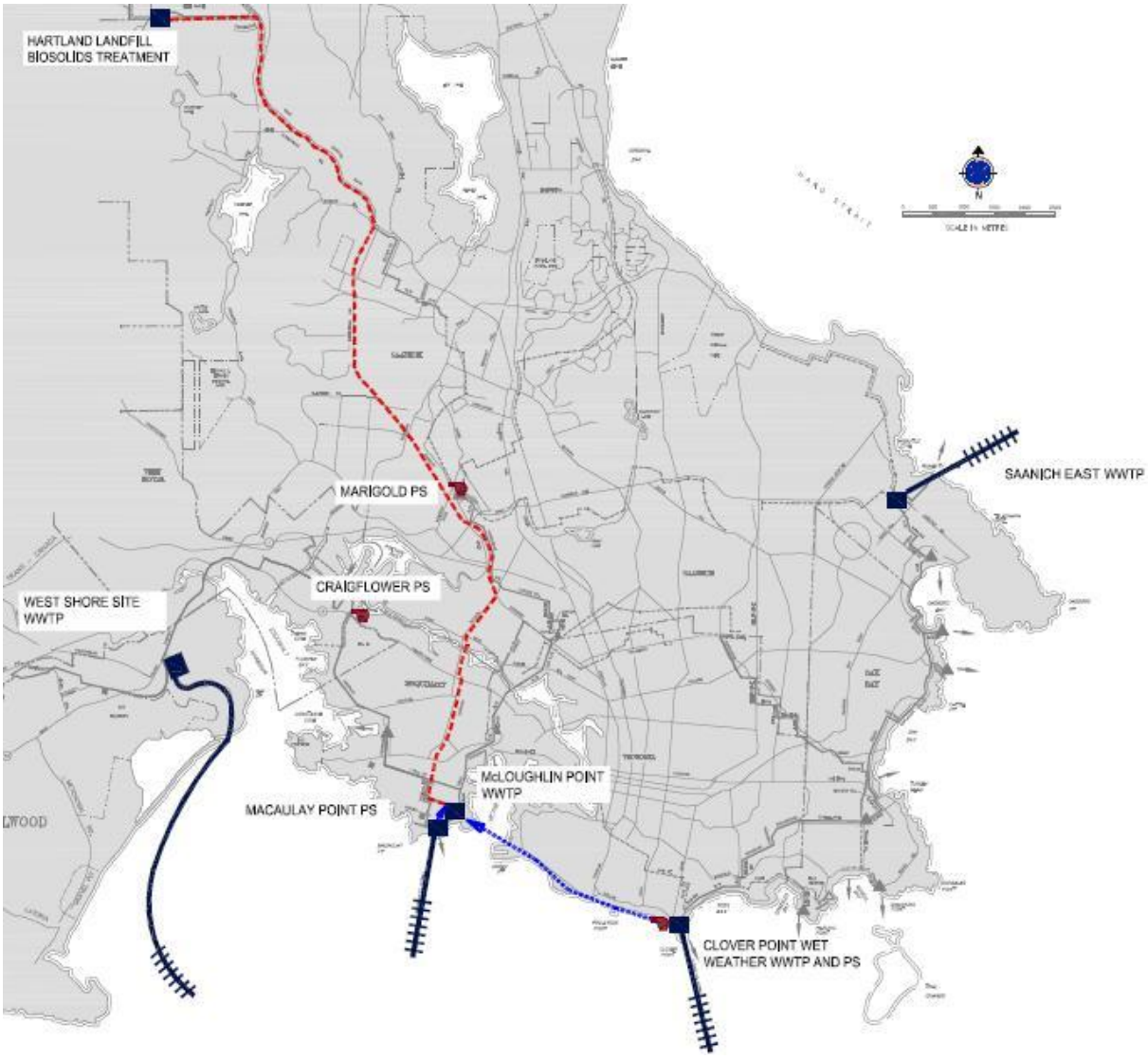
Capital Regional District
Core Area & West Shore Wastewater
Treatment Programs

Business Case in Support of Funding
from the Province of British Columbia

March 16, 2010



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EXECUTIVE SUMMARY

This Business Case has been prepared for submission to the Province of British Columbia – Ministry of Community and Rural Development (**MCD**) in support of a commitment to secure provincial funding and move forward with procurement implementation of the Capital Regional District's (**CRD**) Core Area and West Shore Wastewater Treatment Program (the "**Program**"). This business case was prepared with the input of CRD staff plus the project team which includes:

Project Team Member	Role
Ernst & Young Orenda Corporate Finance Inc.	Business and financial advisory and coordination of the business case preparation.
Stantec Consulting Ltd. / Brown & Caldwell	Technical/engineering advisory and preparation of cost estimates.

The Program can be separated into two major components. The "**West Shore Program**" comprised of a single wastewater treatment facility (liquids only) and associated on-shore conveyance/pumping stations plus a marine outfall for discharge of treated effluent. The "**Core Area Program**" is comprised of three wastewater treatment facilities (liquids only) plus a biosolids treatment facility (the "**Energy Centre**") along with all supporting conveyance piping, pumping stations and outfalls. Together these two components are referred to as the "**Combined Program"** or the Program.

The CRD has spent several years performing detailed investigations and due diligence into the Program and a variety of service delivery alternatives (including resource recovery opportunities). This business case examines the short-listed service delivery options and resource recovery plans, and makes recommendations on the preferred procurement delivery option for the Program. Funding requirements from each level of government are summarized along with an overview of the expected implementation plan required to move the Program forward.

Rationale for the Program: The Infrastructure Gap

- The CRD Core Area is comprised of seven communities in Greater Victoria including Saanich, Oak Bay, Victoria, View Royal, Esquimalt, Colwood and Langford. The communities of Colwood and Langford are referred to as the West Shore communities. There are also two First Nation communities served by the wastewater treatment system.
- All wastewater from these communities is conveyed to existing preliminary treatment consisting of screening at Clover Point and Macaulay Point prior to marine discharge.
- Current preliminary treatment is provided by a 6mm fine screen to remove rocks/solids, plastic and floatable materials which are then disposed at the Hartland landfill. No other wastewater treatment occurs prior to it being discharged into the marine environment at the two main outfalls at Clover Point and Macaulay Point.
- The CRD is the last major coastal community in Western Canada and North America discharging untreated sewage into the marine environment.

- One municipality in the CRD (Oak Bay) currently has combined storm water and sanitary sewers, however this municipality has been mandated to separate by the Provincial Government and is in the process of developing a plan to separate such conveyance.
- Contamination of seabed sediments at the Clover Point and Macaulay Point marine outfalls is sufficient to warrant preliminary designation as contaminated sites under the Provincial Contaminated Sites Regulation.
- As many as 60 sanitary sewer overflows (**SSOs**) currently occur each year throughout the Core Area on the trunk portions of the sewer system managed by the CRD.
- During stormflow events which lead to flows in excess of the system capacity, a number of relief outfalls are used to discharge untreated wastewater directly into the ocean (predominantly in the Clover catchment area).
- The region continues to grow. Added population will exacerbate the situation (particularly for the Macaulay Point outfall which currently handles the West Shore's sewerage catchment area since the West Shore is forecast to grow more quickly than other parts of the region).
- The CRD has recently initiated construction of a small district heating system at the Saanich Peninsula plant, however overall the CRD does not capture energy or other resources from the existing sewerage system because there are no treatment facilities in place.
- In a letter to CRD dated July 21, 2006, the BC Minister of Environment directed the CRD to provide an amendment to the CRD Core Area Liquid Waste Management Plan (**LWMP**) detailing a fixed schedule for the provision of sewage treatment and implementation by the end of 2016. The letter is attached in Appendix 7. The LWMP Amendment No. 7 was provided to the Minister in December 2009.
- Investment in the Combined Program will move the Core Area and West Shore communities into compliance with Federal and Provincial effluent regulations, including the goals of the Canadian Council of Ministers of the Environment (**CCME**) Canada-wide Strategy for the Management of Municipal Wastewater Effluent.
- This investment will ensure, for the Combined Program, all flows up to two times the average dry weather flow (**ADWF**) will receive secondary treatment as required by the Municipal Sewage Regulation (**MSR**) and all systems will be in operation by the end of 2016. All wet weather flows between 2 times and four times ADWF will receive primary treatment and any flows over this level will be screened prior to discharge. The inflow and infiltration program, as described in Section 5 of the LWMP Amendment No. 7, is designed to reduce wet weather flows to less than four times ADWF by 2030, thereby ensuring that after 2030 all flows will receive at least primary treatment.

Program Objectives

The goal of the Combined Program is to protect public health and the environment in a sustainable and cost effective manner. Appendix 10 includes an overview of CRD's strategic objectives for the overall Combined Program. The CRD commits to completing the required wastewater management program by the end of 2016 in a manner that will:

- satisfy all relevant Provincial and Federal permitting requirements (in accordance with plans documented in the Liquid Waste Management Plan Amendment No. 7)
- provide appropriate wastewater treatment for municipalities that will minimize whole life cost to taxpayers
- protect public health and the environment
- provide facilities that are compatible with the surrounding communities
- have a net negative carbon footprint
- be sustainable and optimize the economic recovery and beneficial use of resources
- allow opportunities to integrate the solid and liquid waste functions wherever a mutual benefit can be achieved

Service Delivery Options: Resource Recovery and Distributed Treatment Strategy

The CRD conducted an extensive investigation into the optimal approach to integrating resource recovery with wastewater treatment. A large variety of options were considered (documented in Appendices 20 and 21). The CRD has previously assessed distributed treatment with a range of options consisting of anywhere from four to eleven plants serving the Core Area. Current capital cost budget includes over $57-million in resource recovery facilities and equipment (see table in section B of this business case).

Based upon a detailed analysis these strategies, including an assessment of environmental, social and financial attributes, in a special meeting of the CRD Core Area Liquid Waste Management Committee (**CALWMC**) on June 2, 2009 the CRD approved moving forward with four-plant scheme known as Strategy 1 on condition of further investigation of a number of components of the strategy including:

- Continued analysis of variation to Strategy 1 (investigation of implementation options for this strategy referred to as Option 1A, 1B and 1C) including an assessment of biosolids integration with solid waste activities and functions
- Relocation of the solids processing from the liquid processing site to allow potential integration with solid waste activities and functions
- Further development of the biosolids management plan to reduce operational risks associated with biosolids end uses
- Investigation of opportunities for heat recovery and water reuse with the University of Victoria.
- Research the possibility of a single larger site in the event that the McLoughlin Point site is not selected.
- Plus a number of other conditions as described in the resolution.

An expert Peer Review Team confirmed that the CRD should concentrate on optimizing a four plant scheme. The refinement of the scheme included assessments of scenarios known as Option 1A, Option 1B and Option 1C.

Preferred Service Delivery Option 1A

The CRD completed a number of additional studies related to the June 2, 2009 request by the CALWMC (see Appendix 11). Following review of these studies the CALWMC selected **Option 1A** plan as the preferred service delivery option and this business case concentrates on this specific plan to provide wastewater services to the Core Area. Option 1A includes the following facilities.

Major Components	Description
1. Conveyance System	Collection system modifications, pumping stations and storage facilities. Forcemain to transfer flows from Clover Point to Macaulay Point. Pump station at Macaulay Point and forcemain to convey flows to McLoughlin Point. Also includes monitoring and control systems and personnel. The CRD currently manages the existing conveyance system.
2. West Shore WWTP	New secondary treatment plant (liquids-only) serving Colwood and Langford.
3. Saanich East – North Oak Bay WWTP	New secondary treatment plant (liquids-only) serving Saanich East and North Oak Bay communities.
4. McLoughlin Point WWTP	New secondary treatment plant (liquids-only) from Macaulay and Clover catchment areas.
5. Clover Point pumping station and primary WWTP	An expanded pumping station and new wet weather high rate primary treatment facility.
6. Energy Centre / Biosolids Centre	New centralized organic treatment facility including digestion and biogas production with integration of fats, oils, greases and other preprocessed organic and kitchen organics. Serves entire region.
7. Outfalls and Tunnel	New outfall at Saanich East facility for marine discharge (parallel to existing outfall). New outfall at Macaulay Point (parallel to existing outfall). New West Shore outfall for marine discharge. New tunnel for conveyance of wastewater from Core Area to McLoughlin Point.
8. Resource Recovery Components	A variety of resource recovery opportunities have been identified and integrated into the Program and the procurement process.

Appendix 2 includes a detailed technical overview of Option 1A.

Benefits of the Programs

Option 1A has the following benefits:

- Provides appropriate treatment for the seven participating municipalities in a manner that will balance the whole life cost to taxpayers with environmental and social goals of the community.
- Will be sustainable and optimize present and future recovery and beneficial use of resources.
- Encourages continued water conservation and inflow and infiltration reduction measures.
- The current Combined Program has a net negative (beneficial) carbon footprint resulting from biogas generation. Additional carbon credits will be achieved by recovering heat from effluent initiatives.
- Will effectively protect public health and the environment.
- Will substantially eliminate the discharge of untreated sewage from the Core Area and West Shore. CRD currently discharges average daily volume of 97,000 m3 per day to the marine environment.
- Effluent flows up to two-times the average daily flow rate will be treated to a secondary level. Wet weather flows between two-times and four-times ADWF will receive primary treatment. Extreme peak flows over four-times ADWF will be screened before discharge to deep marine outfalls.
- Provides flexibility for staging of Westshore treatment capacity.
- Will treat wastewater flows for a year 2030 population of 342,266 in the CRD1, and an equivalent population of 493,474 when ICI wastewater is included (see CRD Discussion Paper 033-DP-1 in Appendix 3). In 2030, the projection is that the Westshore will be fully sewered.
- Will reduce the number of SSOs on the CRD-operated trunk conveyance.
- For the Combined Program, all flows up to 2 times ADWF will receive secondary treatment and all systems will be in operation by the end of 2016. All wet weather flows between 2 times and four times ADWF will receive primary treatment and any flows over this level will be screened prior to discharge.
- The inflow and infiltration program is designed to reduce wet weather flows to less than four times ADWF by 2030, thereby ensuring that after 2030 all flows will receive at least primary treatment.
- Facility locations and designs have been assessed using a triple bottom-line (**TBL**) approach taking into consideration social, environmental and economic effects (including lifecycle costs).
- Will provide sludge treatment and management in the Core Area and West Shore for the first time – producing a Class "A" digested biosolids for reuse as a fuel substitute for cement kilns or waste to energy facilities.
- Under the current plan, it is anticipated that the CRD will be seen as a leader in wastewater through the use of innovative technologies, including anaerobic digestion

[1] This estimate excludes people using septic tanks in the region.

for volatile solids destruction and biomethane production. Opportunity for co-digestion of solids with organics and fat, oils, and greases is proposed to increase biomethane production. Other products include phosphorous recovery and drying of biosolids to produce fuel for use as a coal substitute for energy generation at cement kilns or other waste to energy facilities.

- Implementation of the Programs will be very favourably welcomed by CRD's neighbours including the State of Washington and the City of Seattle.
- The Combined Program will provide an estimated 10,124 full-time job years of employment during the design and construction phase and have a substantial positive economic benefit to the local economy.

Notably, Option 1A was not the lowest cost option overall, however the CRD concluded Option 1A balanced financial, environmental and social goals by using distributed treatment strategy to optimize resource recovery.

Procurement Options

The CRD and its advisors have conducted an investigation into a variety of procurement approaches for the major components of the Combined Program. Three short-listed approaches to procurement were identified during this review:

Option A: Traditional Approach. The approach generally assumes the Combined Program will be delivered using a design-bid-build (**DBB**) or construction management at risk (**CMAR**) approach.

Option B: Hybrid Approach. This option uses a variety of procurement approaches from DBB and CMAR to design-build (**DB**) and also design, build, finance, operate and maintain (**DBFO**) approaches.

Option C: Public-Private Partnership Approach. This option includes a more extensive use of the DBFO approach to procurement for the major components of the Program (all wastewater treatment facilities and the Energy Centre). Conveyance, outfalls and the tunnel are assumed to be procured using a more traditional approach.

Summary of Value for Money Assessment

The CRD and its advisors have conducted a financial assessment of the Program for each procurement option. The results of the analysis are as follows (in $000):

Value for Money Summary	Traditional (PV)	Hybrid (PV)	PPP (PV)
Construction costs for Traditional components of Program	667,234	402,004	118,311
Federal & CRD advances to DBFO components (during construction)	-	145,949	311,497
Land purchases	12,996	12,996	12,996
Provincial ASP principal & interest payments on capital costs	-	144,047	281,742
Retained Approvals and Construction Period Risk	50,559	25,945	23,142
TOTAL PV Capital portion of costs	730,789	730,940	747,688
Operations and Maintenance Costs			
CRD O&M net of resource recovery	188,395	128,649	4,175
CRD ASP components for operations and maintenance	n/a	69,341	188,369
CRD membrane replacement	973	924	-
Other Retained Costs	5,905	3,198	-
Total Operations & maintenance costs	195,273	202,113	192,544
Total Competitive Neutrality	3,649	1,730	-
TOTAL NET PRESENT COST	**929,712**	**934,783**	**940,232**

**All amounts discounted to present using discount rate of 7.5% over 6-year construction period and 25 year operating period.*

Summary Multi-Criteria Assessment of Procurement Options

This business case uses a multi-criteria assessment (MCA) approach to evaluating procurement options including environmental, social and financial/risk criteria.

Criteria	Option A: Traditional	Option B: Hybrid	Option C: PPP
Environmentally Oriented Goals			
Sustainability and Resource Recovery Goals	Satisfied Option 1A plan. Flexibility to add innovations later. Value engineering workshops on major components may facilitate additional resource recovery innovation.	Good for Energy Centre. Innovation possible by using "alternative bid procurement" process to generate new proposals beyond Option 1A plans	Good for Energy Centre and Treatment Facilities. Innovation possible by using "alternative bid" process to generate new proposals beyond Option 1A plans

Socially Oriented Goals			
Recruitment & Impact on Staff	Good	Good	Good
Ownership of Facilities	Facilities owned by CRD	Facilities owned by CRD	Facilities owned by CRD
Public Acceptance	Good	Two PPP components may be challenging for public acceptance.	Challenging for Core Area. West Shore more flexible.
Flexibility and Control	Most flexibility and control for CRD	Flexibility during operations for wastewater facilities. Long-term contracts for Energy Centre and West Shore WWTP	Most flexibility for proponents; CRD locked into long-term contract governing operations and performance.
Financial and Risk Oriented Goals			
Risk Management	CRD exposed to more risks that must be managed.	Balanced risk management approach (many construction risks transferred in design-build and PPP approach).	More risks typically transferred to proponent by CRD for construction, operations and long-term maintenance. CRD will pay for risk transfer, but not be exposed to problems with such risks.
Procurement and Implementation Schedule	Good Allows earliest Start.	Good Allows early start.	Tight Schedule for Completion by December 2016. Extensive due diligence requirements delays start.
Competition	Good Smaller contracting packages allows multiple bidders and direct bids to CRD by local/regional firms (rather than such firms having to sub-contract through a larger organization).	Good Bonding may be challenging for large-scale packages (the Energy Centre).	Limited for large-scale projects. Recent history in North America has not been good for large PPP procurements (limited number of bidders). Bonding may be very challenging for large contracts. It may be necessary to split procurement into smaller bundles.

Cost Certainty	Limited. Slow to determine and significant commitment of costs to design required to achieve. Flexibility allows scope changes and higher costs.	Early certainty established for energy Centre and West Shore. Construction cost certainty established early. Operating and maintenance costs of wastewater facilities subject to change.	Best certainty and clarity on whole life costs (construction, operations & maintenance). Achieved at bid stage.
Construction Costs (nominal dollars, excl. financing)	Highest $941.8 million	6.4% lower than Traditional ($60.1 million less)	Lowest 7.4% lower than Traditional ($69.8 million less)
Operating Costs (nominal dollars, excl. financing)	Lowest $19.2 million / year	Highest 4.02% higher than Traditional ($773,000 / year less)	Essentially equal to Traditional Options
Overall Whole Life Costs (Risk-Adjusted Net Present Cost including private sector financing, not MFA financing costs)	$929.7 million Marginally lower cost than other options	$934.8 million 0.55% higher than Traditional	$940.2 million 1.13% higher than Traditional

Recommended Procurement Plan: Hybrid Option

Based upon the analysis included in this business case the Project Team concludes the **Hybrid Option** represents the preferred procurement implementation plan for the CRD. The key reasons for this recommendation include:

- By carrying out a detailed analysis of the potential procurement options for each of the packages, the Project Team believes that the Hybrid Option provides a good balance of risk transfer opportunities for each of the packages.
- The Hybrid Option allows good opportunities for innovation on resource recovery through an alternative bid procurement process for most components of the Program. Note the alternative bid process does not obligate the CRD to implement the alternative bid proposals, but encourages creative proposals for CRD consideration.
- The cost of the Hybrid Option is comparable to the lowest cost option.
- The Hybrid Option provides good flexibility compared to the PPP Option, plus control for the CRD to phase and manage implementation of the overall Program during the six year scheduled build-out.

- The smaller procurement packages in the Hybrid Option are anticipated to facilitate an improved competitive bid process with a higher likelihood of successful execution than the large-scale packaging approach.

Key risks and challenges of the Hybrid Option[2] include:

- The system would not be designed and optimized as a whole. Each component would generally be implemented separately which could lead to sub-optimal design decisions and integration challenges. The CRD would be responsible for overall system integration risks.
- Conflicts may emerge between different operators within the system – CRD operations, Energy Centre and West Shore WWTP operators.
- The CRD is responsible for lifecycle equipment failure risks on the traditional and design-build components of the Program after the two-year warranty period expires.
- Additional risks are described in Appendix 9.

Note this recommendation is subject to further consultation with the Province and Government of Canada on the issues identified in this business case (in section entitled "*Special Issues for Discussion with Funding Stakeholders*" in the Executive Summary) including the amount and timing of federal and provincial funding commitments.

Funding Assumptions

This business case assumes the capital costs of the Program are shared equally by the CRD, Province of British Columbia (the "**Province**") and Government of Canada ("**GOC**"). The CRD will be responsible for all operating and maintenance costs as well as the cost of land acquisitions as described later.

Status of Federal Government Contributions

On December 10th, 2009 the CRD submitted a funding application to Infrastructure Canada – Building Canada Fund in support of one-third of funding of capital costs of the Core Area Program. The CRD continues consultations with representatives of the Government of Canada and Infrastructure Canada's Building Canada Fund. The CRD is seeking GOC ministerial **Approval-in-Principle** of the Combined Program with an associated memorandum of understanding outlining key terms and conditions of such approval. Ultimately, the CRD wishes to secure a committed Contribution Agreement with the GOC for such funding. The CRD will work collaboratively with the Province and Infrastructure Canada staff to determine how funding shall be contributed by GOC for the Combined Program (for example Green Fund contributions versus BCF Major Infrastructure Component contributions, or possible funding arrangements with P3 Canada).

To date, discussions with the GOC have been positive and are ongoing. However, GOC officials confirm that GOC commitments must follow Provincial commitments.

[2] Note these key risks and challenges are also applicable to the Traditional Option

Program Cost and Provincial Funding

The CRD is seeking a funding commitment for one-third of Eligible Costs of the Program from the Province. A financial analysis has been completed in this business case to estimate the amount of funding required by the Province to implement build Option 1A. As discussed with the Province, for analysis purposes in this submission of the business case, the CRD has assumed the Province's contribution toward funding shall be divided across all components of the Program on the basis of one-third of capital costs. Thus components procured using a traditional or design-build approach will require grant funding from the Province during the construction phase, while components procured using a DBFO approach will require a commitment for ongoing payment of the annual service payment (**ASP**) for the capital and interest portions of the ASP. The CRD acknowledges the Province has not finalized its decision on this funding structure and thus any final funding arrangement may include allocations of Provincial funding toward specific major components of the Program (with the CRD and GOC funding the other components). The CRD has held preliminary discussions with the GOC on such special funding allocations across components of the Program and initial response was positive as long as firm commitments for funding are in place among all stakeholders.

CRD Funding Contributions

The CRD has already committed to funding one-third of Eligible Costs of the Program and all Ineligible Costs including interim interest costs and land acquisition costs (see Appendix 1 for CRD Board Resolution) as required under the *Infrastructure Canada – Building Canada Fund (Major Infrastructure Component)*. The CRD will also be responsible for funding all operating costs and lifecycle maintenance costs of the facilities included in the Program.

The CRD will work collaboratively with the Province and MCD staff to determine how funding shall be contributed by each stakeholder toward the various components of the Program (and the timing of such contributions).

Source of CRD Funding Contributions

The CRD's contribution will be borrowed from the British Columbia Municipal Finance Authority (**MFA**). CRD's funding contributions to the Combined Program will be in the form of advances during construction.

CRD will allocate its share of costs for the Combined Program to each client municipality on an equitable basis related to flow rates. Each municipality is anticipated to recover such costs from ratepayers. The CRD has estimated the annual impact of an average household to vary among municipalities between $250 and $450 per annum (assuming two-third funding support from GOC and the Province of BC for Eligible Costs).

Expedited Approval Process Required from Province

Review and approval of this business case is required quickly to ensure the CRD qualifies for GOC funding with the Building Canada Fund and possibly the Green Fund. Both of these funds close in 2014 with funding advances available to March 31, 2016. If this business case is significantly delayed then such delays may place the GOC funding support at risk.

Secondly, the CRD is required under direction of the Provincial Ministry of Environment (**MoE**) to have the Program operational by the end of 2016. Given the scale of the Program, delays at this stage could negatively impact this requirement of the MoE.

Thirdly, the GOC will not commit to funding the Program until after the Province has indicated its support and commitment to move forward.

Possible Special Funding Joint Ventures for Resource Recovery

The CRD recognizes the opportunity to establish special "stand-alone" joint venture arrangements for resource recovery dimensions of the Program. For example a joint venture for biomethane extraction, cleaning and upgrading to gas network standards could be established as a special joint venture with a local natural gas utility, a district heating loop could be established with the municipalities, developers in the northern section of downtown Victoria, or academic institutions in the region such as the University of Victoria or Royal Roads University. An arrangement could be established for the long-term disposal of digested biosolids residuals with a cement kiln operator as a substitute fuel source. The CRD continues to investigate all of these options and reports are included in Appendices 20 and 21 which deal with water reclamation and heat recovery opportunities in the James Bay and University areas.

