TECHNICAL AND COMMUNITY ADVISORY COMMITTEE
CORE AREA WASTEWATER TREATMENT

Notice of Meeting on **Tuesday February 13, 2024 at 1:00 pm**
CRD Room 488, 625 Fisgard Street, Victoria, BC

Brenda Donald	Don Monsour	Jas Paul	Katie Wilson	Richard Ding
Caterina Valeo	Doug Kobayashi (Vice-Chair)	Jim McAloon (CRD)	Lesley Hatch	Winona Pugh
Christopher Coleman (Chair)	Glenn Harris (CRD)	Joel Clary	Lori Nickerson (CRD)	
Claire Remington	Greg Gillespie	John Roe	Michael Engelsjord	
Dale Green (CRD)	Ivan Leung	Josh Andrews	Peter Kickham (CRD)	

AGENDA

1. Territorial Acknowledgement
2. Approval of Agenda
3. Adoption of Minutes of January 19, 2024
4. Chair's Remarks
5. Report to the TCAC - Amendment 13 - Dale Green, CRD
6. Biosolids Options Evaluation - Deacon Liddy, GHD Environmental
   a. Discussion and Q&A
7. Biosolids Public Engagement Update - Katie Hamilton, Tavola Strategy Group
8. Other Business
9. Next meeting: March 7, 2024
10. Closing Comments
11. Adjournment

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REPORT TO TECHNICAL AND COMMUNITY ADVISORY COMMITTEE
MEETING OF TUESDAY, FEBRUARY 13, 2024

SUBJECT **Amendment 13 - Core Area Liquid Waste Management Plan**

ISSUE SUMMARY

Capital Regional District (CRD) staff are seeking final comments from the Technical and Community Advisory Committee (TCAC) regarding the update to Section 5 of the Core Area Liquid Waste Management Plan (the Plan) and supporting technical report so that staff can forward information to the Core Area Liquid Waste Management Committee (CALWMC) for consideration.

BACKGROUND

Liquid Waste Management plans allow the CRD and local governments to develop community-specific solutions for the management of liquid waste, stormwater and environmental protection in accordance with the BC *Environmental Management Act*. The current Plan was originally approved by the Minister of Environment in 2003 and was last updated with Amendment 12 in 2018. The CRD is updating components of the Plan and has formed a Technical and Community Advisory Committee to assist the CALWMC in making appropriate recommendations to the CRD Board in the areas of:

- Inflow and infiltration (I&I)
- Sanitary sewer overflows
- Biosolids management and beneficial use

The first two items will be addressed in an updated Section 5 (Management of Infiltration and Inflow and Control of Wastewater Overflows) of the Plan (Amendment 13) with biosolids planning anticipated to be a separate amendment.

The TCAC has met four times since October 2023 to discuss I&I items including:

- reviewing the background for the need of an update of Section 5
- receiving presentations from CRD staff and Kerr Wood Leidal
- discussing options for managing I&I in the region
- receiving a report from Kerr Wood Leidal summarizing recommendations for updating Section 5
- hearing the municipal approach to asset management for I&I

CRD staff now seek TCAC's final comments and support for the proposed new Section 5 and the Kerr Wood Leidal report which will be submitted as part of an Amendment 13 package to the CALWMC prior to an eventual submission to Ministry of Environment and Climate Change Strategy.

IMPLICATIONS

Climate Action Implications

Since the last meeting of TCAC, CRD staff and Kerr Wood Leidal have made minor changes to the updated Section 5 to incorporate climate change adaptation language to recognize that

climate change is an important consideration for I&I and management of wastewater overflows.

Environmental Implications

The Municipal Wastewater Regulation stipulates that overflows must not occur, unless during a storm with a greater than five-year return period. The Clover Point outfall is the only remaining location that does not meet this requirement, excluding Oak Bay combined sewers, which are being managed separately. Currently, Clover Point overflows are predicted to occur for approximately 60 hours per year during the eight largest winter storm events. These overflows consist of highly dilute sewage mixed with rainwater, are generally short in duration, and are predicted to represent a very low risk to the marine receiving environment.

