approval.

6.0 OPERATIONAL CERTIFICATES

Discharges to the environment are authorized through the issuance of Operational Certificates by the Regional Waste Manager. The Operational Certificate establishes the authorized discharge to the environment, outline general requirements relating to construction, operation and maintenance of the Plan facilities, and specify monitoring and reporting requirements.

The certificate that follows allows for the estimated discharges that will occur in about 20 years. The actual certificate issued by the Regional Waste Manager will authorize a lesser quantity of discharge appropriate to the staging of expansion and upgrading of the treatment plants.

6.1 Joint Utilities Board Lagoon System

The operating certificate for the JUB Lagoons is attached in Appendix 6. The operating certificate reflects the commitments made in the Central Sector Liquid Waste Management Plan prior to the adoption of Amendment No. 1 and Amendment No. 2.

COWICHAN VALLEY REGIONAL DISTRICT
CENTRAL SECTOR LIQUID WASTE MANAGEMENT PLAN

APPENDIX 1 - REFERENCES

(BCE 1992) Guidelines for Developing a Liquid Waste Management Plan, B.C. Environment, August 1992.

(D&K 1995) Cowichan Valley Regional District, Central Sector Liquid Waste Management Plan, Stage 1 Report, Dayton & Knight Ltd., October 1995.

(SM 1995) Cowichan Valley Regional District, Liquid Waste Management Plan, Stage 1 Report, Public Information/Consultation Process Report, Sequoia Management Group, Inc.

(MOE 1997) Ministry of Environment, Lands and Parks, Municipal Organic Matter Recycling, Regulation, DRAFT, August 1997.

(MOE 1998) Ministry of Environment, Lands and Parks, Municipal Sewage Regulation, DRAFT 4.1, April 1998.

(D&K 1998) Cowichan Valley Regional District, Central Sector Liquid Waste Management Plan, Stage 2 report, Dayton & Knight Ltd., August 1998.

(Praxis 1998) Cowichan Valley Regional District, Central Sector, Liquid Waste Management Plan, Stage Two Open House Report, Praxis Pacific, July 1988

(Praxis 1999) Cowichan Valley Regional District, Central Sector, Liquid Waste Management Plan, Stage 3 Open House Report, Praxis Pacific, July 1999

(D&K 1999) Cowichan Valley Regional District, Central Sector LWMP, Stage 3, JUB Lagoon System, Potential Uses of Reclaimed Water, Dayton & Knight Ltd., May 1999.

APPENDIX 2

GLOSSARY AND ABBREVIATIONS

1. Glossary

Sewage	A combination of water carried wastes originating from residential, commercial, institutional and industrial sources, together with any groundwater, surface and storm waters which may be present.
Domestic Sewage	Sewage principally derived from residential sources or produced by normal residential activities.
Commercial Sewage	Sewage generated in areas predominantly commercial in business nature, includes sanitary wastes and wastes resulting from the activities of the business itself. Typically, commercial sewage may include wastewaters from laundromats, restaurants, car washes, and garages.
Industrial Sewage	Wastewaters from manufacturing and industrial processes distinct from domestic or commercial sewage.
Sanitary Flow	Domestic, commercial and industrial sewage flows at the point of source and not including extraneous infiltration or inflow amounts.
Peaking Factor	A factor to describe the peak instantaneous flow as a factor of ADWF. The peaking factor is a function of a number of contributors, or tributary area size.
Infiltration (I)	Groundwater movement into the sewage collection system from faulty construction, disrepair or defective materials. High groundwater tables or saturation of the soil from rains or irrigation waters may add to the infiltration in a sewage collection system.
Inflow (I)	Rain which enters the sewage collection system through direct connections or available openings in the sewer system. Entry may originate from illegal storm connections, manhole lid submergence or catch basin connections. Direct storm inflow is distinct from infiltration and is observed as a peak sewerage flow during a rain storm. In contrast, infiltration would be observed as an extended period of inflow.

Average Dry Weather Flow (ADWF)	Sewage flow measured during periods of little or no rainfall. Rates of flow exhibit typical hourly and daily variations.
Average Wet Weather Flow (AWWF)	Sewage flow during periods of extended or heavy rainfall. Inflow and infiltration may increase the wet weather flow to rates many times larger than the dry weather flow.
Peak Wet Weather Flow (PWWF)	Wet weather flow during an instantaneous peak sanitary sewage flow. The peak wet weather flow is derived by adding the I & I to a peaked sanitary flow.
Harmon Peaking Factor	A method of peaking sanitary flow in inverse proportion to the square root of the total population served.
Biochemical Oxygen Demand	The quantity of oxygen needed to satisfy biological oxidation of the degradable fraction of organic matter contained in sewage. Usually referred to as BOD_5, this oxygen requirement is often used to determine in part the degree of treatment which must be used to produce an acceptable effluent quality. Values for five days used in this report and refer to the oxidation of organic wastes (carbon) only. Biochemical oxygen requirements for conversion of ammonia to nitrates is termed Nitrogenous Oxygen Demand and is not included in this BOD_5 value.
Suspended Solids	The suspended matter transported in sewage. Suspended solids and BOD_5 are two basic criteria used to grade the strength of sewage and quality of effluent. The quantity of suspended material removed during treatment is dependent on the type and extent of treatment used and has an important bearing on sizing of treatment components.
Chlorine Residual	The amount of chlorine left after a given contact time in sewage which remains available for further bacteriological kill. It is the difference between the chlorine requirement and the chlorine demand. The chlorine demand is the chlorine concentration needed to oxidize the chemical, bacteriological, and other species in the wastewater.
RBC	A fixed growth treatment process for biological removal of dissolved organic wastes.

TF/SC	A fixed growth treatment process for biological removal of dissolved organic wastes.
Activated Sludge	A suspended growth treatment process for biological removal of dissolved organic wastes.

2. Abbreviations

ac	acre
ft	feet
gpm	imperial gallons per minute
mgd	million gallons per day
gpcd	gallons per capita per day
gpad	gallons per acre per day
ha	hectare
HP	horsepower
m	metre
L/S	litre per second
m^3/d	cubic metres per day
L/ha/d	litres per hectare per day
mg/L	milligrams per litre