Such joint ventures may be funded separately from the overall program (possibly using different funding shares by the Province, GOC and CRD). The CRD will consider supporting these resource recovery initiatives in the following ways:

(i) With the resource recovery commitments ("RR Commitments" as described later in this business plan),
(ii) structure the physical configuration of facilities at each location to enable third party partners to access the wastewater and Energy Centre facilities,
(iii) consider a limited financial contribution toward the capital cost of such operations as described below in the budget,
(iv) work with local academic institutions (University of Victoria and Royal Roads University) to establish a Centre of Excellence for research into sewage treatment technologies and resource recovery technologies,
(v) work with the Province to validate the feasibility of resource recovery implementation opportunities by the end of 2010, and negotiate Letters of Understanding (LOUs) with prospective customers and partners in order to confirm the size, timing and location of markets for the resources to be recovered from wastewater, including a business plan for each facility, and cost-sharing arrangements with the Province, CRD, LOU partners and other stakeholders, for capital investments required to implement such LOUs, and
(vi) integrate an "alternative bid" process into its DB, DBO and/or DBFO procurement plans to allow innovative new technologies to be considered as part of the overall service delivery solution.

Permit Requirements

The CRD is committed to working with regulatory agencies to satisfy all material permitting requirements of the Combined Program. Discussions are ongoing with the Provincial Ministry of Environment. The CRD has also held preliminary discussions with CEAA and other federal permitting agencies. CEAA permitting is anticipated to be required for (i) the outfall (only) for the Saanich East WWTP, (ii) West Shore outfall requirements, (iii) Macaulay Point outfall twinning, and (iv) possibly Upper Victoria Harbour site (if a site at this location is secured).

Implementation Timing and Next Steps

Upon approval of the Business Case by the Province, the CRD will work toward finalizing Approval-in-Principle with the GOC; this will allow the CRD to incur costs for the Program which will be reimbursed by the GOC once the final Contribution Agreement is approved.

The CRD is in a position to immediately commence implementation of the plan and complete the Program by 2016 **based upon approval of funding from the Province and GOC by May 2010.** The preliminary Program schedule includes the following key milestones dates:

Milestone	Timing
Provincial approval of business case and memorandum of understanding (including key terms and conditions)	May 6, 2010
Federal approval-in-principle of Program and memorandum of understanding	May 20, 2010
Start detailed Program planning	May 21, 2010
Finalize Contribution Agreements with Province and Government of Canada	July 30, 2010
Finalize site selections (Saanich East, West Shore and Core Area facilities)	May 21, 2010
Complete Environmental Impact Study (Provincial)	June 2010
Complete Environmental Social Review (Provincial)	June 2010
Complete Canadian Environmental Assessment Agency (**CEAA**) work and approvals	June 2012

Commence procurement processes: - Saanich East WWTP - Biosolids Facility - Clover Point Wet Weather Facility - McLoughlin Point WWTP - West Shore WWTP - Conveyance system components - Outfalls	June 2010
Commence construction (earliest permits)	June 2011
Complete construction and commence commissioning	June 2016
Full Operational	December 2016

Appendix 4 includes a more detailed schedule for Program implementation including permits and the timing of construction and commissioning of major components.

Special Issues for Discussion with Funding Stakeholders

1. The CRD continues to explore alternative sites for the location of the Energy Centre, which may include the ability to combine some liquid treatment with the Energy Centre or an alternative configuration for the Combined Program. Changes in configuration of the various major components of the Program may have an impact on the overall budget. The CRD will provide updates to the Province in coming months as alternative sites are assessed.

2. Plans on the West Shore continue to be developed. A more detailed West Shore Program will be submitted for funding support in coming months once the configuration of the West Shore system has been finalized.

3. The CRD wishes to consult with the Province on funding issues and the selection of DBO versus DBFO for certain components of the Program.

4. If the Program is updated and Option C (alternative procurement) is chosen by the stakeholders as the preferred service delivery option, then the CRD will conduct further investigations into how such an option can be optimized through additional packaging and consideration of the DBO approach for some components, or possible separation of the Energy Centre from the liquid treatment facilities into two large procurement packages. The overall configuration will also be reviewed if an alternative site is chosen for the Energy Centre with potential opportunities to combine the liquid and solid treatment facilities. Packaging of Options A and B will also be updated/optimized if a new site is adopted.

5. The CRD continues to explore lower cost solutions that also satisfy community expectations for environmental and social goals.

6. The CRD notes that its preliminary investigations into resource recovery options (included in the appendices of this business case) suggest such initiatives may not recoup their costs within a reasonable time period. The CRD wishes to validate such resource recovery plans with the Province prior to finalization of the Program as described in section Resource Recovery Initiatives in this business case.

A PLANNING FUTURE SERVICE DELIVERY

This section of the Business Case identifies the overall goals and objectives for the Program, and reviews long-term CRD wastewater and sewage infrastructure requirements based upon population forecasts, water conservation expectations, inflow and infiltration projections, environmental permit obligations, resource recovery goals and other similar factors. An "infrastructure gap" is determined based upon current capacity and required capacity over the long term.

A.1 INTRODUCTION AND BACKGROUND

The Core Area and West Shore of the CRD is a collaboration of seven local governments and two First Nation areas with a total land area of approximately 215 square kilometres that make up the majority of Greater Victoria. These communities include the Cities of Victoria, Langford and Colwood, the Districts of Oak Bay and Saanich, the Township of Esquimalt, and the Town of View Royal. The figure below illustrates the Capital Regional District and the boundaries of the sewer catchment areas included in the Core Area and Westshore LWMP.

The CRD provides services that are regional in nature including the sewage system which serves a population equivalent of 320,000 in the Core Area (299,000 residents and industrial/commercial users generating wastewater equivalent to an additional 21,000 residents).

Prior to the formation of the regional district in 1966, each municipality designed its own sanitary collection system with, in some cases, multiple outfalls discharging at the low tide mark. The CRD was given the Letters Patent in 1975 giving it responsibility for trunk sewers, treatment and disposal. Over the next few decades, the CRD then designed its system to intercept all of these outfalls and convey the wastewater to the Macaulay Point and Clover Point deep sea outfalls. However, environmental regulations of the day permitted the regional system to have some overflows during storm events at most of the original outfalls.

The CRD has conducted extensive due diligence investigations into wastewater management issues in recent years. Much of this work is available online at CRD's archival library: www.WastewaterMadeClear.ca

A.2 THE CRD SANITARY SEWER SYSTEM – OWNERSHIP AND MAINTENANCE RESPONSIBILITY

Sanitary sewer collection systems receive wastewater from buildings (i.e., from sinks, toilets, showers, washing machines, etc.) and convey it through a series of collection sewers to the marine outfalls. Within the Core Area of the CRD, the collection system is generally defined and operated as follows:

- Sewer laterals convey wastewater from buildings to the municipal sewers. Individual private property owners are 100% responsible for the portion of the lateral that is located on their property.
- Collection sewers gather flows from sewer laterals and transport the sewage to a larger trunk sewer, municipal pump station or regional trunk system operated by the

CRD sewer. Each of the municipalities own and operate their own sanitary sewer system, including gravity sewer lines, pump stations and forcemains.

- The Regional system trunk generally consists of major gravity trunk sewers, siphons, pump stations and forcemains that convey sewage across municipal boundaries and are expected to carry flows from the collector sewers to the point of treatment and/or disposal. These regional conveyance systems are owned and operated by the CRD.

The Core Area sewerage system is primarily serviced by three separate regional trunk sewer collection systems (see Figure A1 below):

- Northwest Trunk Sewer – Northern leg (NWT-N).
- Northwest Trunk Sewer – Western leg (NWT-W).
- Northeast Trunk / East Coast Interceptor (NET/ECI).

These trunk sewer systems have a total length of approximately 55 Km. Due to undulating topography and subsurface conditions, 12 pump stations (including Macaulay Point and Clover Point pump stations) provide service to the Macaulay and Clover Point areas as shown on Figure A1 below. The other ten pump stations are Craigflower, Currie, Harling, Hood, Humber, Lang Cove, Marigold, Penrhyn, Rutland and Trent.

There are approximately 140 municipal pump stations located within the Core Area which are owned and operated by each respective municipality/district. Most of these municipally-owned pump stations are generally smaller than the CRD pump stations.

The CRD does not intend to change this fundamental separation of ownership and maintenance responsibility. New wastewater treatment facilities will be owned by the CRD along with the main trunk sewers. Funding support resulting from this business case will be used to add treatment facilities to the trunk conveyance system and to reconfigure the conveyance as required for the proposed wastewater treatment strategy to fulfill the requirements of the Ministry of Environment directive.

A.3 LIQUID WASTE MANAGEMENT IN THE CRD

The CRD's wastewater system is operated under a Province of British Columbia Liquid Waste Management Plan. The LWMP authorizes the CRD to manage the wastewater collection, treatment and disposal system within a set of operating parameters and future environmental goals.

LWMP Amendment No. 7 is included in Appendix 12. This includes draft copies of the operating permits under which CRD will operate the various WWTPs included in the Combined Program.

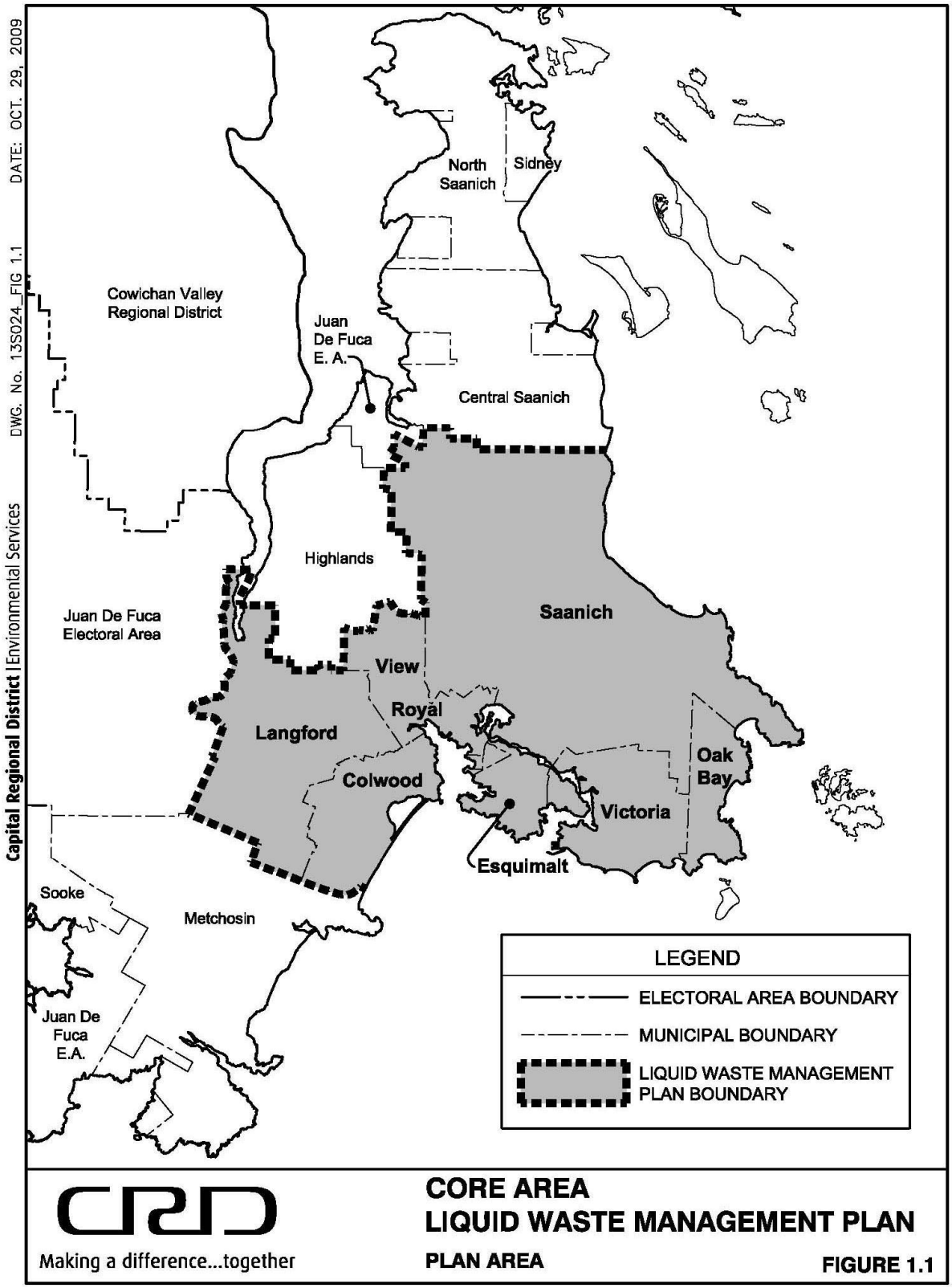
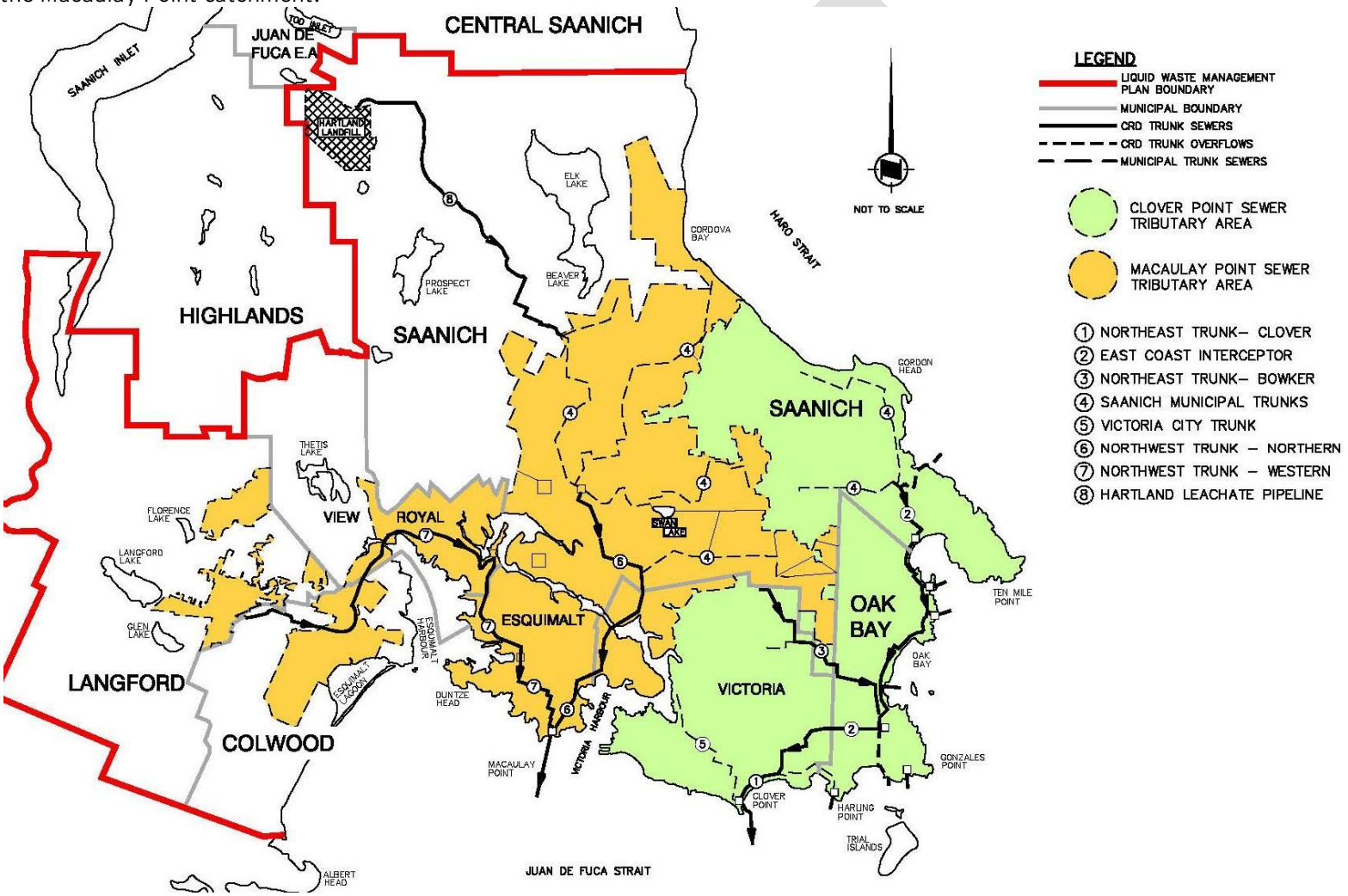

DATE: OCT. 29, 2009
DWG. No. 13S024_FIG 1.1
Capital Regional District | Environmental Services
North Saanich
Sidney
Cowichan Valley Regional District
Juan De Fuca E. A.
Central Saanich
Highlands
Juan De Fuca Electoral Area
Saanich
View
Royal
Langford
Colwood
Oak Bay
Victoria
Esquimalt
Sooke
Metchosin
Juan De Fuca E.A.
LEGEND
ELECTORAL AREA BOUNDARY
MUNICIPAL BOUNDARY
LIQUID WASTE MANAGEMENT PLAN BOUNDARY
Making a difference...together
CORE AREA
LIQUID WASTE MANAGEMENT PLAN
PLAN AREA
FIGURE 1.1

Figure A1: Existing Wastewater Conveyance System and Two Major Catchment Areas

This figure illustrates the geographic boundaries of the CRD's two sewer tributary catchment areas – the Clover Point Area (green) and the Macaulay Point Area (orange). Each catchment area is served by major trunk sewers owned and operated by the CRD (smaller lateral and collections sewers are owned and maintained by each individual municipality in the region). The two catchment areas convey wastewater to the two main marine outfalls at Clover Point and Macaulay Point for discharge. Flows from the West Shore are also currently conveyed to the Macaulay Point catchment.



A.4 MINISTER OF ENVIRONMENT REQUIREMENTS FOR CRD

The BC Minister of Environment, in his letter dated 21 July 2006, directed the CRD to amend its LWMP to include a fixed schedule for the provision of sewage treatment and provide information on the proposed type, number and location of treatment facilities along with a cost estimate for completing the required works. This letter is attached in Appendix 7.

In his letter dated 14 December 2007 the Minister directed that the LWMP amendment be submitted by 31 December 2008 (subsequently extended to 31 December 2009) and that it should include the following:

1. "Decisions on the selected physical infrastructure model, selected resource recovery options, and PPP approach (including supporting rationale)
2. Identifying the site locations for sewage treatment facilities
3. The results of environmental impact studies for each sewage facility (site assessment)
4. The results of environmental impact studies for each new discharge location
5. Draft operational certificates for each sewage treatment facility/discharge location
6. Class B detailed capital and operating costs to implement the plan, and costs per users, both with and without government funding
7. Consultation summary reports (public and First Nations)"

Subsequently, in a letter dated 08 July 2008, the Minister directed that a progress report be submitted by 31 December 2008 and a second progress report by 30 June 2009. Both progress reports were submitted on schedule. The CRD submitted the required amendment (Amendment No. 7) to the Minister in December 2009.

Appendix 7 includes copies of the letters from the BC Minister of Environment on these matters.

A.5 RATIONALE FOR THE PROGRAM: THE INFRASTRUCTURE GAP

As noted in the Executive Summary of this Business Case, the CRD is implementing the Program to address the following challenges:

- All wastewater from the Core Area and West Shore communities is currently conveyed to existing preliminary treatment consisting of a 6mm screen to remove rocks/solids, plastic and floatable materials. No other wastewater treatment occurs prior to it being discharged into the marine environment at the two main outfalls at Clover Point and Macaulay Point.
- Contamination of seabed sediments at the Clover Point and Macaulay Point marine outfalls is sufficient to warrant preliminary designation as contaminated sites under the Provincial Contaminated Sites Regulation.
- As many as 60 SSOs currently occur each year throughout the Core Area and West Shore.
- During significant rainfall events which lead to flows in excess of the system capacity a number of relief outfalls are used to discharge untreated wastewater directly into the ocean (predominantly in the Clover catchment area).

- The region continues to grow. Added population will exacerbate the situation (particularly for the Macaulay Point outfall which handles the West Shore's sewerage catchment area since the West Shore is forecast to grow more quickly than other parts of the region).
- CRD does not currently capture energy or other resources from the existing sewerage system. This may represent a missed opportunity.
- Investment in the Combined Program will move the Core Area and West Shore communities into compliance with Federal and Provincial effluent regulations, including the goals of the CCME Canada-wide *Strategy for the Management of Municipal Wastewater Effluent*.
- This investment will ensure, for the Combined Program, all flows up to two times the ADWF will receive secondary treatment as required by the MSR and all systems will be in operation by the end of 2016. All wet weather flows between 2 times and four times ADWF will receive primary treatment and any flows over this level will be screened prior to discharge. The inflow and infiltration program, as described in Section 5 of the LWMP Amendment No. 7, is designed to reduce wet weather flows to less than four times ADWF by 2030, thereby ensuring that after 2030 all flows will receive at least primary treatment.

A.6 REGULATORY REQUIREMENTS

The discharges of treated water to the marine environment as well as the disposal of biosolids residuals generated during the treatment process are regulated by both the Province of British Columbia and the Government of Canada regulations and guidelines. The Municipal Sewage Regulation (**MSR**) is the provincial regulation governing the design of new wastewater treatment facilities in the Province of British Columbia. Appendix 24 contains a summary of relevant wastewater regulations applicable to CRD.

Regulations include the following:

- Provincial Environmental Management Act lists specific requirements for treated effluent under the Municipal Sewage Regulation.
- Effluent discharge to the "open marine" environment requires that secondary treatment (defined as effluent containing no more than 45 mg/L each of cBOD5 and TSS "*not to exceed*") must be provided for all flows up to 2 x ADWF.
- There is flexibility for flows in excess of 2 x ADWF but equivalent to primary treatment should be provided for flows above 2 x ADWF.
- Federal regulations require an average monthly cBOD5 and TSS of 25 mg/L which is generally deemed equivalent to the not to exceed provincial values.
- CRD requires a liquid waste management plan to document specific details of treatment level in accordance with the Minister of Environment's request.
- Reclaimed water requires special approval and monitoring.
- It is possible new regulations for special issues may be introduced over the design horizon of the Program and thus flexibility in technology choice will be required (for example microconstituent removal, and nitrogen/phosphorus limitations).

For procurement planning these regulations are not anticipated to pose a problem. All professional engineering firms understand these regulations. It will be important for CRD to

(i) establish a clear LWMP with MoE, and (ii) obtain flexibility in such LWMP to allow wet weather flow mitigation plans.

A.7 SUSTAINABILITY AND ENVIRONMENTAL REGULATIONS

The CRD has reviewed the goals and objectives of the following climate change and sustainability legislation:

- B.C.'s Climate Action Plan
- Living Water Smart Plan
- B.C. Energy Plan
- B.C. Bioenergy Strategy

Appendix 17 contains a summary of these regulations relevant to the Program.

From a procurement planning perspective, it is important to note that such climate plans will likely evolve and change over the design horizon of the Program. If CRD enters into a long-term arrangement for operations and maintenance of facilities then agreements must be established to ensure flexibility to meet future climate goals.

A.8 VISION AND GUIDING PRINCIPLES

Appendix 10 includes a detailed description of the CRD's high level Program vision and guiding principles for the Program.

A.9 DEMAND MANAGEMENT AND WATER CONSERVATION EFFORTS

The CRD has had multiple successful initiatives in place for many years including financial incentives to all residents, landlords, property managers and plumbers to switch to water efficient toilets (using 6 litres or less), financial incentives to switch to hi-efficiency washing machines, special programs targeted directly at industrial, commercial and institutional users, plus source control programs to reduce the amount of metals, oils, greases and pharmaceuticals from the local sewer system. Appendix 13 contains an overview of demand management programs and source control initiatives.

Since water conservation programs were introduced by the CRD in the mid 1990s, the total annual water consumption per capita has decreased by about 8% as a result of increasing public awareness of water issues and the CRD's comprehensive demand management program. CRD estimates aggressive implementation of further long-term water conservation efforts would reduce overall water demand per capita by 7% to 15% (see Appendix 13 for details). These levels are consistent with other jurisdictions in North America that have implemented conservation programs.

From a capacity planning perspective, inflow and infiltration challenges within the region have a more significant impact on design capacity requirements for the wastewater system. Peak flows during winter storm events can be 200% to 400% greater than average dry weather flows. As noted later in this Business Case, CRD is proposing to implement a number of initiatives to reduce and manage I&I.

A.10 WASTEWATER CHARACTERISTICS

Appendix 20 contains a summary of wastewater chemistry and constituent concentrations. The CRD has an ongoing investigation program into wastewater chemistry and changes and some of this information is included in Appendix 15. Such data will be available for future procurement planning.

A.11 CAPACITY PLANNING

During the industry and stakeholder consultation process conducted by Ernst & Young Orenda Corporate Finance Inc. (E&Y) in April 2008 (EY 2008), most respondents preferred CRD to provide guidance and direction on population growth assumptions and design flow rates for capacity planning purposes. Most, but not all, parties believed this risk/issue should not be left to the private sector service provider to determine. Furthermore, if the CRD allowed significant variations in design capacity requirements then such an approach would be difficult to provide reliable bid assessments.

The most critical factor driving design capacity of treatment facilities is the organic loading on such plants which is driven by population growth. Thus population growth assumptions are the key underlying factor determining capacity planning decisions. Over the past several years the CRD has been completing wastewater sampling and characterization to assess the design loading that will be required for new treatment facilities. The selected parameters used for preliminary planning work are consistent with the results of this sampling program.

CRD's technical advisors have prepared a detailed memorandum which outlines the design flows and loads for 2030 and 2065 design populations. This memorandum is included in Appendix 30 for reference purposes. Appendix 3 includes a summary of regional population growth estimates. Appendix 15 includes a summary of the design capacities at each facility in the Combined Program. The CRD has assumed it will continue to implement water conservation and I&I reduction programs in the region as part of the LWMP.

A wastewater treatment plant must be designed to handle the organic loading which is a function of the BOD and TSS concentrations as well as the flow. The following values were used for all catchment areas for calculating the design loads:

- ADWF BOD5 : 240 mg/L
- ADWF TSS: 195 mg/L
- Primary clarification efficiency for TSS removal: 55%
- Primary clarification efficiency for BOD5 removal: 30%
- Net yield factor for conversion of primary effluent to secondary solids: 0.8
- Biosolids Loading Factor applied for increase in loads that occur at flows above ADWF conditions: 1.3

The design flows used in the calculations for biosolids loads are ADWF for year 2030 except East Saanich plant. Year 2065 ADWF has been used for East Saanich as it is only 3% higher than the year 2030 ADWF, there would be no facility expansion required in year 2065.

