

SECTION 6 - TREATMENT

**ROYSTON / UNION BAY
SEWAGE COLLECTION, TREATMENT
AND DISCHARGE STUDY**

SECTION 6 - TREATMENT

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1 INTRODUCTION

It is recognized that the point of discharge and level of treatment required is "the" key issue for this study. The goal is to identify a treatment system which complies with or exceeds all aspects of the Municipal Sewage Regulation (MSR).

Extensive work reviewing treatment system options was carried out as part of the Union Bay LWMP in the Review of Secondary Wastewater Treatment Technologies for Union Bay, by Leslie Consultants Ltd. and Motherwell & Associates Engineering Ltd. In addition, a detailed assessment of sewage treatment and disposal options for the Saratoga\Miracle Beach area is being carried out by Associated Engineering Services Ltd. The information that follows is derived from these two studies.

2 MUNICIPAL SEWAGE REGULATION REQUIREMENTS

The discharge of treated effluent from a municipal wastewater treatment plant is governed by the Municipal Sewage Regulation, (MSR) which is regulated by the Ministry of Environment. The level of treatment required is dependent on the discharge source. Table 1 presents the minimum level of treatment required for discharge to ocean, fresh watercourse, land, and reuse.

Table 1 - Municipal Sewage Regulation for Various Discharge Sources

Parameter	Open Marine Waters	Creek/Stream Dilution $\geq 40:1$	Creek/Stream Dilution $\geq 10:1$	Ground Discharge Class C (1)	Restricted Reclaimed Water Use	Unrestricted Reclaimed Water Use
Treatment Level	Secondary	Secondary	High Secondary	Secondary	Secondary, Disinfection	(2)
BOD ₅ (mg/L)	45	45	10	45	≤ 45	≤ 10
TSS (mg/L)	45	45	10	45	≤ 45	≤ 5
Turbidity (NTU)	n/a	n/a	n/a	n/a	n/a	≤ 2
pH	6 to 9	6 to 9	6 to 9	n/a	6 to 9	6 to 9
Fecal Coliform (per 100 mL)	14	200	200	n/a	≤ 200	≤ 2.2
Total Phosphorous (mg/L)	n/a	1.0 (3)	1.0 (3)	n/a	n/a	n/a
Ortho-phosphate (mg/L)	n/a	0.5 (3)	0.5 (3)	n/a	n/a	n/a
Ammonia	(4)	(4)	(4)	n/a	(4)	(4)

Notes:

n/a Not Applicable.

- (1) Based on no drinking water well within 300 m and a subsurface travel time not less than 10 days before reaching property boundary.
- (2) Secondary Treatment, with Chemical Addition, Filtration, Disinfection, and Emergency Storage.
- (3) May be waived or reduced, subject to an environmental impact study
- (4) Maximum allowable effluent ammonia concentration to be determined by a back calculation from the edge of the initial dilution zone (IDZ).

3 TECHNOLOGY OPTIONS & COST ESTIMATE

Six treatment systems, three from the Review of Secondary Wastewater Treatment Technologies for Union Bay study and three from the Saratoga/Miracle Beach study were reviewed. The quality of effluent obtainable from each, the resulting available discharge sources, land requirements, construction costs and annual O&M costs for each are presented in Table 2 below.

Table 2 - Treatment Options and Cost Estimates

Treatment System	Open Marine Waters	Ground Discharge	Trent River or Smaller Water Courses	Unrestricted Reclaimed Water Use	Land Area Required (ha)	Construction Cost Estimate	Annual O&M Costs
Exceeding Secondary (≤ 25 mg/L BOD₅, ≤ 25 mg/L TSS)							
SBR (1)	Yes	Yes (7)	no	no	0.3	\$ 5.8 M (8)	\$ 140,000 (9)
RBC (2)	Yes	Yes (7)	no	no	0.32	\$ 6.6 M (8)	\$ 140,000 (9)
OD (3)	Yes	Yes (7)	no	no	0.34	\$ 6.0 M (8)	\$ 140,000 (9)
Unrestricted Reclaimed Water Use (≤ 10 mg/L BOD₅, ≤ 5 mg/L TSS)							
SBR-FF,UV (4)	Yes	Yes	Yes	Yes	0.68	\$ 7.4 M	\$ 160,000
SBR-DBUCBSF,UV (5)	Yes	Yes	Yes	Yes	0.68	\$ 7.7 M	\$ 160,000
MBR,UV (6)	Yes	Yes	Yes	Yes	0.54	\$ 8.2 M	\$ 230,000 (10)

Notes:

- (1) SBR - Sequencing Batch Reactor
- (2) RBC - Rotating Biological Contactor
- (3) OD - Oxidation Ditch
- (4) SBR-FF,UV - Sequencing Batch Reactor, Fabric Filter, Ultraviolet Irradiation Disinfection
- (5) SBR-DBUCBFS,UV - Sequencing Batch Reactor, Deep Bed Upflow Continuous Backwash Sand Filter, Ultraviolet Irradiation Disinfection
- (6) MBR,UV - Membrane Bioreactor, Ultraviolet Irradiation Disinfection
- (7) While the level of treatment meets the MSR requirement, ground discharge is not considered feasible as a solution for the entire Royston/Union Bay service area, as per the findings of the Land Discharge Section of this study.