COWICHAN VALLEY REGIONAL DISTRICT
CENTRAL SECTOR LIQUID WASTE MANAGEMENT PLAN

APPENDIX 3
PUBLIC AND TECHNICAL LIQUID WASTE ADVISORY COMMITTEE

CENTRAL SECTOR LIQUID WASTE MANAGEMENT PLAN

STAGE 3 COMMITTEE STRUCTURE

CVRD BOARD OF DIRECTORS

STEERING COMMITTEE

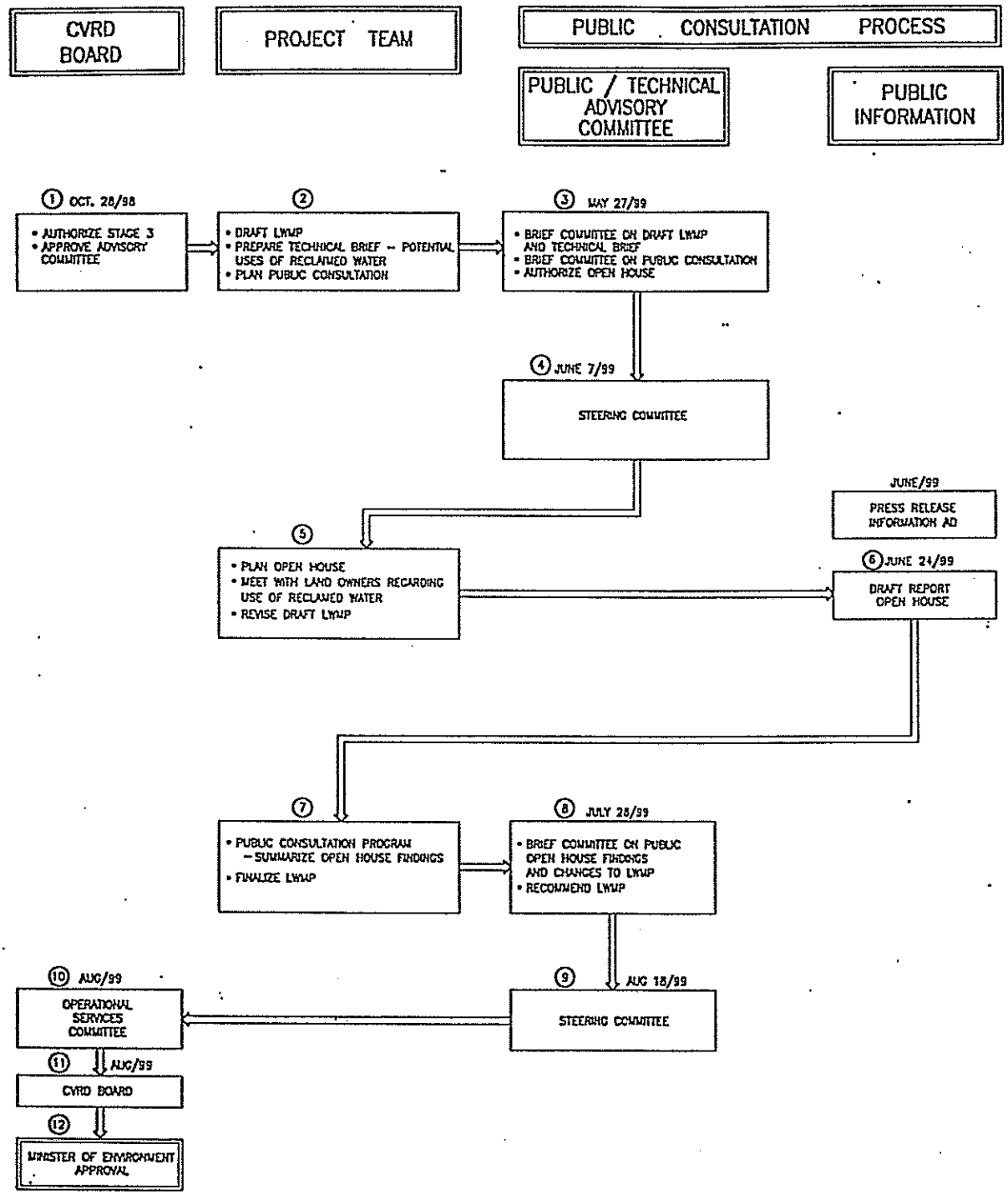
Mayor Anne Murray, District of North Cowichan, Chair
Earl Warnock, B.C. Environment
Chief Lydia Hwitsum, Cowichan Tribes
Director John Clarkson, Electoral Area E
Director Don Robinson, Electoral Area D
Mayor Mike Coleman, City of Duncan

PUBLIC & TECHNICAL LIQUID WASTE ADVISORY COMMITTEE

Director J. Clarkson, Electoral Area E, Chair
Director D. Robinson, Electoral Area D
Derek York, Manager or
Brian Dennison, Deputy Manager, CVRD Engineering Services
CVRD Development Services Representative
John MacKay, District of North Cowichan
Trevor Kushner, City of Duncan
Dave Brown/Duncan McLaren, Ministry of Environment
Eric Bonham, Municipal Affairs
Glen Smith, Central Vancouver Island Health Region
Bill Seymour, Cowichan Tribes
Phil Wong, Environment Canada
Carl Burton, Public Representative
Jerry Mattu, Public Representative
Fred Oud, Public Representative
Betty Taylor, Public Representative
John Yeomans, Public Representative

APPENDIX 4
PLANNING FLOW CHART

COWICHAN VALLEY REGIONAL DISTRICT
CENTRAL SECTOR LIQUID WASTE MANAGEMENT PLAN - STAGE 3
PLANNING FLOW CHART



○ PROCESS STEP AND RESPONSIBILITY

ISSUED : NOV.30/98
REVISED : SEPTEMBER 2, 1999

DAYTON & KNIGHT LTD.
Consulting Engineers
DRAWN BY: DBC
DWG. No. 260.3.3

COWICHAN VALLEY REGIONAL DISTRICT
CENTRAL SECTOR LIQUID WASTE MANAGEMENT PLAN

APPENDIX 5

STAGE 1 AND STAGE 2 REPORT SUMMARY

The Stage 1 and Stage 2 reports that were prepared for the Central Sector are as follows:

Stage 1 — Cowichan Valley Regional District, Central Sector Liquid Waste Management Plan, Stage 1 Report, October 1995

Stage 2 — Cowichan Valley Regional District, Central Sector Liquid Waste Management Plan, Stage 2 Report, August 1998

Planning flow charts that illustrate the report development process are also attached.

1. Stage 1 Report Summary and Recommendations for Stage 2

A summary of the Stage 1 report findings and the recommendations for Stage 2 follow. Some of the Stage 1 recommendations were modified or deleted in the Stage 2 work to reflect more up to date information since completion of Stage 1 work and/or direction from the Advisory Committee (revisions are noted in parenthesis where applicable).

There are an estimated 33,330 people in the Central Sector and an estimated 18,500 people are serviced by community sewers through the Joint Utilities Board system or the Cowichan Bay system. The remaining 14,830 people (5,930 homes) rely primarily on individual septic tank and ground disposal systems.

Certain sewage facilities such as interceptor sewers and treatment plant sites should be planned for the long term future to avoid future costly duplication in developed areas. Preliminary projections of growth and development indicate that the population in the Central Sector may reach 79,000 in the long term future (40 or 50 years). The majority of

future growth is predicted to occur in existing areas of urbanized development and adjacent to these presently serviced areas. The existing rural areas are predicted to accommodate only minor growth because of policy directed toward preserving rural areas and the constraints imposed by the agricultural and forest land reserves.

The existing Cowichan Bay treatment plant is overloaded and the Joint Utility's lagoons are operating near capacity. Both the Ministry of Environment and Environment Canada have advised that in the future the outfall from the lagoons into the Cowichan River should be relocated to Satellite Channel. Both authorities have also indicated that a new discharge of effluent into Cowichan Bay should not be considered.

The assessment of land within the Central Sector to accept large volumes of wastewater indicates that the majority of land is unsuitable, due primarily to either shallow soils, high water table or relatively impervious soils. The extensive use of groundwater for drinking demands a precautionary approach in order to protect the aquifers from possible contamination resulting from ground disposal of effluent.