The goal of updating the CRD and municipal commitments in the Plan is to clarify efforts to reduce sub-five-year return period overflows on an appropriate timeline. The proposed approach of reducing and eliminating overflows during sub-five-year storm events is intended to be a practical solution that meets regulatory requirements while ensuring long-term environmental protection.

Intergovernmental Implications

An amendment to the CALWMP to address management of I&I will satisfy a provincial regulatory requirement as a condition of the provincial approval of Amendment 12.

When the TCAC review of the the updated Section 5 and supporting report is complete, this information will be forwarded to the CALWMC for consideration. The CALWMC would then approve a package to be referred to all service participants for review and comment. Public consultation will be required since this is an amendment to the Liquid Waste Management Plan. After receiving all comments, the information will be brought back to the CALWMC and CRD Board to be finalized and submitted to the provincial regulator.

CONCLUSION

The TCAC has considered an updated Section 5 of the Core Area Liquid Waste Management Plan and a report from Kerr Wood Leidal summarizing recommendations for updating Section 5. To move forward with Amendment 13 to the Plan, CRD staff must forward the proposed Section 5 and supporting report to the CALWMC as a next step.

RECOMMENDATION

Staff recommend that the TCAC provide final comments and support for the proposed new Section 5 and Kerr Wood Leidal report so that staff can forward to the CALWMC.

ATTACHMENTS

Appendix A: Proposed update of Section 5 of the Core Area Liquid Waste Management Plan
Appendix B: Review of Core Area LWMP Section 5: Management of I&I and Control of Wastewater Overflows, Kerr Wood Leidal

Submitted by:	Peter Kickham, Manager, Regulatory Services, M.E.T., R.P.Bio.
Concurrence:	Glenn Harris, Ph.D., R.P.Bio., Senior Manager, Environmental Protection

SECTION 5
MANAGEMENT OF INFILTRATION AND INFLOW AND CONTROL OF WASTEWATER OVERFLOWS

REGULATORY REQUIREMENT

The Municipal Wastewater Regulation (MWR), ***Part 3, Division 2 – Overflows, and Inflow and Infiltration Requirements,*** sets out the conditions for overflows and inflow and infiltration.

With respect to Overflows, MWR Article 42 (1) (a) states: "A discharger must ensure that an overflow does not occur during storm or snowmelt events with a less than 5-year return period, unless the person responsible for the municipal wastewater collection system develops and implements, as part of a liquid waste management plan, measures to eliminate overflows" .

And with respect to Inflow and Infiltration, MWR Article 44 (1) (a), states that: "a discharger must ensure that inflow and infiltration does not occur such that the maximum daily flow exceeds 2 times the ADWF at the treatment plant during storm or snowmelt events with a less than 5-year return period, unless the person responsible for the municipal wastewater collection system addresses, as part of a liquid waste management plan, how inflow and infiltration can be reduced".

On March 24, 2022 The CRD was directed to "complete the separation of combined sewers in the Humber Catchment area by December 31, 2025" and to propose a new timeline for the separation of the Rutland Catchment that is "in line with the overarching commitment to reduce inflow and infiltration to below four times average dry weather by 2030."

GOAL

The goal of the Core Area Liquid Waste Management Plan is to meet the intent of the MWR by preparing Inflow, Infiltration and Overflow Management Plans to achieve the following:

The primary objective is to reduce inflow and infiltration to eliminate overflows for storm events with less than a 5-year return period from all CRD facilities by 2030, except the Clover Point Long outfall. The next key objective would be to eliminate overflows for storm events with less than a 5-year return period from all CRD facilities including the Clover Point Long outfall by year 2045.

COMMITMENTS

To achieve the goals and objectives noted above, the CRD and participants discharging into the CRD wastewater system commit to the following actions:

CRD Commitments:

1. Monitoring municipal sewer flows into the core area trunk sewer system and assessing compliance with the peak flow allocations in CRD Bylaw 4304 (Table 1).

2. Analyzing available flow data for I&I on a periodic basis including flow data from the CRD cost sharing meters and municipal pump stations (when suitable).

3. Completing a study assessing the impacts of storm event overflows from the Clover Long outfall including: climate change implications, environmental impacts, social impacts, budget estimates to eliminate 5-year overflows, and impact on taxpayers.

4. Establishing an education program for homeowners and key stakeholders (i.e. home inspectors, realtors, plumbers) that promotes repair and maintenance of private property sewer laterals.