The design loads for all plant sites with secondary treatment were computed and summarized in the table below:

Table A2. 2030 Design Loads for Plant Sizing

Plant Site	Design Flow (ML/d)	Design Load (kg/d)	Action
East Saanich	16.1	5,410	To Clover Point via sanitary sewers
Clover Point (Primary Treatment)	37.8	5,410	No additional loads. Biosolids from East Saanich in sewage up to 2xAWDF is pumped to McLoughlin WWTP
Macaulay Point / McLoughlin Point	46.4 + 37.8 from Clover Point.	29,430	Off-site Treatment
West Shore	24.1	7,570	On-site Treatment

In the East Saanich, Clover Point and Macaulay Point catchments there is little difference in the design flow and load between the 2030 and 2065 design conditions. The only exception is the West Shore where flows are expected to increase significantly in the future but where a significant portion of the area is currently unsewered. Existing flows from West Shore catchments are currently in the order of 7 ML/d. One staging option may be to provide a capacity of 14 ML/d for the initial phase of construction (a 7 ML/day Westshore plant and continue to bring the current 7 ML/day flow to the McLoughlin Point facility) and provide capability for future expansion of a West Shore plant or with additional WWTPs associated with larger developments in the Westshore.

A.11.1 CLOVER POINT WET WEATHER FLOW FLEXIBILITY

The CRD notes the current plans for Clover Point could be improved and costs reduced by adopting a new configuration option which was submitted by CRD to the MoE in February 2010. The CRD is in discussion with MoE on the requirements for treatment of peak flows over 2xADWF at Clover Point. Given the low frequency of peak flows, the challenges of expanding the Clover Point location, and the operational issues associated with bringing a chemically-enhanced primary treatment plant on-line during a storm event, after it has been sitting dormant for several months, the CRD is exploring opportunities to manage I&I to minimize the infrastructure work and associated costs at Clover Point. Additional plans to manage I&I are discussed later in this business case. This solution would consist of upstream storage to attenuate large flows and it would also involve increasing the pumping capacity at Clover Point to convey up to 3 times ADWF to the McLoughlin plant. This approach, if approved by MoE, would eliminate the wet weather treatment facility at Clover Point.

A.12 TREATMENT TECHNOLOGIES INVESTIGATED

The CRD has investigated a variety of possible wastewater treatment technologies (see Discussion Papers including #03 (2007), #034-1: Liquid Process Alternatives (2009), and #034-2: Solids Process Alternatives (2009) in the CRD online document archive). Key challenges of such evaluation included:

- Cost and energy requirements
- Technical criteria (site area needs, process reliability, flexibility and potential for resource recovery),
- Ease of operations and maintenance,
- Aesthetics and environmental criteria (local impact, GhG impact, chemical demand)

A number of acceptable representative technologies were identified in this review including biological aerated filtration (**BAF**), membrane bioreactors (**MBR**), high rate primary treatment, primary/secondary effluent blending, and thermophilic anaerobic digestion for sludge treatment. The limited land area available for most urban locations under consideration by the CRD limits the potential technologies for consideration. It is possible that other technologies may be considered at the procurement stage. If a larger site can be found then more opportunities for a variety of technologies could be considered.

The CRD has also conducted a market sounding survey on resource recovery matters to validate the feasibility of various technology implementations.

The CRD acknowledges there is a high degree of innovation in the resource recovery sector. The procurement methodology described later in this Business Case describes how an "alternative bid" process can be used to allow innovative technologies to be integrated into the process plans.

B SUMMARY OF THE COMBINED PROGRAM

This section of the business case reviews the engineering and service delivery options to address the infrastructure gap identified in Section A and compares how the different options satisfy the requirements of the CRD. The CRD has used a triple bottom line assessment considering lifecycle financial costs, resource recovery potential, environmental and social factors as well as risk. The engineering work has been peer reviewed by a panel of independent specialists in the field of wastewater treatment[3].

B.1 SERVICE DELIVERY OPTIONS CONSIDERED

The CRD used a two-step service delivery evaluation process based upon an analysis of environmental, social and financial factors important to the CRD.

Initially, the CRD conducted an extensive investigation into the optimal approach to integrating resource recovery with wastewater treatment. A large variety of options were considered (documented in Appendix 19). Appendix 18 includes a review of the evaluation of a distributed wastewater strategy options plus associated CRD staff report summarizing the issues and options on the selection of the preferred strategy. These options were summarized into three primary strategies as follows based upon the number and extent of distributed wastewater treatment plants located through the region:

Strategy 1: Resource Recovery on a Regional Basis

- Three liquid-only treatment plants and a wet weather primary wastewater treatment plant
- Biosolids management and treatment using anaerobic digestion with biomethane and phosphorous recovery and disposal/reuse plans, at up to two locations (Core Area and West Shore)
- Heat energy recovery opportunities and reclaimed water from effluent at three plants
- Integration of fats, oils, greases (FOG) processing and other kitchen wastes and organics within an integrated solid waste and liquid waste management plan

Strategy 2: Resource Recovery on a Combined Regional and Local Basis

- Five liquid-only treatment plants and a wet weather primary wastewater treatment plant
- Biosolids management and treatment using anaerobic digestion with biomethane and phosphorous recovery and disposal/reuse plans, at up to two locations (Core Area and West Shore)
- Heat energy recovery and reclaimed water from effluent from up to five plants
- Other attributes similar to Strategy 1 including biosolids treatment, biomethane and phosphorous recovery, FOGs/organics integration, heat energy recovery

[3] A copy of the Peer Review Team final report is available online at CRD's project archival online document library along with all other analysis work to date.

Strategy 3: Resource Recovery on a Local Scale

- Ten liquid-only treatment plants and a wet weather primary wastewater treatment plant
- Biosolids management and treatment using anaerobic digestion with biomethane and phosphorous recovery and disposal/reuse plans, at up to two locations (Core Area and West Shore)
- Heat energy recovery and reclaimed water from effluent at 11 plants.
- Other attributes similar to Strategy 1 including biosolids treatment, biomethane and phosphorous recovery, FOGs/organics integration, heat energy recovery
- Water recycling at individual buildings.

The CRD established a sustainability assessment framework to perform an evaluation of these strategies including environmental, social and financial goals as well as risks (see Appendix 18). This analysis concluded Strategy 1 best satisfied the overall requirements and goals of the community. The CRD also retained an expert panel of advisors (the "**Peer Review Team**") to evaluate work on the Program. The Peer Review Team suggested the CRD should concentrate on optimizing Strategy 1. The Peer Review Team's full report is included in Appendix 27.

In a special meeting of the CALWMC on June 2, 2009 the CRD approved moving forward with Strategy 1 on condition of further investigation of a number of components of the strategy including:

- Continued analysis of variation to Strategy 1 (investigation of implementation options for this strategy referred to as Option 1A, 1B and 1C) including an assessment of biosolids integration with solid waste activities and functions
- Relocation of the solids processing from the liquid processing site to allow potential integration with solid waste activities and functions
- Further development of the biosolids management plan to reduce operational risks associated with biosolids end uses
- Investigation of opportunities for heat recovery and water reuse with the University of Victoria.
- Research the possibility of a single larger site in the event that the McLoughlin Point site is not selected.
- Plus a number of other conditions as described in the resolution.

The refinement of Strategy 1 included assessments of three implementation scenarios referred to as Option 1A, Option 1 B and Option 1C and summarized below.

Option 1A	*Option 1B*	*Option 1C*
Three treatment plants for up to 4xADWF located at: - Saanich East - Macaulay Point/McLoughlin Point - West Shore. (Secondary treatment to 2 x ADWF, and up to 4 x ADWF receives primary treatment)	This option assumes a more centralized facility using conventional, high rate non-nitrifying activated sludge treatment instead of MBR. For analysis purposes this option may also use conventional primary clarification rather than chemically-enhanced primary clarification. Such a	This option consolidates treatment facilities on the West Shore. All treatment for up to 4 x ADWF would be located on the West Shore in a single facility. Flows up to 4 x ADWF would be pumped from Macaulay Point and Clover Point to the West Shore via underwater pipeline or tunnel.

Heat energy recovery opportunity from effluent at up to three plants Wet weather flow plant for between 2xADWF and 4xADWF located at: - Clover Point Biosolids management and treatment using anaerobic digestion with disposal/reuse plants at up to two locations (Core Area and West Shore)	plan would likely be located on the West Shore and would convey 2 x ADWF from the east service area via an underwater pipeline or tunnel to the treatment facilities. Intermittently operated high rate treatment facilities for wet weather flow events would be located at Macaulay Point and Clover Point for flows over 2 x ADWF. The Saanich East plant would still be built in this option.	Intermittently operated treatment facilities at Macaulay Point and Clover Point would be eliminated in this option. The Saanich East plant would still be built in this option.

B.2 PREFERRED SERVICE DELIVERY OPTION 1A

The CRD's technical consultants completed a number studies[4] related to the June 2, 2009 request by the CALWMC. Following review of these studies the CALWMC subsequently selected **Option 1A** as the preferred service delivery option.

Option 1A is described in detail in Appendix 2 and summarized below:

- A liquid only treatment plant in East Saanich.
- A pumping station and wet weather treatment facility at Clover Point. Up to 2 times ADWF will be pumped to a secondary treatment plant located at McLoughlin Point.
- A new secondary treatment plant at McLoughlin Point
- A central biosolids facility or "Energy Centre" located at the Hartland landfill site.
- A West Shore Plant
- Associated conveyance, pumping and marine outfalls

The CRD identified Option 1A as the option that best meets the needs of the community and achieves all the project objectives. The staff report supporting the analysis of these options is also included in Appendix 11.

This business case divides the preferred service delivery option into two components: The Core Area Component and the West Shore Component. Each of these components may be procured and implemented separately, however for the purposes of funding the plans remain joined at this stage.

B.3 LOW COST OPTION

The CRD's technical consultants have also investigated a low cost option referred to as "**Option 1A-prime**". The option deferred plans for a West Shore plant and continued to bring flows to the McLoughlin Point plant for a period of 10 years. It was estimated that approximately $200-million

[4] All studies are available on the CRD's project archival online document library.

of capital works could be deferred for a period of 8-10 years. After reviewing the social, environmental and financial attributes of Option 1A-prime, the CRD chose to reject it. Thus, by direction of the CRD, this option has been excluded from this business case.

B.4 SUMMARY OF CORE AREA PROGRAM

The CRD commits to providing, by the end of 2016, a wastewater management system that will include the following major components in the Core Area:

Major Core Area Components	CRD Commitments
Saanich East McLoughlin Point West Shore Secondary Treatment Facilities	• A new 16.1 Ml/d Saanich East (liquids only) secondary treatment plant for flows up to 1.75 times average dry weather flow (**ADWF**). Flows between 1.75 ADWF and up to four times ADWF shall receive primary treatment. Biosolids are returned to the conveyance system for downstream treatment. Note effluent up to two-times ADWF will satisfy secondary-level treatment requirements through the use of an innovative strategy of blending flows from membrane bioreactor in this facility. A new outfall is proposed at this facility. • A new 84.2 Ml/d McLoughlin Point secondary treatment plant serving the Macaulay sewerage catchment for flows up to two times ADWF from the northwest trunk (Macaulay catchment) and from Clover Point, and primary treatment for flows up to four times ADWF. • Some expansion work of the existing Macaulay Point pump station linking to the Macaulay Point outfall. Treated effluent from the new McLoughlin treatment facility will be conveyed to the Macaulay Point pump station for discharge through the existing and new outfall at that location.
Clover Point Wet Weather Treatment Plant and Pumping Station	• A pump station at Clover Point that will pump two times the ADWF at this location to McLoughlin Point for secondary treatment. • Wet weather flows over two times ADWF up to four times ADWF will receive primary treatment at Clover Point. • Extreme wet weather flows over four times ADWF shall be screened and discharged.
Macaulay Point Pump Station	• Upgrade and expansion of Macaulay Point Pump station to transfer flows to the McLoughlin Point plant. • A new forcemain to transfer flows from Macaulay pump station to McLoughlin WWTP.
Biosolids Treatment Facility	A centralized biosolids facility will be implemented for the Combined Program. The current biosolids management plan (**BMP**) contemplates a centralized biosolids facility at the Hartland Landfill site. The plan includes a sludge conveyance pipe from the McLoughlin Point WWTP to the Hartland Landfill biosolids facility. (As noted elsewhere in this business case, an alternate biosolids processing and resource recovery facility site is still under consideration which may allow consolidation of some liquid treatment as well as solids treatment.) The CRD has conducted an extensive analysis of alternatives for the BMP. The current plan for the BMP is referred to as Option 1. The CRD's biosolids

<table>
<tr><td></td><td>facility will process the biosolids generated by primary and secondary treatment in a manner that will optimize opportunities for beneficial use by:
• using thermophilic anaerobic digestion to stabilize and reduce solids, kill pathogens and generate methane gas (biogas) for use onsite or offsite in the natural gas distribution system,
• drying all of the digested biosolids and selling it as a fuel for cement kilns, paper mills or other energy facilities; and / or
• Extraction of Struvite (phosphate) from dewatering centrate for use as fertilizer.

The biosolids facility will treat sludge to produce equivalent USEPA Class “A” standard. The BMP uses year 2030 as the design horizon. The table below shows the expected flows and loads for the CAWTP. The flows shown represent the dry weight per day of the estimated biosolids generation. These estimates are based on Option 1A system configuration with a population equivalent of 493,000 (342,000 population plus 151,000 population equivalent, industrial, commercial and institution). See Appendix 3 for details.

<table>
<tr><th>Item</th><th>Average Day (kg/day)</th><th>Peak day (kg/day)</th></tr>
<tr><td>Primary Solids</td><td>12,700</td><td>20,200</td></tr>
<tr><td>Secondary Solids</td><td>16,800</td><td>24,500</td></tr>
<tr><td>Total Raw Solids</td><td>29,400</td><td>44,700</td></tr>
<tr><td>Total Raw Volatile Solids</td><td>24,700</td><td>37,500</td></tr>
</table>
</td></tr>
<tr><td>Conveyance & Trunk Sewer Upgrades</td><td>• Upgrades to existing forcemain and Clover Point pump station
• Upgrades to the Macaulay outfall
• Conveyance works between Macaulay Point and McLoughlin Point
• Conveyance works between Clover Point and McLoughlin Point, including tunnel works.</td></tr>
<tr><td>Outfalls</td><td>Treated wastewater from the WWTPs will be discharged to the marine environment through existing outfalls. New outfall will be constructed for the new Saanich East WWTP. Some upgrade work on the outfalls is necessary, including twinning of the existing major marine outfall at Macaulay Point.</td></tr>
<tr><td>Resource Recovery & Sustainability Initiatives</td><td>• Generation of methane gas at the biosolids facility for use onsite or offsite in the natural gas distribution system.
• Biosolids digesters shall have a 10% increase in capacity to allow acceptance of fats, oil and greases and/or preprocessed food waste to enhance production of biomethane by up to 50%.
• Will recover waste heat from the digesters to pre-heat sludge feed (reducing heat required by digesters).
• Reuse of digested biosolids for sale as fuel for cement kilns, paper mills, or other energy facilities, Extraction of Struvite (phosphate) from biosolids for use as fertilizer.</td></tr>
</table>

	• Implement of heat pumps and exchangers to recover heat form effluent for supplemental building and digester heat. Opportunities to expand the system for future district heating systems will be included. • Capability for secondary effluent reuse will be provided if feasible and if there is a market for the water.
Operations	• CRD shall ensure ongoing operations of the facilities (including the possibility of contracting with third party providers for certain services).

B.4.1 SUMMARY OF WEST SHORE PROGRAM

The CRD is working with the West Shore communities of Colwood and Langford to establish a plan for the implementation of wastewater management systems in those areas. The current plan includes the following facilities for the West Shore Program:

Major West Shore Components	CRD Commitments
Wastewater Treatment Facilities	• A 14 Ml/d West Shore secondary treatment capacity plant in the Juan de Fuca area for liquid-only flows up to two times ADWF from the northwest trunk, and primary treatment for flows up to four times ADWF.
Biosolids Facility	• The current plan with a WWTP on the West Shore in the Juan de Fuca area assumes biosolids are reintroduced into downstream piping for removal and treatment at the Core Area centralized biosolids facility at Hartland landfill site.
Conveyance & Trunk Sewer Upgrades	• Conveyance works between West Shore and the WWTP. • Onshore conveyance from WWTP to the outfall location.
Outfall	• A new outfall extending from West Shore WWTP shoreline to southern marine discharge.
Resource Recovery & Sustainability Initiatives	• Resource recovery components of West Shore Program expected to include heat recovery from effluent for building heat. Opportunities to expand the system to include future district heating systems and water reuse in purple pipes for new development.

B.4.2 EFFLUENT QUALITY TARGET COMMITMENTS

The Combined Program will move the Core Area and West Shore communities into compliance with Federal and Provincial effluent regulations, and will bring the CRD in-line with the goals of the Canadian Council of Ministers of the Environment (**CCME**) *Canada-wide Strategy for the Management of Municipal Wastewater Effluent*. The Combined Program will also reduce the number of SSOs each year in the region, and provide secondary wastewater treatment for 91% of this community's 299,000 residents (a majority of the remaining +/-9% of residents use septic systems which will be phased out over time).

As noted in **Table B1** the vast majority of daily wastewater flows are below two-times ADWF levels. The CRD commits to treating all flows up to two-times ADWF to at least Federal and Provincial

standards as described in **Table B2** below. Flows above two-times ADWF will be treated as described below.

Table B1: Statistical Flow Data from Clover Point Pump Station
(per CRD 2009)

Flow Range	2006	2007	2008
Number of days flow did not exceed 2xADWF	345	349	362
Number of days flow was between 2xADWF and 4xADWF	20	16	3
Number of days flow exceeded 4xADWF	0	0	0
TOTAL	365	365	365

Table B2: Level of Treatment

Flow Rate	Level of Treatment
Up to 2 x ADWF	**Secondary Treatment**[5] Treatment levels to satisfy both Federal and Provincial standards: Provincial Standards: cBOD5 not to exceed 45 mg/L TSS not to exceed 45 mg/L Federal Standards: cBOD5 monthly average of 25 mg/l TSS monthly average of 25 mg/l Total Residual Chlorine (TRC) – maximum of 0.02 mg/L based on periodic average (or applicable provincial license requirements, whichever is more stringent) Note the CRD Combined Program does not include the use of chlorine for disinfection at this time and thus the TRC limitation will not apply.
2 x ADWF – 4 x ADWF (tributary)	**Primary Treatment** cBOD5 not to exceed 130 mg/L TSS not to exceed 130 mg/L
>4 ADWF (tributary)	**Screened Preliminary Treatment** Flows over 4 x ADWF are screened Flows under 4 x ADWF are treated as described above

[5] These Provincial "never to exceed" treatment levels are generally considered to be equivalent to the Federal CCME regulations requiring "monthly averages not to exceed" cBOD5 25 mg/L and TSS 25 mg/L.

pH	All effluent shall be within the range of 6 to 9 pH
Biosolids	The biosolids shall be treated to a Class "A" level.

B.4.3 INFLOW AND INFILTRATION PLANS

"Inflow & Infiltration" or "I&I" refers to water that enters the sanitary sewer system from direct stormwater connection (inflow) or indirectly through the land (infiltration), or both. I&I is a significant issue for the CRD. Appendix 14 includes a review of the CRD's I&I challenges and the impact of peak capacity planning requirements during winter months. Storm water occasionally results in wastewater volumes over 200% of average daily rates during wet weather months, and peaking by as much as 400% has been experienced in the past. As noted above, if CRD implements aggressive residential water conservation programs then wastewater volumes could be reduced by 7% to 15%. It is not anticipated that I&I reduction would significantly impact the size of the wastewater treatment facilities as the total organic load that would have been treated by the secondary treatment system would be the same.

The goal of the CRD I&I program is to comply with the requirements of the Municipal Sewage Regulation (**MSR**) by developing and implementing a strategy aimed at reducing the amount of rainwater and groundwater entering the core area's sanitary sewer system from both the publicly owned and privately owned parts of the system in order to reduce the frequency and magnitude of overflows from the system.

I&I Commitments

The CRD and participating municipalities commit to the following actions to reduce I&I sufficiently to reduce maximum daily wet weather flows to less than four times the average dry weather flow by 2030:

1. Continue flow monitoring in each municipality to further refine priority areas for remediation.
2. Develop, by the end of 2011, comprehensive inflow and infiltration management plans for the Core Area that will:
    a. identify and evaluate options and opportunities that promote the minimization of groundwater and rainwater inflow and infiltration into municipal sanitary sewer systems, including inflow and infiltration originating from service laterals (private and public sections of sewer connections)
    b. identify needed changes to legislation and legal authority to enable options and strategies
    c. identify opportunities for the inspection of private sewers connected to municipal sewers:
        i) as part of the municipal process in evaluating and issuing renovation and building permits for serviced properties; and/or
        ii) at the time of property transfer; and/or
        iii) targeted inspections
    d. require the repair or replacement of private sewers that have cross-connections between storm sewers and sanitary sewer or are identified as being in poor condition.
3. Update, by the end of 2011, and enforce sewer use bylaws to prohibit the construction of rainwater and groundwater connections to sanitary sewers.

4. Implement the overflow reduction plans contained in the sanitary sewer overflow management plan, which was submitted to the Ministry of Environment in June 2008.

The CRD has a number of challenges when planning long-term design capacities for treatment facilities including possible variances in I&I, changes in water conservation, and changes in rainfall due to climate change. CRD initiatives to manage I&I and peak flows in the region include:

- Encouraging client municipalities to invest at least 1% of the conveyance system value into I&I reduction
- Addition of a wet weather facility at Clover Point to manage peak flows
- Exploring other opportunities to manage I&I by conveying additional flows to the central treatment plant at McLoughlin Point and by incorporating storage tanks in to the conveyance to attenuate flows during peak flow periods

B.5 RESOURCE RECOVERY INITIATIVES

The CRD has conducted extensive due diligence, planning and analysis into resource recovery in recent years. This research is fully documented in CRD's online archive and summarizes below.

Table B3: Resource Recovery Research Conducted by CRD

Area of Interest	Discussion Paper
Energy from Organics	Biosolids Management / Organic Residuals Energy Resource Recovery - 031-DP-3 Biosolids / Organics Residuals Strategy Evaluation 031-DP-9
Wastewater Heat Energy	Feasibility Study for Heat Recovery for James Bay and Downtown Victoria, January 2010 (see Appendix 21) Heat Recovery - 031-DP-6
Water Reuse	Effluent Reuse and Heat Recovery for the University of Victoria and Surrounding Area, January 2010 (see Appendix 20) Water Reclamation and Re-Use - 031-DP-7
Nutrient Recovery	Phosphorus Recovery - 031-DP-5 Urine Separation - 031-DP-8
Other Niche Applications	Flow Energy Management and Pressure Energy Recovery - 031-DP-4
Greenhouse Gas Issues	Methodology to Assess GHG Management Performance - 032-DP-1

Resource Recovery Strategy Assessment	Identification and Evaluation of Resource Recovery Opportunities - 036-DP-1
Identification and Evaluation of Resource Recovery Opportunities	An exhaustive and detailed review of resource recovery opportunities within the region. See Appendix 19
Biosolids	Biosolids Management Plan, Stantec and Brown & Caldwell, November 2009 (Appendix 16)

B.5.1 RESOURCE RECOVERY INCLUDED IN THE PROGRAM

Based upon CRD research to date, the CRD has identified the following significant resource recovery opportunities that will be available as a result of Program implementation:

- Integration of digestion of fats, oils and greases (FOG) as well as other kitchen wastes and organics in the Energy Centre
- Dried biosolids for use as energy generation (e.g. cement kilns)
- Struvite recovery
- Water recovery from WWTPs
- Heat recovery from wastewater effluent for providing WWTP building heat, heating digesters and drying of biosolids.

The CRD has allocated capital costs to implement some of these opportunities in the Program budget (described below). Current plans assume an additional 10% capacity in the digestion facilities to receive the FOG and preprocessed kitchen and organic wastes. Garden and yard wastes are anticipated to continue to be composted at homes or at municipal or commercial facilities.

B.5.2 COST ESTIMATES OF RESOURCE RECOVERY COMPONENTS

The current Program budget includes the following financial commitments to be shared among the funding stakeholders. It is anticipated that further capital will be required to implement all aspects of resource recovery plans (joint venture arrangements may be one source of such investment as well as certain sustainability funding from the GOC and/or Province).

Location	Resource Recovery Works	Estimated Capital Costs
West Shore WWTP	Equipment for Heat Extraction and Heat Water Piping	$3,284,400
East Saanich	Equipment for Heat Extraction and Heat Water Piping	10,058,000
East Saanich	Estimated recalimed water equipment premium (estimated 15% premium for MBR included in curretn WWTP budget)	15,400,000
McLoughlin Point WWTP	Heat Water Piping & Equipment for Heat Extraction	13,241,900
University of Victoria and Royal Roads joint ventures	Joint ventures and possible centre of excellence in wastewater technologies. Funding plans to be agreed among parties.	0
Energy Centre	Struvite Recovery Facilities	6,182,400
Energy Centre	Biogas Facilities (gas scrubbing and associated costs osts included in Energy Centre budget)	9,638,000
Energy Centre	Cement Kiln Disposal works	TBD
Total Capital Costs		**$57,804,700**

*Note this table includes both direct costs for resource recovery (e.g. heat extraction equipment, as well as add-on costs that enhance resource recovery within a specific WWTP (e.g. the estimate of an extra 15% in cots for MBR in the Saanich East WWTP).

B.5.3 ADDITIONAL CRD RESOURCE RECOVERY COMMITMENTS

The CRD recognizes the opportunity to establish special "stand-alone" joint venture arrangements for resource recovery dimensions of the Combined Program. For example facilities for biomethane extraction, cleaning and upgrading to gas to network standards could be established as a special joint venture, a district heating loop could be established with the municipalities, developers in the northern section of downtown Victoria, or academic institutions in the region such as the University of Victoria or Royal Roads University. An arrangement could be established for the long-term disposal of digested biosolids residuals with a cement kiln operator as a substitute fuel source. The

CRD continues to investigate all of these options and reports are included in Appendices 20 and 21 which deal with water reclamation and heat recovery opportunities in the James Bay and University areas.

Such joint ventures may be funded separately from the overall program (possibly using different funding shares by the Province, GOC and CRD). The CRD will consider supporting these initiatives in the following ways:

a) structure the physical configuration of facilities at each location to enable third party partners (like gas network operators or district heating loop operators) to access the wastewater and Energy Centre facilities,
b) consider a limited financial contribution toward the capital cost of such operations as described below in the budget,
c) work with local academic institutions (University of Victoria and Royal Roads University) to establish a Centre of Excellence for research into sewage treatment technologies and resource recovery technologies (the CRD has already entered memorandums of understanding with these institutions to pursue such research),
d) work with the Province to validate the feasibility of resource recovery implementation opportunities by the end of 2010, and negotiate Letters of Understanding (LOUs) with prospective customers and partners in order to confirm the size, timing and location of markets for the resources to be recovered from wastewater, including a business plan for each facility, and cost-sharing arrangements with the Province, CRD, LOU partners and other stakeholders, for capital investments required to implement such LOUs, and
e) integrate an "alternative bid" process into its DB, DBO and/or DBFO procurement plans to allow innovative new technologies to be considered as part of the overall service delivery solution.

