

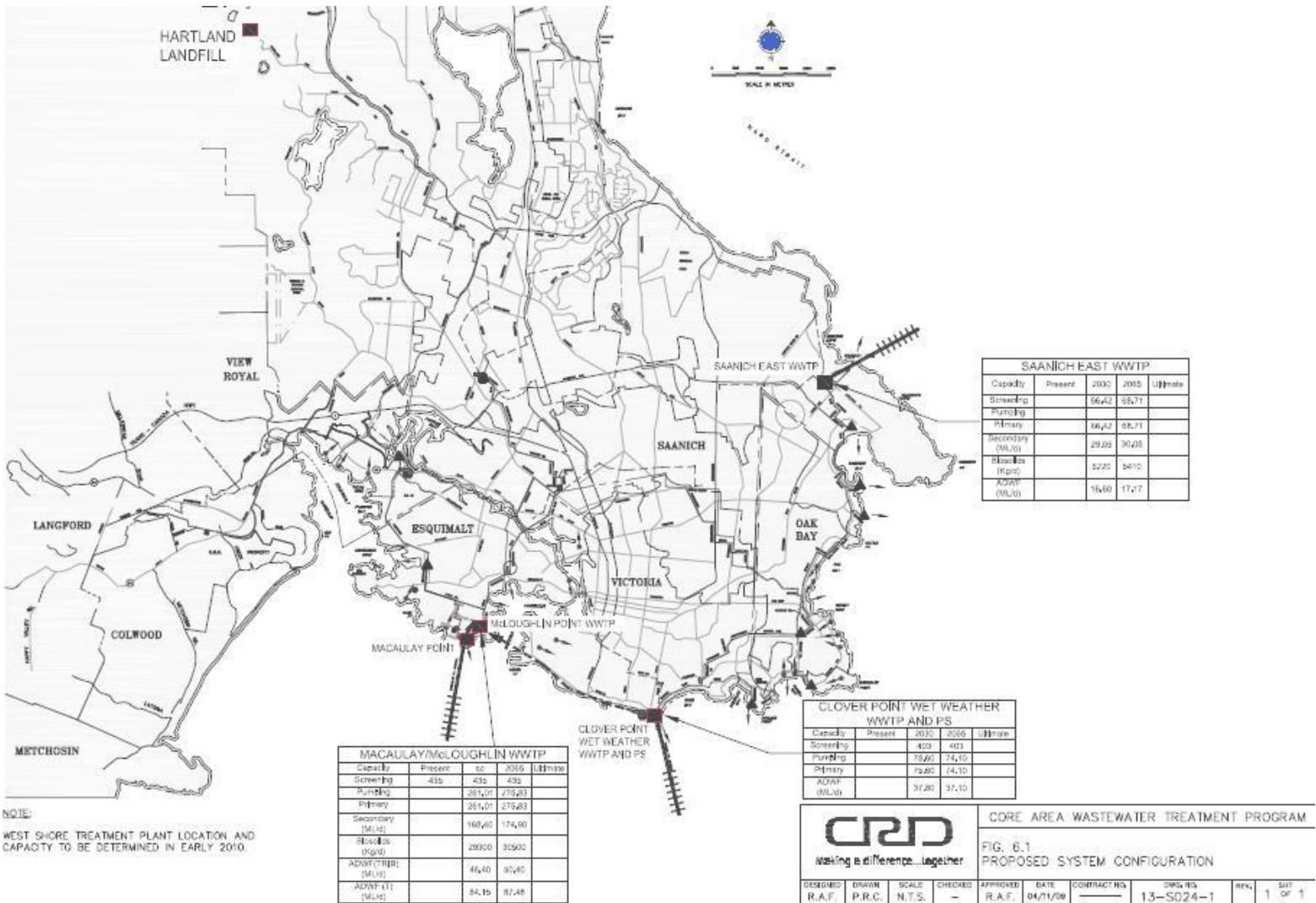


Making a difference...together

## Capital Regional District Core Area & West Shore Wastewater Treatment Programs

### Business Case in Support of Funding Under the Infrastructure Canada Building Canada Fund - Major Infrastructure Component

December 9, 2009



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CORE AREA WASTEWATER TREATMENT PROGRAM

**FIG. 6.1  
PROPOSED SYSTEM CONFIGURATION**

| DESIGNED | DRAWN  | SCALE  | CHECKED | APPROVER | DATE     | CONTRACT NO. | DWG. NO.  | REV. | SHEET  |
|----------|--------|--------|---------|----------|----------|--------------|-----------|------|--------|
| R.A.F.   | P.R.C. | N.T.S. | -       | R.A.F.   | 04/21/09 | -            | 13-S024-1 | 1    | 1 OF 1 |



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## A EXECUTIVE SUMMARY

This Business Case has been prepared for submission to Infrastructure Canada in support of a request for funding from the Building Canada Fund - Major Infrastructure Component (**BCF-MIC**). CRD is seeking funding for one-third of Eligible Costs of the Capital Regional District's Core Area and West Shore Wastewater and Sewage Treatment Programs (the "**Combined Program**" or the "**Programs**"). This business case thus also functions as the funding application for the Combined Program.

The Combined Program has estimated total Eligible Costs (as defined in the BCF-MIC) of \$920.5-million. **CRD is seeking BCF-MIC funding support at this time of \$268,624,433 for the Core Area Program.** CRD will submit a follow-on request for funding for an additional amount of funding of approximately **\$38,223,733 for the West Shore Program.** The total overall funding request for both the Core Area Program and the West Shore Program is anticipated to be approximately **\$306,848,167.**

The Capital Regional District (**CRD**) wishes to secure Infrastructure Canada/Government of Canada (**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 Infrastructure Canada staff to determine how funding shall be contributed by GOC for the Combined Program (for example Green Fund contributions versus MIC contributions).

Investment in the Core Area and West Shore Wastewater Treatment Programs 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*. The Combined Program will also eliminate virtually all sanitary sewer overflows (**SSOs**) each year in the region, and provide secondary wastewater treatment for 91% of this community's 299,000 residents.

### *Current Situation*

- 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 is conveyed to existing preliminary treatment consisting of screening at Clover Point and Macaulay Point.
- 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 largely untreated sewage into the marine environment.
- Contamination 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 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 handles the West Shore's sewerage catchment area since the West Shore is forecast to grow more quickly than other parts of the region).
- 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.

### *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 early 2010 once the configuration of the West Shore system has been finalized.

### *Recipient of Funding*

The Recipient of GOC funding is anticipated to be the CRD or a wholly-owned subsidiary of the CRD, and shall be eligible to receive such funding under BCF-MIC regulations. The CRD is currently reviewing project management and governance issues for implementation of the Combined Program.

If a public-private partnership approach to procurement is used for a component of the Combined Program then CRD commits to ensuring such a structure will remain in compliance with GOC requirements and the CRD will own, directly or indirectly, all facilities and land. Ownership will not be transferred to the private sector service provider.

### *Wastewater Subcategories in Funding Application*

For the purposes of this BCF-MIC funding submission, the Program should be classified under the following Wastewater Subcategories:

1. Wastewater collection systems and wastewater treatment facilities (including grey water reuse) (the "**WWTP Facilities**"),
2. Wastewater sludge treatment and management (the "**Biosolids Facility**"), and
3. Sanitary sewer overflow management systems including real-time control and systems optimizations to manage inflow and infiltration ("**I&I**") (the "**System Optimizations**").

One municipality in the CRD (Oak Bay) currently has combined storm water and sanitary sewers, however this municipality is developing a plan to separate such conveyance and has received a grant to fund such costs itself outside of BCF-MIC funding.