In summary, the Stage 1 findings included the following key components:

- A Source Control Program to regulate the introduction of toxic materials into the sewer system
- A Waste Volume Reduction Program to minimize the generation of wastewater.
- A Waste Recycling and Reuse Program to beneficially use the effluent and biosolids that result from the treatment processes.
- Staged expansion of the existing collector sewer system to service all urban development.
- Future extension of the trunk sewer system to provide service to Maple Bay when public health concerns within existing development dictate need for a community sewage system.
- Future abandonment of the Cowichan Bay treatment plant and connection of the collector sewer system to a new Central treatment plant.

- Future construction of a new central secondary treatment plant.
- Future construction of a new effluent outfall to Satellite Channel.
- Rural development should continue to be serviced primarily by on site treatment and ground disposal systems authorized by the Central Vancouver Island Health Unit using its new On-Site Sewage Disposal Standards for Subdivision Assessment. The CVRD should encourage the Ministry to authorize proven alternate treatment systems to resolve problem areas within existing development.
- Satellite treatment plants should not be permitted unless they are District owned and operated for the purpose of resolving a sewage disposal problem in an area of existing development or if future changes to Official Community Plans result in a new development in a rural area that warrants a community sewer system and treatment plant.
- Upgrading of the existing lagoons to allow their continued use for a further 5 to 10 years in order to acquire a new treatment plant site and to construct a new plant.

The preliminary estimate of cost (1996 $) presented in the Stage 1 report for future treatment and disposal facilities was:

	Item	Capital Cost	Initial Years O&M Costs
1.	Treatment Plant Site	250,000	--
2.	Treatment Plant	18,300,000	500,000
3.	Interceptor Sewers	2,094,000	2,000
4.	Effluent Pipeline & Outfall	11,216,000	5,000
5.	Maple Bay Trunk	1,960,000	60,000
6.	Cowichan Bay Trunk	2,070,000	45,000
TOTAL PROJECT		**$35,890,000**	**$612,000 /yr**

The future treatment plant was sized for 35,000 people while the interceptor and disposal facilities were sized to service 70,000 people. If these facilities were financed over 20 years at 8% interest, and if an average 30,000 people were serviced during the 20 year period, then the cost per residential connection would be about $305.

Options considered in the Stage 1 work included a separate treatment plant for Maple Bay and continued operation of the Cowichan Bay plant. Neither option provided a cost advantage while environment impact was found to be more severe than the proposed Plan. It was noted that if a large treatment plant site could be obtained, then significant cost savings (about $7.5 million) could be effected through use of alternate secondary treatment technologies.

The following recommendations for Stage 2 work were made in the Stage 1 report. Noted in parenthesis are the deletions and/or modifications to the recommendations that have been made by the Advisory Committee.

1. Source Controls

- An outline for a Source Control Bylaw should be developed using GVRD, CRD and the Environment Canada bylaw as a guideline (delete).
- Use of the EPA PRELIM model to establish pollutant limits for restricted wastes should be assessed in conjunction with the treatment and disposal work (delete).
- The methodology for conducting an inventory of non-residential discharges in order to assess industrial, commercial and institutional contributions to the sewer collection system should be developed (delete).
- Educational material used by other jurisdictions should be obtained to assist with the development of an educational program for the District.
- (Incorporate initiatives of the Joint Utilities Board regarding development of a source control bylaw.)

2. Waste Volume Reduction

- Membership and objectives for a Water Conservation Committee should be determined (delete).

- A program for undertaking a benefit cost analysis of water supply demand management should be outlined, along with resources needed, schedule and budget requirements (delete).
- Rate structures used in other jurisdictions should be reviewed in order to assist the Water Conservation Committee with evaluating the merits of converting to a inclining block rate structure for water consumption within the urbanized area of the Central Sector (delete).
- Flow records at the pumping station and lagoons and rainfall records should be analyzed to provide a preliminary assessment of the extent of inflow and infiltration (I&I) into the collection sewer system. These data should be used to outline a preliminary I&I investigative program to better identify the sources of I&I. The program should include schedule and costs.
- Educational material used by other jurisdictions should be obtained to assist with the development of educational program material for the District.

3. Waste Recycling and Utilization

- The potential uses for reclaimed water and biosolids should be evaluated. Uses may include golf course irrigation, farm land irrigation, silviculture irrigation, park land irrigation. (Specific reference to treatment plant site selection is deleted.)
- In conjunction with the development of the biosolids criteria (or regulation) by the Ministry of Environment; biosolids use options should be identified. These may include soil amendment, direct application to forest land, direct application to tree or forest nursery and direct application to farm land. (Specific reference to treatment plant site selection is deleted.)
- Educational material used by other jurisdictions should be obtained to assist with the development of educational program material for the District.

4. Treatment and Disposal Plan

The selected Plan, comprising a centralized treatment and disposal system for the urban development area (centered on City of Duncan, adjacent south portion of District of North Cowichan and Eagle Heights, Cowichan Bay and the adjacent Cowichan Tribe lands) and primarily the reliance on individual on-site treatment and ground disposal systems under Ministry of Health jurisdiction for rural development areas should be advanced as follows:

- Determine potential for effluent reuse (associated with each treatment plant site alternative delete); on golf courses, in parks, on agricultural land, for silviculture, etc.
- Evaluate treatment plant sites between existing lagoons and Cherry Point. Focus on obtaining a large site suitable for extended aeration forms of secondary treatment. Provide concept design layouts for each site. Select best site or possibly two sites (delete).
- Advance to preliminary design level the requirements for conveying sewage from existing lagoons to the preferred new plant site(s) and for discharging effluent to Satellite Channel (delete).
- (Determine routing for discharging effluent to Satellite Channel. Routing options to minimize impact on the inter-tidal zones of Cowichan Bay.)
- Advance to preliminary design level trunk sewer system requirements for future servicing of Maple Bay area and Cowichan Bay area. (Incorporate existing routing for trunk sewer system for future servicing of Maple Bay area into Plan and determine routing for connection of Cowichan Bay system to the central system. Routing options to minimize impact on the inter-tidal zones of Cowichan Bay. Prepare preliminary cost estimates for these connections.)
- Discuss treatment plant options including costs. Advance to preliminary design level a treatment plant design suitable for the proposed site. Provide site layout of unit processes (delete).
- (Discuss treatment plant options and incorporate proposed modifications of Cowichan Bay Sewage treatment plant and service area into plan.)
- Assess with Ministry of Health the potential for future public health concerns that may result from failed on site treatment and disposal systems within existing

development and outline (procedure to develop) concept level solutions for either upgrading individual systems or constructing community systems.

- Obtain any additional (existing) data on oceanographic characteristics in vicinity of proposed outfall in Satellite Channel and update assessment of impact of discharge at this location. (Assess implications and investigate and recommend options for staging the development of the outfall. Provide recommendations for a pre and post discharge monitoring system.)
- Develop preliminary design for upgrading existing lagoons for a further 5 to 10 year period to allow acquisition of a new treatment plant site and construction of the new plant (delete, this task completed by North Cowichan).
- Provide recommendations for a comprehensive monitoring program to assess overall impact of river discharge. Incorporate modifications to the lagoon system to be carried out by the Joint Utilities Board. Provide minimum effluent quality recommendations.