The CRD's LWMP Amendment No. 7 includes the following commitments (the "**RR Commitments**"):

a) By the end of 2010 CRD will prepare a comprehensive and detailed Resource Recovery and Use Plan for optimizing the management and processing of resources from wastewater, taking into account the approved system configuration, facility locations and currently available or probable markets for resources
b) By the end of 2011 CRD will complete Letters of Understanding with prospective customers and partners in order to confirm the size, timing and location of markets for the resources to be recovered from wastewater, including a business plan for each facility and cost-sharing arrangements with the Province, CRD, partner and other stakeholders, for capital investments required to implement such LOUs
c) By mid 2011 CRD will define the system configuration and facility designs to ensure system compatibility with currently available and probable markets for resources.

Recovery of Energy From Biosolids Plans

The CRD will, by the end of 2016:

a) provide thermophilic anaerobic digesters to produce biogas from sludge, reduce solids mass and provide pathogen destruction
b) provide some additional capacity in the digesters to accept clean food waste and/or fats, oils and greases (FOG) to enhance the production of biomethane
c) upgrade the biogas to high quality biomethane and inject it into the natural gas pipeline system
d) recover waste heat from the digesters to warm the raw sludge being fed to them, thereby reducing digester heating costs
e) thermally dry the digested biosolids to be used as a fuel for cement kilns, pulp mills or waste to energy facilities

Recovery of Heat from Effluent Plans

Based upon the outcome of economic analysis and RR Commitment (b) above, the CRD will:

a) use effluent source heat pumps to help heat the anaerobic digesters and treatment plant buildings using hot water loops
b) provide opportunities for heat recovery from effluent for:
   (i) existing developments that have compatible heating infrastructure; and/or
   (ii) new developments using district heating systems

Reclaimed Water Use Plans

Based upon the outcome of economic analysis and RR Commitment (b) above, the CRD will provide tertiary membrane filtration to produce reclaimed water to meet marketable water demands for customers.

Phosphorus Recovery Plans

The CRD will recover phosphorous fertilizer (via struvite crystallization) from anaerobic digester return streams.

Greenhouse Gas Reduction and Carbon Footprint Plans

The CRD will complete the wastewater treatment system in a manner that will result in its operation being carbon neutral, or better, due largely to the extensive utilization of wastewater resources, in particular biogas. The CRD is developing a region-wide GHG management strategy and is committed to the principle of achieving carbon neutrality. Note the CRD has signed the Local Communities Climate Action Charter which pledges communities to:

- Become carbon neutral.
- Measure and report on their community's greenhouse gas emissions profile.
- Work to create compact, more energy-efficient communities.

B.5.4 COMPARISON TO IRM RESOURCE RECOVERY

The CRD notes the work of the Integrated Resource Management Study Team and the *Resources from Waste* report of February 2008 (the "IRM Report"). The IRM Report includes recovery from both the solid and liquid waste streams (that is, household/industrial garbage combined with wastewater) and derived most of its revenue estimates from the solid waste stream. The IRM Report is therefore not directly comparable to the Combined Program. Notwithstanding the emphasis on solid waste in the IRM Report (and optimistic perspective on costs and revenues also included report), it did identify a number of potential resource recovery areas that have been further investigated by the CRD and its advisors. In particular the CRD notes the work conducted by Stantec Consulting Ltd. in the Biosolids Management Plan, Section 9 (see Appendix 16) and the resource recovery reports for the University of Victoria and James Bay area (Appendices 20 and 21 respectively).

The CRD remains confident that the due diligence investigations conducted over the last year by its advisors form a realistic basis for optimizing resource recovery components of the Combined Program. However, as noted above, the CRD wishes to work with the Province to validate the financial feasibility of plans before proceeding. Assessing such financial feasibility is beyond the scope of this business case, however it is notable that the Peer Review Team performed a preliminary assessment of such matters and concluded some of the plans have an unattractive financial return profile (see section 5, page 5-16 of the Peer Review Team report in Appendix 27).

B.6 SITE SELECTION

The CRD is composed of a large urban core area with growing suburban municipalities. Identification of land sites appropriate for wastewater treatment facilities and also acceptable to the public and First Nations has been a challenging endeavour for the CRD. Extensive studies of sites have been conducted over the last three years (available on the CRD library website www.wastewatermadeclear.com).

The current plan includes separate sites for each wastewater treatment facility (Saanich East, McLoughlin Point, Clover Point, and West Shore) as well as a separate site for the centralized biosolids facility. Investigation into alternative sites continues.

B.7 IMPLEMENTATION SCHEDULE

Appendix 4 includes a detailed schedule of permit approvals and construction timing. Current plans assume CRD receives funding approval in early 2010. Any delays in funding will result in delays in the overall schedule – funding is a critical path item.

The CRD is in a position to immediately commence implementation of the plan and complete the Program by 2016 based upon approval of funding from the Province and GOC by May 2010. This date is considered a critical milestone date to meet the completion of the program by the end of 2016. The preliminary Program schedule includes the following key milestones dates:

Milestone	Timing
Provincial approval of business case and memorandum of understanding (including key terms and conditions)	May 6, 2010
Federal approval-in-principle of Program and memorandum of understanding	May 20, 2010
Start detailed Program planning	May 21, 2010
Finalize Contribution Agreements with Province and Government of Canada	July 30, 2010
Finalize site selections (Saanich East, West Shore and Core Area facilities)	May 21, 2010
Complete Environmental Impact Study (Provincial)	June 2010
Complete Environmental Social Review (Provincial)	June 2010
Complete Canadian Environmental Assessment Agency (**CEAA**) work and approvals	June 2012
Commence procurement processes: - Saanich East WWTP - Biosolids Facility - Clover Point Wet Weather Facility - McLoughlin Point WWTP - West Shore WWTP - Conveyance system components - Outfalls	June 2010
Commence construction (earliest permits)	June 2011
Complete construction and commence operations	June 2016
Fully Operational	December 2016

B.8 SUMMARY OF COMBINED PROGRAM COSTS

The CRD's engineering advisors, Stantec Consulting Ltd., have prepared cost estimates[6] for the Combined Program. The cost estimates are deemed to be at the Class "C" level and will be clarified in coming months as due diligence continues on the Programs.

B.8.1 TOTAL COMBINED PROGRAM COSTS FOR EACH COMPONENT

This table provides a break-out of capital costs for each option and each major component of the Program. Costs typically differ for each component under each option for due to assumptions regarding efficiencies during construction under each approach. Details on the efficiencies assumed are documented later in the business case (see Section C).

Development Costs	Option A: Traditional	Option B: Hybrid			Option C: PPP	
	Traditional (Nominal)	Traditional (Nominal)	DB (Nominal)	PPP (Nominal)	Traditional (Nominal)	PPP (Nominal)
Conveyance, Pumping, Storage	51,867	51,913	-	-	51,914	-
West Shore	71,099	-	-	64,734	-	64,874
Saanich East	107,084	107,178	-	-	-	591,082
McLoughlin Point	234,126	-	200,088	-	-	Incl in "SE"
Clover Point	28,722	-	24,932	-	-	Incl in "SE"
Energy Ctr / Biosolids	243,553	-	-	238,893	-	Incl in "SE"
Resource Recovery (Biogas, Heat, Water, Struvite, Disposal)	29,764	29,790	-	-	-	Incl in "SE"
Outfalls & Tunnels	100,381	100,470	-	-	100,473	-
Land Purchase	13,512	13,512	-	-	13,512	-
Development Cost Sub-Total	***880,108***	***302,863***	***225,019***	***303,626***	***165,899***	***655,955***
Approvals and Construction Period Risk	61,702		50,156		50,175	
Total	**941,810**		**881,666**		**872,030**	
Difference (from Traditional)	*-%*		*(6.39%)*		*(7.41%)*	

Note: All cost estimates exclude HST/GST. These estimates are in nominal dollars and include an allowance for inflation during the build-out period to 2016.

[6] Note: The financial analysis included in this draft of the business case is based upon preliminary designs using "representative technologies" for treatment of wastewater.

B.8.2 ANNUAL OPERATING COSTS

This table summarizes the estimated annual operating costs that will be incurred by the CRD under each approach to procurement. Components procured using a PPP approach have been consolidated into a single amount paid to the proponent in Option C.

Annual Operating Costs	Option A: Traditional	Option B: Hybrid			Option C: PPP	
	Traditional (Real)	Traditional (Real)	DB (Real)	PPP (Real)	Traditional (Real)	PPP (Real)
Conveyance, Pumping, Storage	602	602	-	-	602	-
West Shore	1,920	-	-	1,708	-	1,728
Saanich East	2,542	2,542	-	-	-	15,601
McLoughlin Point	6,087	6,367	-	-	-	Incl in "SE"
Clover Point	970	969	-	-	-	Incl in "SE"
Energy Ctr / Biosolids	4,265	-	-	3,938	-	Incl in "SE"
Resource Recovery (Biogas, Heat, Water, Struvite, Disposal)	2,363	2,363	-	-	-	Incl in "SE"
Outfalls	268	268	-	-	268	-
Tunnels	64	64	-	-	64	-
Revenue Offset	(1,012)	(1,012)	-	-	(1,012)	-
Operations Insurance	600	325	-	275	-	600
SPV Costs	-	-	-	1,000	-	1,000
Operating Cost Sub-Total	***18,668***	***12,487***	***-***	***6,921***	***(78)***	***18,929***
Operating Period Risk	538	455	-	115	251	100
Total	**19,206**		**19,979**		**19,201**	
Difference (from Traditional)	*-%*		*4.02%*		*(0.02%)*	

All amounts are expressed as of December 31, 2009. CRD is assumed to receive resource recovery revenues.

B.8.3 MAJOR CAPITAL REPAIRS AND REPLACEMENT

At this stage of Program development, detailed analysis into major capital repairs and replacement differences under each option has not been conducted. This analysis assumes a basic reserve of 1.1% of capital costs is used under each option (plus a minor adjustment for replacement of membrane bioreactors for MBR WWTPs). The risk analysis reflects a small difference between options related to long-term capital repairs risks.

Major Capital Repair Profile by Option	Description of Major Capital Work Under This Option
Option A: Traditional	Analysis will be developed as Program due diligence continues.
Option B: Hybrid	Same as above.
Option C: PPP	Same as above.

B.8.4 ASSUMED FUNDING SOURCES / SUPPORT

This table illustrates how funding from each level of government is allocated to the componts of the Program by procurement contracting approach. CRD and Federal government contributions toward DBFO components are advanced during construction and are not assumed to be financed using private sector funding. Only the Province's one-third share of contributions toward PPP components of the Program are assumed to be funded using private sector debt.

Funding Sources	Option A: Traditional (Nominal)	Option B: Hybrid (Nominal)	Option C: PPP (Nominal)
DBB Components			
CRD Funding	322,945	126,681	81,033
Provincial Funding	309,433	113,169	67,521
Federal Funding	309,433	113,169	67,521
DB Components			
CRD Funding	-	75,006	-
Provincial Funding	-	75,006	-
Federal Funding	-	75,006	-
PPP Components			
CRD Funding	-	101,209	218,652
Provincial Funding	-	101,209	218,652
Federal Funding	-	101,209	218,652
Totals			
CRD Funding	322,945	302,897	299,685
Provincial / PPP Funding	309,433	289,385	286,173
Federal Funding	309,433	289,385	286,173
Total	**941,810**	**881,666**	**872,030**

Note the CRD typically contributes slightly more to the Program capital costs than the Province and Federal governments because the CRD is responsible for 100% of the cost of land and interim financing (plus other "Ineligible Costs" that are incurred during implementation).

B.8.5 ANNUAL CASH REQUIREMENTS DURING CONSTRUCTION PHASE FOR EACH OPTION

	Total	31-Dec-09	30-Jun-10	31-Dec-10	30-Jun-11	31-Dec-11	30-Jun-12	31-Dec-12	30-Jun-13	31-Dec-13	30-Jun-14	31-Dec-14	30-Jun-15	31-Dec-15	30-Jun-16
Traditional															
Conveyance, Pumping, Storage	51,867	-	-	1,704	1,704	2,856	6,843	20,986	15,810	1,963	-	-	-	-	-
West Shore	71,099	-	-	2,371	2,371	2,371	400	400	4,036	14,020	26,107	11,918	5,612	1,492	-
Saanich East	107,084	-	2,754	5,507	9,270	22,082	40,285	23,269	3,918	-	-	-	-	-	-
McLoughlin Point	234,126	-	2,717	5,434	5,434	5,434	5,434	4,689	16,923	25,576	37,688	53,262	35,958	23,845	11,732
Clover Point	28,722	-	671	1,342	745	148	148	148	148	148	148	3,831	14,233	7,015	-
Energy Ctr / Biosolids	243,553	-	3,251	6,503	6,503	6,503	15,617	22,086	47,287	63,488	47,287	20,286	4,743	-	-
Outfalls & Tunnels	100,381	-	-	4,418	4,418	6,588	31,757	47,708	5,492	-	-	-	-	-	-
Resource Recovery (Biogas, Heat, Water, Struvite, Disposal)	29,764	-	397	795	795	795	1,908	2,699	5,779	7,759	5,779	2,479	580	-	-
Land Purchase	13,512	6,512	3,000	-	4,000	-	-	-	-	-	-	-	-	-	-
Retained Approvals and Construction Period Risk	61,702	13,264	547	1,569	1,746	2,614	5,723	6,818	5,555	6,313	6,540	5,130	3,417	1,808	656
Total	941,810	19,776	13,337	29,642	36,984	49,390	108,115	128,803	104,949	119,267	123,549	96,906	64,542	34,161	12,388
Hybrid															
Conveyance, Pumping, Storage	51,913	-	821	1,643	4,204	5,738	11,603	17,550	7,383	2,970	-	-	-	-	-
West Shore	64,734	-	943	1,886	1,886	1,886	348	348	3,658	12,748	23,753	10,835	5,093	1,351	-
Saanich East	107,178	-	2,756	5,512	9,278	22,101	40,321	23,289	3,921	-	-	-	-	-	-
McLoughlin Point	200,088	-	1,986	3,971	3,971	3,971	3,971	7,033	14,463	21,857	32,209	45,519	30,730	20,378	10,027
Clover Point	24,932	-	-	726	726	726	430	134	134	134	134	3,331	12,360	6,095	-
Energy Ctr / Biosolids	238,893	-	2,142	4,284	4,284	4,284	4,284	8,230	21,004	32,073	56,792	56,792	32,073	12,651	-
Outfalls & Tunnels	100,470	-	1,733	3,467	5,912	26,179	49,782	13,396	-	-	-	-	-	-	-
Resource Recovery (Biogas, Heat, Water, Struvite, Disposal)	29,790	-	267	534	534	534	534	1,026	2,619	4,000	7,082	7,082	4,000	1,578	-
Land Purchase	13,512	6,512	3,000	-	4,000	-	-	-	-	-	-	-	-	-	-
Retained Approvals and Construction Period Risk	29,821	12,076	261	547	850	2,044	3,679	2,154	984	999	1,360	1,930	1,625	968	346
Transferred Approvals and Construction Period Risk	20,335	-	207	413	413	413	310	574	1,652	3,002	5,394	4,529	2,489	938	-
Total	881,666	18,588	14,116	22,984	36,059	67,878	115,263	73,735	55,817	77,784	126,725	130,017	88,370	43,958	10,372
PPP															
PPP (East Saanich, McLoughlin Point, Clover Point, Energy Ctr / Biosolids, Resource Recovery)	591,082	-	5,350	10,700	10,700	10,700	10,700	22,131	55,406	73,739	100,809	140,127	80,821	50,240	19,659
Conveyance, Pumping, Storage	51,914	-	489	978	978	978	978	2,241	12,713	25,835	6,725	-	-	-	-
West Shore	64,874	-	560	1,119	1,119	1,119	1,119	1,119	4,436	13,161	23,804	10,858	5,104	1,353	-
Outfalls & Tunnels	100,473	-	993	1,986	1,986	1,986	1,986	7,340	57,992	26,206	-	-	-	-	-
Land Purchase	13,512	6,512	3,000	-	4,000	-	-	-	-	-	-	-	-	-	-
Retained Approvals and Construction Period Risk	24,906	17,018	77	153	153	153	153	496	3,660	2,694	348	-	-	-	-
Transferred Approvals and Construction Period Risk	25,270	-	228	455	455	455	455	896	2,305	3,348	4,801	5,816	3,310	1,988	757
Total	872,030	23,530	10,696	15,391	19,391	15,391	15,391	34,223	136,513	144,982	136,487	156,802	89,235	53,581	20,416

B.8.6 COST ESTIMATES WILL BE UPDATED AS DUE DILIGENCE CONTINUES

The CRD's engineering advisors continue due diligence on the Combined Program and will update budgets as new information is integrated into the plan.

The following issues may have a material impact on the cost estimates for the Combined Program:

- Delays in the funding approvals process.
- Delays resulting from the environmental approvals process (Provincial and Federal).
- Delays resulting from rezoning of the sites and public consultation.
- Site acquisition negotiations (if new sites are pursued).
- Detailed geotechnical and environmental investigations of the proposed sites,
- Material changes to the scope of the Combined Program or the procurement process.

B.8.7 BRIEF SUMMARY OF CONTINGENCIES AND ALLOWANCES

Current cost estimates are deemed to be at the "Class C" level. The Program remains in the planning stages of preliminary design. The contingencies carried are consistent with industry practice at this stage of the project. As more detailed work is completed, sites are finalized, and more information becomes available a risk adjusted contingency will be completed. Thus, the current budget estimates include contingencies for all retained risks. Where possible some of these allowances have been adjusted for various procurement methods.

The following provides a high-level summary of various allowances and contingencies currently included in the cost estimate.

The Construction Contingency addresses changes during the course of construction and takes into account the expected degree of difficulty to be encountered on site. The Construction Contingency is intended to deal with issues as they arise after the award of the construction contract(s), but not for any changes in the scope of the project. As described in the risk section, this contingency has been divided into three components: (i) a general contingency, (ii) a contingency for quantified retained risks, and (iii) a contingency for quantified transferred risks. Appendix 9 includes a detailed review of these amounts.

Design allowance will be consumed during the design stage and will reduce as the design proceeds and will directly correspond to an increase in accuracy and detail of design information.

Other factors influencing the contingency range include: the complexity of construction; lack of detailed site information (high degree of uncertainty of quantity of environmental remediation on the McLoughlin Point contaminated site); risks related to new potential sites under review (high degree of uncertainty as to the extent of mitigative measures); risks related to permitting and approvals process (federal and provincial environmental).

The CRD's engineering advisors, Stantec Consulting Ltd. have provided estimates for Program Management, Administration and Miscellaneous costs are percentages of direct costs based on historical experience - taking into account program size, complexity, duration and other factors. Items that are included under the Administrative and Miscellaneous heading include (but not limited to): project wrap-up liability insurance during construction, bonding,

development charges, permit fees, site offices/trailers (set-up and operating), communication and public awareness/consultation programs, appraisal fees, miscellaneous municipal levies and charges, reimbursable expenses, etc.

B.8.8 INTEGRATION OF RISK ANALYSIS INTO CONTINGENCIES

As described later in this document, the project team conducted a detailed review of risks facing the CRD during implementation. Certain risks were identified and quantified, and then included in the overall analysis. An allowance was also added to the budget of each option to account for unidentified general risks. As described in Appendix 9 of this report, the construction contingency included in the Stantec budgets was replaced by a general contingency to account for unknown/unidentified risks.

C PROCUREMENT OPTIONS ANALYSIS

This section of the business case analyzes various procurement methodologies for the major components of Option 1A using financial, non-financial, risk analysis plus market sounding feedback. This section also reviews the level of specificity required in procurement documents to achieve the Program's goals and objectives (for example specified technical solution for design-build components at each site versus allowing more flexibility, or using alternative technologies on some sites).

C.1 PROCUREMENT OBJECTIVES

The CRD has the following objectives for its procurement:

- Protect public health and the environment within the timelines specified by the Ministry of the Environment
- Implement plans in a sustainable manner (both environmentally and financially)
- Provide cost-effective wastewater management
- Accommodate future growth through a flexible, distributed system (requiring a flexible financial plan)
- Consider wastewater a resource (and adopt procurement strategies that accommodate resource recovery and technological innovation)
- Achieve good value for money for ratepayers
- Maximize competition among service providers by implementing a fair, transparent competitive bid process based upon a realistic and well-defined risk transfer plan

C.2 MARKET SOUNDING SUMMARY

Appendix 26 includes a detailed overview of the responses to the Stakeholder and Market Sounding process conducted for the Program by the CRD in early 2008. While the financial conclusions (including bonding/surety issues) were pre-credit crisis and thus are no longer applicable to the Program, the non-financing aspects of the market sounding process remain valid and have been used to guide the implementation plans of the Program.

C.3 BUNDLING / PHASING OF PROJECT COMPONENTS

The CRD has significant flexibility in the types of procurement approaches it uses for the major components of the Program. Each of the major components can feasibly be delivered using a variety of procurement methodologies – from traditional design-bid-build to public-private partnership. Given the risk profile, overall scale, and specialized technical requirements of certain components of the Program, a variety of contracting strategies are anticipated for successful implementation. There is no one-size-fits-all approach to delivery of wastewater infrastructure. Virtually every type of procurement methodology has been successfully used for delivery of wastewater projects across North America. This was confirmed during the market sounding and stakeholder consultation process conducted by the CRD and its advisors (April 2008).

The table below breaks out the Program into its major components. Some of the major components have a unique risk profile, technical requirement or other characteristic allowing for stand-alone procurement (e.g. tunnel and outfalls). Other major components can be

feasibly packaged together for bulk procurement at the discretion of the CRD (e.g. wastewater treatment facilities).

C.3.1 MAJOR COMPONENT BUNDLING

Program Major Component	Description
A. Conveyance system, pumping stations and storage facilities	The CRD currently operates the conveyance and pumping infrastructure for the main trunk lines within the region. CRD will continue to operate and maintain the new conveyance, pumping and storage facilities. New facilities will be procured in a conventional design bid build procurement. It is anticipated that pumping, conveyance and storage facilities will be procured in separate contracts because each type of work requires specialized contractors with different skill sets.
B. Wastewater treatment plants (liquids only)	The Core Area Program includes two main wastewater treatment facilities at Saanich East and McLoughlin Point, with a third pumping station and limited wet weather primary treatment facility at Clover Point. The existing Macaulay Point pumping station must be closely integrated into these wastewater treatment plants ("WWTP"). The West Shore Program includes one WWTP. Each of the WWTPs could be procured separately or all the WWTPs could be bundled together as a single procurement. The McLoughlin Point WWTP and Clover Point Wet Weather facility could be bundled as one procurement package to allow for innovation in allowing proponents to provide proposals that address the interconnection of these two faculties.
C. Energy Centre / Biosolids Facility	The Energy Centre could be procured separately or as part of a bundled procurement with the WWTP facilities. Based upon feedback received during the market sounding process, it would be desirable to have the main Core Area WWTP facility and biosolids facility operated by a single entity because the operation of these processes must be carefully coordinated.
D. Specialized construction work (Outfalls and Tunnel)	The outfalls and tunnel in the Program require specialized engineering and building expertise and thus the CRD has determined that they should be procured separately to "de-risk" the other major work packages and also foster competition among the small number of specialized firms that can provide these services.
E. Resource recovery which includes the following	The key factor in determining packaging and procurement options is the level of assumed integration with each WWTP and the Energy Centre. Resource recovery that can be physically separated from the WWTPs can be procured more flexibly than components that are

	integrated directly into the WWTP treatment process. The major resource recovery opportunities are anticipated to be as follows: • Biogas from Energy Centre digesters • Collection of fats, oils and greases (FOG) as well as other kitchen wastes and organics for inclusion in the digestion process • Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns) • Struvite recovery • Water recovery from WWTPs • Heat recovery from wastewater effluent • Energy usage in heating district • Other (e.g. energy from digested biosolids used on-site for heat generation) See the table below for details on the bundling of each resource recovery component.
F. Special agreements with BC Hydro, University of Victoria and Terasen gas etc.	The CRD will review these special opportunities on a case-by-case basis and determine if direct negotiations and arrangements should be established between the CRD and each possible partner. Business arrangements for such opportunities will be reviewed as the Program moves forward. Under such special arrangements, the CRD will require any third party wastewater/service provider seeking to partner with such organizations to do so (i) on a non-exclusive basis, (ii) to inform CRD of all discussions related to work on the Program, and (iii) to provide CRD with the right, but not the obligation, to be a joint signatory to any agreement relating to the CRD Program.
G. Long-term plans to manage inflow and infiltration	Given complexity and overlapping jurisdiction issues of I&I, the CRD anticipates that I&I will continue to be managed by each client municipality within the CRD.
H. Demand Management and Source Control Programs	The CRD manages a variety of source control and demand management programs to control contaminants entering the wastewater system and also manage water consumption during summer dry months. All such programs shall remain controlled and managed by CRD.

C.3.2 RESOURCE RECOVERY BUNDLING ASSUMPTIONS

Component	Bundling with Other Major Component(s)
Biogas from Energy Centre digesters	Can be structured as stand-alone procurement arrangement with clarification of interfaces with Energy Centre operator (if different from biogas service provider). Interface issues to be managed related to access to digesters, quality and quantity of biogas generated by digesters, etc. During the market sounding process Terasen indicated an interest in providing such a stand-alone biogas arrangement. There are also likely other parties who would be interested in purchasing biogas from the Energy Centre. These could include fleet vehicle operators and new developments or industry in close proximity of the Energy Centre.
FOG and Organics Collection	Current collections in the region are provided by private sector firms and the CRD is currently reviewing potential options. It is anticipated that the Energy Centre operator (or CRD) would receive a tipping fee for accepting such preprocessed organic and kitchen wastes.
Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns)	This component can be structured as a stand-alone arrangement between the Energy Centre operator (the CRD or other party) and the end-user of the biosolids (e.g. cement kiln operators). Alternative innovative applications could be considered during the procurement phase through use of an "alternative bid" process under a Design-Build or DBFO procurement approach.
Struvite recovery	Preliminary investigations suggest at least one party may be interested in providing this service on a stand-alone basis.
Water recovery from WWTP's	The membrane bioreactor (MBR) technology currently contemplated for water recovery is fully integrated into the WWTP. Thus separation of this service from general WWTP operations would be challenging. If implemented, water recovery is anticipated to be the responsibility of the WWTP operator with users being charged on a consumption basis. A separate water delivery contractual arrangement and sales program could be implemented by the CRD if desired to pre-sell and distribute such water to the end-user.
Heat recovery from wastewater effluent	Heat recovery may be used on-site for buildings and digestion heat. Such uses are clearly integrated into WWTP and Energy Centre operations. Heat recovery could be implemented as an option within a WWTP proposal as an add-on alternative bid.