### *Status of CRD Contribution*

The CRD Board of Directors has passed a resolution approving the contribution of CRD's share of costs (both the Eligible and Ineligible portions) for the Core Area Program and the West Shore Program separately. A copy of the resolution is included in Appendix 1 of this Business Case.

The source of funds of 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.

### *Status of Provincial Government Contributions*

The CRD continues consultations with the BC Provincial government and will submit a detailed business case outlining an analysis of procurement options to the Province in early 2010. The Provincial business case will comply with BC Capital Asset Management policy 5.3 and review various procurement options, value for money, risk management, and will include extensive due diligence of the lifecycle costs of the Programs. Expedited review and acceptance of the Provincial business case is anticipated.

### *BCF-MIC Wastewater Project Assessment Criteria*

As detailed later in this Business Case, the Combined Program satisfies all aspects of the BCF-MIC project assessment criteria as documented in the *Infrastructure Canada* document *BCF-MIC Project Overview Requirements for Wastewater Projects* (the "**BCF-MIC Requirements**"):

- CRD has prepared a detailed Program overview (Appendix 2) along with schedule of estimated start and completion dates (Appendix 4).
- CRD has prepared detailed costs estimates for the Combined Program including Eligible and Ineligible Costs (see below as well as Appendix 2).
- The CRD is committed to funding its one-third share of Eligible Costs as well as all Ineligible Costs.
- CRD intends to utilize debt funding for its share of costs using funds borrowed from the MFA. CRD has held preliminary discussions with the MFA and no problems were identified with the scale of the Program or ability of CRD to carry such additional debt.
- CRD will allocate its share of Combined Program costs and all operating costs of the Programs as well as debt amortizations costs to each client municipality on an equitable basis related to flow rates, population and other factors. Each client municipality is anticipated to recover such costs from ratepayers.
- 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).
- CRD has the capacity to operate and maintain service levels required in the Combined Program.
- CRD is committed to working with regulatory agencies to satisfy all material permitting requirements of the Combined Programs. CRD has held preliminary discussions with CEAA and other federal permitting agencies. CEAA permitting is anticipated to be required for (i) the outfall (only) at the Saanich East WWTP, (ii) West Shore outfall requirements, and (iii) possibly Victoria Harbour facilities (if a site at this location is secured).
- CRD has held detailed discussions with the BC Ministry of Environment on permitting issues and is seeking exceptions for the Clover Point high rate primary treatment facility. However for the purposes of this Business Case CRD has assumed no exception from MoE is forthcoming and high rate primary treatment will be required at Clover Point.
- CRD continues to work collaboratively with First Nations and address identified concerns. CRD has developed a risk mitigation plan to manage issues raised during the First Nations process including project impacts on sensitive foreshore areas in the Lagoon Road area (West Shore) and participation of First Nations in special monitoring programs of fisheries, fish habitat and shell fish

harvesting areas to avoid or reduce closures. First Nations have informed CRD they would not support use of federal lands for the location of treatment facilities.

- CRD is performing a detailed review of procurement plans as required under Provincial business case submission for funding over \$50 million. Resulting procurement plans will be fully documented and will be implemented using a fair, transparent and competitive process. All procurement will comply with Canada's Agreement on Internal Trade.
- CRD has documented the benefits of the Combined Program in this Business Case (summarized below) as well as conducting ongoing risk management initiatives.
- CRD has satisfied all BCF-MIC Minimum Federal Requirements (as documented in the BCF-MIC Requirements).

### *Benefits of the Programs*

The Combined Program has the following benefits to Canadians:

- Will substantially eliminate the discharge of untreated sewage from the Core Area and West Shore. CRD currently discharges average daily volume of 97,000 m<sup>3</sup> per day to the marine environment.
- Effluent flows up to two-times the average daily flow rate shall be treated to a secondary level. Storm water flows between two-times and four-times ADWF shall be treated to primary level. Extreme peak flows over four-times ADWF will be screened to remove plastics and other floatables before discharge.
- The current Combined Program has a net negative (beneficial) carbon footprint over its lifecycle (as a result of resource recovery initiatives).
- Will treat wastewater flows for a year 2030 population of 342,266 in the CRD<sup>1</sup>, 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 from a high of 60 per year to almost zero (CRD estimates the possibility of one every five years at the existing 12 problem locations after upgrades have been completed).
- 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.
- 
- Under the current plan, it is anticipated that the CRD will be seen as a leader in wastewater through the use of innovative technologies which will include a variety of biosolids beneficial reuse initiatives, including biomethane production, anaerobic digestion of biosolids to produce Class A biosolids. Co-digestion of solids with organics and fat, oils, and greases is proposed to increase biomethane production by as much as 50%. 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 support an estimated 10,400 full-time jobs and have a substantial positive economic benefit during the current challenging environment.

<sup>1</sup> This estimate excludes people using septic tanks in the region.





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### *Risk Mitigation*

CRD is implementing extensive risk mitigation and management plans. Appendix 9 includes a summary of the current Risk Registry for the Combined Program and a summary of the methodology being followed.

## B SUMMARY OF ELIGIBLE AND INELIGIBLE COSTS

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

### B.1 TOTAL COMBINED PROGRAM ELIGIBLE COSTS

| Description                                    | CORE AREA PROGRAM COSTS | West Shore WWTP       | TOTAL COMBINED PROGRAMS |
|--|-------------------------|-----------------------|-------------------------|
| Design/Engineering & Construction              | \$ 684,962,700          | \$ 97,466,200         | \$ 782,428,900          |
| Administration, Program Mgmt. & Misc.          | 47,649,400              | 6,780,300             | 54,429,700              |
| Preliminary Inflation Estimate                 | 73,261,200              | 10,424,700            | 83,685,900              |
| <b>Total Eligible Costs</b>                    | <b>\$ 805,873,300</b>   | <b>\$ 114,671,200</b> | <b>\$ 920,544,500</b>   |
| Land Purchase                                  | 10,512,000              | 3,000,000             | 13,512,000              |
| Interim Financing Estimate                     | 29,304,500              | 4,169,900             | 33,474,400              |
| <b>Total Ineligible Costs</b>                  | <b>\$ 39,816,500</b>    | <b>\$ 7,169,900</b>   | <b>\$ 46,986,400</b>    |
| <b>TOTAL COSTS (Eligible &amp; Ineligible)</b> | <b>\$ 845,689,800</b>   | <b>\$ 121,841,100</b> | <b>\$ 967,530,900</b>   |

\*Costs exclude impact of HST which may add a further 1.75% (non-refunding component) or +/- \$16-million.

### B.2 ASSUMED FUNDING SOURCES

This table summarizes the requested funding contribution from the BCF-MIC. CRD assumes two-thirds of Eligible Costs will be funded by the Province of BC and Government of Canada, with the CRD funding the remaining one-third Eligible Costs plus all Ineligible Costs. Ineligible Costs included in this calculation include interim financing costs during construction plus land acquisitions.

|   | CORE AREA PROGRAM COSTS | WEST SHORE PROGRAM   | TOTAL COMBINED PROGRAMS |
|---|-------------------------|----------------------|-------------------------|
| CRD Contribution (1/3 Eligible Costs + Ineligible Costs)      | \$ 308,440,933          | \$ 45,393,633        | \$ 353,834,567          |
| Provincial Contribution (1/3 Eligible Costs)                  | \$ 268,624,433          | \$ 38,223,733        | \$ 306,848,167          |
| <b>Government of Canada Contribution (1/3 Eligible Costs)</b> | <b>\$ 268,624,433</b>   | <b>\$ 38,223,733</b> | <b>\$ 306,848,167</b>   |
| Total Contributions   | \$ 845,689,800          | \$ 121,841,100       | \$ 967,530,900          |

### B.3 ANNUAL FUNDING REQUIREMENTS & CONTRIBUTIONS

This table illustrates preliminary estimates of annual spending on each major component of the Combined Programs. For the purposes of this Business Case, it is assumed all funding contributions will occur during the construction phase of the Combined Program.