5. Assisting municipalities with catchment specific studies designed to address high I&I and/or overflows (as budget allows).

6. Assessing storage and treatment options to reduce overflows caused by I&I at the Clover Point Long outfall.

7. Reviewing and updating, if appropriate, the CRD model bylaw for private sewer lateral laterals (2015) for municipalities to consider adopting or incorporating into existing bylaws.

8. Creating a mass balance model/tool to assess, document, and improve the effectiveness of the municipal asset management plans and CRD I&I Management Plan for eliminating overflows at the Clover Long Outfall by 2045.

9. Submitting 5-year updates of the I&I Management Plan to the Province.

The Participants who discharge into the CRD wastewater system commit to the following actions:

1. Performing detailed catchment investigations and preparing compliance plans for participant area inputs to the core area sewer system that both (1) exceeds their sewer allocations and (2) contribute to sub 5-year overflows.

2. Preparing asset management plans identifying sewer asset life span, when sewer assets will be replaced, the level of funding required, and how that will help to reduce inflow and infiltration over time as infrastructure is renewed.

3. Preparing drainage improvement plans for those areas where building foundation drains are unable to connect to the storm drainage system.

4. Applying for grants targeted specifically to address catchment areas contributing to overflows less than a 5-year return period.

5. Carrying out additional flow monitoring in catchments with elevated I&I, as appropriate.

6. Carry out the recommendations outlined in the I&I Management Plan that relate to their specific participant area or collection system.

7. If sanitary municipal sewer flows exceed allotted flows from Bylaw 4304, consider implementing a private sewer lateral replacement bylaw to replace laterals that have exceeded their service life and separate combined storm and sanitary connections.

Table 1: Allocated Sewer Flows from Bylaw 4304

Allocation Point	Allocated Average Dry Weather Flow (ML/day)	Allocated Peak Daily Flow (ML/day)
COLWOOD		
Total (Parson's minus Meaford)	**4.70**	**18.8**
ESQUIMALT		
Esquimalt Panhandle	0.12	0.48
Lang Cove Pump Station	1.28	5.12
Dockyard	1.01	4.04
Kinver	0.44	1.76
Pooley Place	0.06	0.24
Devonshire	1.85	7.40
Wilson	0.37	1.48
Head	1.68	6.72
Anson	0.24	0.97
Total	**7.09**	**28.36**
LANGFORD		
Total *(Meaford)*	**14.12**	**56.48**
OAK BAY		
Windsor	2.92	11.68
Humber *(combined sewers)*	0.60	2.40
Rutland *(combined sewers)*	0.37	1.48
Currie Net	0.97	3.88
Currie Lift Station	1.62	6.48
Harling Point Pump Station	0.20	0.79
Total	**6.62**	**26.48**
SAANICH		
Marigold PS	13.19	52.76
City Boundary	5.88	23.52
Harriet	3.27	13.08
Townley	0.61	2.44
Haultain	0.57	2.27
Arbutus	7.08	28.31
Haro	0.79	3.17
Penrhyn Lift Station	0.93	3.73
Total	**32.89**	**131.56**
VICTORIA		
Cecelia	3.14	12.57
Chapman & Gorge	0.35	1.40
Selkirk	0.28	1.11
Langford - Vic West	0.19	0.77

Allocation Point	Allocated Average Dry Weather Flow (ML/day)	Allocated Peak Daily Flow (ML/day)
Hereward	1.91	7.65
Sea Terrace	0.33	1.32
Trent Net	7.33	29.32
Hollywood	0.54	2.16
Olive	23.06	92.24
Clover Net	1.50	6.01
Total	**38.30**	**153.19**
VIEW ROYAL		
Craigflower Pump Station	3.54	14.16
Shoreline Trunk	0.14	0.55
Total	**3.54**	**14.16**
ESQUIMALT NATION		
Total	0.07	0.28
SONGHEES NATION		
Songhees Nation	0.59	2.36
Maplebank	0.010	0.04
Total	**0.63**	**2.52**

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Review of Core Area LWMP Section 5