Energy usage in heating district	Generation of energy for use in a heating district could be structured as an extension of the WWTPs or Energy Centre. The CRD would provide access to treated effluent for heat recovery (within the lot lines of each WWTP) to a potential third party partner. A service provider would be responsible for implementation of the heating district outside the lot lines of each WWTP – including piping ambient or hot water to users and, where necessary, retrofitting buildings or integrating into new buildings. The CRD anticipates such arrangements could be structured as stand-alone agreements, possibly as an allowed "alternative bid" during the procurement process if a DB, DBO or DBFO approach to procurement is used. These opportunities would be subject to ensuring sufficient demand or market is available for this heat. Note, retrofitting existing buildings for heating district integration may be economically challenging. New developments offer more attractive opportunities for heating district integration.

C.3.3 PROCUREMENT OPTIONS

Appendix 22 includes a detailed review of the process the CRD followed to define the procurement options reviewed in this business case. Given the complexity of the Program and large number of major components, a variety of possible procurement approaches are available. The CRD selected a short-list of three procurement packaging plans as "representative procurement options" for detailed analysis. The CRD wishes to review these plans and the associated implementation schedule with funding stakeholders prior to moving forward to ensure key stakeholder funding/timing needs are satisfied.

The CRD wanted to review the value for money attributes of a traditional approach to procurement of the Program. This approach is referred to as "**Option A: Traditional**" in this business case. Option A assumes all components of the Program are procured using design-bid-build or construction management at risk.

For analysis purposes, the CRD also wished to establish an intermediate option that included a variety of procurement methodologies based upon the attributes of each component and other factors documented in Appendix 22. This led to the inclusion of **Option B: Hybrid Approach**. This option combines DBFO, design-build and traditional forms of procurement. As noted in Appendix 22, the CRD includes a procurement option focused on public-private partnership (**PPP**) delivery to comply with Capital Asset Management[7] policy 5.3. This PPP Option is described below as "**Option C: PPP Procurement**".

CRD required that all options analyzed in this business case assume the conveyance system is to be procured using a traditional approach and operated by CRD staff.

[7] The Provincial capital planning policy requires a review of alternative procurement options in any business case seeking funding over $50-million from the Province of British Columbia. These requirements are documented here:
http://www.fin.gov.bc.ca/ocg/fmb/manuals/CPM/05_Capital_Asset_Mgmt.htm

C.3.4 PROCUREMENT OPTIONS FOR EACH MAJOR PROGRAM COMPONENT

Procurement Packages	Procurement Option A "Traditional"	Procurement Option B "Hybrid"	Procurement Option C "PPP/DBFO" or DBO
A. Conveyance System - trunk conveyance - pumping stations - storage facilities - monitoring & control	Design-Bid-Build CRD operates and maintains	Design-Bid-Build CRD operates and maintains	Design-Bid-Build CRD operates and maintains
B1. West Shore WWTP	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Stand-alone DBFO	Stand-alone DBFO
B2. Saanich East WWTP	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Construction Management at Risk CRD operates and maintains	Bundled DBFO package including: Saanich East WWTP McLoughlin Point WWTP Clover Point WWTP Energy Centre/Biosolids Facility Resource Recovery (as described below)
B3. McLoughlin Point WWTP	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Design-Build CRD operates and maintains	
B4. Clover Point WWTP	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Design-Build CRD operates and maintains	
C. Energy Ctr. / Biosolids Ctr.	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Stand-alone DBFO	
D1. Outfalls	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains
D2. Tunnels	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains

*CMAR approach typically requires potentially expensive performance and labour/materials bonding with limited risk transfer and thus traditional design, bid, build may be used.

E. Resource Recovery	Biogas from Energy Centre digesters	Stand-alone DBFO for gas upgrading and sales to distribution network.	Biogas from Energy Centre digesters	Stand-alone DBFO for gas upgrading and sales to distribution network.	Biogas from Energy Centre digesters	Part of DBFO contract.
	FOG and Organics Collection	CRD outsources collection under rolling contract.	FOG and Organics Collection	CRD outsources collection under rolling contract.	FOG and Organics Collection	Responsibility for collections transferred to DBFO service provider.
	Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns)	Cement kiln sales CRD negotiates and manages	Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns)	Cement kiln sales CRD negotiates and manages	Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns)	Part of DBFO contract. Assumes cement kiln, no land uses.
	Struvite recovery	Stand-alone DBFO	Struvite recovery	Stand-alone DBFO	Struvite recovery	Part of DBFO contract.
	Water recovery from WWTPs	CRD builds, manages, operates	Water recovery from WWTPs	CRD builds, manages, operates	Water recovery from WWTPs	Part of DBFO contract.
	Heat recovery from wastewater effluent	Used on-site at WWTPs to heat buildings	Heat recovery from wastewater effluent	Used on-site at WWTPs to heat buildings	Heat recovery from wastewater effluent	Part of DBFO contract. Assume used on-site at WWTPs to heat buildings
	Energy usage in heating district	CRD WWTPs function as "platform enablers" for possible separate DBFO for heating loop.	Energy usage in heating district	CRD WWTPs function as "platform enablers" for possible separate DBFO for heating loop.	Energy usage in heating district	Optional part of DBFO contract. No heating district assumed implemented in current analysis.
	Other	No additional resource recovery currently included in analysis.	Other	CRD to consider limited "alternative bid" proposals for other resource recovery at Biosolids/Energy Centre as well as WWTPs built as	Other	CRD to consider limited "alternative bid" proposals for other resource recovery during procurement. No additional resource recovery currently

Resource Recovery ....continued		design-build during procurement. No additional resource recovery currently included in analysis. Same as Traditional Approach except for more flexible "alternative bid" process in procurement implementation.	included in analysis. For analysis purposes, similar resource recovery assumptions have been used in the DBFO option, however all such applications are assumed to be rolled under the large DBFO contract. An "alternative bid" process will also be used to allow further flexibility in resource recovery under this option.
F. Special Agreements (for example, such parties may include one or more of the following: BC Hydro, Terasen Gas, UVic, Royal Roads etc.)	CRD negotiates special off-take agreements directly with each party.	CRD negotiates special off-take agreements directly with each party.	CRD enters tri-partite negotiations with DBFO service provider and each special party.
G. Inflow & Infiltration Management	CRD and Client Municipalities to coordinate maintenance and repairs over long-term.	CRD and Client Municipalities to coordinate maintenance and repairs over long-term.	CRD and Client Municipalities to coordinate maintenance and repairs over long-term.

C.4 PROCUREMENT DOCUMENT SPECIFICITY ON TECHNICAL MATTERS

The market sounding process conducted by the CRD identified large number of technical due diligence materials required for a successful procurement process (see Appendix 26, section 17 for details). Key technical requirements in procurement documents include (i) design capacity flows and loads to be specified by the CRD, (ii) confirmation of wastewater characteristics, (iii) permits and approvals requirements (including First Nations and Department of National Defense requirements), and (iv) specific sustainability targets for energy consumption, resource recovery and carbon emissions.

The CRD has adopted an alternative bid process to facilitate flexibility and innovation during the procurement phase for components procured using a DB, DBO and DBFO approach. This will facilitate new proposals outside plans currently included in Options 1A. This will be particularly important for fostering innovation with resource recovery.

For DB procurements, the CRD anticipates specifying no more than 25% to 30% of required design drawings. This will allow bidders to innovate while ensuring CRD minimum operational and quality requirements are satisfied.

The CRD will enforce strict requirements for architectural requirements, possibly establishing an "architectural allowance and design guidelines" in bid documents.

The CRD will secure sites anticipated to be used for the treatment facilities in advance of the procurement process. Any winning bidder will be provided with access to such sites under a licensing arrangement.

The CRD may consider alternative site and configuration proposals, however such proposals will be scrutinized to ensure feasibility, timely permit approval targets, and public consultation. Due to the potential for excessive delays for approving new sites, the CRD anticipates new site proposals during the procurement process will be challenging to integrate into the Program. Delays may result from any of the following issues: (i) confirmation the alternative site will be owned by the CRD, (ii) confirmation of availability of all required permits (including federal CEAA process, provincial EIS and LWMP amendments, local zoning permits, accessibility etc.), (iii) confirmation of the acceptance of the surrounding community, (iv) confirmation of the feasibility of outfall and conveyance system integration (including possible permit updates), and (v) confirmation of other criteria important to the CRD. For alternative site proposals acceptable to the CRD which also appear to have a reasonable probability of expedient permit approvals and community acceptance, the CRD will provide support to obtain required permits on a reasonable commercial efforts basis.

C.5 ALTERNATIVE BID PROCESS

The CRD will use an alternative bid process which will allow respondents for each procurement process to propose new innovative solutions as an alternate to the base case bid. These options must meet the capacity planning objectives of the CRD as well as the overall project objectives set by the CALWMC. The CRD will consider such proposals in the procurement of the following components:

- Saanich East WWTP for heating district loop with University of Victoria and other possible resource recovery innovations including energy generation
- McLoughlin Point WWTP for heating district loop with downtown users
- Energy Centre for biomethane cleaning and upgrading
- West Shore for all aspects of resource recovery.

C.6 RISK ASSESSMENT

The fundamental principle underlying value for money analysis is optimal allocation of risk between the public and private sectors. The foundation for risk allocation is based on the premise that the party which is best able to manage any given risk should assume that risk. The CRD held a number of workshops to identify risks and determine which could best be managed by a proponent versus the CRD. The project team also estimated the value of major risks identified during the workshop process. These risk estimates were integrated into the project budgets for each procurement option and are reflected in this analysis. Details of the risk analysis and workshops are included in Appendix 9.

Participants in the risk workshops included the following:

Management & Operations	Procurement	Financial
CRD Dwayne Kalynchuk Tony Brcic Larisa Hutchinson Dan Telford Seamus McDonnell Jack Hull Malcolm Cowley Stantec Bob Dawson Robert Campbell Other Wolf Keller Dave Robertson	Stantec Dave Walker Reno Fiorante Gilbert Cote Other Jonathan Huggett Sue Fimrite* Brian Simons	CRD Diana Lokken E&Y Tim Philpotts Gary Morrison Terence Chow Catherine Peacock Matt Dugaro

Note: Sue Fimrite participated to discuss Partnerships BC "best practices" for risk analysis for part of one of the risk workshops.

C.6.1 RISK ALLOCATION BASED UPON TYPICAL CONTRACT CHARACTERISTICS

Importantly, at this stage the assessment of risk allocation is based upon intrinsic/characteristic attributes typically observed for each type of procurement method under review. The final risk profile of the Program will not be known until completion of the procurement phase and finalization of all Program-related legal agreements with third-party service providers.

Typical Risk Profile of Each Procurement Methodology

The risk profile of the Program is directly related to the procurement approach and legal contracting structured established for each major component. Generally speaking, DBFO approaches to procurement transfer more risk to the private sector party, while traditional approaches to procurement tend to retain risks which the CRD must therefore manage. The table below summarizes how risks are typically allocated based upon the contracting structure between the CRD and service providers.

Regardless of contracting structure and delivery method chosen, the CRD will still face a number of risks associated with implementation of the Program. The CRD recognizes these risks and will implement a risk management plan to manage such risks as it moves forward with plans. The CRD anticipates it must manage the following risks regardless of procurement methodology – all are anticipated to be retained by the CRD:

1. Site selection for WWTPs and Energy Centre
2. Rezoning of various sites by each municipality
3. Funding delays by senior levels of government
4. Changes in scope of Program at request of the CRD or public
5. Approval timing by CALWM Committee during procurement phase
6. Discharge Permit Liability – the CRD remains ultimately liable under the Discharge Permit, the private operator is responsible for the contractual service levels
7. Force Majeure – natural hazard events that have catastrophic impacts, which are outside the control of either contractual party
8. Operating performance requirements - establishing appropriate contractual service levels for operations and maintenance of the facilities
9. Regulation – future changes in applicable regulations

Risk Allocations Typically Intrinsic to Each Approach to Procurement

	CMAR or DBB Methodologies			Design-Build Methodology			DBFO / DBO Methodologies		
	Higher Level of Transfer	Higher Level of Retention	Shared	Higher Level of Transfer	Higher Level of Retention	Shared	Higher Level of Transfer	Higher Level of Retention	Shared
Contract Negotiations – lack of clarity in specifications / documents and overall negotiations between the CRD and service providers			✓			✓			✓
Design –flaws in final design		✓		✓ *Note 1*			✓		
Construction – general risk during construction phase		✓		✓			✓		
Geotechnical Risk - associated with the plant site		✓				✓			✓
Process Technology – effectiveness of the technology chosen for treatment of wastewater		✓		✓ *Note 2*			✓		
Integration risk of conveyance system and WWTPs		✓			✓				✓ *Note 3*
Integration risk of WWTPs and Energy Centre system and WWTPs		✓			✓				✓ *Note 4*

Operating - general operations associated with the WWTP		✓			✓		✓		
Maintenance – long-term lifecycle maintenance risks for major equipment failure		✓			✓ *Note 5*		✓		
Resource Recovery – revenues lower than expected, or costs higher than expected		✓			✓		✓		
Resource Recovery – technology risks		✓			✓		✓		

Risk Notes:

1. The level of risk transfer under design-build will depend upon the detail specified in procurement documents. If designs are largely completed (drawings over 30-50% level) then the CRD will be exposed to design risk since much of the designs are largely specified to bidders. If documents include a lower level of specification then such design risks are more effectively transferred to the bidders.

2. As with the design comment above, if the CRD includes specific technologies in its procurement documents as a specified solution then the CRD will effectively retain the risk of such technology failures. Bidders would then take responsibility for installation under the DB approach.

3. Since the CRD will build and manage the conveyance system along with associated pumping stations and storage facilities, it is anticipated that the CRD will establish an arrangement whereby it commits to providing volumes of wastewater within a defined range to each WWTP. Bidders will therefore have clarity over the assumed design capacity requirements and operating performance expectations. If volumes fall outside of such range then the CRD may incur punitive costs. This issue is particularly important for the CRD since I&I is a significant problem and leads to frequent peak-flows of highly dilute water. A biological treatment process could be "washed out" in such circumstances of the flows are extreme. The CRD would be obligated to manage flows within the agreed range to avoid such under-performance.

4. In the Hybrid option, the current operators of the WWTPs and the Energy Centre are different. While most operating performance risks could be transferred to private operators, the CRD is anticipated to remain responsible for ensuring interfaces among WWTP and Energy Centre are managed and disputes resolved. For

example, in the case of a WWTP managed by the CRD or a third party private operator and the Energy Centre managed by the third party operator, there remains room for disputes about sludge chemistry and volume which must be captured in the various procurement documents. Since the CRD is responsible for stitching such procurement documentation together, there is room for the CRD to retain some risks in this area.

5. Typical design-build contracts include a warranty for 1-2 years after commissioning. Thus, the CRD would be exposed to operating risks and lifecycle maintenance risks after expiry of the warranty period.

C.6.2 RISK QUANTIFICATION

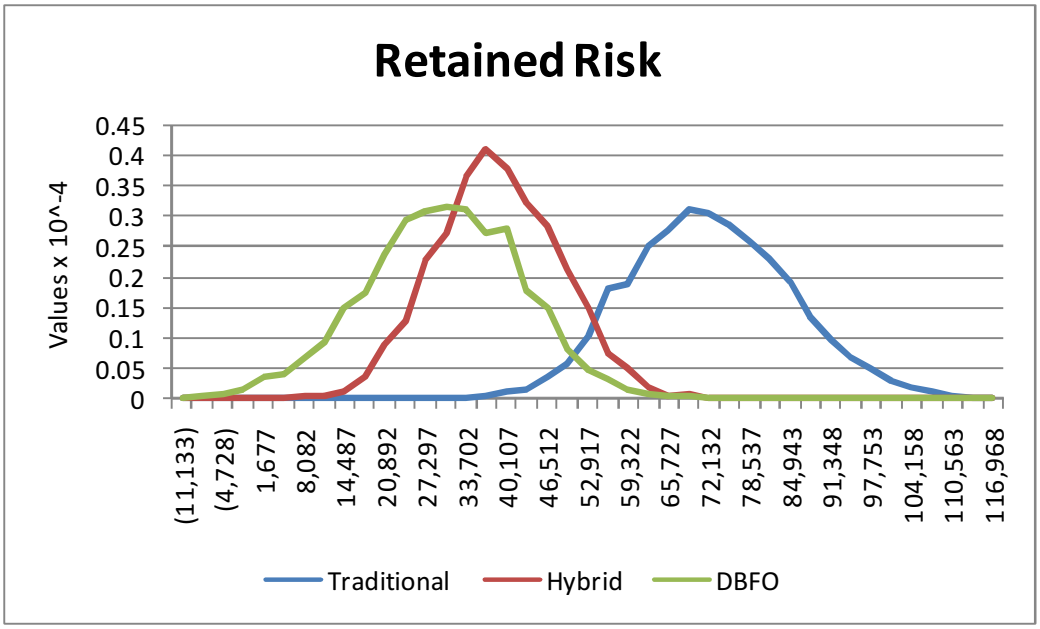
As part of the risk workshop the participants quantified the risks on an individual basis. This quantification involved the participants estimating both the estimated likelihood (probability of the risk event occurring) and impact of the risks (using a best, most likely and worst case analysis) based on their collective experience and judgment of the events under the different procurement options. The risk quantification information was the quantified using a stochastic modeling program ("@Risk").

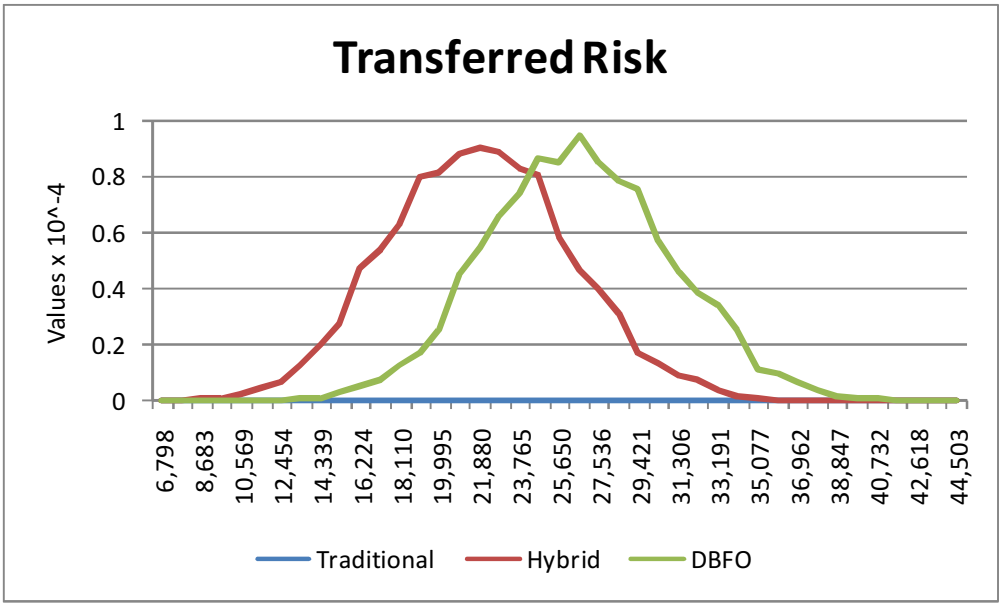
The table below summarizes the outcome of the risk analysis and quantification process to date. It illustrates the risk transfer typically achieved through the contracting structures used in each option (amounts in $000).

C.6.2.1 CONSTRUCTION RISKS

	TRADITIONAL	HYBRID	DBFO
Quantified Construction Risk			
Retained "**Project Reserve**"	61,702,082	29,821,107	24,905,864
Transferred Risk (at cost of transfer)	-	20,335,201	25,269,535
Total Quantified Construction Risks (nominal dollars)	61,702,082	50,156,308	50,175,399

This following charts illustrates the expected probability distribution of retained and transferred risks based upon the input of the project team on the best case/worst case outcomes of impacts. Note the Traditional Option retains all risks for CRD to manage. The DBFO Option transfers more risks to the proponent to manage.





C.6.2.2 CONSTRUCTION CONTINGENCIES & ADJUSTED GENERAL CONTINGENCY

The above construction risks were combined with a adjusted general contingency to account for unknown/unidentified risks. These new amounts replaced the existing contingencies estimated by Stantec in the budgets for the analysis in this business case and calculation of value for money of options.

	TRADITIONAL	HYBRID	DBFO
Quantified Construction Risk			
Retained "**Project Reserve**"	61,702,082	29,821,107	24,905,864
Transferred Risk (at cost of transfer)	-	20,335,201	25,269,535
Total Quantified Construction Risks (nominal dollars)	61,702,082	50,156,308	50,175,399
Adjusted General Contingency			
Original amount in budget	27,042,218	32,843,692	31,824,601
Adjusted General Contingency (consistent pricing err	7,753,139	-	636,433
Sub-Total Adjusted General Contingency	34,795,357	32,843,692	32,461,034
CONSTRUCTION CONTINGENCY	**96,497,439**	**83,000,000**	**82,636,433**

C.6.2.3 OPERATING PERIOD RISKS

	TRADITIONAL	HYBRID	DBFO
Quantified Operations Phase Risks (total over lifecycle)			
Retained	10,588,995	8,957,683	4,944,832
Transferred	-	1,631,311	1,411,041
Total Operations Phase Risks	10,588,995	10,588,995	6,355,873

These risks were integrated into the budget of each option. See Appendix 9 for details on risk calculations and how each risk has been integrated into the analysis.

C.7 FINANCIAL ASSESSMENT

The CRD and project team have conducted a preliminary review[8] of efficiencies during construction, operations and long-term maintenance phases of the Program for each type of procurement option under consideration. The results of this analysis are summarized below.

C.7.1 EFFICIENCIES DURING CONSTRUCTION PHASE

The following potential[9] savings were identified for the WWTP components of the Combined Program (no savings applied to the conveyance or outfalls/tunnels).

Cost Items	Traditional Option	DB Delivery Option	PPP/DBFO Delivery Option
Engineering Allowance [1]	N/A (budget currently assumed allowance of 15% of Direct Costs)	Estimated 4% of Direct Costs savings (thus budget assumes **Engineering Allowance of 11% of Direct Costs**)	Estimated 3% of Direct Costs savings (thus budget assumes **Engineering Allowance of 12% of Direct Costs**)
Administration & Program Mgt Allowance[1]	N/A (budget currently assumed allowance of 6% of Direct Costs)	Estimated 1% of Direct Costs savings (thus budget assumes Administration Allowance of 5% of Direct Costs)	Estimated 1% of Direct Costs savings (thus budget assumes Administration Allowance of 5% of Direct Costs)
Savings on Process Equipment	N/A	2% of Equipment Costs	2% of Equipment Costs
Savings on Project Efficiencies and Innovation	N/A	3% of Construction Costs	4% of Construction Costs
Discount for One Large DBFO [2]	N/A	N/A	1% of Construction Costs

Notes:
1 Engineering, program management and administration costs are adjusted to reflect efficiencies in various procurement methods.
2 Efficiencies due to single contract execution.

Source: Stantec Consulting Ltd.

[8] Note: The financial analysis included in this draft of the business case is based upon preliminary designs using "representative technologies" for treatment of wastewater. When updated, these items could have a material impact on the overall costs and financial analysis contained in the business case.

[9] Note these estimates are hypothetical at this stage of Program design and planning. Actual efficiency savings may be greater than or less than the estimates here.

C.7.1.1 EFFICIENCIES DURING OPERATIONS PHASE

Some efficiencies were identified under a DBFO approach to procurement for labour and management services. Note the actual wage rates of staff and management was assumed to be the same in all options analyzed. Savings were derived from assumptions regarding fewer plant managers and staff at each location.

Note the following estimates are based upon typical public sector staffing levels for the Traditional Option. The CRD anticipates that if the Program is operated by CRD staff then the actual number of people may vary from these estimates since operation of the program would be integrated into the existing operations and management structure (thus fewer new staff would be required). The CRD continues to review such integration opportunities and overlap areas.

Assumed Savings by Service Delivery Method[10]

WWTP Facility	Traditional Option		Hybrid Option		PPP Option	
	Management & Staff Level	Annual Cost (incl. benefits)	Management & Staff Level	Annual Cost (incl. benefits)	Management & Staff Level	Annual Cost (incl. benefits)
Saanich East	8	$690,000	8	$690,000	5	420,000
Clover Point	4	280,000	4	280,000	3	230,000
McLoughlin Pt.	14	1,160,000	14	1,160,000	11	910,000
West Shore	7	610,000	5	420,000	5	420,000
Energy Centre	8	650,000	5	360,000	5	360,000
	41	**$3,390,000**	**36**	**$2,910,000**	**29**	**$2,340,000**
		Estimated Savings:		*$480,000*		*$1,050,000*
		Savings as % of Total Operating Costs:		*2.7%*		*5.8%*

Source: Stantec Consulting Ltd.

No savings in chemicals or power consumption have been included at this stage as it is assumed that all delivery methods would have qualified operators who would be capable of optimization of processes to minimize consumption.

The staff levels have been benchmarked with similar sized facilities in Western Canada including the City of Saskatoon.

C.7.1.2 EFFICIENCIES DURING LIFECYCLE MAINTENANCE PHASE

No efficiencies in major capital repairs and replacement have been quantified or assumed at this stage.

[10] Note these estimates are hypothetical at this stage of Program design and planning. Actual efficiency savings may be greater than or less than the estimates here. The project team assumes the same general level of service will be achieved across all options, despite the differences in staff levels listed above.

C.7.2 VALUE FOR MONEY ASSESSMENT

The Province typically evaluates funding proposals for projects using a value for money (**VFM**) approach that takes into consideration the whole life costs of a project. Such whole life costs include:

- Capital (construction) costs
- Operating costs over the life of the project
- Major capital repairs and replacement costs over the life of the project
- Adjustments to the above for specific risks during each stage
- Adjustments for corporate taxes paid by private sector firms referred to as "competitive neutrality" (such corporate taxes would not be generated if the operations were managed by the public sector)

These amounts are evaluated over the long-term and discounted to the present day to allow an overall financial assessment using an appropriate discount rate (described below). The goal of such analysis is to provide executive decision makers with as complete information as possible when evaluating projects, plus to ensure the analysis is based upon a foundation of good financial practices and norms.