| Fiscal years ending March 31               |                     |                      |                       |                       |                       |                       |                       |                     |
|--|---------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|
|  | 2010                | 2011                 | 2012                  | 2013                  | 2014                  | 2015                  | 2016                  | 2017*               |
| <b>Construction &amp; Engineering</b>      |                     |                      |                       |                       |                       |                       |                       |                     |
| Saanich East WWTP                          |                     | \$ 12,967,200        | \$ 67,926,229         | \$ 40,884,171         | \$ -                  | \$ -                  | \$ -                  | \$ -                |
| Clover Point Pump Stations & Primary WWTP  |                     | 5,502,900            | -                     | -                     | -                     | 5,444,627             | 45,025,957            | 305,717             |
| McLoughlin Point WWTP & Biosolids Facility |                     | 24,798,038           | 31,413,038            | 54,604,888            | 171,469,888           | 171,469,888           | 52,399,888            | 972,472             |
| West Shore WWTP                            |                     | 5,720,850            | 3,813,900             | -                     | 10,352,864            | 56,193,227            | 21,343,227            | 288,932             |
| Administration, Project Mgmt, Misc.        |                     | 10,433,161           | 10,433,161            | 9,663,343             | 7,353,888             | 7,353,888             | 7,353,888             | 1,838,472           |
| Inflation Estimate                         |                     | 1,627,450            | 12,534,811            | 16,932,372            | 14,893,122            | 17,846,322            | 19,851,822            | -                   |
| <b>TOTAL ELIGIBLE COSTS</b>                |                     | <b>61,049,598</b>    | <b>126,121,138</b>    | <b>122,084,774</b>    | <b>204,069,762</b>    | <b>258,307,952</b>    | <b>145,974,782</b>    | <b>3,405,593</b>    |
| Land                                       | 6,512,000           | 7,000,000            | -                     | -                     | -                     | -                     | -                     | -                   |
| Interest Costs                             | -                   | 650,988              | 5,013,950             | 6,772,963             | 5,957,245             | 7,138,527             | 7,940,727             | -                   |
| <b>SUB-TOTAL INELIGIBLE COSTS</b>          | <b>6,512,000</b>    | <b>7,650,988</b>     | <b>5,013,950</b>      | <b>6,772,963</b>      | <b>5,957,245</b>      | <b>7,138,527</b>      | <b>7,940,727</b>      | <b>-</b>            |
| <b>TOTAL COSTS</b>                         | <b>\$ 6,512,000</b> | <b>\$ 68,700,586</b> | <b>\$ 131,135,088</b> | <b>\$ 128,857,737</b> | <b>\$ 210,027,008</b> | <b>\$ 265,446,480</b> | <b>\$ 153,915,510</b> | <b>\$ 3,405,593</b> |

#### Annual Contributions

|                                   | 2010         | 2011                 | 2012                 | 2013                 | 2014                 | 2015                 | 2016                 | 2017*               |
|-----------------------------------|--------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------------------|
| CRD Share                         | \$ 6,512,000 | \$ 28,000,854        | \$ 47,054,329        | \$ 47,467,887        | \$ 73,980,499        | \$ 93,241,178        | \$ 56,598,988        | \$ 1,135,198        |
| Province of BC share              | \$ -         | \$ 20,349,866        | \$ 42,040,379        | \$ 40,694,925        | \$ 68,023,254        | \$ 86,102,651        | \$ 48,658,261        | \$ 1,135,198        |
| <b>Government of Canada share</b> | <b>\$ -</b>  | <b>\$ 20,349,866</b> | <b>\$ 42,040,379</b> | <b>\$ 40,694,925</b> | <b>\$ 68,023,254</b> | <b>\$ 86,102,651</b> | <b>\$ 48,658,261</b> | <b>\$ 1,135,198</b> |

\*Some start-up and commissioning costs in 2017 are under review for acceleration into 2016.

Source: Stantec Consulting Ltd.



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Capital Regional District  
Core Area & West Shore Wastewater  
Treatment Programs

**B.4 COST OF EACH MAJOR COMPONENT OF THE COMBINED PROGRAM**

This table illustrates the cost of each wastewater treatment plant (“WWTP”) and the biosolids facility, as well as the cost sharing assumed for each major component.

| Description                                    | East Saanich WWTP     | Clover Point Wet Weather WWTP | McLoughlin - Macaulay Point WWTP | Biosolids Facility (incl. Struvite) | CORE AREA PROGRAM COSTS | West Shore WWTP       | TOTAL COMBINED PROGRAMS |
|--|-----------------------|-------------------------------|----------------------------------|-------------------------------------|-------------------------|-----------------------|-------------------------|
| Design/Engineering & Construction              | \$ 121,728,300        | \$ 56,252,100                 | \$ 282,476,500                   | \$ 224,505,800                      | \$ 684,962,700          | \$ 97,466,200         | \$ 782,428,900          |
| Administration, Program Mgmt. & Misc.          | 8,468,000             | 3,913,200                     | 19,650,500                       | 15,617,700                          | 47,649,400              | 6,780,300             | 54,429,700              |
| Preliminary Inflation Estimate                 | 13,019,600            | 6,016,500                     | 30,212,700                       | 24,012,400                          | 73,261,200              | 10,424,700            | 83,685,900              |
| <b>Total Eligible Costs</b>                    | <b>\$ 143,215,900</b> | <b>\$ 66,181,800</b>          | <b>\$ 332,339,700</b>            | <b>\$ 264,135,900</b>               | <b>\$ 805,873,300</b>   | <b>\$ 114,671,200</b> | <b>\$ 920,544,500</b>   |
| Land Purchase                                  | 6,512,000             | -                             | 4,000,000                        | -                                   | 10,512,000              | 3,000,000             | 13,512,000              |
| Interim Financing Estimate                     | 5,207,900             | 2,406,600                     | 12,085,100                       | 9,604,900                           | 29,304,500              | 4,169,900             | 33,474,400              |
| <b>Total Ineligible Costs</b>                  | <b>\$ 11,719,900</b>  | <b>\$ 2,406,600</b>           | <b>\$ 16,085,100</b>             | <b>\$ 9,604,900</b>                 | <b>\$ 39,816,500</b>    | <b>\$ 7,169,900</b>   | <b>\$ 46,986,400</b>    |
| <b>TOTAL COSTS (Eligible &amp; Ineligible)</b> | <b>\$ 154,935,800</b> | <b>\$ 68,588,400</b>          | <b>\$ 348,424,800</b>            | <b>\$ 273,740,800</b>               | <b>\$ 845,689,800</b>   | <b>\$ 121,841,100</b> | <b>\$ 967,530,900</b>   |

\*Costs exclude impact of HST which may add a further 1.75% (non-refunding component) or +/- \$16-million.

## **B.5 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. Budgets will also be updated based upon possible changes to the scope of the Programs (described later in this Business Case).

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.
- Labour shortages in the construction market.

## **B.6 INFLATION ASSUMPTIONS**

An inflation estimate of 10% of total program costs (direct and indirect) has been added to the cost estimates. Actual cost estimates are in 2009 dollars. This estimate will be refined prior to finalization of the budgets.

## **B.7 CRD RESPONSIBILITY FOR INELIGIBLE COSTS**

The CRD is also assumed to be responsible for 100% of Ineligible Costs (as defined in the BCF-MIC Requirements) as well as 100% of operating costs of the facilities (including resource recovery activities) upon completion of construction and commissioning.

## **B.8 BRIEF SUMMARY OF CONTINGENCIES AND ALLOWANCES**

Current cost estimates are deemed to be at the "Class C" level. The Program remains in the early stages of design.

