



ISSUED FOR USE

To:	Tom Boatman, P.E., Senior Manager of Solid Waste	Date:	June 9, 2014
C:		Memo No.:	008
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Subject: Leachate Management Strategy
Revised Cost Estimates and Current Unknown Variables
Leachate Treatment Options Assessment

1.0 INTRODUCTION

Further to the May 8, 2014 meeting with the Comox Valley Regional District (CVRD) Board regarding update on leachate management work for the expansion of the CVRD landfill, this memo summarizes additional details on cost estimates, uncertainties, and relative risks of the three short-listed options. This memo relies on the work conducted since the earliest part of the project, and feedback information from the CVRD and Comox Valley Waste Management Centre (CVWMC) staff.

In all, six (6) options were considered for leachate treatment strategy. Three (3) options have been short-listed and will be discussed in this document (Option 1 and Option 2 are two variations of on-site treatment, Option 4 is off-site treatment at the proposed South Sewer Plant, and Option 6 is off-site treatment at the Brent Road facilities). In this assessment, other options are not considered any further.

2.0 COST ESTIMATES

2.1 Updated Detailed Cost Estimates

Initial cost estimates were made during the early phase of the project. Upon review of Tetra Tech EBA's Technical Memo 4 by the CVRD staff (see *CVRD Staff Reports 5330-20/SS and 5340-20*), it was found that some of the assessments used in the off-site options cost estimates needed to be revised to provide detailed cost information. More specifically, the sewer use fees had been under-estimated and contributions to the capital and operational costs of the wastewater treatment plants had not been taken into account. Also, the incremental costs for the tank option and the engineering have been added for options 1/2 (on-site), 4 and 6.

Cost estimates for each of the preferred options have been updated and can be found in Table 1 below.

Table 1: Costs Summary for Options 1, 2, 4, and 6 (Rev 1) – Class C Estimate

Item	Description	Option 1 On-site SBR w/ ground discharge	Option 2 On site MBBR w/ ground discharge	Option 4 Off-site to CVRD SS project	Option 6 Off-site to Brent Rd facility
Preliminary Capital Costs					
1.0	Equalization tank	\$ 1,162,000	\$ 1,162,000	\$ 1,162,000	\$ 1,162,000
2.0	On-site treatment plant	\$ 2,935,000	\$ 3,035,000	\$ -	\$ -
3.0	Infiltration bed for ground discharge	\$ 250,000	\$ 250,000	\$ -	\$ -
4.0	Pre-treatment (on-site)	\$ -	\$ -	\$ 690,000	\$ 690,000
5.0	Pumping and conveyance of leachate	\$ -	\$ -	\$ 1,052,000	\$ 1,568,000
6.0	Contribution to wastewater treatment plant	\$ -	\$ -	\$ 3,000,000	\$ 600,000
	SUB-TOTAL	\$ 4,347,000	\$ 4,447,000	\$ 5,904,000	\$ 4,020,000
	Contingency (25%)	\$ 1,086,750	\$ 1,111,750	\$ 1,476,000	\$ 1,005,000
	Engineering (10%)	\$ 543,375	\$ 555,875	\$ 738,000	\$ 502,500
	Capital Costs - Total	\$ 5,977,125	\$ 6,114,625	\$ 8,118,000	\$ 5,527,500
Preliminary Yearly Operational and Maintenance Costs					
1.0	Energy	\$ 118,330	\$ 118,330	\$ 78,140	\$ 78,140
2.0	Chemicals	\$ 133,090	\$ 133,090	\$ 31,150	\$ 31,150
3.0	Maintenance	\$ 36,880	\$ 39,380	\$ 39,040	\$ 39,040
4.0	Sludge management	\$ 5,400	\$ 5,400	\$ -	\$ -
5.0	Manpower	\$ 58,240	\$ 58,240	\$ 23,300	\$ 23,300
6.0	Sewer use fees	\$ -	\$ -	\$ 67,100	\$ 70,150
7.0	Contribution to treatment plant operation costs	\$ -	\$ -	\$ 60,000	\$ -
	Operational Costs - Total	\$ 351,940	\$ 354,440	\$ 298,730	\$ 241,780
Preliminary Total Costs (Lifespan)					
	Lifespan (years)	20	20	20	20
	Total - Capital Costs	\$ 5,977,125	\$ 6,114,625	\$ 8,118,000	\$ 5,527,500
	Total - Operational Costs	\$ 351,940	\$ 354,440	\$ 298,730	\$ 241,780
	Total Costs (Lifespan)	\$ 13,015,925	\$ 13,203,425	\$ 14,092,600	\$ 10,363,100