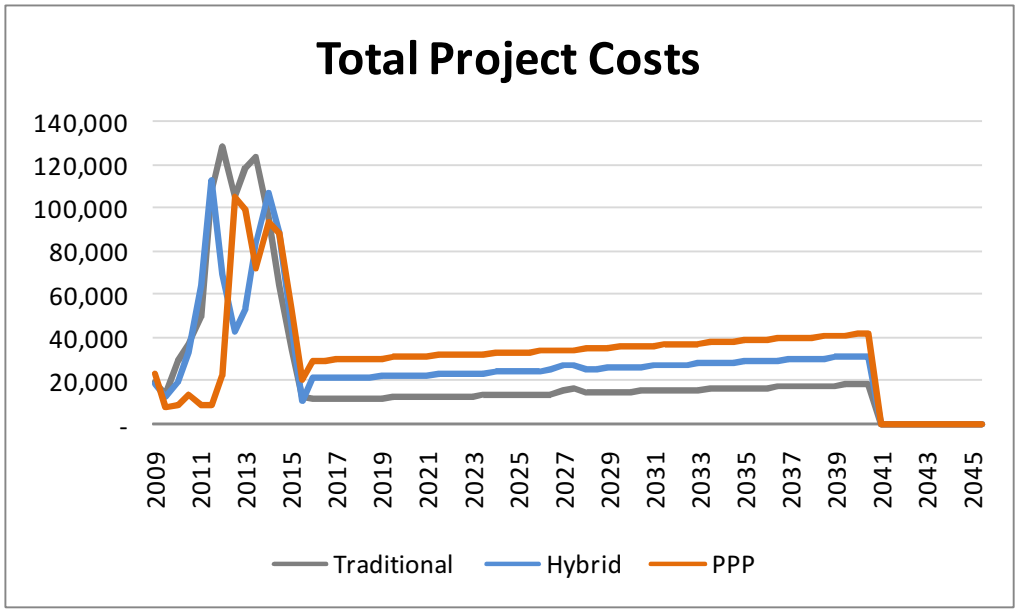
The following tables summarize the VFM estimates for each procurement option. These estimates also include efficiencies achieved during construction and operations for some options.

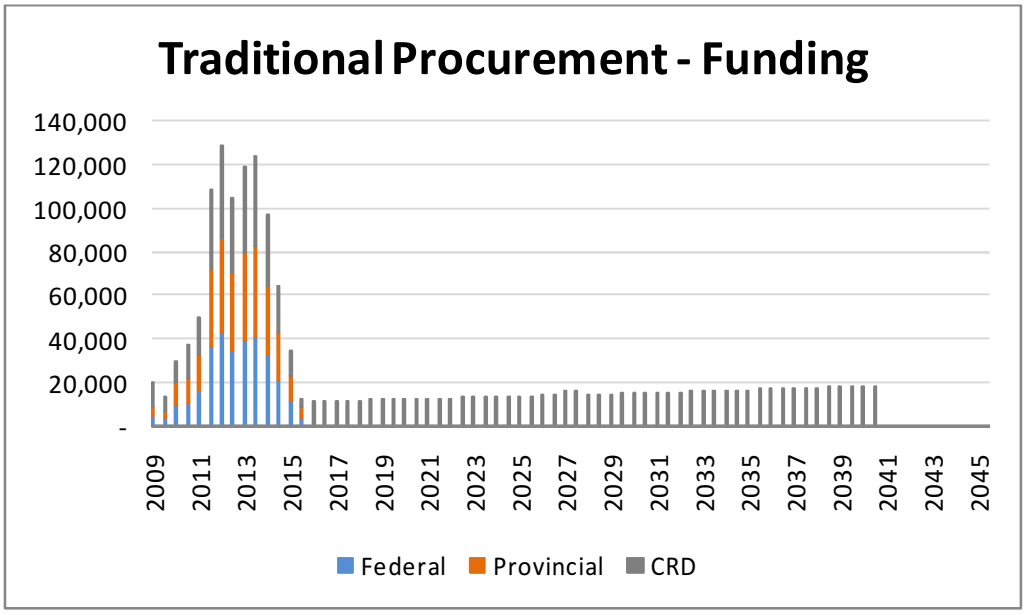
Value for Money Summary	Traditional *(PV)*	Hybrid *(PV)*	PPP *(PV)*
Construction costs for Traditional components of Program	667,234	402,004	118,311
Federal & CRD advances to DBFO components (during construction)	-	145,949	311,497
Land purchases	12,996	12,996	12,996
Provincial ASP principal & interest payments on capital costs	-	144,047	281,742
Retained Approvals and Construction Period Risk	50,559	25,945	23,142
TOTAL PV Capital portion of costs	730,789	730,940	747,688
Operations and Maintenance Costs			
CRD O&M net of resource recovery	188,395	128,649	4,175
CRD ASP components for operations and maintenance	n/a	69,341	188,369
CRD membrane replacement	973	924	-
Other Retained Costs	5,905	3,198	-
Total Operations & maintenance costs	195,273	202,113	192,544
Total Competitive Neutrality	3,649	1,730	-
TOTAL NET PRESENT COST	**929,712**	**934,783**	**940,232**

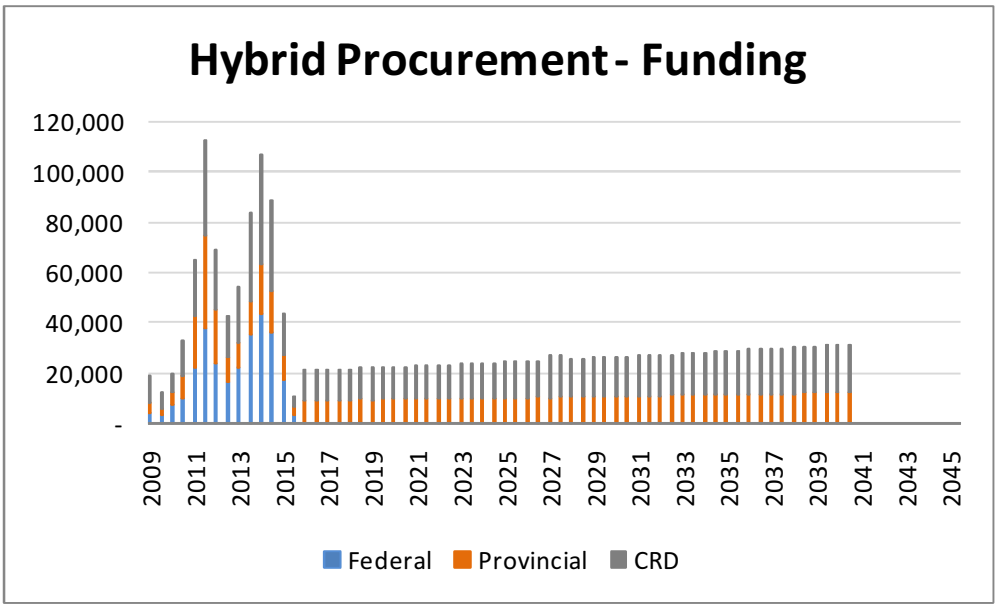
The above table is based upon the capital costs, operating costs, major repair/maintenance assumptions as described in section B of this business case as well as the financing assumptions described below. Appendix 6 includes further details on this estimate.

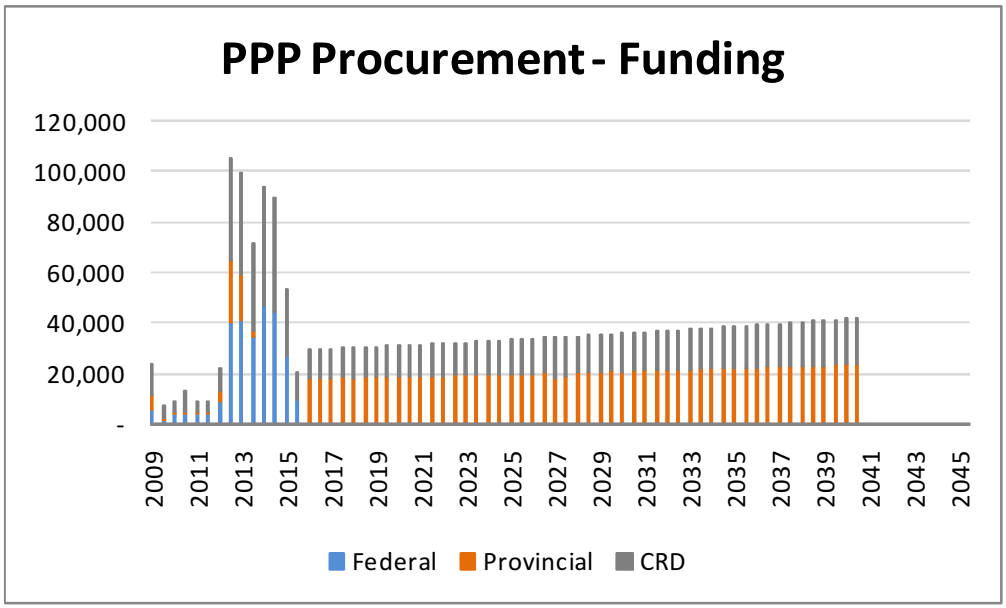
C.7.3 WHOLE LIFE COSTS OF EACH APPROACH TO PROGRAM DELIVERY

Appendices 33, 34 and 35 include annual cash flow projections for each option considered over the full life of the Program. The following charts reflect graphical illustrations of the same data.






Hybrid Procurement - Funding
120,000
100,000
80,000
60,000
40,000
20,000
-
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
2037
2039
2041
2043
2045
Federal
Provincial
CRD


PPP Procurement - Funding
120,000
100,000
80,000
60,000
40,000
20,000
-
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
2037
2039
2041
2043
2045
Federal
Provincial
CRD

C.7.4 TERMINAL VALUE OF FACILITIES

The analysis assumes all facilities under each procurement option are maintained to a similar level and quality during the analysis period (25 years of operations) and thus the terminal value of such facilities is comparable for each option. Thus no adjustment for differing terminal values has been made in this analysis.

This analysis also assumes 1.1% of the capital costs of each option is set aside each year for major capital repairs and replacement. The above charts include this "flat-line" approach to capital expenditures (actual expenditures on capital repairs will vary from year to year).

C.7.5 SUMMARY OF KEY FINANCIAL ASSUMPTIONS

PPP Assumptions

Cost Data	Hybrid	PPP
Development Costs	4,500	6,500
Due Diligence Costs	3,500	3,500
Annual SPV Operating Costs	1,000	1,000
Debt		
Type	Bond	Bond
Tenor		
Gearing Ratio	88.00%	88.00%
Arrangement fee	300	300
Base rate	410	410
Margin	300	300
Total	710	710
Repayment profile	Sculpted	Sculpted
Minimum DSCR	1.20x	1.20x
Equity		
Return	12%	12%
Funded by Sub-debt	66.7%	66.7%
Funded by Equity	33.3%	33.3%

Note: For comparison purposes, the CRD would likely interest of +/-5.19% its portion of long-term debt if borrowed by the BC Municipal finance Authority.

C.7.6 SENSITIVITY ANALYSIS

A number of sensitivity analysis scenarios have been investigated in this business case. The table below summarizes the impact of changes to interest rates, operating costs and construction inflation. The impact is measured against the VFM for each option.

Note changes in interest rates have a significant impact on the PPP and Hybrid options. Changes in construction inflation impact all options significantly.

Impact on VFM as Each of the Following Change:	Traditional *VFM (PV)*	Hybrid *VFM (PV)*	PPP *VFM (PV)*
Base Case	929,712	934,783	940,232
PPP Senior Debt Interest Rate +100bp	930,535	962,616	993,863
PPP Senior Debt Interest Rate -100bp	928,994	911,514	895,407
Operating Costs +1%	931,645	936,799	942,190
Operating Costs -1%	927,778	932,767	938,274
Construction Inflation +1%	961,467	966,050	972,535
Construction Inflation -1%	897,790	903,234	907,250
Efficiency incease 10m (for PPP and Hybrid)	929,667	926,688	931,908
Efficiency decrease 10m (for PPP and Hybrid)	929,722	942,805	948,417
Inflation (Construction + Operations) +1%	998,158	1,005,299	1,010,695
Inflation (Construction + Operations) -1%	867,532	871,011	876,461

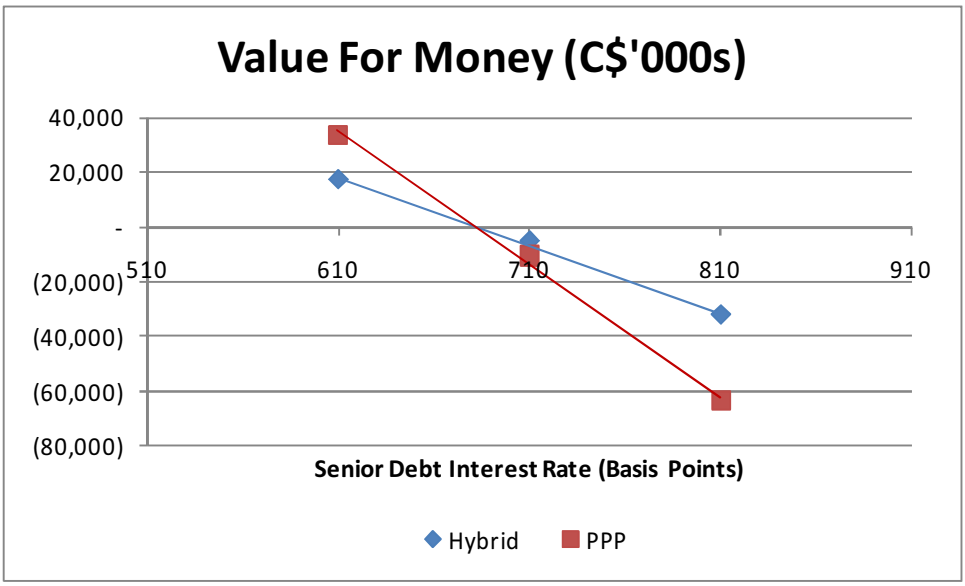
Percentage Change in VFM	Traditional *VFM (% from Base Case)*	Hybrid *VFM (% from Base Case)*	PPP *VFM (% from Base Case)*
Base Case	-%	-%	-%
PPP Senior Debt Interest Rate +100bp	0.09%	2.98%	5.70%
PPP Senior Debt Interest Rate -100bp	(0.08%)	(2.49%)	(4.77%)
Operating Costs +1%	0.21%	0.22%	0.21%
Operating Costs -1%	(0.21%)	(0.22%)	(0.21%)
Construction Inflation +1%	3.42%	3.34%	3.44%
Construction Inflation -1%	(3.43%)	(3.37%)	(3.51%)
Efficiency incease 10m (for PPP and Hybrid)	(0.00%)	(0.87%)	(0.89%)
Efficiency decrease 10m (for PPP and Hybrid)	0.00%	0.86%	0.87%
Inflation (Construction + Operations) +1%	7.36%	7.54%	7.49%
Inflation (Construction + Operations) -1%	(6.69%)	(6.82%)	(6.78%)

Percentage Change Relative to Traditional	Traditional *VFM (% from Traditional)*	Hybrid *VFM (% from Traditional)*	PPP *VFM (% from Traditional)*
Base Case	-%	0.55%	1.13%
PPP Senior Debt Interest Rate +100bp	-%	3.45%	6.81%
PPP Senior Debt Interest Rate -100bp	-%	(1.88%)	(3.62%)
Operating Costs +1%	-%	0.55%	1.13%
Operating Costs -1%	-%	0.54%	1.13%
Construction Inflation +1%	-%	0.48%	1.15%
Construction Inflation -1%	-%	0.61%	1.05%
Efficiency incease 10m (for PPP and Hybrid)	-%	(0.32%)	0.24%
Efficiency decrease 10m (for PPP and Hybrid)	-%	1.41%	2.01%
Inflation (Construction + Operations) +1%	-%	0.72%	1.26%
Inflation (Construction + Operations) -1%	-%	0.40%	1.03%

C.7.7 SELECTED SENSITIVITY CHARTS

The following charts illustrate the sensitivity impact on value for money when certain parameters are changed. Each change is measured relative to the change in the Traditional Option (and not the absolute change in the VFM amount).

C.7.7.1 SENSITIVITY TO SENIOR DEBT INTEREST RATE CHANGES

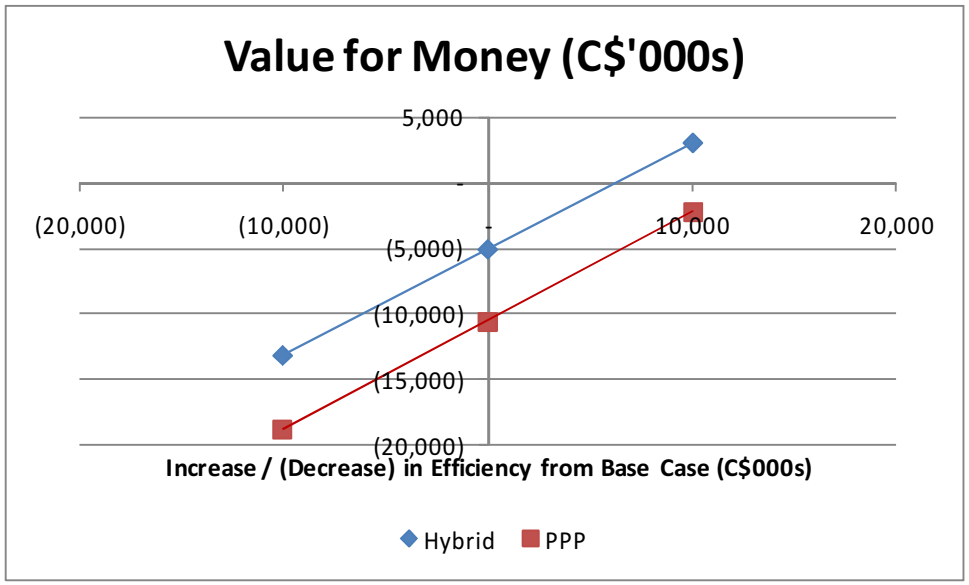


An interest rate of approximately 6.88% would result in the options having a similar net present cost (the "interest rate break-even point").

For each 100 basis point (1%) increase in interest rates the net present cost of the PPP Option increases by an additional $52.8-million relative to the Traditional Option, and thus the PPP Option becomes a total of $63.3-million more expensive than the Traditional Option on an net present cost basis. The impact is smaller for the Hybrid Option because it uses less debt. For each 100 basis point increase there is a $27.0-million increase in net present cost relative to the Traditional Option.

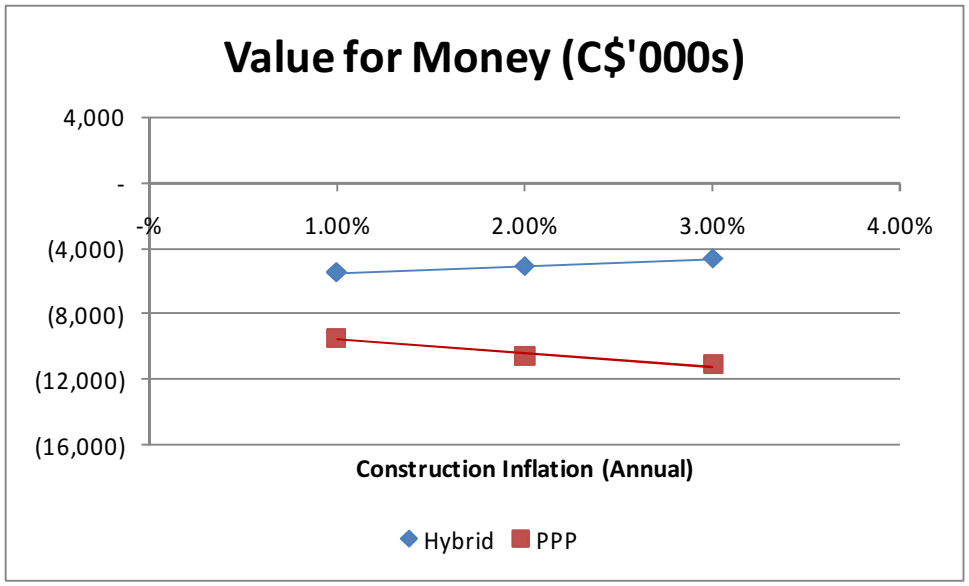
Decreases in interest rate would give the Hybrid and PPP Options a lower net present cost than the Traditional Option at a comparable rate.

C.7.7.2 SENSITIVITY TO EFFICIENCY CHANGES



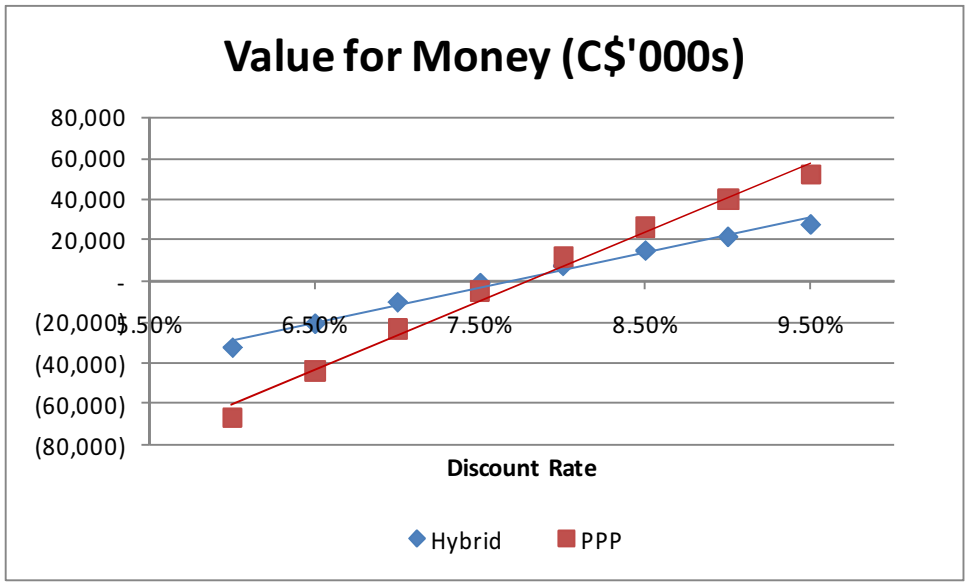
An additional efficiency saving during construction of $6.3-milion would result in the Hybrid Option having a VFM equal to the Traditional Option. The PPP Option would require an additional efficiency increase of approximately $12.7-million to break-even with the Traditional Option.

C.7.7.3 SENSITIVITY TO CONSTRUCTION INFLATION



Changes to construction inflation impact all options, thus the slope of these sensitivity lines is relatively flat since the Traditional Option changes at a comparable rate as the other options.

C.7.7.4 SENSITIVITY TO DISCOUNT RATE CHANGES



This chart illustrates how discount rate changes impact VFM relative to the overall VFM of the Traditional Option. A discount rate of approximately 7.81% results in all procurement options having the same value for money amount (the "break-even" point).

Discount Rate	Traditional	Hybrid	PPP
6.000%	1,020,399	1,057,351	1,092,879
6.500%	988,052	1,013,185	1,037,659
7.000%	957,894	972,445	986,930
7.500%	929,712	934,783	940,232
8.000%	903,314	899,893	897,161
8.500%	878,533	867,503	857,358
9.000%	855,220	837,372	820,505
9.500%	833,242	809,285	786,320
Break even discount rate (Traditional vs. PPP)	7.81%		

C.7.8 DISCOUNT RATE

The primary discount rate used in this analysis is **7.50%.** This rate has been selected to meet provincial expectations[11] as an estimate of the average long term project internal rate of return ("**Project IRR**") for a public sector wastewater procurement similar to the Combined Program.

The CRD has evaluated the project using a broad range of discount rates as illustrated above. The CRD believes a lower discount rate may be more appropriate for the evaluation of this

[11] Provincial expectations for business case analysis are documented in the Partnerships BC publication "*Methodology for Quantitative Procurement Options Analysis*" January 2010.

project, however for the purposes of this provincial submission in support of funding of over $300-million the CRD includes analysis based upon provincial expectations.

C.7.9 CONSTRUCTION INFLATION

Current construction budgets assume an average annual inflation rate during the development period of approximately 2% per annum (2010 to 2016) for direct and indirect costs. Current construction cost inflation in British Columbia has been estimated[12] as high as 3-4% after 2011, however the project team concluded the current inflation allowance and inflation contingency are sufficient. Such rates will vary and depend upon competition at time of tender or procurement offering. Inflation is a significant risk for the project due to the extended build-out period.

C.7.10 OPERATING COST INFLATION

Operating costs for treatment facilities are assumed to increase at 2% per annum.

C.7.11 RESOURCE RECOVERY REVENUES

For analysis purposes, all options assume the same level of resource recovery. Furthermore, all revenues are assumed to flow to the benefit of the CRD (note DBFO options would be managed by the proponent and revenues in excess of current plans could be retained by the proponent as a performance incentive).

[12] per BTY Group *Market Intelligence* update, 2009/2010.

C.8 MULTIPLE CRITERIA ANALYSIS

The CRD conducted an investigation into qualitative issues important to Program implementation using a multiple-criteria assessment (**MCA**) approach. This MCA review was conducted via a workshop attended by the people identified below along with follow-up discussion and review of workshop results with the project team. The goal of such MCA consultations is to gather the "collective wisdom" of the participants on Program issues and consolidate such knowledge into a framework for assessment of the three procurement options. The tables on following pages summarize the results of process.

Workshop Attendance

Management & Operations	Procurement	Financial
CRD Dwayne Kalynchuk Tony Brcic Larisa Hutchinson Dan Telford Seamus McDonnell Jack Hull Stantec Bob Dawson Gilbert Cote	Stantec Dave Walker Reno Fiorante Other Jonathan Huggett	CRD Diana Lokken E&Y Gary Morrison Catherine Peacock Tim Philpotts Matt Dugaro

The criteria used for the MCA assessment were developed by the project team and reviewed by Committee prior to commencement of the workshop. They were designed to capture environmental and social issues important to the CRD as well as qualitative issues not included in the financial analysis and risk analysis to date. Some criteria were updated following the workshop (for example "Flexibility" and "Control" criteria were combined.

Criteria have been broadly grouped into three categories: Environmental, Social and Financial/Risk. No ranking or weighting has been applied to the criteria. They are designed to be considered as a whole by Committee and Provincial funding reviewers.

C.8.1 SUMMARY MCA ASSESSMENT

The following MCA reviews each procurement option. Note within each option are a variety of major components (WWTPs, Energy Centre, conveyance, outfalls, tunnel, and resource recovery). Individual components were reviewed for procurement options in a separate discussion paper included in Appendix 22 – Program Delivery Options. This MCA reviews how each major procurement option satisfies the criteria listed (considering all components of the Program).