CRD acknowledges the limitation on administrative and similar costs in the definition of Ineligible Costs under the BCF-MIC and is reviewing the current budgets to ensure they align with BCF-MIC expectations.

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.

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).

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 insurance, 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.9 RISK MANAGEMENT AND PLANNING**

The CRD and its advisors are conducting extensive risk management planning as part of the Combined Program. Work is ongoing and a full risk analysis report will be prepared as part of the Provincial business case including an assessment of how risks can be mitigated and managed through the procurement process.

The current budgets will be updated with the outcome of CRD risk management plans.

Appendix 9 includes a summary of the risk registry for the Combined Program identified to date.

## C INTRODUCTION AND BACKGROUND

This Business Case examines the following:

- The service delivery options considered by CRD during its planning in recent years,
- Recommendations for the preferred service delivery option including a detailed scope of the network of conveyance systems, pumping stations/forcemains, wastewater treatment plants and biosolids treatment and disposal plans,
- A summary of resource recovery and sustainability targets included in the Combined Program,
- Funding requirements from each level of government,
- A review of fundamental aspects of the plan including First Nations consultations to date, risk planning, and permitting requirements,
- A summary of technical criteria and issues including capacity requirements, scheduling, wet weather flow management, and wastewater chemistry issues, and
- All other issues required under the Infrastructure Canada – Building Canada Fund (Major Infrastructure Component) funding program.

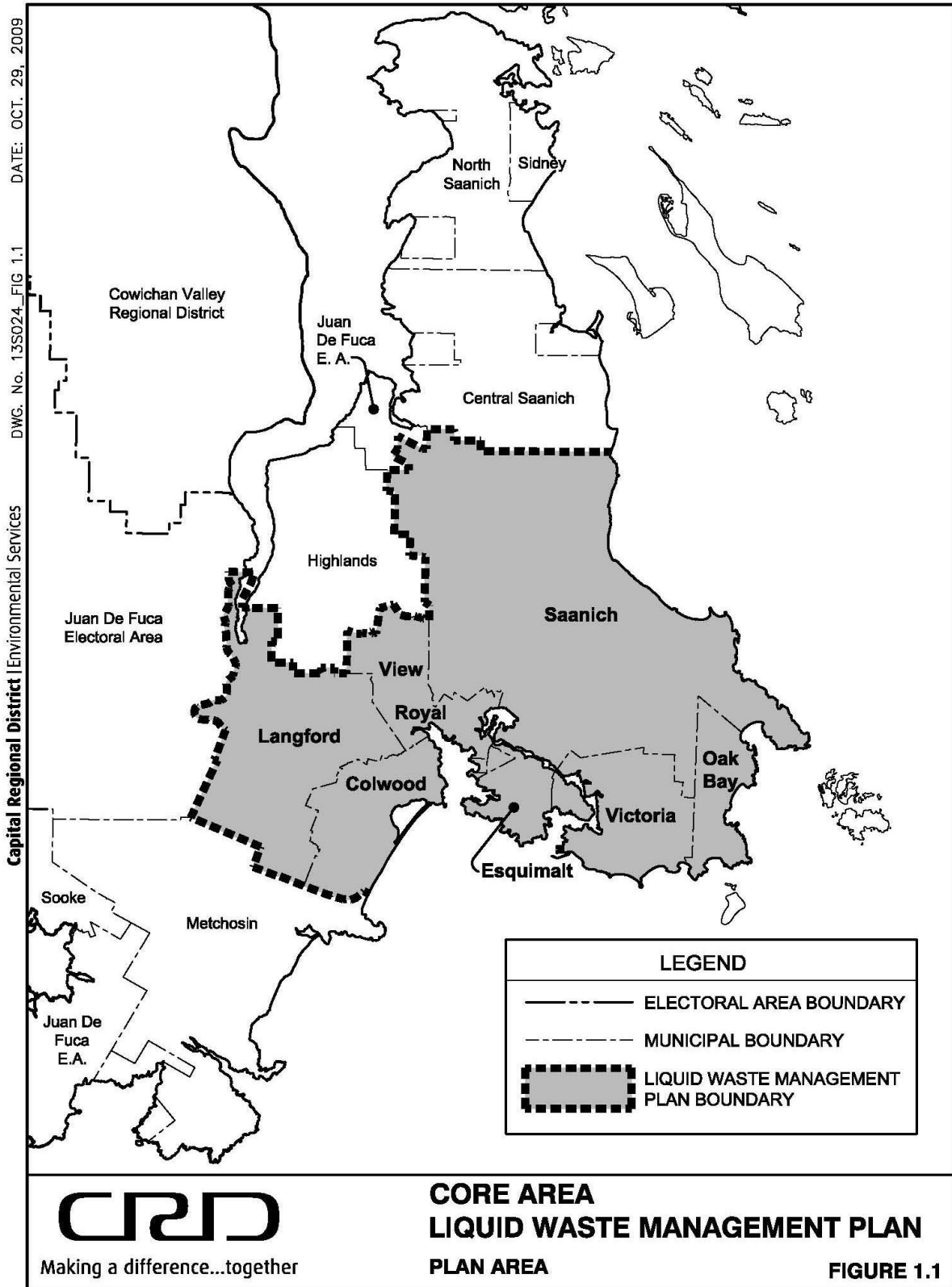
The Core Area and West Shore of the CRD is a collaboration of seven local governments and two First Nation areas with a total land area of approximately 215 square kilometres that make up the majority of Greater Victoria. These communities include the Cities of Victoria, Langford and Colwood, the Districts 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 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 letter of 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 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](http://www.WastewaterMadeClear.ca)





## C.1 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. Key features of the LWMP include:

- A source control program for contaminants entering the collection system.
- An I&I reduction program.
- Preliminary wastewater treatment using 6 mm diameter fine screening.
- Effluent disposal to the marine environment through two major outfalls.
- A marine monitoring program.

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

## C.2 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.

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 P3 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.

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

### **C.3 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 sewer. Each of the municipalities own and operate their own sanitary sewer system, including municipal sewer lines and pump stations.
- Regional trunk sewers are generally major pipelines 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 sewers are larger, deeper and generally installed on flatter grades. 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:

- 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 C1 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 small.

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 under this Business Case will be used to add treatment facilities to the trunk conveyance system.

### **C.4 CAPACITY PLANNING, DEMAND MANAGEMENT AND INFLOW AND INFILTRATION**

The CRD is a leader in demand management and water conservation. There are multiple successful initiatives already in place 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.