5. Additional Study Requirements

A number of items not addressed in the Stage 1 work were recommended for inclusion in the Stage 2 study as follows:

- Provide preliminary outline of stormwater management issues and address jurisdictional constraints.
- Evaluate pumping station overflows. (Incorporate the District of North Cowichan's existing pumping station overflow management practices into the Plan. Evaluate remaining pump station overflows.)
- Evaluate septic tank pumpage. (Incorporate CVRD septic tank pumpage treatment and disposal system into the Plan.)
- (Include the requirement that new developments address stormwater management, reuse of effluent where feasible and water conservation.)
- (Incorporate into the plan a requirement that on-site sewage systems serving new developments be subject to take-over and operation by local government.)

2. Stage 2 Report Summary

Stage 2 work addressed the Stage 1 report recommendations and culminated in a draft LWMP. The draft LWMP included the following elements:

1. A source control program that includes both regulatory and educational elements as follows:

- Amendment of the CVRD source control bylaws to conform with those of the JUB.
- An educational program to support the bylaw.
- In the future, planning for additional source control program elements that may include an inventory of non-domestic discharges and monitoring of influent and effluent quality at the treatment plants.

2. A sewer system volume reduction program that includes both inflow and infiltration control measures, procedures for mitigating sanitary sewer overflows and a supporting educational program.

3. A stormwater management program that includes an educational element to inform dischargers to the storm drainage system about the need for source controls. In the future, amendment of the CVRD Letters Patent to provide authority to address stormwater management issues and the formation of a committee to coordinate stormwater management issues within the Central Sector.

4. The JUB lagoon system and outfall to the Cowichan River and a new CVRD treatment plant using the existing outfall at Cowichan Bay Village will be the treatment and disposal facilities that serve the urbanized areas within the Central Sector for the immediate future.

5. The CVRD and the JUB will investigate potential sites and uses for reclaimed water in Stage 3 of this Plan. As a priority the JUB will work to secure sites for use of reclaimed water to lower effluent discharge to the Cowichan River in the summer months. The CVRD and the JUB will investigate sites and will develop a biosolids management plan. The CVRD and the JUB will develop an educational program to support the beneficial uses of reclaimed water and biosolids.

6. Rural areas will be protected from urban type development and problems with on-site sewage disposal systems in existing development will be addressed through implementation of the following initiatives:

- New sewage systems within rural areas will continue to be assessed and authorized under Ministry of Health or Ministry of Environment regulations.
- The CVRD, or member municipality, will work co-operatively with MOH and/or MELP to assess sewage system needs for:
  a) problem areas in existing development;
  b) future Village centres that may be established under updated OCPs;
  c) existing MOE permitted discharges that require upgrading or expansion.
- The CVRD, or member municipality, with the consent of the private sector when applicable, will be the holder of any new Permit issued by the MELP and will be prepared to take over an existing Permit, when in the public interest.
- Sewer local service areas will be established for all new community sewage systems to enable financing and operation on a user pay basis.
- The CVRD will develop a regulation, in co-operation with the CRD and RDN, to regulate private sector management of septage within the CVRD.
- The CVRD, in co-operation with the District of North Cowichan, the City of Duncan and the Cowichan Tribes, will develop a brochure for on-site sewage system management.

- The CVRD will plan for the future need to accept boat pump out discharges at the Cowichan Bay wharf.

7. The District of North Cowichan will plan for the future provision of collector sewers within Maple Bay and a pumped connection to the existing sewer system along Maple Bay Road. Further public consultation will be undertaken.

8. The JUB will finance, expand and upgrade the lagoon system to provide service for a further 10 to 20 years.

9. In Cowichan Bay, the CVRD will expand the sewer local service area to include new development in the south west portion of the Village and will allow private sector construction of a new treatment plant that utilizes the existing outfall to service the Village in the immediate future (5 to 10 years). The CVRD will own the treatment plant site and will hold the Permit.

10. The CVRD, in co-operation with the District of North Cowichan, the City of Duncan and the Cowichan Tribes, will in the future continue efforts to locate a new site for a central treatment plant that can service a minimum 70,000 people. In conjunction with treatment plant site selection, pre-design, environmental and cost benefit study work will be undertaken to evaluate outfall routing options for discharge of effluent to Satellite Channel. A public education/consultation process will support these efforts.