Notes:

SBR – Sequential Batch Reactor

MBBR – Moving Bed Bioreactor

SS – Suspended Solids

- Item 6 in preliminary capital cost for Option 4 is for the construction and for Option 6 for the upgrade of the existing facility.
- Class C Estimate: An estimate prepared with limited site information and based on probable conditions affecting the project. It represents the summation of all identifiable project elemental costs and is used for program planning, to establish a more specific definition of client needs and to obtain preliminary project approval (ref.: APEGS BC, Budget Guidelines for Consulting Engineering Services).

Updating the sewer use fees increases operational costs for off-site treatment options by approximately \$50,000/yr. which adds up to about \$1,000,000 on a 20-year lifespan. In addition, a contribution by the CVRD for capital costs of the new South Sewer Project (\$3,000,000 in infrastructure) or the Brent Road/Comox Valley Water Pollution Control Centre (CVWPCC) facilities upgrade (\$600,000) has a significant effect on the overall costs of Option 4 and Option 6.

In financial terms, the revised estimates bring all options much closer to each other. Option 4 (South Sewer Project) is now the most expensive, while Option 6 (Brent Road) remains less expensive than on-site treatment options by \$3,700,000.

Please note that cost estimates may have to be further updated at a future date for Option 4 and Option 6 once more detailed design is determined:

- Option 4 (South Sewer Project) does not include the cost of hauling and disposing leachate to a treatment facility during the time gap between the commissioning of the landfill expansion and the South Sewer Project wastewater treatment plant
- Option 6 (Brent Road Facilities) does not include probable contributions for operational costs of the Brent Road Facility because the information is not yet available. However, those costs are expected to be minimal because of the small contribution of the volume of leachate compared to the total volume of municipal waste water treated at this plant. Moreover, land may have to be purchased in order to build the leachate conveying pipe between the CVWMC landfill and Courtenay's sewer system.

3.0 UNKNOWN VARIABLES FOR EACH OPTION

Multiple assessments have been made regarding the technical, regulatory, social, financial, and other aspects of potential leachate treatment solutions. This has allowed us to develop scenarios and quantitative indicators that led us to identify preferred options, including preliminary cost estimates, and design.

However, some of our assumptions have not been confirmed yet, and can be considered as unknown variables. The uncertainties relative to each option are listed below.

Option 1 and Option 2 (on-site treatment)

- Regulatory:
 - Construction permit issued by the Village of Cumberland (VoC) for new facilities on landfill property;
 - Approval by the British Columbia (BC) Ministry of Environment (MoE) for a discharge to ground approach;
 - Environmental impact assessments to groundwater.

Option 4 (South Sewer Project)

- Financial:
 - Uncertainties in CVRD's final leachate treatment costs for the proposed South Sewer Plant;
 - Costs of additional systems at the proposed South Sewer Plant for leachate-related processes (removing of heavy metals if necessary); and
 - Additional costs for leachate hauling before commissioning of South Sewer Plant.
- Public interactions:
 - Public perception about the discharge of treated leachate into Baynes Sound.
- Technical:
 - Impact of pre-treated leachate on the biological components of the treatment and increased fouling of the membranes.

- Schedule:
 - Realization of the project;
 - Date of the commissioning of South Sewer Plant; and
 - Schedule incompatibilities raise questions (technical, logistics, financial).
- Regulatory
 - Provincial permitting required.

Option 6 (Brent Road Facilities)

- Financial:
 - CVWMC’s final contribution to future Brent Rd facilities upgrades and contribution to the operational costs.
- Regulatory:
 - Authorization to use sewerage service initially created for City of Courtenay, Town of Comox, Department of Defense and K’ómoks First Nation;
 - Authorization by the owner to convey pre-treated leachate into their system; and
 - Approval by land owners for the construction of a pre-treated leachate line from CVWMC to Courtenay sewer system and related costs.
- Public interaction:
 - Public perception about the discharge of treated leachate into the Strait of Georgia.

The project team has identified and quantified uncertainties to the various leachate treatment options including a basic ranking system of the options. Inherent in this process is converting subjective interpretation of certain factors and weighting of their importance to an objective score. A ranking matrix was developed and is presented on Table 2.

A 1-to-10 scale is used for rating each factor, 1 being the poorest grade (most unfavourable) and 10 the best grade (most favourable).