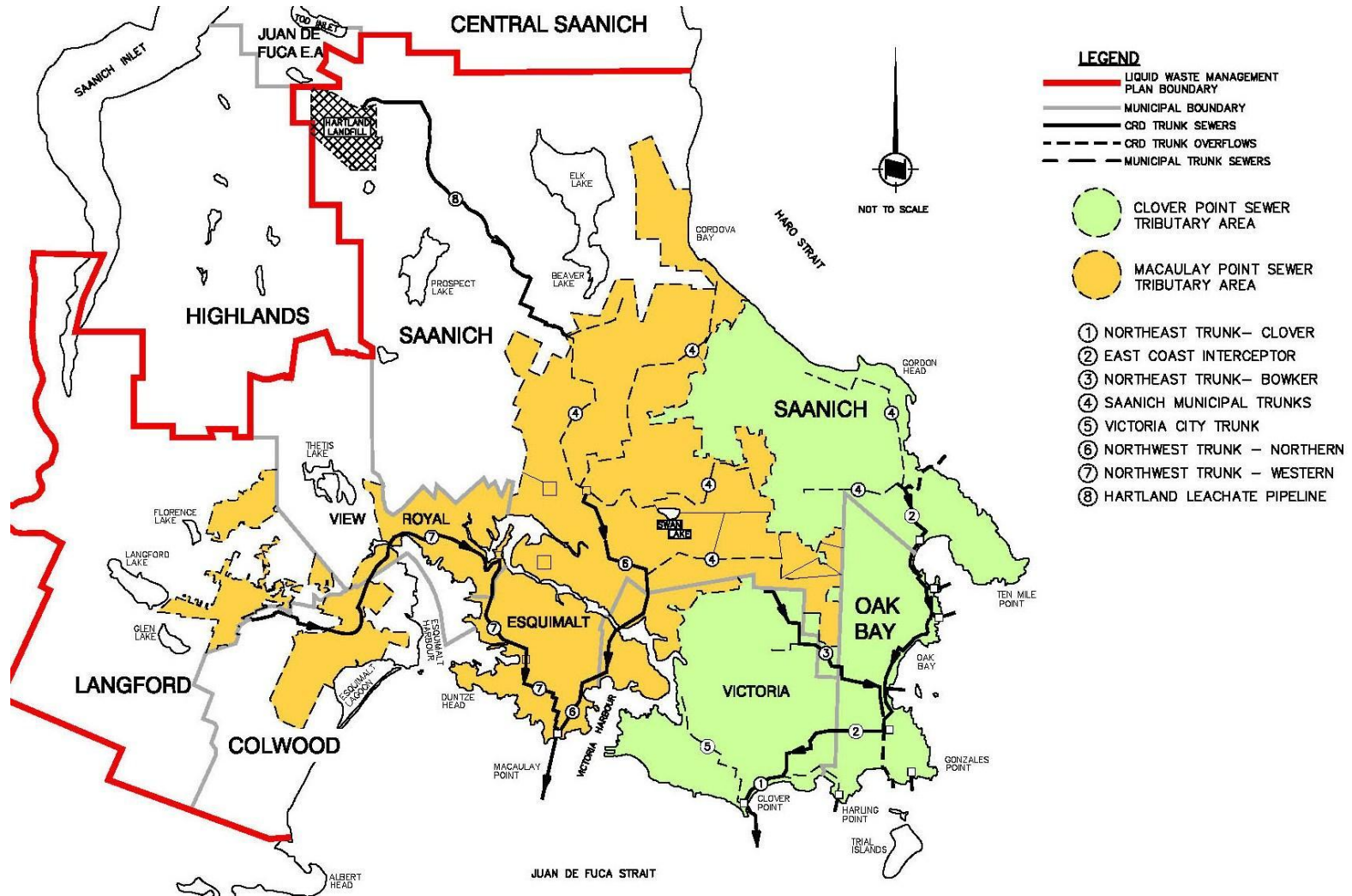
Since water conservation programs were introduced by the CRD in the mid 1990s, the total annual water consumption per capita has decreased by about 8% as a result of increasing public awareness of water issues and the CRD's comprehensive demand management program. CRD estimates aggressive implementation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

From a capacity planning perspective, I&I 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.

Appendix 15 includes a detailed review of capacity planning issues including I&I initiatives and population growth estimates. Appendix 3 includes a detailed assessment of CRD's population growth.

**Figure C1: Existing Wastewater Conveyance System and Two Major Catchment Areas**

This figure illustrates the geographic boundaries of the CRD's two sewer tributary 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.



## D SUMMARY OF THE COMBINED PROGRAM

The CRD has conducted an extensive review of service delivery options over the last two years. The analysis of options included an assessment of distributed treatment facilities throughout the community (as many as 11 different plants), innovative treatment technologies, resource recovery and sustainability issues, partnering strategies, procurement planning, plus extensive First Nations and public consultation. Engineering work has been peer reviewed by a panel of independent specialists in the field of wastewater treatment<sup>2</sup>. The selection process of the preferred option was based upon an enhanced triple bottom line assessment considering lifecycle financial costs, resource recovery revenue potential, environmental and social factors as well as risk. Appendix 11 includes details of the options considered by the CRD. The CRD's preferred option is described below and is known as Option 1A.

### D.1 DETAILED WEST SHORE PLAN TO FOLLOW EARLY IN 2010

As noted earlier, 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 early 2010 once the configuration of the West Shore system has been finalized. We note, however, that approval of the West Shore system is essential as the Core Area facilities at McLoughlin Point have not been sized to accept flows from the West Shore.

### D.2 GOALS OF THE COMBINED PROGRAM

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:

- a) satisfy all relevant Provincial and Federal permitting requirements (in accordance with plans documented in the LWMP amendment)
- b) provide appropriate wastewater treatment for municipalities that will minimize lifecycle cost to taxpayers
- c) protect public health and the environment
- d) provide facilities that are compatible with the surrounding communities
- e) have a net negative carbon footprint
- f) be sustainable and optimize the recovery and beneficial use of resources
- g) allow opportunities to integrate the solid and liquid waste functions wherever a mutual benefit can be achieved

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<sup>2</sup> A copy of the Peer Review Team final report is available online at CRD's main project archival document library at [www.WastewaterMadeClear.com](http://www.WastewaterMadeClear.com) along with all other analysis work to date.

### D.3 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   |
|---------------------------------|---|
| Wastewater Treatment Facilities | <ul style="list-style-type: none"> <li>• A new 1.6 MI/d Saanich East (liquids only) secondary treatment plant for flows up to 1.75 times average dry weather flow (<b>ADWF</b>). 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.</li> <li>• A new 84.2 MI/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.</li> <li>• 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.</li> </ul>                        |
| Clover Point Pumping Station    | <ul style="list-style-type: none"> <li>• A pump station at Clover Point that will pump two times the ADWF at this location to McLoughlin Point for secondary treatment.</li> <li>• Wet weather flows over two times ADWF up to four times ADWF will receive primary treatment.</li> <li>• Extreme wet weather flows over four times ADWF shall be screened and discharged.</li> </ul>   |
| Macaulay Point Pump Station     | <ul style="list-style-type: none"> <li>• Upgrade and expansion of Macaulay Point Pump station to transfer flows to the McLoughlin Point plant.</li> <li>• A new forcemain to transfer flows from Macaulay pump station to McLoughlin WWTP.</li> </ul>   |
| Biosolids Treatment Facility    | <p>A centralized biosolids facility will be implemented for the Combined Program. The current biosolids management plan (<b>BMP</b>) 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 later, a biosolids processing and resource recovery facility at an upper harbour industrial site is also under consideration.)</p> <p>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 facility will process the biosolids generated by primary and secondary treatment in a manner that will optimize opportunities for beneficial use by:</p> <ul style="list-style-type: none"> <li>• 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,</li> <li>• drying some or all of the digested biosolids and selling it as a fuel for cement kilns, paper mills or other energy facilities; and / or</li> </ul> |