11. Preliminary cost estimates and implementation schedule for the LWMP program elements are summarized as follows:

PRELIMINARY COST ESTIMATES AND IMPLEMENTATION SCHEDULE

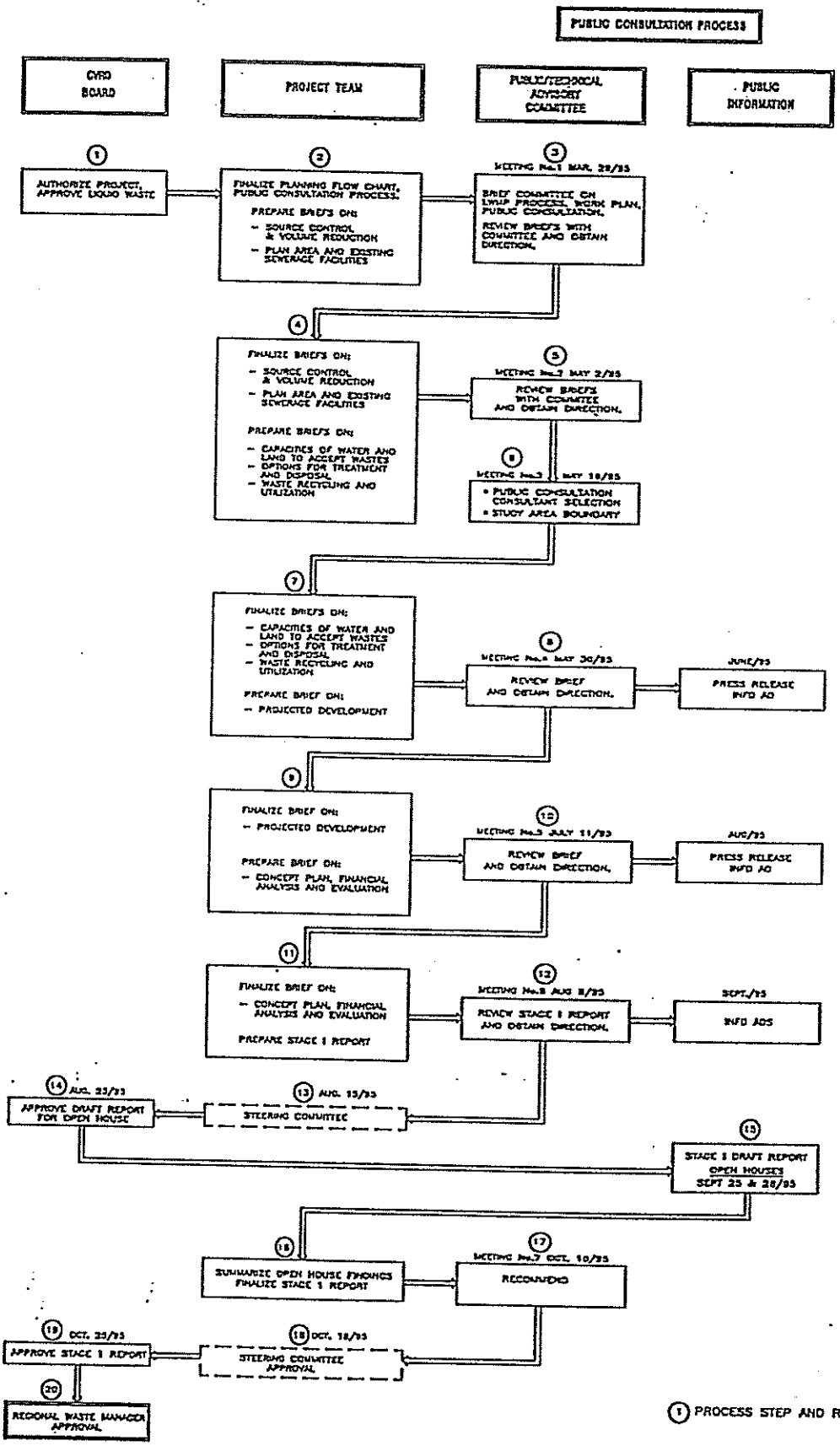
Program or Project	Estimated Cost (1998 $)	Schedule
1. Source Control Program		
- Education	$40,000	1999 to 2004
- CVRD Bylaw	$5,000	1998 to 1999
2. Volume Reduction		
- Education	$20,000	1999 to 2004
- I&I Investigation	$250,000	1998 to 2003
- Sanitary Sewer Overflows	$20,000	1999 to 2000
3. Stormwater Management		
- Education	$25,000	1999 to 2004
- Authority for Function	$5,000	2000 to 2001
- Co-ordinating Committee	--	2001 and continuing
4. Waste Recycling and Utilization		
- Education	$15,000	1998 to 1999
- Reclaimed Water Site and Feasibility Investigation	$50,000	1998 to 1999
- Reclaimed Water Pumping and Transmission Facilities	$2,000,000	2000 to 2005
- River Monitoring	$75,000	2001 to 2005
- Biosolids Site Investigation and Management Plan	$50,000	1999 to 2004
5. Rural Areas		
- Develop Septage Regulation	$20,000	1999 to 2001
- Develop Brochure	$25,000	1999 to 2004
6. Maple Bay and Cowichan Bay Pre-design Studies		
- Maple Bay	$50,000	2005 to 2010
- Cowichan Bay	$35,000	2005 to 2010
7. Central Plant and Outfall Siting		
- Plant Site Investigations	$100,000	2010 to 2015
- Outfall Pre-design Studies	$105,000	2010 to 2015
- Outfall Base Line Monitoring	$85,000	2010 to 2015
TOTAL	$2,975,000	

The LWMP program and project costs total $2,975,000 (1998 dollars) and the implementation schedule spans year 1998 through year 2015. If financed over a 15 year period at 8% and assuming an average 25,000 people (10,000 connections) served by the sewer systems, the annual cost per connection reduces to about $38. Per connection costs

will be lower because some programs and projects are included in normal annual operating budgets.

COWICHAN VALLEY REGIONAL DISTRICT

LIQUID WASTE MANAGEMENT PLAN
STAGE 1 REPORT
PLANNING FLOW CHART

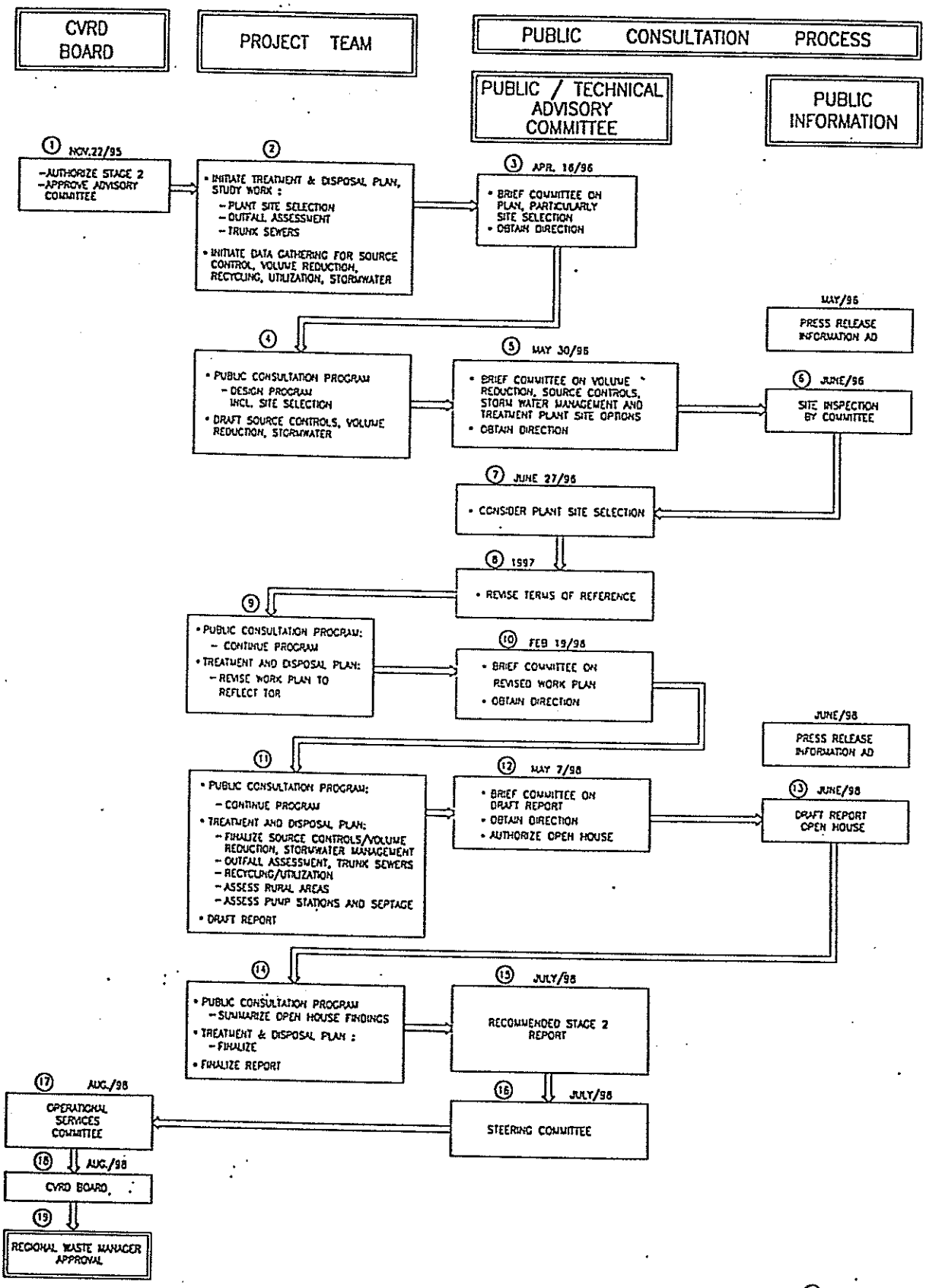


DAYTON & KNIGHT LTD.
Consulting Engineers

ISSUED : SEPT. 13, 1994 REVISED : AUGUST 10, 1995

ACAD DWG. 260-3-1A

COWICHAN VALLEY REGIONAL DISTRICT
CENTRAL SECTOR LIQUID WASTE MANAGEMENT PLAN - STAGE 2
PLANNING FLOW CHART



○ PROCESS STEP AND RESPONSIBILITY

DAYTON & KNIGHT LTD.
Consulting Engineers
DRAWN BY: DBC
DWG. No. 260.3.2

ISSUED : NOV.30/95
REVISED : FEB. 25, 1998

APPENDIX 6

1. Draft Operational Certificate for JUB Lagoon System

The following modifications should be made so the operating certificate reflects the amended plan.