Management of I&I and Control of Wastewater Overflows

Final Report Version 1
February 6, 2024
KWL Project No. 0283.481-300

Prepared for:
Capital Regional District

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Contents

Figures

Tables

Appendices

1. Review of Core Area LWMP Section 5

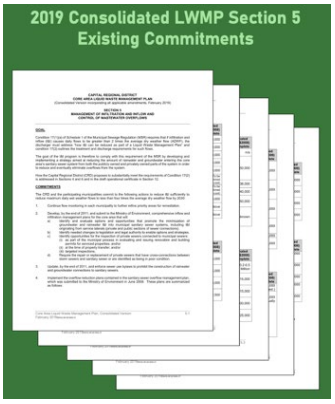
1.1 Background

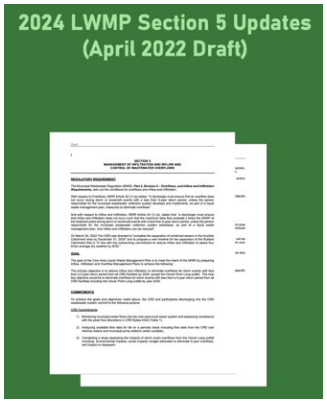
The purpose of this report is to review the options for the Capital Regional District (CRD) and member municipalities regarding the CRD's proposed amendments to *Section 5: Management of Infiltration and Inflow and Control of Wastewater Overflows* of the *Core Area Liquid Waste Management Plan* (LWMP). Specifically, this report reviews the CRD's proposed amendments developed by a CRD Technical Working Group in April 2022.

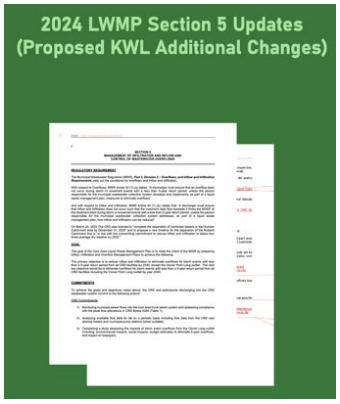
Section 1 of this report reviews the current commitments, develops a strategy on how they may be improved, and recommends some changes for consideration. Sections 2 through 6 provide further detail and clarity regarding the proposed changes.

1.2 Previous and Updated Changes to LWMP Section 5 Commitments

There are three versions of Section 5 discussed in this section, namely the original commitments, the CRD's proposed changes developed in 2022, and suggested changes for consideration put forward by KWL.







2019 LWMP Section 5 Commitments

The current commitments of Section 5 of the LWMP are presented as Appendix A and were consolidated in 2019. There are four commitments focusing on the following: developing I&I management plans, continued flow monitoring, enforcement of sewer use bylaws, and a commitment to undertake specific capital programs.

Proposed 2022 Section 5 Commitments Update

The CRD formed a Technical Working Group (consisting of Core Area municipal engineers and CRD staff) in early 2022 as part of a project to update the LWMP. The group's first task was to develop an update to Section 5. The proposed update was developed in April 2022 and is included as Appendix B.

The proposed changes adopted in 2022 are included as Appendix B. The proposed changes re-commit the municipalities to I&I management and SSO reduction with the following objectives:

> *The primary objective is to reduce inflow and infiltration to eliminate overflows for storm events with less than a 5-year return period from all CRD facilities by 2030, except the Clover Point Long outfall. The next key objective would be to eliminate overflows for storm events with less than a 5-year return period from all CRD facilities including the Clover Point Long outfall by year 2045.*

The changes also commit the CRD to eight commitments ranging from monitoring and flow analysis to assisting municipalities in I&I management programs and reporting to the province. Further, there are five commitments for participants that discharge wastewater into the CRD's conveyance system ranging from conducting I&I investigations to development of asset management plans and funding levels.

Proposed Recommendations to the 2024 Commitments Update

The CRD and the member municipalities dramatically reduced sanitary sewer overflows (SSOs) over the past 25-years such that there is only one location (Clover Point) where SSOs occur less than a 5-year return period. As a result of this achievement, the new commitments reflect a combination of managing existing I&I in younger collection systems and further reducing I&I in older systems, particularly in areas tributary to Clover Point. However, there is a deadline extension request of fifteen years to allow more time for member municipalities to lower I&I flows. The deadline originally proposed by the CRD and granted by the Province was 2030. The new requested deadline is 2045. For the Province to accept this request, it is likely that a number of conditions will be required.