|   | <ul style="list-style-type: none"> <li>Extraction of Struvite (phosphate) from dewatering centrate for use as fertilizer.</li> </ul> <p>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 to Appendix 3 for details.</p> <table border="1" data-bbox="553 604 1333 837"> <thead> <tr> <th>Item</th> <th>Average Day (kg/day)</th> <th>Peak day (kg/day)</th> </tr> </thead> <tbody> <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> </tbody> </table> | Item              | Average Day (kg/day) | Peak day (kg/day) | Primary Solids | 12,700 | 20,200 | Secondary Solids | 16,800 | 24,500 | Total Raw Solids | 29,400 | 44,700 | Total Raw Volatile Solids | 24,700 | 37,500 |
|---|--|-------------------|----------------------|-------------------|----------------|--------|--------|------------------|--------|--------|------------------|--------|--------|---------------------------|--------|--------|
| Item  | Average Day (kg/day)   | Peak day (kg/day) |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |
| Primary Solids  | 12,700   | 20,200            |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |
| Secondary Solids  | 16,800   | 24,500            |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |
| Total Raw Solids  | 29,400   | 44,700            |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |
| Total Raw Volatile Solids                                 | 24,700   | 37,500            |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |
| <p>Conveyance &amp; Trunk Sewer Upgrades</p>              | <ul style="list-style-type: none"> <li>Upgrades to existing forcemain at Clover Point pump station</li> <li>Upgrades to the Macaulay outfall</li> <li>Conveyance works between Macaulay Point and McLoughlin Point</li> <li>Conveyance works between Clover Point and McLoughlin Point, including tunnel works.</li> </ul>   |                   |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |
| <p>Outfalls</p>   | <p>Treated wastewater from the WWTPs will be discharged to the marine environment through existing outfalls. Some upgrade work on the outfalls is necessary, including:</p> <ul style="list-style-type: none"> <li>Twinning of the existing major marine outfall at Macaulay Point, and</li> <li>Expansion and extension of the existing marine outfall at Finnerty Cove.</li> </ul>   |                   |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |
| <p>Resource Recovery &amp; Sustainability Initiatives</p> | <ul style="list-style-type: none"> <li>Each secondary treatment plant will produce reclaimed water suitable for irrigation, toilet flushing and other uses.</li> <li>Generation of methane gas at the biosolids facility for use onsite or offsite in the natural gas distribution system.</li> <li>Biosolids digesters shall include adequate capacity to accept clean food waste and/or fats, oils and greases (<b>FOG</b>) to enhance production of biomethane by up to 50%.</li> <li>Will recover waste heat from the digesters to pre-heat sludge feed (reducing heat required by digesters).</li> <li>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.</li> <li>Possible implementation of heat recovery exchangers for heating district (under review).</li> <li></li> </ul>  |                   |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |
| <p>Operations</p>   | <ul style="list-style-type: none"> <li>CRD shall ensure ongoing operations of the facilities (including the possibility of contracting with third party providers for certain services).</li> </ul>  |                   |                      |                   |                |        |        |                  |        |        |                  |        |        |                           |        |        |

#### D.4 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                | <ul style="list-style-type: none"> <li>A 14 MI/d West Shore secondary treatment plant for liquid-only flows up to two times ADWF from the northwest trunk, and primary treatment for flows up to four times ADWF.</li> </ul> |
| Biosolids Facility                             | <ul style="list-style-type: none"> <li>The current plan assumes biosolids are returned to the conveyance system for downstream treatment at the Core Area centralized biosolids facility.</li> </ul>                         |
| Conveyance & Trunk Sewer Upgrades              | <ul style="list-style-type: none"> <li>Conveyance works between West Shore and McLoughlin Point.</li> <li>Onshore conveyance from WWTP to shoreline of outfall.</li> </ul>   |
| Outfall  | <ul style="list-style-type: none"> <li>A new outfall extending from West Shore WWTP shoreline to southern marine discharge.</li> </ul>   |
| Resource Recovery & Sustainability Initiatives | <ul style="list-style-type: none"> <li>Resource recovery components of West Shore Program expected to be similar in breadth to planned Core Area Program initiatives.</li> </ul>   |

#### D.5 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.wastewatremadeclear.com](http://www.wastewatremadeclear.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.

The CRD has identified a number of possible sites in the Core Area which are large enough to accommodate a combined wastewater liquid treatment facility plus the centralized biosolids facility. Discussions with land owners of these sites is ongoing. If such a site were to be acquired then CRD anticipates the updated plan may lead to a reduction in the overall costs of the Combined Program and resulting lower level of Eligible Costs.



## D.6 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.

## D.7 RESOURCE RECOVERY INITIATIVES

The CRD is pursuing a number of sustainability and resource recovery initiatives as part of the Combined Program. Such plans include partnerships for water reuse, heat recovery and the beneficial use of biosolids, and by aggressively pursuing opportunities to minimize greenhouse gas emissions.

CRD plans include the following commitments (the “**RR Commitments**”):

- a) By mid 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 2010 CRD will complete 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
- 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 wet 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 by up to 40%
- 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) use effluent source heat pumps to provide cost-effective heat to:
  - (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.

## E IMPLEMENTATION PLANNING FOR THE COMBINED PROGRAM

Program implementation planning continues by CRD. The following issues are under review and subject to CRD obtaining successful funding commitments.

### E.1 IMPLEMENTATION SCHEDULE

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

### E.2 PROCUREMENT PLANS

The CRD will complete a detailed procurement analysis and implementation plan as part of the Provincial business case process (with completion in February 2010). Key aspects of the procurement plans will include:

- All major components of the Combined Programs will be competitively bid through a tender process or request for proposals process,
- CRD will follow a fair and transparent process for all procurement plans (consistent with all work to date),
- As required under Building Canada Fund (BCF) guidelines, CRD will follow a procurement and contract award process that does not include sole source contracts and no union-only processes, and
- CRD will implement procurement plans that are open to bidders from other provinces as well as international firms – the process will be compliant with the Agreement on Internal Trade.

### E.3 GOVERNANCE

CRD is reviewing a number of options for governance and management of the Combined Program. The governance structure will likely evolve over the life of the Programs from planning stage to procurement implementation to final operations phase. The CRD and West Shore may establish parallel governance structures for implementation of their respective Programs.

Significant flexibility exists in governance planning. There is no “one size fits all” governance plan however the following options are under consideration by CRD for each major phase of the Program.

#### *Pre-funding Stage*

This phase is under way and being managed by CRD staff under the guidance of the CRD Liquid Waste Management Committee.

#### *Procurement / Design Phase (2010)*

This is a critical phase of the Programs and will require rapid decision-making to evaluate and review bids. The governance structure must also maintain an open and transparent bid process to

encourage competitive procurement. The governance structure will be subject to public scrutiny and pressures. Funding partners may be participate in the governance structure at this stage.

Models under consideration include:

- Corporate Special Purpose Vehicle (owned by CRD)
- Steering Committee
- Utility approach

### ***Construction Phase (2011 to 2016)***

A focus on delivering the Programs on budget and on schedule will be required at this stage while controlling scope creep. Funding partners may be participate in the governance structure at this stage.

Models under consideration include:

- Corporate Special Purpose Vehicle (owned by CRD)
- Steering Committee
- Utility approach

### ***Operations Phase (2017+)***

This will be a relatively easy phase of the Programs and a simple, efficient governance structure will be appropriate focusing on satisfying performance requirements of the operation and maintaining effluent targets. Participation of funding partners will likely not be required at this stage.

Models under consideration include:

- Corporate Special Purpose Vehicle (owned by CRD)
- Steering Committee
- Utility approach

## **E.4 IMPACT OF CLIMATE CHANGE ON I&I AND IMPLEMENTATION PLANS**

A joint Federal/Provincial (see CLIMATE 2008) estimate of sea level changes projected an increase for Victoria of 0.20 to 0.33 metres based on mean estimates, and as much as 0.89 to 0.94 metres based on extreme high estimates of global sea levels. Furthermore, it is noted that such changes could have significant consequences where development and harbour infrastructure is close to present high tide limits (particularly during extreme weather events such as storm surges, occurring at the same time as high tides).

The CLIMATE 2007 report did identify statistically measurable increases in the overall rainfall intensity and volume (non-extreme events) and interpreted this as being a result of large scale climate change. Given the challenges CRD is facing with I&I, such rainfall growth trends and storm water management issues must be managed.

Analysis work completed in KWL 2008 on the Metro Vancouver sewerage area's susceptibility to climate change suggests "intense rainfall" in the Vancouver area could increase by 17% by 2050, and overall total annual rain could increase by 14% by 2050. Sea levels could increase by 0.26m by 2080. Similar weather pattern changes and precipitation increases may be expected in the CRD. However

the impacts of higher rainfall on I&I over this period will be offset by rehabilitation work by municipalities to improve/replace existing infrastructure. Further work is required to clarify such offsetting trends to allow clearer capacity planning.