1) *Clause 1.1.1 should be modified to read as follows:*

"The maximum authorized rate of discharge is 49,000 m^3/d. Before, or on, July 1, 2002 the Duncan – North Cowichan Joint Utilities Board must have the necessary infrastructure in place to begin reducing the phosphorus load to the Cowichan River. After June 30, 2005, the maximum authorized mass of phosphorus that may be discharged to the Cowichan River from July 1 to September 30 (inclusive) each year is 18 kg/d."

2) *Clause 1.2 should be modified as follows:*

"... discharge of reclaimed water to agricultural and forest land for irrigation (if implemented),..."

3) *The following text in Clause 1.2.5 should be deleted:*

"...reclaimed water pumping station, and a force main for seasonal irrigation, on or before July 1, 2002."

4) *Clause 1.3 should be modified as follows:*

"...and reclaimed water to agricultural and forest land for irrigation (if implemented)..."

5) *Clause 2.13 should be modified as follows:*

"...which provides details for the proper operation and maintenance of sewage conveyance, treatment, disposal and reclaimed water reuse (if implemented) facilities, including ..."

6) *Clause 2.14 should be modified as follows:*

"Construction and operation of reclaimed water irrigation facilities (if constructed)..."

7) *Clause 3.1.1 should be modified as follows:*

"Additionally, during the discharge of reclaimed water to agricultural and forest land for irrigation (if implemented)..."

Text describing the conditions under which water reclamation can be implemented has been left in the said certificate in the event that water reclamation is implemented to reduce, or help reduce, the phosphorus loading to the Cowichan River.

BRITISH COLUMBIA

MINISTRY OF ENVIRONMENT, LANDS AND PARKS

Vancouver Island Region
Pollution Prevention
2080-A Labieux Road
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Telephone: (250) 751-3100
Fax: (250) 751-3103

OPERATIONAL CERTIFICATE
ME-01497

Under the Provisions of the Waste Management Act

Duncan - North Cowichan Joint Utilities Board

PO Box 278, 7030 Trans Canada Highway

Duncan, British Columbia

V9L 3X4

is authorised to discharge effluent to the Cowichan River and to agricultural and forest land for irrigation, from a municipal sewerage system located in Duncan, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Waste Management Act* and may result in prosecution.

This operational certificate supersedes and amends all previous versions of permit PE-01497, issued under Part 2 Section 10 of the *Waste Management Act*.

1. AUTHORISED DISCHARGES

1.1 This subsection applies to the discharge of effluent to the Cowichan River from a **MUNICIPAL SEWAGE TREATMENT FACILITY**. The site reference number for this discharge is E100569.

1.1.1 The maximum authorised rate of discharge is 49,000 m^3/d. After June 30, 2005 the maximum authorised rate of discharge to the Cowichan River from July 1 to September 30 (inclusive) each year is 4,000 m^3/d.

1.1.2 The characteristics of the discharge shall not exceed:

5-day Biochemical Oxygen Demand	- 30 mg/L
Total Suspended Solids	- 40 mg/L
Fecal Coliform	- 200 CFU/100ml (median of 7 consecutive tests)
	- 800 CFU/100ml (in any sample)
Toxicity (LC_{50} - 96 hour)	- 100% effluent
pH	- 6.0 – 9.0

Date Issued: MAY 15 2001
Date Amended:
(most recent)
Page: 1 of 9

Blake Medlar
Assistant Regional Waste Manager

1.1.3 The authorised works are a sewage collection system, influent pumping facilities, mechanical screens, grit removal tanks, one complete mix aerated lagoon, three polishing lagoons, chlorination and de-chlorination facilities, a biosolids storage lagoon, an outfall with diffuser, and related appurtenances approximately located as shown on attached Site Plan A.

1.1.4 The authorised works must be complete and in operation on and from the date of this operational certificate.

1.1.5 The location of the facilities from which the discharge originates is Lots 27-1-1, 27-A-1, 28-1-1, 26-1, 27-1 and 42-1, Sections 16 and 17, Range 8, Quamichan District, on the Cowichan Indian Reserve No. 1.

1.1.6 The location of the point of discharge is the Cowichan River.

1.2 This subsection applies to the discharge of reclaimed water to agricultural and forest land for irrigation, from a MUNICIPAL SEWAGE TREATMENT FACILITY. The site reference number for this discharge is E241964.

1.2.1 The rate of discharge will be in accordance with the approved operational plan required in Subsection 2.13.

1.2.2 The authorised discharge period is from April 1 to September 30 each year.

1.2.3 The characteristics of the discharge shall not exceed:

5-day Biochemical Oxygen Demand	- 30 mg/L
Total Suspended Solids	- 40 mg/L
Fecal Coliform	- 200 CFU/100ml (median of 7 consecutive tests)
	- 800 CFU/100ml (in any sample)
Toxicity (LC_{50} - 96 hour)	- 100% effluent
pH	- 6.0 – 9.0

1.2.4 The authorised works are a sewage collection system, influent pumping facilities, mechanical screens, grit removal tanks, one complete mix aerated lagoon, three polishing lagoons, chlorination and de-chlorination facilities, a biosolids storage lagoon, reclaimed water pumping station, a force main for seasonal irrigation, and related appurtenances approximately located as shown on attached Site Plan A.

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1.2.5 The authorised works must be complete and in operation as follows:
- a sewage collection system, influent pumping facilities, mechanical screens, grit removal tanks, one complete mix aerated lagoon, three polishing lagoons, chlorination and de-chlorination facilities, a biosolids storage lagoon, on and from the date of this operational certificate;
- reclaimed water pumping station, and a force main for seasonal irrigation, on or before July 1, 2002.

1.2.6 The location of the facilities from which the discharge originates is Lots 27-1-1, 27-A-1, 28-1-1, 26-1, 27-1 and 42-1, Sections 16 and 17, Range 8, Quamichan District, on the Cowichan Indian Reserve No. 1.

1.2.7 The location of the points of discharge are as described in the Operational Plan required in Subsection 2.13.

1.3 This subsection applies to the discharge of effluent to the Cowichan River and reclaimed water to agricultural and forest land for irrigation from a MUNICIPAL SEWAGE TREATMENT FACILITY.