- (8) Includes outfall construction cost of \$1.7 M for Option B - East of Comox Bar (north and east of Sandy Island). For Option A - Northern Baynes Sound Outfall, the total construction cost for each would decrease to: \$4.7 M, \$5.5 M and \$4.9 M, respectively.
- (9) Excluding Outfall O&M costs.
- (10) Includes an allowance of \$70,000 for membrane replacement on a 7 year cycle.

The sewage treatment plant construction cost estimates include a 40% allowance for engineering and contingencies but is exclusive of GST, administration, legal or financing and land costs. The outfall construction cost estimate includes a 25% allowance for engineering and contingencies.

The estimates are for a treatment plant capable of servicing a population of 4,400. This is larger than the population estimate of 3,141 for the initial service areas as reported in Section 2, Table 2-11a of this report. Based on an annual population growth rate of 2%, the treatment plant would be able to accommodate the population increase for 17 years.

4 SITE LOCATIONS

Two site locations have been identified, as shown on Figure 3. Regional District staff has identified the northern site as the preferred location.

4.1 Northern Site

This site is located at the boundary between the Royston and Union Bay Improvement District's. It is based on the potential location for a marine outfall as per the findings of the Ocean Discharge Section of this study. It also has the potential for surface discharge to one or more of the adjacent drainage courses, with Argyle Creek being the closest and therefore the most probable.

To eliminate the need for an outfall pumping station for Option A - Northern Baynes Sound and Option B - East of Comox Bar, the treatment plant would be constructed at approximately 14 m and 22 m geodetic elevation, respectively. This precludes land on the east side of Highway 19A.

For Option C - Submarine Connection to Comox Treatment Plant, there are no site elevation constraints as a pumping station will be required. This option, however, requires Royston/Union Bay to join the City of Courtenay or to become a new municipality. The ability to join the City of Courtenay is considered to be remote for the near future based on the expansion boundary agreement established by Courtenay and Comox in the fall of 2004. Creation of a new municipality is being studied, but is in the early stages. The potential for presentation to the public for approval via referendum is expected to be several years away.

Three phase power, telephone and cablevision service is located along the highway. Municipal water can be obtained from the Royston or Union Bay Improvement District water systems.

4.2 Southern Site

This site is located in the vicinity of the mouth of Hart (Washer) Creek, and is based on work previously done under the Union Bay Liquid Waste Management Plan (UBLWMP) in 1999.

Three phase power, telephone and cablevision service is located along the highway. Municipal water can be obtained from the Union Bay Improvement District water system.

The 1999 UBLWMP did identify a third site at the top of McLeod Road. This site has not been reviewed further because of its more than 70 m geodetic elevation.

5 DISCHARGE POINTS

Though technically feasible, a marine outfall into Baynes Sound (Option A) or the northeast side of Denman Island (Option B) is anticipated to meet strong resistance from the public and the aquaculture industries. See Section 2 - Ocean Discharge for a review of comments from various biological stakeholders.

Discharge to Argyle Creek, Washer Creek, or any of the other small creeks/drainage courses in the area will require treatment to Unrestricted Reclaimed Water Use as noted previously in Section 2 - Wastewater Flows and Freshwater Discharge. Treating to this level provides the opportunity for the beneficial reuse of the water in the community. This could include, among other things, irrigation, stream flow augmentation, and reuse in toilets and urinals. The Kingfisher Inn and Huband Elementary school are two facilities in the Comox Valley that recycle water.