For procurement planning purposes, CRD will manage this risk by specifying guidelines on design flow minimum requirements to ensure climate change peak flows and risks are accommodated. This issue will not be left to service providers to determine.

## F PROJECT ASSESSMENT CRITERIA

The following table summarizes the Core Area Program and West Shore Program against rating criteria in the BCF-MIC requirements.

| BCF-MIC Criteria   | Core Area Program  | West Shore Program  |
|--|--|---|
| <b>Detailed Design</b>   | <p>See Appendix 2 for details on the Core Area Program including maps and diagrams of the planned configuration of conveyance system upgrades, WWTPs, biosolids treatment facilities and outfalls.</p> <p>The report includes preliminary drawings and layout/design work for each major component of the Programs.</p>  | <p>See Appendix 2 for details on the West Shore Program.</p>  |
| <b>Estimated Start and Completion Date of Project Components</b> | <p>Appendix 4 includes a schedule illustrating the timing of each major component.</p> <p>Project launch will vary slightly depending upon the approach to procurement implemented (P3 versus traditional approaches).</p> <p>Construction will be complete by March 31, 2016 to ensure compliance with BCF-MIC requirements. The current schedule will be updated to reflect this goal as the plan moves forward.</p> | <p>See Appendix 4 for details.</p>  |
| <b>Eligible and Ineligible Costs</b>                             | <p>A summary of Eligible Costs and Ineligible Costs are included in above in Section B in this Business Case.</p>  | <p>See Section B above for details.</p>   |
| <b>Level of Accuracy of Cost Estimates</b>                       | <p>CRD currently has a cost estimate generally based upon a "Class C" level of accuracy. Work continues on the cost estimates to clarify various allowances and contingencies included.</p> <p>As part of the Provincial business case process, CRD will complete additional due diligence to refine all budgets, contingencies and allowances.</p>  | <p>Same as Core Area Program assumptions.</p>   |
| <b>Capacity to Operate and Maintain</b>                          | <p>CRD is committed to ensure the new Combined Program will be operated and maintained on a sustainable long-term basis.</p> <p><b>Operational Capacity</b><br/>The number of new staff required to operate the WWTPs and biosolids facility will depend on the approach to procurement used. CRD is reviewing such issues. At this stage CRD anticipates the</p>  | <p>West Shore communities of Colwood and Langford are committed to long-term sustainable management of the Program.</p> <p><b>Operational/Staffing</b><br/>West Shore communities are exploring all options for</p> |

|  |   |  |
|--|---|--|
|  | <p>conveyance system and WWTP operations will be managed by existing and new staff. CRD staff currently successfully operate and maintain the existing conveyance system as well as a WWTP in the Saanich Peninsula and Gulf Islands.</p> <p><b>Environmental Sustainability</b><br/>CRD is integrating a number of resource recovery initiatives in the Combined Program. Such technologies may require specialized expertise and thus CRD is reviewing such opportunities for P3 arrangements. CRD is also exploring partnerships with service providers to share revenue risks of such technologies (for example entering into a long-term agreement with biogas distributors to buy gas from CRD).</p> <p><b>Financial Capacity</b><br/>CRD has the capacity to fund ongoing operating costs of the new facilities.</p> <p>Annual operating and maintenance costs are estimated for the facility at \$18.5-million per year (this excludes potential revenues from resource recovery and energy sales which are estimated at +/- \$1.0-million per year). Annual interest and principal amortization costs on MFA debt carried by CRD for the Combined Program is estimated to be \$27.43-million (assuming fixed 5.35% interest rate and 25-year sinking fund amortization). Thus, total carry costs are \$45.93-million per annum for the entire Core Area Program.</p> <p>CRD has held preliminary discussions with MFA and no problems with the scale of the Program or ability of CRD to carry such excess debt were identified</p> <p>CRD participating municipalities will be allocated a proportionate share of such costs based upon an equitable formula agreed among the jurisdictions. Each municipality will be responsible for the allocation of such costs through property taxes and/or development charges.</p> <p>The current CRD estimate of annual cost per average home, assuming two-thirds senior government funding of Eligible Costs, varies between municipalities from \$250 to \$450 per household for the entire Combined Program.</p> | <p>operations of the new facilities, including a P3 arrangement.</p> <p><b>Environmental Sustainability</b><br/>West Shore communities will pursue aggressive resource recovery opportunities. As with the Core Area Program, the West Shore communities will likely partner with specialized service providers to operate and manage the risks of such activities.</p> <p><b>Financial Capacity</b><br/>West Shore municipalities shall be allocated a share of costs based upon the cost of their portion of the Program. Each municipality is anticipated to allocate such costs to ratepayers through property taxes and development cost charges.</p> |
|--|---|--|



|  |  |  |
|--|--|--|
| <p><b>Federal Permits and Authorizations</b></p> | <p>The CRD core area communities are committed to ensure it will comply with all applicable federal legislation and obtain all necessary federal permits and authorizations required for the Core Area Program.</p> <p>CRD plans will include compliance with the CCME <i>Canada-wide Strategy for the Management of Municipal Wastewater Effluent</i>. CRD will work cooperatively with the Canadian Environmental Assessment Agency (<b>CEAA</b>) to ensure compliance to all requirements.</p>  | <p>The West Shore communities are also committed to ensure compliance with all federal and provincial permitting requirements.</p> <p>West Shore plans for permitting of the West Shore Program are currently under review. The West Shore may pursue a separate approval process from the Core Area for certain aspects of its Program.</p> |
| <p><b>Status of Permitting Plans</b></p>         | <p>Appendix 4 includes a schedule of permit requirements and the timing of each. All required permits are expected to be obtained over the next 12-24 months.</p> <p><b>CEAA Requirements:</b><br/>CRD has held preliminary discussions with federal officials for CEAA requirements. The following CEAA special permitting is expected to be required:</p> <ol style="list-style-type: none"> <li>1. The outfall at Finnerty Cover from the Saanich East WWTP is anticipated to require a CEAA process (outfall only).</li> <li>2. The West Shore Program new outfall.</li> </ol> <p>No substantial permitting issues are anticipated with the work on existing outfalls at Clover Point and Macaulay Point.</p> <p><b>Provincial MoE Requirements:</b><br/>CRD has been working closely with the Provincial Ministry of Environment on multiple aspects of the Combined Program. The following permits are anticipated:</p> <ol style="list-style-type: none"> <li>1. An exception for Clover Point wet weather flow treatment. CRD is exploring the possibility of eliminating the requirement for high-rate primary treatment during storm events.</li> <li>2. The West Shore Program new outfall, plus conveyance work to outfall.</li> </ol> | <p>It is possible the West Shore may pursue permits separately from the CRD.</p> <p>If additional sites are added to the Program then permitting may expand.</p> <p>The West Shore and CRD are committed to satisfying all required Provincial and Federal permit requirements.</p>  |