The following table uses a simple colour-coding approach to weight performance of each option:

Poor / Worst	Acceptable / Manageable	Average / Neutral	Good / Best

Environmentally-Orientated Criteria

Criteria	Issues Considered	Option A: Traditional	Option B: Hybrid	Option C: PPP
a) Regulatory Compliance	All delivery approaches will comply with regulations	**Good** Allows more flexibility for future change. Has clear responsibility for ownership of interface and single point of responsibility	**Good** If multiple operators then there could be some risk of ambiguous responsibility among multiple operators.	**Good** Allows enforcement of penalties. Allows financial incentive for certain types of performance. Has clear responsibility for ownership of interface and single point of responsibility.
b) Sustainability and greenhouse gas emissions impacts	The extent to which each delivery option incorporates measures for resource recovery and also reduces	**Average** Resource recovery limited to what is specified in the Program plan. Easier to	**Good** More innovation possible through alternative bid process (on DBFO or DB	**Best for Energy Centre** **Good for WWTPs** More innovation possible through alternative bid

including for Resource Recovery etc.)	impacts on climate change.	expand plans in future. Innovation could be expanded during process if value engineering and innovation workshops were held for the major components of the Program, and followed by technical reviews to ensure such innovations were implemented.	portions of Hybrid) For alternative bid process, the CRD must establish clear goals and evaluation criteria that motivates bidders to consider resource recovery otherwise proponents will likely eliminate such costs during proposal stage. Ability to integrate such plans in future may be limited. Adopting new technologies in future will be more challenging (and could be more costly) if long-term operations contract in place at Energy Centre and West Shore. Thus, such additions must be part of contract language in DBFO agreements.	process today Innovation will be most important in the Energy Centre / Biosolids Facility. Proponents will prepare bids to meet minimum standards specified by the CRD in procurement documents (or to the extent bonuses for alternative bids are included in evaluation). Otherwise proponents will likely eliminate such costs during proposal stage . Ability to integrate such plans in future may be limited. Allows innovation at time of bid. Adopting new technologies in future will be more challenging (and could be more costly) if long-term operations contract is in place over most facilities. Thus, such additions must be part of contract language in DBFO agreements.
c) Opportunities to adopt best practices	The extent to which each delivery option offers opportunities to adopt best practices in design, construction or	**Good** More flexibility to adopt new best practices in future.	**Average** Future changes may be at premium if long-term operator in place (eg	**Average** Future changes may be at premium if long-term operator in place (e.g.

	operations.		contract negotiation).	contract negotiation).
d) Permitting	The extent to which each delivery option allows for timely achievement of the required Federal, Provincial and municipal permits to begin construction. Federal and provincial permits will be secured by CRD.	**Good** Completion by 2016 achievable in current schedule.	**Good** Medium start. Completion by 2016 achievable in current schedule.	**Good** Slow start may lead to delays in some permitting. Completion by 2016 achievable in current schedule.

Socially-Orientated Criteria

Criteria	Issues Considered	Option A: Traditional	Option B: Hybrid	Option C: PPP
a) Impact on existing staff and recruitment of new staff	The extent to which each delivery option allows for the recruitment, training and retention of qualified and competent staff. The extent to which each delivery option has an impact on relationships with existing staff, their	**Good** Long development build-out allows CRD to hire and train staff well in advance of completion and commissioning. Thus while challenging to find and train staff, the current long-term build-out accommodates such plans. More retention and	**Good** Staff split between multiple operations and thus easier for each (smaller number for each). If different operators (public and private) have different pay scales then there will be tension with staff. CRD could be forced to	**Good** Third party operators may find staffing personnel and managers a little easier as well as training. Private operators have more flexibility on compensation to attract and retain staff[13] (stock options etc.)

[13] Note for the purposes of this analysis, all options assume the same pay scales for staff. However the number of staff at each location does change from option to option due to assumptions regarding how each plant would be managed.

	collective agreements, and staff in other CRD areas of work.	promotion opportunities for existing staff through expanded Program.	increase rates to meet market rates.	
b) Ownership of Facilities	Who will own the facilities (land, buildings and engineering equipment)?	**Owned by CRD.**	**Owned by CRD.** CRD will require land and facilities are owned by CRD.	**Owned by CRD.** CRD will require land and facilities are owned by CRD.
c) Public acceptance and communications impact	Consideration of the likely public acceptance of each of the delivery options.	**Good**	**PPP for Energy Centre in Core Area may be challenging.** **West Shore believed to be more flexible on PPP issues.** Involvement of the private sector in **facilities operations** is anticipated to be challenging. Use of private sector financing may also cause challenges, however this issue is believed to be less problematic than the operations issue for both Core Area and West Shore.	**Challenging for Core Area. West Shore more flexible** Involvement of the private sector in **facilities operations** is anticipated to be challenging. Use of private sector financing may also cause challenges, however this issue is believed to be less problematic than the operations issue for both Core Area and West Shore.
d) Level of CRD control and flexibility to make changes to Program during design,	The extent to which each delivery option allows the CRD to make changes during the development phase of the project whilst not impacting adversely on schedule or cost.	**Best Flexibility and control, but risk of change orders.** Design team can take direction on changes at any time (costs / schedule impacts accordingly).	**Good flexibility/control during design/proposal stage and operations.** **Limited during construction stage.** Design team can take direction on changes at	**Good during design/proposal stage.** **Limited flexibility and control during construction and operations for CRD.** After contract is signed then CRD ability to change

construction and operations phase	The extent to which each delivery option allows the CRD to make changes during the operations phase of the project. CRD controls tipping fees in all scenarios. Thus disposal of residuals and pricing of such disposal controlled by CRD. The ability of the CRD to protect the public interest during both the design and construction phase and during long term operations. With control follows responsibility and accountability.	After construction contracts are signed then ability to change plans is reduced however the CRD can act unilaterally to make changes to design (and cost / schedule impact is generally less than DB and DBFO models). Flexibility can lead to greater susceptibility to change orders and scope creep during construction process. Significant flexibility if CRD operates facility. Expansion of plants and equipment can be competitively bid with multiple parties.	any time (costs / schedule impacts accordingly). After contract is signed then ability to change plans requires negotiations. Limited on West Shore and Energy Centre (managed under long-term arrangement). Flexible for other components of Program. Note change mechanisms can be integrated into long-term operating contracts (specifying cost-plus arrangements for additional construction and other matters), however changes will be implemented on sole source basis. DBFO components will be locked in for +/-25 years (with complex termination provisions).	plans requires negotiations. Most flexibility for proponent to optimize plans. Limited flexibility forces the CRD to perform extensive up-front work on requirements documentation to ensure changes are minimized during construction phase (hence the slower start to this approach). Note change mechanisms can be integrated into long-term operating contracts (specifying cost-plus arrangements for additional construction and other matters), however changes will be implemented on sole source basis. Changing operator is challenging if significant financing included in DBFO (financing take-out costs significant). A DBO approach has greater flexibility for termination provisions than a DBFO. CRD would be locked into long-term arrangement (+/-25 years) under DBFO with

				complex termination provisions.
e) Customer Service	How each delivery option provides the required levels of service to the member municipalities in a timely manner and how concerns of local residents can be addressed?	**Very Good** Will match quality of existing customer service within the CRD. Will lead to more direct contact between public and CRD. Will lead to more direct contact between public and CRD. Good for Saanich East where significant public interest is required and responsiveness needed for public feedback.	**Very Good** Good but must rely on operating contract to force private sector parties to respond to difficult situations with customers. Direct to CRD plus some Indirect customer service contacts for West Shore and Energy Centre. Incentives and penalties can be structured in operating contract to ensure operator responds to all customer complaints in a timely manner. Good for Saanich East where significant public interest is required and responsiveness needed for public feedback.	**Good** Must rely on operating contract to force private sector parties to respond to difficult situations with customers. Incentives and penalties can be structured in operating contract to ensure operator responds to all customer complaints in a timely manner. Establishes clear responsibility for operations performance and aligns interests of CRD staff, political representatives and public to force performance of private sector operator.
f) Economic impact	The ability for the delivery option to provide maximum economic benefit to the CRD and British Columbia in terms of jobs and other economic benefits.	**Good** Smaller work packages used during construction phase may allow for more direct local participation.	**Good** More bids likely to be received with small to mid-size packages.	**Good** Large DBO and DBFO firms expected to bid, however local sub-contractors will be used by such firms. Thus expenditures remain in community and most jobs (similar to other approaches).

				If non-BC firm wins then some dividends/profit and overhead/administration fees will flow outside community (cumulative total after-tax profits from operations estimated at $90 million spread over 25 years)
g) Centre of Excellence and Research & Development		**Best** Facilitated with CRD operations.	**Limited** Partial implementation may be possible for CRD operated components of program.	**Unlikely** Difficult to implement with all operations managed by third party, but could be done at a cost if requested under contract.

Financial and Risk-Orientated Criteria

Criteria	Issues Considered	Option A: Traditional	Option B: Hybrid	Option C: PPP
a) Risk Allocation Goals	Consideration of how the proposed delivery option allocates risks with the objective of transferring risks to the party best able to manage each risk. This would include consideration of the guarantees that the public sector entity	**More Risks Typically Retained by CRD for Management** No single party guarantees overall performance. CRD retains equipment failure risk after basic +/-2 year warranty on most equipment (future costs may not be funded by provincial and federal governments). CRD typically retains most	**Medium Risk for CRD** Care required to ensure only risks that can be managed by service providers are transferred (otherwise CRD will pay a premium for risk transfer). For DB components, parts of design liability for plant performance plus all of construction liabilities transferred to contractor for +/-2 years after	**More Risks Typically Transferred to Proponent by CRD** CRD will pay for risk transfer during bid phase (versus retaining and managing such risks in other options) Care required to ensure only risks that can be managed by service providers are transferred (otherwise CRD will pay a

	would receive in respect of long-term performance of the assets and the ability of the CRD to enforce the risk allocation over the duration of the contract.	risks, including performance of each treatment plant plus overall integration risks. CRD will rely on bonding and recourse to suppliers in case of problems. For components where risk are very difficult for anyone to ascertain (e.g. outfalls and tunnel), Traditional approach may fit best.	completion. For DB and CMAR components, CRD is fully responsible for long-term operations and maintenance costs and problems. Under DBFO leading consortium sponsor responsible for providing financing (DBO relies upon corporate guarantee to sponsor and contractual recourse). Financing typically leads to a greater level of due diligence being directed at service providers – both during construction as well as during long-term operations. Long-term equipment failures on non-DBFO components may be 100% responsibility of CRD (may not be funded by provincial and federal governments).	premium for risk transfer). Under DBFO leading consortium sponsor responsible for providing financing (DBO relies upon corporate guarantee to sponsor and contractual recourse). Financing typically leads to a greater level of due diligence being directed at service providers – both during construction as well as during long-term operations. Service provider motivated to ensure performance of operations otherwise CRD can withhold some payments (which in turn typically triggers lender review of activities of service provider). Revenue risks for resource recovery from Energy Centre could be transferred to service provider.
b) Procurement and Implementation Schedule	How each delivery model affects the proposed project procurement and implementation schedule? This	**Good** All delivery methods are based upon December 2016 completion and operations. Allows quick start.	**Good** All delivery methods are based upon December 2016 completion and operations. Allows ability for CRD to	**May be Challenging** Slow start due to documentation requirements results in compressed construction period to achieve 2016

	criterion considers financial incentives for timely completion together with levels of complexity associated with each delivery option. It also considers budget and schedule risks during the procurement phase.	Allows ability for CRD to start construction early on Saanich East site without completion of designs of other components. This method results in the longest potential construction duration.	start construction early on Saanich East site without completion of designs of other components.	deadline. Current plans allow completion by 2016, however assumes shortest construction duration to achieve 2016 deadline (could add to costs to achieve schedule). Currently shortest construction duration due to front-end work required to complete requirements and documentation. Potential for delays during commercial negotiations related to financing and complexity of large-scale offering. Extended document preparation time - the Program is composed of a significant number of inter-dependent, integrated components and the scope of each must be more clearly defined before a large-scale procurement process could be implemented. Some conveyance work could be accelerated.
c) Level of competition during the	The extent to which each delivery option impacts on the likely	**Best.** Significant competition expected for smaller work	**Good.** Variety of procurement approaches allows multiple	**May be Challenging.** Recent large-scale offerings encountered problems with

procurement	market interest in the project to ensure that there is competitive tension in the procurement process.	packages during the construction phase. Small work packages facilitates opportunities for local and regional contractors to bid directly to CRD/PMO for work (rather than sub-contracting in large-scale procurement option). No competition during design phase.	bidding opportunities for firms of all sizes. Larger work packages should attract participation of national and international bidders. Design-build components may see greater variety of non-standard technical/innovative solutions.	financing. For implementation, large-scale DBFO package could be split into two components (WWTPs and Energy Centre) to facilitate a more competitive procurement. Program could also be implemented as DBO to increase competition and reduce financing challenges. Access to bonding may be a challenge for all firms in this approach (post-credit crisis). The significant cost of preparing a bid for a large-scale project (estimated at 1% to 1.5% of construction value) often deters bidders and limits the number of bidders who can take such procurement risks. Some challenges assessing bids and preparing an "apples to apples" comparison, particularly when alternative bids are allowed.
d) Cost certainty	The extent to which each delivery option provides the CRD	**Limited.** Exposed to more inflation	**Good for construction costs, limited for some long-term operations and**	**Good.** Cost certainty achieved for

	with price certainty during the design and construction phase as well as over the long-term operational period.	and surprises during the process. Cost certainty is the slowest to achieve of all options, and significant expenditures required on planning/design to achieve such cost certainty. This does exposes the CRD to potential cost and schedule over-runs.	**maintenance costs.** Price certainty of DBFO components plus more price certainty for construction phase in DB contracts. This option provides the opportunity for the earliest construction cost certainty. Surprises possible during the process if parts of scope undefined (particularly if alternative bids allowed).	construction, operations and maintenance costs defined at completion of procurement phase. Surprises possible during system operation and the process if parts of scope undefined (particularly if alternative bids allowed).
e) Complexity of immediate and future procurement	Feasibility of procurement packaging plan and ability to implement with CRD's multi-year, multi-component build-out Program.	**Least complex.**	**Medium complexity.**	**Highly complex.**
f) Lifecycle maintenance	The extent to which each delivery option manages and provides for long-term lifecycle costs and minimizes deferred maintenance of the facilities.	**CRD exposed to long-term maintenance risks.** CRD responsible 100% of capital repairs (assume no funding from province of federal governments).	**Risky for CRD after expiry of warranty period (+/-2 years) on DB components** CRD responsible for lifecycle risks on non-DBFO components after expiry of two-year warranty period.	**DBFO Best** **DBO Good** Lifecycle risks transferred to service provider with appropriate oversight of contract. CRD exposed to risk of poor commercial terms over the life of the operations contract.

g) Operational efficiencies	The potential for operational efficiencies that could be achieved by each delivery option.	**See Operating Costs table below.**	Labour efficiencies in DBFO (or DBO) generate savings over Traditional. PPP administration and overhead costs offset operational savings.	Labour efficiencies in DBFO (or DBO) generate savings over Traditional PPP administration and overhead costs offset operational savings.
h) Risk adjusted capital cost	The capital costs of each option.	See risk-adjusted capital cost table below.	Efficiencies identified for DB and DBFO construction	Efficiencies identified for DB and DBFO construction
i) Risk adjusted whole life cost (NPC)	Costs of each option over 6-year construction and 25 year operations.	See Value for Money Summary table below.		

Summary of Operating Costs

This table summarizes the differences in operating costs for each procurement option. Specific operational efficiencies in labour are documented above, and such efficiencies impact costs for each option as follows:

Annual Operating Costs	Option A: Traditional	Option B: Hybrid			Option C: PPP	
	Traditional (Real)	Traditional (Real)	DB (Real)	PPP (Real)	Traditional (Real)	PPP (Real)
Conveyance, Pumping, Storage	602	602	-	-	602	-
West Shore	1,920	-	-	1,708	-	1,728
Saanich East	2,542	2,542	-	-	-	15,601
McLoughlin Point	6,087	6,367	-	-	-	Incl in "SE"
Clover Point	970	969	-	-	-	Incl in "SE"
Energy Ctr / Biosolids	4,265	-	-	3,938	-	Incl in "SE"
Resource Recovery (Biogas, Heat, Water, Struvite, Disposal)	2,363	2,363	-	-	-	Incl in "SE"
Outfalls	268	268	-	-	268	-
Tunnels	64	64	-	-	64	-
Revenue Offset	(1,012)	(1,012)	-	-	(1,012)	-
Operations Insurance	600	325	-	275	-	600
SPV Costs	-	-	-	1,000	-	1,000
Operating Cost Sub-Total	***18,668***	***12,487***	***-***	***6,921***	***(78)***	***18,929***
Operating Period Risk	538	455	-	115	251	100
Total	**19,206**		**19,979**		**19,201**	
Difference (from Traditional)	*-%*		*4.02%*		*(0.02%)*	

Cumulative Operating Costs Risk Adjustments

The following operating risks were also integrated into the lifecycle analysis (expressed in present value dollars here).

	TRADITIONAL	HYBRID	DBFO
Quantified Operations Phase Risks (total over lifecycle)			
Retained	10,588,995	8,957,683	4,944,832
Transferred	-	1,631,311	1,411,041
Total Operations Phase Risks	10,588,995	10,588,995	6,355,873
Total Risks Quantified	**72,291,077**	**60,745,302**	**56,531,272**

Risk-Adjusted Capital Costs

This table summarizes the capital cost of each major component for each option (identifying how each component is assumed to be procured within each option).

Development Costs	Option A: Traditional	Option B: Hybrid			Option C: PPP	
	Traditional (Nominal)	Traditional (Nominal)	DB (Nominal)	PPP (Nominal)	Traditional (Nominal)	PPP (Nominal)
Conveyance, Pumping, Storage	51,867	51,913	-	-	51,914	-
West Shore	71,099	-	-	64,734	-	64,874
Saanich East	107,084	107,178	-	-	-	591,082
McLoughlin Point	234,126	-	200,088	-	-	Incl in "SE"
Clover Point	28,722	-	24,932	-	-	Incl in "SE"
Energy Ctr / Biosolids	243,553	-	-	238,893	-	Incl in "SE"
Resource Recovery (Biogas, Heat, Water, Struvite, Disposal)	29,764	29,790	-	-	-	Incl in "SE"
Outfalls & Tunnels	100,381	100,470	-	-	100,473	-
Land Purchase	13,512	13,512	-	-	13,512	-
Development Cost Sub-Total	***880,108***	***302,863***	***225,019***	***303,626***	***165,899***	***655,955***
Approvals and Construction Period Risk	61,702		50,156		50,175	
Total	**941,810**		**881,666**		**872,030**	
Difference (from Traditional)	*-%*		*(6.39%)*		*(7.41%)*	

Construction Cost Risk Adjustments:

The following risks were integrated into the capital cost budgets (in nominal dollars).

	TRADITIONAL	HYBRID	DBFO
Quantified Construction Risk			
Retained "**Project Reserve**"	61,702,082	29,821,107	24,905,864
Transferred Risk (at cost of transfer)	-	20,335,201	25,269,535
Total Quantified Construction Risks (nominal dollars)	61,702,082	50,156,308	50,175,399
Adjusted General Contingency			
Original amount in budget	27,042,218	32,843,692	31,824,601
Adjusted General Contingency (consistent pricing err	7,753,139	-	636,433
Sub-Total Adjusted General Contingency	34,795,357	32,843,692	32,461,034
CONSTRUCTION CONTINGENCY	**96,497,439**	**83,000,000**	**82,636,433**

Whole Life Costs After Adjusting for Identified Risks

The VFM summary table is based upon a whole life cost estimate. It is adjusted for the risks identified and quantified as part of the risks analysis process by the project team.

Value for Money Summary	Traditional (PV)	Hybrid (PV)	PPP (PV)
Construction costs for Traditional components of Program	667,234	402,004	118,311
Federal & CRD advances to DBFO components (during construction)	-	145,949	311,497
Land purchases	12,996	12,996	12,996
Provincial ASP principal & interest payments on capital costs	-	144,047	281,742
Retained Approvals and Construction Period Risk	50,559	25,945	23,142
TOTAL PV Capital portion of costs	730,789	730,940	747,688
Operations and Maintenance Costs			
CRD O&M net of resource recovery	188,395	128,649	4,175
CRD ASP components for operations and maintenance	n/a	69,341	188,369
CRD membrane replacement	973	924	-
Other Retained Costs	5,905	3,198	-
Total Operations & maintenance costs	195,273	202,113	192,544
Total Competitive Neutrality	3,649	1,730	-
TOTAL NET PRESENT COST	**929,712**	**934,783**	**940,232**

**All amounts discounted to present using discount rate of 7.5% over 6-year construction period and 25 year operating period.*

C.8.2 OTHER IMPORTANT CRITERIA USED IN EVALUATION

The CRD also conducted a brief review of other Provincial environmental guidelines and action plans. This review is described in Appendix 17 and summarized below. Overall, the CRD's plans are in-line with the Province's various climate action plans.

While all options satisfy Provincial expectations, both the Hybrid Option and the PPP Option offer the potential for greater resource recovery innovations by using a more flexible procurement approach which may consider allowing respondents to propose new and innovative extensions to the existing Program. This may enable the CRD (working collaboratively with the Province to fund such innovations) to implement more aggressive resource recovery plans and better satisfy Provincial sustainability initiatives.

Provincial Climate Change Action Plans and Strategies[14]

Criteria	Option A: Traditional	Option B: Hybrid	Option C: PPP
B.C.'s Climate Action Plan	✓	✓	✓
Living Water Smart Plan	✓	✓	✓
B.C. Energy Plan	✓	✓	✓
B.C. Bioenergy Strategy	✓	✓	✓

Finally, a comparison of the options based upon CRD's stated goals was performed. All options satisfy the goals of CRD (the goals of minimizing whole life costs is reviewed in the financial assessment section above).

C.9 FUNDING REQUIREMENTS AND STATUS

This section summarizes the various contribution required from each level of government to move forward with implementation of the program.

C.9.1 PROVINCIAL FUNDING CONTRIBUTIONS

As discussed with the Province, for analysis purposes in this submission of the business case, the CRD has assumed the Province's contribution toward funding shall be divided across all components of the Program on the basis of one-third of capital costs. Thus components procured using a traditional or design-build approach will require grant funding from the Province during the construction phase, while any components procured using a DBFO approach will require a commitment for ongoing payment of the annual service payment

[14] This assessment of Provincial climate change plans was conducted by the CRD project team. The CRD anticipates such plans will be acceptable to the Province, however no specific approval of the plans has been provided to the CRD at this time.

(ASP) for the capital and interest portions of the ASP. The CRD has held preliminary discussions with the GOC on such special funding allocations across components of the Program and initial response was positive as long as firm commitments for funding are in place among all stakeholders.

After the CRD selects a preferred procurement approach, it will submit a funding plan to the Prove that includes the following information:

- Provincial contribution toward procurement costs (a one-time procurement contribution to allow the CRD to move forward with implementation plans)
- Funding contributions toward construction costs from 2010 to 2016 for one-third of costs of major components of the Program procured using a traditional or design-build approach
- A commitment to fund the ASP to the private sector proponents of any DBFO components (this includes capital costs portion plus interest and associated financing fees)
- A flexible funding commitment that will not be finalized until completion of the procurement phase (and which allows additional ASP(s) and/or cash funding for special stand-alone resource recovery joint ventures identified during an "alternative bid procurement" process at the bid stage)
- No operating costs to be funded by Province
- No lifecycle maintenance costs to be funded by Province
- Province to provide the CRD with an assignable guarantee[15] for ASPs to facilitate any third party debt financing used

C.9.2 CRD FUNDING CONTRIBUTIONS

The CRD has already committed to funding one-third of Eligible Costs of the Program and all Ineligible Costs (see Appendix 1 for CRD Board Resolution) as required under GOC agreements. The CRD will also be responsible for funding all operating costs and lifecycle maintenance costs of the facilities included in the Program.

The CRD will work collaboratively with the Province and MCD staff to determine how funding shall be contributed by each stakeholder toward the various components of the Program (and the timing of such contributions).

C.9.3 SOURCE OF CRD FUNDING CONTRIBUTIONS

The CRD's contribution will be borrowed from the British Columbia Municipal Finance Authority (**MFA**). CRD's funding contributions to the Combined Program will be in the form of advances during construction.

CRD will allocate its share costs for the Combined Program to each client municipality on an equitable basis related to flow rates. Each municipality is anticipated to recover such costs

[15] Such guarantee can only be assigned to the bona fide third party lenders to the private sector proponents of the West Shore WWTP and the Energy Centre (and not subordinated debt funding by related parties to the proponents).

from ratepayers. The CRD has estimated the annual impact of an average household to vary among municipalities between $250 and $450 per annum (assuming two-third funding support from GOC and the Province of BC for Eligible Costs).

C.9.4 STATUS OF FEDERAL GOVERNMENT CONTRIBUTIONS

On December 10th, 2009 the CRD submitted a funding application to Infrastructure Canada – Building Canada Fund ("**GOC**") in support of one-third of funding of capital costs of the Core Area Program. The CRD continues consultations with representatives of the Government of Canada and Infrastructure Canada's Building Canada Fund. The CRD is seeking GOC ministerial **Approval-in-Principle** of the Combined Program with an associated memorandum of understanding outlining key terms and conditions of such approval. Ultimately, the CRD wishes to secure a committed Contribution Agreement with the GOC for such funding. The CRD will work collaboratively with the Province and Infrastructure Canada staff to determine how funding shall be contributed by GOC for the Combined Program (for example Green Fund contributions versus BCF Major Infrastructure Component contributions, or possible funding arrangements with P3 Canada).

To date, discussions with the GOC have been positive and are ongoing. However, GOC officials confirm that GOC commitments must follow Provincial commitments.

C.9.5 KEY FUNDING ASSUMPTIONS

1. The CRD will fund all operating costs and lifecycle maintenance costs plus all Ineligible Costs (including land acquisitions).Provincial contributions are based upon 1/3 of all Eligible Costs.
2. Province contributes funding or commitments to all components of the Combined Program regardless of how such components are procured (DBFO, design-build or traditional). Thus Province's contribution is a mix of grants during construction (2011 to 2016) and long-term commitments to pay ASPs on DBFO components (West Shore and Energy Centre).
3. GOC contributes 1/3 of Eligible Costs in the form of a grant during construction.
4. The CRD contributes 1/3 of Eligible Costs and 100% of Ineligible Costs (primarily land acquisitions).
5. The CRD will borrow all of its capital cost contributions from the MFA. The CRD will repay all such costs.
6. The CRD also funds 100% of operating and lifecycle maintenance costs.
7. DBFO components of the Program will thus be funded using 2/3 cash contributions during construction from the CRD and GOC, and up to 1/3 financed by proponent funding (and the Province will assume the obligation for the capital portion of such ASP along with associated interests costs and fees). The CRD will pay the operating and lifecycle maintenance portions of the ASP.
8. The 1/3 proponent funding of DBFO components assumed 88% debt, 12% equity. Assumed debt interest rate is 7.1%, and equity return requirement of 12%. A third of the equity will be advanced as subordinated debt by the proponent.