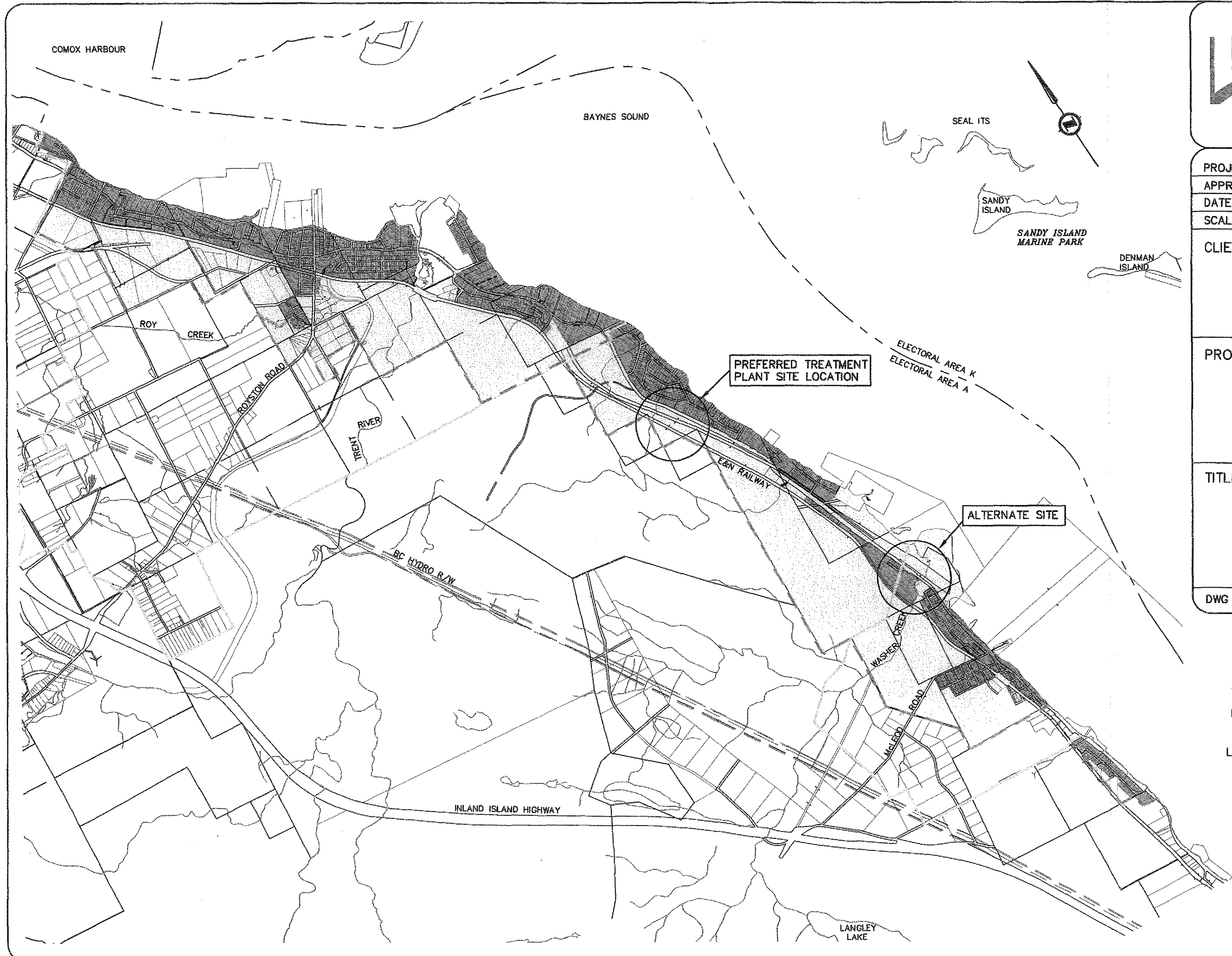
Treatment of effluent to the unrestricted reclaimed water use is anticipated to be acceptable to the public because of the highest level of treatment and the availability for beneficial reuse of water in the community.

6 CONCLUSIONS

Based on the findings, the following conclusions are made:

1. An SBR, RBC or OD system are capable of producing an effluent quality that exceeds the MSR requirements for ocean discharge.
2. An enhanced SBR or MBR are capable of producing an effluent quality meeting the MSR requirements for unrestricted reclaimed water use. This level of treatment is required for Royston/Union Bay if discharge is to be to land or freshwater.
3. The ocean discharge option has the lowest construction and operating cost, excluding connection to the Comox sewage treatment plant which requires Royston/Union Bay joining the City of Courtenay or forming a new municipality.

4. A marine outfall into Baynes Sound (Option A) or the northeast side of Denman Island (Option B) is anticipated to meet strong resistance from the public and the other stakeholders.
5. Discharge to land or freshwater has the highest construction and operating cost.
6. Two potential treatment sites have been located. The northern site is located near the intersection of the Royston and Union Bay Improvement District boundaries. The southern site is located near the mouth of Washer Creek.
7. The northern site is the preferred location.
8. Power, telephone, cablevision and municipal water are near both sites.
9. Treatment of effluent to the unrestricted reclaimed water use, though it carries the highest capital and O&M costs, is anticipated to be acceptable to the public because of the highest level of treatment and the availability for beneficial reuse of water in the community.



KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

PROJECT NO. 0348
 APPROVED
 DATE MAY/2005
 SCALE 1:40,000

CLIENT
 REGIONAL DISTRICT
 COMOX-STATHCONA

PROJECT
 ROYSTON-UNION BAY
 SEWAGE COLLECTION,
 TREATMENT, AND
 DISCHARGE STUDY

TITLE
 POTENTIAL
 TREATMENT PLANT
 SITE LOCATIONS

DWG No. FIGURE 3

LEGEND

POTENTIAL SEWER SERVICE AREA

LOCAL AREA PLAN BOUNDARY

SERVICE AREA:
 INITIAL
 ULTIMATE