1.3.1 The combined average daily rate of discharge to the Cowichan River (authorised in Subsection 1.1) and to the agricultural and forest land irrigation sites (authorised in Subsection 1.2), based on an annual averaging period, is as follows:

Year	Average Daily Discharge m^3/d	Year	Average Daily Discharge m^3/d
2000	11,430	2010	14,490
2001	11,700	2011	14,840
2002	11,990	2012	15,190
2003	12,270	2013	15,560
2004	12,570	2014	15,930
2005	12,870	2015	16,310
2006	13,180	2016	16,700
2007	13,500	2017	17,110
2008	13,820	2018	17,520
2009	14,150		

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2. GENERAL REQUIREMENTS

2.1 Maintenance of Works and Emergency Procedures

The Duncan - North Cowichan Joint Utilities Board shall inspect the authorised works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the Duncan - North Cowichan Joint Utilities Board which prevents effective operation of the approved method of pollution control, the Duncan - North Cowichan Joint Utilities Board shall notify the Regional Waste Manager immediately and take appropriate remedial action. The Regional Waste Manager may reduce or suspend the operation of the Duncan - North Cowichan Joint Utilities Board to protect the environment until the approved method of pollution control has been restored.

2.2 Bypasses

The Duncan - North Cowichan Joint Utilities Board shall ensure that no waste is discharged without being processed through the authorised works unless prior written approval is received from the Regional Waste Manager.

2.3 Plans - New Works

Plans and specifications of the reclaimed water pumping station and force main for seasonal irrigation, authorised in Subsection 1.2.4 shall be certified by a qualified professional licensed to practice in the Province of British Columbia, and submitted to the Regional Waste Manager for review prior to the start of construction. A qualified professional licensed to practice in the province of British Columbia must certify that the works have been constructed in accordance with the submitted plans.

2.4 De-Chlorination

The effluent shall be de-chlorinated prior to discharge to reduce the total chlorine residual to less than 0.01 mg/L.

2.5 Sludge Reuse and Disposal

Sludge generated by the treatment plant shall be managed in a manner approved by the Regional Waste Manager and in accordance with the sludge management strategies developed in the Central Sector Liquid Waste Management Plan.

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2.6 Posting of Outfall

The Duncan - North Cowichan Joint Utilities Board shall erect a sign along the alignment of the outfall above high water mark. The sign shall identify the nature of the works. The wording and size of the sign requires the approval of the Regional Waste Manager.

2.7 Outfall Inspection

The Duncan - North Cowichan Joint Utilities Board shall conduct an inspection of the outfall every five years or as may otherwise be required by the Regional Waste Manager.

2.8 Standby Power

The Duncan - North Cowichan Joint Utilities Board shall provide auxiliary power facilities to insure that during power outages, the discharge from the authorised works continue to meet the effluent criteria specified in this operational certificate.

2.9 Odour Control

Should objectionable odours, attributable to the operation of the sewage treatment plant, occur beyond the property boundary, as determined by the Regional Waste Manager, measures or additional works will be required to reduce odour to acceptable levels.

2.10 Effluent Upgrading

Based on receiving environment monitoring data and/or other information obtained in connection with this discharge, the Duncan - North Cowichan Joint Utilities Board may be required to provide additional treatment facilities.

2.11 Facility Classification and Operator Certification

The Duncan - North Cowichan Joint Utilities Board shall have the works authorised by this operational certificate classified (and the classification shall be maintained) by the Environmental Operators Certification Program Society (Society). The works shall be operated and maintained by persons certified within and according to the program provided by the Society. Certification must be completed to the satisfaction of the Regional Waste Manager. In addition, the Regional Waste Manager shall be notified of the classification level of the facility and certification level of the operators, and changes of operators and/or operator certification levels within 30 days of any change.

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Alternatively, the works authorised by this operational certificate shall be maintained by persons who the Duncan - North Cowichan Joint Utilities Board can demonstrate to the satisfaction of the Regional Waste Manager, are qualified in the safe and proper operation of the facility for the protection of the environment.

2.12 Infiltration and Inflow Reduction

The Duncan - North Cowichan Joint Utilities Board shall take measures, in accordance with the strategies developed in the Central Sector Liquid Waste Management Plan, to reduce the inflow and infiltration into the sewage collection system. A report shall be submitted once every year to the Regional Waste Manager that provides details of the measures taken in the preceding year to reduce inflow and infiltration. The first report shall be submitted on or before June 30, 2001.

2.13 Operational Plan

The Duncan - North Cowichan Joint Utilities Board shall develop an Operational Plan, to be prepared by a qualified professional, which provides details for the proper operation and maintenance of sewage conveyance, treatment, disposal and reclaimed water reuse facilities, including the monitoring details. The plan shall provide details of the areas to be irrigated, irrigation schedule and application rates as determined by a registered professional Agrologist. The plan shall be certified by the qualified professional that it is adequate for the works being installed and the water reuse being proposed. The plan shall be submitted to the Regional Waste Manager for review by March 31, 2002.

2.14 Agricultural and Forest Land Irrigation

Construction and operation of the reclaimed water irrigation facilities shall be in accordance with the *Municipal Sewage Regulation Appendix 3 to Schedule 7 - Health and Safety Criteria for Use of Reclaimed Water.*

Surface ponding and/or runoff due to irrigation is prohibited. Irrigation using reclaimed water is only permitted during the period from April 1 to September 30 and only on the areas identified in the Operational Plan required in Subsection 2.13. Depending on local climatic conditions, the irrigation period may be reduced or extended by the Regional Waste Manager.

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3. MONITORING AND REPORTING REQUIREMENTS

3.1 Discharge Monitoring

3.1.1 Sampling and Analysis

The Duncan - North Cowichan Joint Utilities Board shall install a suitable facility and obtain samples of the effluent for analysis as follows:

Parameter	Frequency	Sample Type
5-day Biochemical Oxygen Demand	monthly	grab
Total Suspended Solids	monthly	grab
Ammonia Nitrogen (N)	monthly	grab
Ortho Phosphate Phosphorus (P)	monthly	grab
Total Phosphorus	monthly	grab
Fecal Coliform	monthly	grab
Toxicity	quarterly	composite

Additionally, during the discharge of reclaimed water to agricultural and forest land for irrigation, effluent samples shall be collected and analysed in accordance with the following schedule:

Parameter	Frequency	Sample Type
Fecal Coliform	weekly	grab
pH	weekly	grab

3.1.2 Flow Measurement

Provide and maintain a suitable flow measuring device and record once per day the effluent volume discharged to the Cowichan River and to the reclaimed water irrigation facilities over a 24-hour period.

3.2 Receiving Environment Monitoring

3.2.1 Sampling Stations

The permittee shall establish and maintain two Cowichan River monitoring stations as follows:

Station #1: Approximately 50 m upstream of outfall PE-01497;
Station #2: Approximately 200 m downstream of outfall PE-01497.

The exact sampling locations are subject to the approval of the Regional Waste Manager.

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Assistant Regional Waste Manager

3.2.2 Sampling and Analyses

a) Substrate Sampling

The permittee shall collect a sample of the substrate at three sampling sites at each station once during the first 10 days of August each year, once during the third week of August each year and once during the first 10 days of September each year, commencing in the year 2001. Each sample shall be analyzed for Chlorophyll-a.

b) River Water Sampling

The permittee shall collect a sample of the river water at each station and a sample of the authorised discharge once during the first 10 days of August each year, once during the third week of August each year and once during the first 10 days of September each year, at the same time the substrate samples are collected, commencing in the year 2001.