C.10 ECONOMIC IMPACT ASSESSMENT SUMMARY

Based upon the standard Federation of Canadian Municipalities economic development infrastructure impact calculator[16], the overall impact of the Combined Program on the Canadian economy will be as follows:

Economic Impact Measure	Impact of CRD Combined Program
Overall benefit to the Canadian economy and GDP:	Direct Costs: $941,809,692 (Traditional Option costs) GDP Impact: $1,211,167,263
Impact on Canadian Employment:	Will support the provision of approximately 10,124 job year equivalents
Impact on Government Tax Revenues:	Federal: $114.88-million Provincial: $118.55-million Municipal: $2,760,000 Plus FPT Transfers from municipalities: $535-million Impact on current government spending: minus $55,116,000
Government Net Cash Balances:	Federal: minus $160.5-million Provincial: minus $179.5-million Municipal: minus $314.9-million

These calculations assumed Programs with capital cost and cost-sharing between all three levels of government as described above.

C.11 SPECIAL ISSUES

The CRD has identified the following special issues requiring further investigation or consultation.

C.11.1 SITE SELECTION ALTERNATIVES

This business case has been developed on the basis of Option 1A and the configuration of the facilities described in that plan. For analysis purposes, alternative sites have not been evaluated at this time. However the CRD has identified a number of possible site alternatives which may result in a new configuration with a lower overall cost for all stakeholders. Such investigations are ongoing.

[16] The FCM infrastructure economic impact calculator is available online at http://www.fcm.ca/english/calculator.asp?x=1

C.11.2 DBO VERSUS DBFO

For analysis purposes this business case assumes a DBFO approach for some major components of the Program. Prior to implementation of any procurement strategy, the CRD wishes to consult with the Province on the utilization of the design-build-operate (DBO) approach to procurement for these components to determine the Province's preferred delivery method. The CRD is flexible on the selection of DBO versus DBFO for delivery certain components. While recognizing the DBFO approach has stronger risk transfer attributes, the CRD also acknowledges the DBO approach may generate more interest from wastewater industry specialist firms because of the current economic climate. Since only the Provincial piece of funding is anticipated to be financed using a DBFO approach, the CRD will work with the Province to structure the funding arrangements to meet expectations and mutual interests of the stakeholders.

Importantly, the DBO approach would provide more flexibility for the CRD to terminate long-term operating contracts without significant penalty or cost. The DBFO approach typically requires the owner to payout financing (and associated penalties) to terminate a long-term contract at the discretion of the owner.

C.11.3 VARIOUS IMPLEMENTATION APPROACHES FOR OPTION C: PPP APPROACH

If Option C is selected as the preferred delivery strategy then the CRD will explore how such a plan can be optimized prior to final implementation. As noted in Appendix 22, Option C could include separating the liquid treatment facilities into a stand-alone DBFO (or DBO), or combining the McLoughlin Point WWTP with the Energy Centre into a single DBFO (or DBO). This final implementation plan will be heavily influenced by the site selection and finalization of the overall configuration.

C.11.4 DETAILED WEST SHORE PLAN TO FOLLOW EARLY IN 2010

For the purposes of this submission, the CRD has split its funding requirements into two project components based upon geographic location: The Core Area Program (Victoria, Esquimalt, View Royal, Oak Bay and Saanich plus two First Nations communities) and the West Shore Program (Langford and Colwood). This Business Case focuses on the Core Area Program and includes a summary of the West Shore Program. A more detailed West Shore Program will be submitted for funding support in March 2010 once the configuration of the West Shore system has been finalized.

C.11.5 SUCCESSORSHIP RIGHTS

The CRD notes that the Saanich Peninsula Water commission already operates a wastewater treatment facility for the CRD. This facility is operated by unionized CUPE staff. As such, it is possible that successorship rights apply to all new wastewater treatment facilities. For the purposes of the financial analysis and cost estimates assumed in this business case, all labour rates are assumed to equal the rates used in CUPE-organized facilities for wastewater treatment.

Labour issues require a more in-depth analysis prior to the commencement of procurement plans to determine the implications of successorship rights and the obligation of service

providers. The CRD will work with all stakeholders to clarify such matters and establish a Labour Strategy.

C.11.6 FIRST NATIONS DISCUSSIONS

Appendix 8 includes an overview of discussions between the CRD and several First Nations communities related to the Program.

C.11.7 HST

The application of the Harmonized Sales Tax (HST) for the provision of water services by either a regional government or a private partner are to be reviewed and clarified as HST legislation evolves.

C.11.8 OTHER LEGAL MATTERS

This business case has not evaluated the legal implications of each type of procurement based upon various national and international trade agreements and treaties including the North American Free Trade Agreement (NAFTA), the Agreement on Internal Trade (AIT), the Trade Investment and Labour Mobility Agreement (TILMA), and more recently introduced Canada-US Procurement Agreement (CUPA) implemented in response to the credit crisis and the American Recovery and Reinvestment initiative. Such a legal assessment is beyond the scope of the business case.

D PROCUREMENT IMPLEMENTATION PLANS

This final section of the Business Case reviews procurement implementation matters including the procurement budget and schedule, governance structure, and public communications.

D.1 PROCUREMENT IMPLEMENTATION BUDGET AND SCHEDULES

The procurement and implementation budget includes items such as preliminary technical planning and preparation of procurement packages, evaluation of bids, establishment and operation of the program management office, and administration costs. These costs are estimated at $ 60 million.

Appendix 4 the current schedule for implementation of the Program.

Appendix 32 includes a preliminary schedule for procurement planning.

D.2 PROGRAM GOVERNANCE

This project is one of the larger projects to be procured in the Province of British Columbia. It is also very complex and composed of multiple major treatment facilities that must be integrated and managed without problem or error, regardless of weather conditions and varying flow rates. A variety of procurement methodologies are available for implementation - from traditional to DBFO. The project will require a well developed governance and project management organization along with monitoring/audit function to ensure the project is delivered on time, within the budget and with an uncompromised level of quality.

D.3 CURRENT GOVERNANCE STRUCTURE

The Project has been managed to date by the CALWMC functioning as the Steering Committee. However, to accommodate the increasing workload that will arise as the project progresses further through the procurement process, a more independent and project specific body should be created. This will also allow for involvement of independent members and potentially the funding partners (if involvement of the provincial and federal government is a pre-condition of funding).

Project specific issues affecting governance structure include:

- The project will transcend multiple municipal and provincial elections and therefore the governance arrangements that are put in place should recognize the need for continuity and consistency over the project lifecycle.
- This project is much larger and more complex than any past or likely future project managed by the CRD and consists of a highly complex series of procurement packages with a capital cost well over $900-million.
- The complexity of the Project means that there needs to be a governance structure in place that can facilitate timely decision-making which may be outside of the currently scheduled Committee and Board meetings.

- Multiple funding partners. The Federal and Provincial governments will be investing significant amounts of funding in the project. The CRD expects to discuss appropriate levels of involvement of representatives of the Federal and Provincial governments going forward.
- Some municipalities on the West Shore may choose to pursue stand-alone separate procurement plans on a parallel track with the Core Area plans. Separate procurements may require governance arrangements that are independent of the wider Project.

Governance options are currently under review by the CRD. Before finalizing the plan, the CRD wishes to consult with its funding partners to determine the role of each during the procurement, development and operations phases of Program implementation.

D.4 PROJECT MANAGEMENT OFFICE

Regardless of governance structure, it is anticipated the CRD will establish a project management office (**PMO**) for day-to-day implementation of the Program. The PMO will take direction from the governance entity established by the CRD and funding stakeholders. The structure of the PMO is still to be determined. Responsibilities for specific areas of the project plan will be assigned to specific team members through the PMO. The composition of the PMO may include a mix of internal CRD staff and external advisors and will be reviewed and updated from time to time by the PIB as appropriate.

Experience indicates that one common characteristic of large successful capital projects is that a comprehensive, multidisciplinary project management team led by an experienced professional with project management expertise, strong public communications expertise, and an understanding of community issues and concerns.

Clearly defined roles and responsibilities for the project management team are necessary, with individual responsibility assigned for budget management, schedule management, quality control, contract management, communications and information management, etc.

It is recommended that a PMO be established and continue throughout the life of the project. This PMO would include a team of individuals responsible for the timelines, including critical path and task schedules; management of work in progress; budget management and reporting; quality control; issues management; change order process; and internal project communications.

The PMO will facilitate teams of resources to accomplish project tasks. These teams will deliver the project elements and the PMO will coordinate their integration and ensure acceptable completion.

Appendix 29 includes further details on how the CRD governs existing water authorities and management bodies, including a discussion of financial controls.

D.5 COMMUNICATIONS

As noted in BC regulation 261/2004 5(c), the CRD may qualify for consideration by the Province of exemption from certain elector approval requirements if it complies with certain provisions of the BC *Environmental Management Act* including "*a process for comprehensive review and consultation with the public respecting all aspects of the development, amendment and final content of a waste management plan*". The CRD continues to conduct extensive consultation with communities throughout the region. Details of such consultation are included in Appendix 28.

Some near-term communications plans have been developed dealing with procurement decisions as follows. The communications plan will be developed in more detail once the CRD has more clarity once procurement plans are finalized and approved by all levels of government.

Purpose
To inform residents and stakeholders on procurement options for the Wastewater Treatment Program and report on procurement decisions

Goals & Objectives
- Increase awareness of procurement options and evaluation criteria
- Provide easily accessible, up-to-date information on procurement options and subsequent decisions

Key Messages
- The CRD is exploring all procurement options
- The CRD is committed to providing the best procurement option for this project

Target Audiences

Internal
- Capital Regional District Board
- Capital Regional District staff

External
- Residents of the CRD
- CUPE
- Unions
- Municipal governments
- Community Associations
- Industry Associations
- Media
- MLAs

Communications Strategies
In order to reach the identified goals and objectives, communications on procurement will take place in two phases employing a number of communications strategies.

Phase One: Open houses, a stakeholder workshop will focus on informing and educating the target audiences on procurement options and evaluation criteria. At these venues, feedback will be gathered on the provided options.

As well as feedback collected at these events, an online surveys will also collect input from target audiences. The public will also be able to address the committee at a special committee meeting which will focus purely on procurement issues.

To promote open houses and the online survey, paid media and earned media strategies will be crucial in increasing attendance and participation.

Phase Two: Earned media will be used to communicate the CALWMC's decision on procurement with the Committee Chair as the primary spokesperson.

Proposed Paid Media Strategy:

- Strategies to ensure that target audiences are aware of the procurement options for the Wastewater Treatment Program.
- Brochure to be created detailing background information, goals and purposes of the program and contact information.
- Display Boards to be created detailing background information, goals and purposes of the program to be used to answer questions and encourage discussions at community open houses.
- Frequently Asked Questions to be clarify the procurement options and decision making process.
- Newspaper & Radio Advertisements
    - Advertisements leading to further engagement for more information about open houses.
- Website page created on the wastewatermadeclear.ca site with details of the bylaw, roll-out schedule, background information and frequently asked questions. Create a hot topic for a couple of weeks.

Proposed Earned Media Strategy:
In support of the above discussed paid media strategy, proactive earned media will be used to reinforce positioning and information sharing with stakeholder groups.

Op Ed Opportunities & Drop in Articles for media sources, such as printed and online: community newsletters, association newsletters, trade publications, and community newspapers

Local Radio Talk Show proactive participation in radio talk programs supporting project developments and milestones

News Releases for media sources citing developments and milestones

Social Media monitoring and response to social media tools and discussions on project

Backgrounders and Speaking Notes prepared proactively to support public representatives on key messages and points around developments, milestones, timelines and key dates.

Evaluation:
In order to evaluate the communications plan, the following criteria will be used:

- Monitor and evaluate media coverage
- Use CRD website and open houses, workshop for Q/A and feedback
- Monitor stakeholder/industry publications
- Correspondence – respond to feedback from public, industry, stakeholders

E CONCLUSIONS AND RECOMMENDATIONS

1. The CRD has conducted an extensive investigation into service delivery options to resolve wastewater challenges in the Core Area and Westshore areas of the region, including distributed wastewater treatment and extensive investigations into resource recovery options.

2. The CALWMC selected the solution known as Option 1A as the preferred service delivery plan. This plan includes four liquid waste treatment facilities distributed throughout the region plus a centralized solid waste treatment facility, along with associated conveyance, pumping stations and marine outfalls.

3. The CRD has reviewed procurement issues for delivery of Option 1A. Three procurement options were reviewed in detail in this business case: Traditional, Hybrid and PPP Approach.

4. The PPP Option has the lowest construction costs and operating costs. The following table summarizes total costs for implementing the Program under each procurement option.

Summary Costs for the Program

	Option A: Traditional	Option B: Hybrid	Option C: PPP
Construction Costs (nominal dollars)	$ 941,810	$ 881,666	$ 872,030
Difference (from Traditional)	*-%*	*(6.39%)*	*(7.41%)*
Operating Costs per year	$ 19,206	$ 19,979	$ 19,201
Difference (from Traditional)	*-%*	*4.02%*	*(0.02%)*

****This summary excludes interest costs.***

5. These estimates are based upon analysis work to date on efficiencies across delivery options and risk quantification efforts. Such work will be updated as the project team continues its due diligence investigations.

6. On a discounted net present cost basis, the overall whole life cost of the Program is very similar across procurement options – a less than 1% difference in costs across options.

7. The sensitivity analysis on key assumptions suggests the following:
    - If the interest rate used on private sector debt were dropped to approximately 6.88% (from 7.1% currently used) then the net present cost of the Hybrid and PPP Options would be the same as the Traditional Option. A 1% increase in interest rates has a significant impact on value-for-money (VFM) for the PPP Option, increasing overall VFM by 5.69% and impacting the Hybrid option VFM by 2.96%.
    - Using a discount rate of 7.81% (instead of current 7.5%) would result in the options having a similar VFM.
    - Efficiency savings of $6.3-million for the Hybrid Option and $12.7-million for the PPP Option would result in net present costs being equal to the Traditional Option. Higher efficiencies would give these options a lower net present cost than Traditional.
    - Changes to inflation during construction has a significant impact on all options. A 1% increase in construction inflation impacts overall VFM by approximately 3.4% for each option. Inflation during the operations phase has a similar impact on all options – increasing VFM for all options by approximately 4%.

8. All procurement options satisfy CRD's environmental criteria. The Hybrid Option and PPP Option performed slightly better than the Traditional Option because they facilitate more innovation, particularly in the area of resource recovery, through an alternative bid process.

9. The Traditional Option has a more attractive social goal profile than the other options (mainly due to the flexibility and control it provides to the CRD as well as the potential community backlash against PPP-forms of procurement in the Hybrid and PPP Options).

10. The PPP Option transfers more risk to service providers, while the Traditional Option retains risk for CRD staff to manage and control. The Hybrid Option has a more balanced risk profile with the CRD transferring more Energy Centre-related and West Shore WWTP risks to the proponent.

11. All options can deliver the Program before the MoE target date of December 2016, however the PPP Option may be tight and there is little slack in the schedule.

12. If the CRD secures a new site for the Energy Centre then this may lead to significant cost reductions (particularly if the McLoughlin Point WWTP can be consolidated onto the same site as the Energy Centre).

13. The CRD will consult with the Province on a number of issues as it moves forward, including new site discussions as well as funding plans (including the possibility of the CRD using a DBO approach to procurement for one or more components of the Program).

The major risks facing the CRD that were identified by the project team are:

X means risks typically not transferred
✓ means risk is typically transferred under this procurement option

Major Risks Identified	Ability of CRD to Transfer Risk Under Each Option		
	Traditional	Hybrid	PPP
Managing change requests during construction phase	X	✓	✓
Managing change requests during planning phase	X	X	X
Increases in construction inflation	X	Some Transferred	✓ More Risk Transferred
Non-competitive bids for large DBFO procurement	Risk avoided	Risk mostly avoided	X
Long-term major capital maintenance and repairs	X	X	✓
Equipment failure and problems during operations	X	Partial Transfer During 2-year warranty period	✓
Funding approval delays	X	X	X
Resource recovery revenues and expenses	X	Some Transferred	Likely Transferred
Delays during the procurement process	X	X	X
Integration of Energy Centre and Wastewater Facilities	X	X	✓

The above table illustrates the key risks where the CRD should invest resources to manage issues and avoid potential problems.

E.1 SUMMARY MULTI-CRITERIA ASSESSMENT RESULTS

Criteria	Option A: Traditional	Option B: Hybrid	Option C: PPP
Environmentally Oriented Goals			
Sustainability and Resource Recovery Goals	Satisfied Option 1A plan. Flexibility to add innovations later. Value engineering workshops on major components may facilitate additional resource recovery innovation.	Good for Energy Centre. Innovation possible by using "alternative bid procurement" process to generate new proposals beyond Option 1A plans	Good for Energy Centre and Treatment Facilities. Innovation possible by using "alternative bid" process to generate new proposals beyond Option 1A plans
Socially Oriented Goals			
Recruitment & Impact on Staff	Good	Good	Good
Ownership of Facilities	Facilities owned by CRD	Facilities owned by CRD	Facilities owned by CRD
Public Acceptance	Good	Two PPP components may be challenging for public acceptance.	Challenging for Core Area. West Shore more flexible.
Flexibility and Control	Most flexibility and control for CRD	Flexibility during operations for wastewater facilities. Long-term contracts for Energy Centre and West Shore WWTP	Most flexibility for proponents; CRD locked into long-term contract governing operations and performance.
Financial and Risk Oriented Goals			
Risk Management	CRD exposed to more risks that must be managed.	Balanced risk management approach (many construction risks transferred in design-build and PPP approach).	More risks typically transferred to proponent by CRD for construction, operations and long-term maintenance. CRD will pay for risk transfer, but not be exposed to problems with such risks.
Procurement and Implementation Schedule	Good Allows earliest Start.	Good Allows early start.	Tight Schedule for Completion by

			December 2016. Extensive due diligence requirements delays start.
Competition	Good Smaller contracting packages allows multiple bidders and direct bids to CRD by local/regional firms (rather than such firms having to sub-contract through a larger organization).	Good Bonding may be challenging for large-scale packages (the Energy Centre).	Limited for large-scale projects. Recent history in North America has not been good for large PPP procurements (limited number of bidders). Bonding may be very challenging for large contracts. It may be necessary to split procurement into smaller bundles.
Cost Certainty	Limited. Slow to determine and significant commitment of costs to design required to achieve. Flexibility allows scope changes and higher costs.	Early certainty established for energy Centre and West Shore. Construction cost certainty established early. Operating and maintenance costs of wastewater facilities subject to change.	Best certainty and clarity on whole life costs (construction, operations & maintenance). Achieved at bid stage.
Construction Costs (nominal dollars, excl. financing)	Highest $941.8 million	6.4% lower than Traditional ($60.1 million less)	Lowest 7.4% lower than Traditional ($69.8 million less)
Operating Costs (nominal dollars, excl. financing)	Lowest $19.2 million / year	Highest 4.02% higher than Traditional ($773,000 / year less)	Essentially equal to Traditional Options
Overall Whole Life Costs (Risk-Adjusted Net Present Cost including private sector financing, not MFA financing costs)	$929.7 million Marginally lower cost than other options	$934.8 million 0.55% higher than Traditional	$940.2 million 1.13% higher than Traditional

E.2 SUMMARY OF VALUE FOR MONEY ASSESSMENT

The CRD and its advisors have conducted a financial assessment of the Program under varying procurement approaches. The results of the analysis are as follows:

Value for Money Summary	Traditional (PV)	Hybrid (PV)	PPP (PV)
Construction costs for Traditional components of Program	667,234	402,004	118,311
Federal & CRD advances to DBFO components (during construction)	-	145,949	311,497
Land purchases	12,996	12,996	12,996
Provincial ASP principal & interest payments on capital costs	-	144,047	281,742
Retained Approvals and Construction Period Risk	50,559	25,945	23,142
TOTAL PV Capital portion of costs	730,789	730,940	747,688
Operations and Maintenance Costs			
CRD O&M net of resource recovery	188,395	128,649	4,175
CRD ASP components for operations and maintenance	n/a	69,341	188,369
CRD membrane replacement	973	924	-
Other Retained Costs	5,905	3,198	-
Total Operations & maintenance costs	195,273	202,113	192,544
Total Competitive Neutrality	3,649	1,730	-
TOTAL NET PRESENT COST	**929,712**	**934,783**	**940,232**

**All amounts discounted to present using discount rate of 7.5% over 6-year construction period and 25 year operating period.*

E.3 RECOMMENDED PROCUREMENT PLAN: HYBRID OPTION

Based upon the analysis included in this business case the Project Team concludes the **Hybrid Option** represents the preferred procurement implementation plan for the CRD. The key reasons for this recommendation include:

- By carrying out a detailed analysis of the potential procurement options for each of the packages, the Project Team believes that the Hybrid Option provides a good balance of risk transfer opportunities for each of the packages.
- The Hybrid Option allows good opportunities for innovation on resource recovery through an alternative bid procurement process for most components of the Program. Note the alternative bid process does not obligate the CRD to implement the alternative bid proposals, but encourages creative proposals for CRD consideration.
- The cost of the Hybrid Option is comparable to the lowest cost option.
- The Hybrid Option provides good flexibility compared to the PPP Option, plus control for the CRD to phase and manage implementation of the overall Program during the six year scheduled build-out.
- The smaller procurement packages in the Hybrid Option are anticipated to facilitate an improved competitive bid process with a higher likelihood of successful execution than the large-scale packaging approach.

Key risks and challenges of the Hybrid Option[17] include:

- The system would not be designed and optimized as a whole. Each component would generally be implemented separately which could lead to sub-optimal design decisions and integration challenges. The CRD would be responsible for overall system integration risks.
- Conflicts may emerge between different operators within the system – CRD operations, Energy Centre and West Shore WWTP operators.
- The CRD is responsible for lifecycle equipment failure risks on the traditional and design-build components of the Program after the two-year warranty period expires.
- Additional risks are described in Appendix 9.

Note this recommendation is subject to further consultation with the Province and Government of Canada on the issues identified in this business case (in section entitled "*Special Issues for Discussion with Funding Stakeholders*" in the Executive Summary) including the amount and timing of federal and provincial funding commitments.

[17] Note these key risks and challenges are also applicable to the Traditional Option

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G GLOSSARY

These definitions are taken from the BC Municipal Sewage Regulations as well as AE et al 2008-2009 discussion papers prepared by Associated Engineering Ltd. and CH2M Hill.

"**Average Annual Flow**" or "**AAF**" – an estimate of the total flow at a given site for an entire year, including both dry and wet weather periods.

"**Average Domestic Flow**" or "ADF" – the average flow coming purely from the "Total Population Equivalents", i.e. excludes all sources of I&I.

"**Average Dry Weather Flow**" or ADWF means the daily municipal sewage flow to a sewage facility that occurs after an extended period of dry weather such that the inflow and infiltration has been minimized to the greatest extent practicable and is calculated by dividing the total flow to the sewage treatment facility during the dry weather period by the number of days in that period. In CRD this typically occurs between the months of April to September.

"**Biosolids**" means inorganic or organic solid residuals from a sewage facility, or septic tank sludge, resulting from a municipal sewage treatment process which has been sufficiently treated to reduce vector attraction and pathogen densities, such that it can be beneficially recycled.

"**BOD**" biochemical oxygen demand.

"**cBOD5**" carbonaceous 5-day biochemical oxygen demand.

"**CEPT**" chemically-enhanced primary treatment.

"Core Area Program" composed of Victoria, Esquimalt, View Royal, Oak Bay and Saanich plus two First Nations communities.

"**DBB**" means Design Bid Build.

"**DBFO**" means Design, Build, Finance, Operate and Maintain.

"**DB"** means design-build with design drawings and planning to approximately the +/-10% level.

"**DB 30%"** means design-build with design drawings and planning to approximately the 25% to 30% level (high level of detail).

"**DBO**" means design, build, operate and maintain.

"**Effluent**" means the liquid resulting from the treatment of municipal sewage;

"**ICI Equivalents**" or "**ICI**" – an estimate of the contribution of flow from industrial, commercial, and institutional activities, expressed as a number of fulltime residential population equivalents.

"**Inflow & Infiltration**" or "**I&I**" means water that enters the sanitary sewer system from direct stormwater connection (inflow) or indirectly through the land (infiltration), or both. Can be expressed as a return period based value (i.e. 25-Year Return I&I).

"**Microconstituents**" include hundreds of compounds, which encompass endocrine disrupting compounds (EDC's), pharmaceutically-active compounds (PhAC's) and Personal Care

Products (PCP's). These compounds are typically present in raw wastewater at ng/L to ug/L concentrations, 5 to 6 orders of magnitude less than the concentration of conventional pollutants.

"**Peak Domestic Flow**" or "PDF" – the peak flow coming purely from the "Total Population Equivalents", i.e. excludes all sources of I&I. Expressed as a short duration average, (i.e. 15-minutes), suitable for use in hydraulic design.

"**Peak Dry Weather Flow**" is the peak daily flow that usually occurs once in the morning and then again in the evening.

"**Peak Wet Weather Flow**" is the peak flow rate that occurs at the height a rainfall or snowmelt event. "**PWWF**" = PDF + I&I. Expressed as a return period based value (i.e. 25-Year Return PWWF).

"**Per-Capita Rate**" – the average flow associated with each "Total Population Equivalent", expressed as L/per/day.

"**Primary Treatment**" means any form of treatment, excluding dilution, that consistently produces an effluent quality with a BOD5 not exceeding 130 mg/L and TSS not exceeding 130 mg/L.

"**Septic Tank**" means a watertight vessel into which municipal sewage is continually conveyed such that solids within the municipal sewage settle, anaerobic digestion of organic materials occurs and an effluent is discharged;

"**Sewage**" or "**Base Sanitary Flow**" refers to water that is contaminated with waste matter of domestic, commercial, industrial, or natural origin. The average person uses almost 225 litres of water per day performing routine activities such as bathing, recreation and body waste elimination.

"**Secondary Treatment**" means any form of treatment, excluding dilution, that consistently produces an effluent quality with a BOD5 not exceeding 45 mg/L and TSS not exceeding 45 mg/L, except for lagoon systems for which the effluent quality is not to exceed a BOD5 of 45 mg/L and a TSS of 60 mg/L.

"**Total Population Equivalents**" = "Residential Population" + "ICI". Also known as "**Contributory Population Equivalent**" means the number of persons and equivalent commercial and industrial contribution connected to the municipal sewage collection system based on the most current census data.

"**Tributary Area**" or "Area" – the estimated sewered land area associated with a catchment.

"**TSS**" means total suspended solids or non-filterable residue.

"West Shore Program" composed of the communities of Colwood and Langford.

"**WWTP**" wastewater treatment plant.