Table 2 below summarizes the results of our best judgment at the present on various factors influencing each option.

Table 2: Uncertainties with Options

Factor	% Weight	Relative Factor Rating/Score					
		Option 1 and Option 2 On-site treatment/discharge	Option 1/ Option 2 Factor Score	Option 4 South Sewer Project	Option 4 Factor Score	Option 6 Brent Road facilities	Option 6 Factor Score
Financial	20	8	160	7	140	9	180
		Similar to Option 4. Cost estimate most accurate		Facility treatment cost not well known		Least costly option facility treatment cost not well known	
BC MoE Acceptance/ Ease of approval	20	8	160	9	180	9	180
		Onsite discharge criteria need to be submitted for MoE approval		Provincial permits required		Provincial permits required	
Public Interactions	20	8	160	7	140	6	120
		Most consultation completed		Public consultation required as part of environmental assessment		Public consultation required as part of environmental assessment	
Other Municipalities Acceptance	20	9	180	8	160	6	120
		Solid Waste Management Plan (SWMP) supports the facility		Some public consultation required		Public consultation/acceptance required	
Technical Feasibility	5	7	35	8	40	9	45
		Flow capacity of infiltration beds		Further assessments required		Does not appear to be a significant concern, dilution ratio is quite low. Further assessments required	
Project Schedule	5	9	45	4	20	7	35
		Schedule within CVRD control		Greater uncertainties in schedule		Uncertainties in schedule	
Environmental Aspects	10	7	70	9	90	9	90
		Ground Water impact may be a concern		Would meet regulatory criteria		Would meet regulatory criteria	
TOTAL	100		810		770		770

Relative ratings for factor scores were assigned based on discussions between Tt and the CVRD staff. Weighting for various evaluation factors were provided by the CVRD staff. These are subjective in nature and cannot be accurately quantified. Table 2 could be revisited as uncertainties are further defined.

The main emphasis of data presented in Table 2 is to give a relative comparison of risks presented by various factors influencing the leachate treatment option. The total estimated scores for various options are within a normal margin of error.

As per Tetra Tech EBA's Revised Technical Memo 06 dated April 29, 2014 (*Optimum Recommendation on Leachate Management Option Strategy*), on-site treatment and disposal of leachate to the ground appears to be the preferred option to pursue at the present, based on recent ratification by the Comox Valley Sewage Commission and the decision by the CVRD Board not to pursue the Brent Road Facility Option.

4.0 STRATEGY FOR MOVING FORWARD

Option 4 and Option 6 appear attractive in several ways, but, there are higher uncertainties around input and influence from public and stakeholders consultations and acceptance by other municipalities. Option 1 and Option 2 (on site) will have a relatively lower acceptance by the BC MoE and would require further modelling of groundwater and environmental assessments.

The BC MoE would prefer the sewer treatment option (according to their feedback in the December 4, 2013 meeting). According to the information brought forward by the CVRD, which complements the screening work conducted that highlighted three (3) preferred options; it appears that the CVRD should pursue the on-site discharge option at the present and overcome any barriers that may hinder the success of this option. As stated earlier, this option was assessed as the "fall back" option in the event the options to discharge the treated leachate to the sewer plant were not feasible.

The update of the preliminary cost estimates shows that Option 4 (South Sewer) is the most expensive on a 20-year life span while the Option 6 (Brent Road) is the less expensive one. Again for Brent Road, there are still uncertainties that remain regarding the cost (contribution to Brent Road Facility operation, acquisition of right-of-way for the force-main through Courtenay, and other contribution for the future upgrade of that facility).

The on-site treatment and discharge of leachate offers some advantages. The reclaimed leachate would be discharged to the ground, a much less sensitive environment than the marine and coastal areas. An on-site treatment would also not require conveying pre-treated leachate through force-mains and into municipal sewer systems. Finally, an on-site solution would ensure that the landfill expansion does not depend on the schedule of any other infrastructure project. Liability would be significantly reduced in terms of environmental concerns, social interests, and project management.

Our recommendations to make the option of on-site discharge of leachate successful in an expedient manner are to:

1. Maintain ongoing communications and consultations with stakeholders.
2. Develop and agree with the BC MoE site-specific criteria for discharge of treated leachate to the ground on site. This work would require groundwater modelling and assessing impacts on sensitive receptors.

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6.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.



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Attachment: (1) Tetra Tech's General Conditions

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