|  |   |   |
|--|---|---|
| <p><b>Status of First Nations Consultation</b></p> | <p>CRD has ongoing discussions with First Nations representatives. Appendix 8 includes details of First Nations consultations to date.</p> <p>Key issues reviewed to date include the following:</p> <ol style="list-style-type: none"> <li>1. First Nations communities do not have concerns on the sites selected to date for WWTP and biosolids facilities. CRD will also continue due diligence with respect to archeological activities on sites.</li> <li>2. Outfalls to the marine environment were identified as a concern for some First Nations, particularly in the Finnerty Cove area. The impact of effluent on fisheries and shell fish harvesting has been identified as an issue (particularly if shell fish harvesting is reduced or closed). Disinfection has been considered to mitigate this concern.</li> </ol> <p>CRD Plans and Mitigation Actions:</p> <ol style="list-style-type: none"> <li>1. CRD has committed to include local First Nations communities in all ongoing marine monitoring of operations upon completion of the Program.</li> <li>2. CRD is working with First Nations in the Finnerty Cover area to determine exactly where existing shell fish harvesting is occurring. These areas will be monitored more closely. Certain local islands are of particular interest to First Nations communities and will receive special attention during the planning of outfall locations.</li> <li>3. CRD will commit to reducing the risk of fisheries/harvesting closures. This may include expanding the level and approach to disinfection of effluent at the Finnerty Cove outfall.</li> </ol> | <p>West Shore Program issues include the following:</p> <ol style="list-style-type: none"> <li>1. The foreshore impact of the proposed West Shore outfall and conveyance may be problematic. The lagoon area on the West Shore is a known sensitive area for archeological matters. CRD may use tunneling to mitigate impact of this issue.</li> </ol> <p>Mitigation Plans:</p> <ol style="list-style-type: none"> <li>1. As with Core Area, West Shore communities shall commit to First Nations participation in monitoring.</li> <li>2. CRD's plan to use tunneling in the area around Lagoon Road to avoid disturbing sensitive surface locations as viewed positively during First Nations discussions.</li> </ol> |
| <p><b>Contract Award Process Fairness</b></p>      | <p>CRD and West Shore are committed to implementing a transparent and fair competitive bid process for all aspects of the Combined Program. The process will be consistent with Canada's Agreement on Internal Trade and will be open to local, national and international service providers. The procurement methodology is currently under review as part of the Provincial business case analysis.</p>   |   |

The following additional requirements are identified in the BCF-MIC.

| <b>BCF-MIC<br/>Criteria</b>  | <b>Combined Program</b>  |
|--|--|
| <b>Provides Access for<br/>People with<br/>Disabilities</b>                | Satisfied.   |
| <b>Project meets or<br/>exceeds energy<br/>efficiency<br/>requirements</b> | Satisfied.<br>Project buildings to comply to LEED Silver.  |
| <b>CCME Criteria for<br/>cBOD5, TSS and Total<br/>Residual Chlorine</b>    | Satisfied.<br>Satisfied cBOD5 and TSS criteria.<br>Chlorination of effluent is not being utilized thus TRC criteria are not applicable. CRD is planning to use UV and ozone disinfection to reduce the amount of chemicals released to the marine environment and improve the LEED score of the project. |

## G PROJECT BENEFITS

This section briefly summarizes some of the key benefits of the Combined Program.

### G.1 EFFLUENT QUALITY TARGET COMMITMENTS

The Combined Programs 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 substantially 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 G1 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 G2 below. Flows above two-times ADWF will be treated as described below.

**Table G1: 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 G2: Level of Treatment**

| Flow Rate      | Level of Treatment   |
|----------------|--|
| Up to 2 x ADWF | <p><b>Secondary Treatment<sup>3</sup></b><br/>Treatment levels to satisfy both Federal and Provincial standards:</p> <p><u>Provincial Standards:</u><br/>cBOD5 not to exceed 45 mg/L<br/>TSS not to exceed 45 mg/L</p> |

<sup>3</sup> 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.

|                                 |   |
|---------------------------------|---|
|                                 | <p><u>Federal Standards:</u><br/> cBOD5 monthly average of 25 mg/l<br/> TSS monthly average of 25 mg/l<br/> Total Residual Chlorine (TRC) – maximum of 0.02 mg/L based on periodic average (or applicable provincial license requirements, whichever is more stringent)</p> <p>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.</p> |
| 2 x ADWF – 4 x ADWF (tributary) | <p><b>Primary Treatment</b><br/> cBOD5 not to exceed 130 mg/L<br/> TSS not to exceed 130 mg/L</p>   |
| >4 ADWF (tributary)             | <p><b>Screened Preliminary Treatment</b><br/> Flows over 4 x ADWF are screened<br/> Flows under 4 x ADWF are treated as described above</p>   |
| pH                              | All effluent shall be within the range of 6 to 9 pH   |
| Biosolids                       | The biosolids shall be treated to a Class “A” level.  |

## G.2 ECONOMIC IMPACT ASSESSMENT SUMMARY

Based upon the standard Federation of Canadian Municipalities economic development infrastructure impact calculator<sup>4</sup>, the overall impact of the Combined Programs on the Canadian economy will be as follows:

| Economic Impact Measure                          | Impact of CRD Combined Program      |
|--|-------------------------------------|
| Overall benefit to the Canadian economy and GDP: | \$1,247,000,000<br>0.1% of real GDP |
| Impact on Canadian Employment:                   | Approximately 10,400 jobs           |
| Impact on Government                             | Federal: \$118,300,000              |

<sup>4</sup> The FCM infrastructure economic impact calculator is available online at <http://www.fcm.ca/english/calculator.asp?x=1>

|                               |   |
|-------------------------------|---|
| Tax Revenues:                 | Provincial: \$122,086,000<br>Municipal: \$2,840,000<br>Plus FPT Transfers from municipalities: \$616,000,000<br><br>Impact on current government spending: minus \$55,116,000 |
| Government Net Cash Balances: | Federal: minus \$154,581,000<br>Provincial: minus \$174,211,994<br>Municipal: minus \$345,591,000   |

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

### G.3 IMPROVED RELATIONS WITH WASHINGTON STATE AND SEATTLE AREA

The existing effluent discharge situation has created a negative perception of the CRD among some regional neighbours in Seattle and surrounding area. The Combined Program would eliminate this cross-border tension and be warmly embraced by Washington State.

### G.4 CRD COMMITMENT TO SHARE RESEARCH AND LESSONS LEARNED

The CRD is following an open and transparent process with all research, analysis and methodologies available to the public and other governmental agencies through the CRD project website at [www.wastewatertomadeclear.ca/media/archived-documents](http://www.wastewatertomadeclear.ca/media/archived-documents). This website includes extensive archival libraries of helpful analysis.

CRD has also hosted other public sector agencies interested in implementing similar types of wastewater projects, including parties from the USA.

The CRD is committed to sharing its research with all interested parties.

### G.5 RESOURCE RECOVERY AND CARBON NEUTRALITY

As noted in this Business Case, the CRD is committed to implementing a large number of sustainability initiatives in these Programs. The CRD will demonstrate leadership in the field of wastewater treatment and beneficial reuse, and also aim for carbon neutrality.

## H REFERENCES

1. CRD, 2000. Capital Regional District Core Area Liquid Waste Management Plan, Stage 3, July 2000.
2. AE et al. 2008-2009. Discussion Paper numbers 030-1 to 030-9, 032-1, 033-1 to 033-3, and 036-1.
3. KWL 2008. Vulnerability of Vancouver Sewerage Area Infrastructure to Climate Change, Kerr Wood Leidal Associates Limited, March 2008.
4. CRD 2009. CRD-published discussion paper "Cost versus Benefit of Reducing Inflow and Infiltration", March 2009.
5. CRDWATER 2008. Water Use and Conservation Update report produced by CRD in April 2008.
6. CLIMATE 2008. Projected Sea Level Changes for British Columbia in the 21st Century, December 2008 as BC/Government of Canada publication based upon a report by R.E. Thomson, B.D. Bornhold and S. Mazzotti, An Examination of the Factors Affecting Relative and Absolute Sea Level in British Columbia.
7. Core Area Wastewater Treatment, Assessment of Wastewater Treatment Options 1A, 1B and 1C, Stantec Consulting Ltd./ Brown and Caldwell, September 16, 2009.

## I 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 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 facility during the dry weather period by the number of days in that period.

**“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.

**“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/pe/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 liters 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 Langford and Colwood.

**"WWTP"** wastewater treatment plant.