Obtain analyses of the samples for the following:

Total Phosphorus (P);
Ortho Phosphorus (P);
Total Nitrogen (N);
Ammonia Nitrogen (N);
pH;
Temperature.

3.3 Monitoring Procedures

3.3.1 Sampling and Analytical Procedures

Flow Measurement shall be carried out in accordance with the procedures described in "Field Criteria for Sampling Effluents and Receiving Waters", April 1989, or by suitable alternative procedures as authorised by the Regional Waste Manager.

Copies of the above manual may be obtained from the Pollution Prevention Division, Ministry of Environment, Lands and Parks, P.O. Box 9342, Stn. Prov. Govt. Victoria, British Columbia V8W 9M1. The manual is also available for review at all Pollution Prevention Offices.

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Sampling shall be carried out in accordance with the procedures described in the "British Columbia Field Sampling Manual for Continuous Monitoring Plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. 1996 Edition (Permittee)", or by suitable alternative procedures as authorised by the Regional Waste Manager.

Analyses are to be carried out in accordance with procedures described in the "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials (March 1994 Permittee Edition)", or by suitable alternative procedures as authorised by the Regional Waste Manager.

Copies of the above manuals may be purchased from the Queen's Printer Publications Centre, P. O. Box 9452, Stn. Prov. Gov't. Victoria, British Columbia, V8W 9V7 (1-800-663-6105 or (250) 387-6409), and are also available for inspection at all Pollution Prevention offices.

3.4 Reporting

Maintain data of analyses and flow measurements for inspection and every quarter submit the data, suitably tabulated, to the Regional Waste Manager for the previous quarter. The first report is to be submitted by June 30, 2001. Based on the results of the monitoring program, the Duncan - North Cowichan Joint Utilities Board monitoring requirements may be extended or altered by the Regional Waste Manager.

An annual report shall be prepared by an independent qualified professional which includes a summary and interpretation of the discharge and receiving environment monitoring results for the previous year. The report shall provide an assessment of the impact of this discharge on the receiving environment and recommended changes (if any) to the monitoring program. The first report shall be submitted by December 31, 2002.

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Assistant Regional Waste Manager

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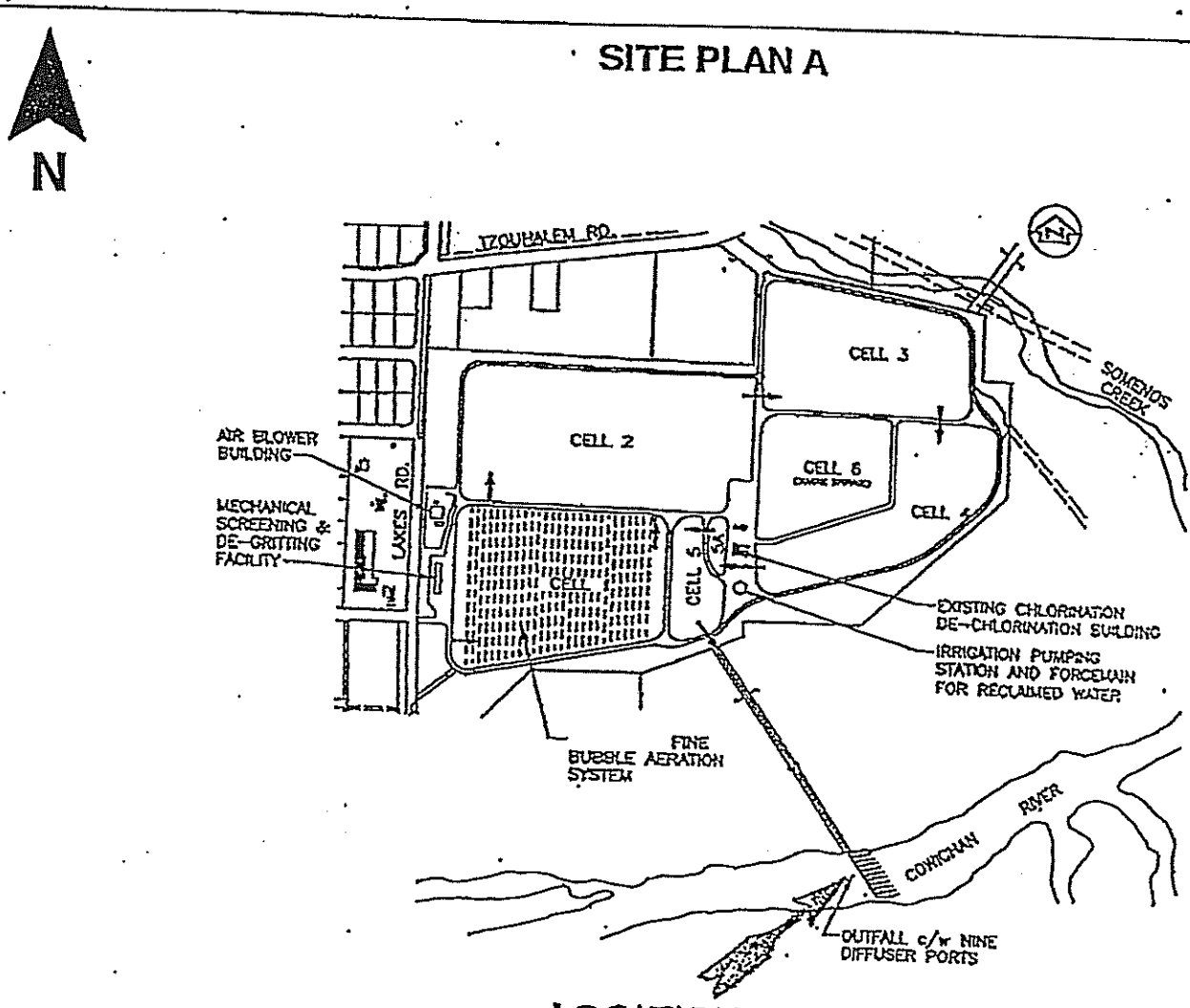
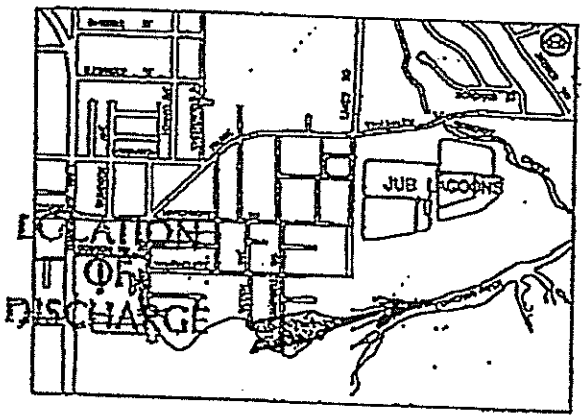
Pollution Prevention

SITE PLAN A



Location Map



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OPERATIONAL CERTIFICATE: ME-01497

Date: MAY 15 2001

Blake Medlar
Assistant Regional Waste Manager
Vancouver Island Region

Duncan 2001-05-01