KWL's recommended changes to the proposed 2024 Section 5 Commitments are discussed in Section 1.3 below.

1.3 Approach to 2024 Review

The strategy adopted in this review focusses on four points:

1. **Understanding the rationale for the proposed timeline extension**: Considerable work has been performed by the CRD and member municipalities on understanding the extent of I&I response since the mid 1990s. Significant lessons have been learned on the amount of I&I reduction required to complete the next phase including understanding the scale of partially separated service connections. The CRD should strive to develop an 'auditable' I&I reduction strategy that shows how the SSO elimination target of 2045 can be met. Dealing with the partially separated service connections and implementing a private service renewal bylaw will take additional time. This should be the basis for the request of an extension;
2. **Linking existing asset management plans and life-expectancy infrastructure planning to funding levels.** This establishes the funding that can be put into place to rehabilitate sewer systems. It is an important step to establishing the scope of I&I reduction programs. Showing how these rehabilitation programs will achieve the I&I reduction needed to meet the 2045 deadline will be an important step in demonstrating proof;
3. **Establishing a date when a private sewer lateral renewal bylaw can be implemented.** Since private property I&I levels can range from 50% to 80% of total I&I, establishing a date when services can be renewed/replaced is important; and
4. **Develop drainage plans to properly service areas with partially separated sewer laterals**. Laterals from partially separated lots cannot be separated without a proper drainage system. A sewer lateral renewal bylaw cannot be enforced without providing a homeowner with a proper connection.
5. **Evaluate the impact of a changing climate on the 5-year return period.** Rainfall patterns are changing. Storms are becoming less frequent but more intense. The current 5-year return period analysis is based on historical rainfall records. It is important for the CRD to review the current analysis and adjust for future climate trends.

1.4 Proposed Additional Commitments

Based on the strategy above, the following additional commitments are recommended to be included in the 2024 Section 5 update.

Additional/Modified CRD Commitments

1. *Complete a study assessing the impacts of storm event overflows from the Clover Long outfall including climate change implications, environmental impacts, social impacts, budget estimates to eliminate 5-year overflows, and impact on taxpayers.*
2. *Assess storage and treatment options to reduce overflows caused by I&I at the Clover Point Long outfall.*
3. *Create a mass balance model/tool to assess, document, and improve the effectiveness of the municipal asset management plans and CRD I&I Management Plan for eliminating overflows at the Clover Long Outfall by 2045.*

The first additional commitment provides an order of magnitude cost to accommodate the current flows and eliminate SSOs at Clover Point. It is important to know this number, and understand the consequence of not reducing I&I.

The second additional commitment creates a tool that when coupled with a proper asset management plan and funding levels can predict how the 2045 deadline will be achieved.

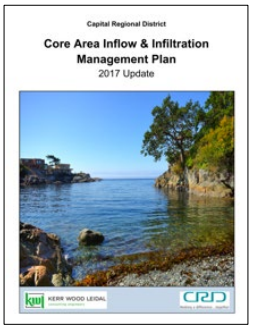
Additional Participants (municipalities) Commitments

1. *Prepare drainage improvement plans for those areas where building foundation drains are unable to connect to the storm drainage system.*
2. *If sanitary municipal sewer flows exceed allotted flows from Bylaw 4304, consider implementing a private sewer lateral replacement bylaw to replace laterals that have exceeded their service life and separate combined storm and sanitary connections.*

The first additional participant commitment recognizes the increased effort to resolve and correct partially separated sewer laterals. In some cases, the solution will involve the rebuilding of the local storm sewer system.

The second additional commitment recognizes that I&I originating from private sewer laterals can range from 50 to 80% of all I&I. Therefore, if a participant is close to or exceeding their allotted flows, that participant should consider implementing a bylaw that renews service laterals.

2. I&I Management



The CRD and the member municipalities began their I&I reduction programs in the 1990 through a program of pilot studies. Those pilot programs continued through to 2020. In 2017, the CRD issued the Core Area I&I Management Plan. The plan laid out a common approach to I&I reduction and how it was to be measured, reported, and compared between municipalities. It also set in place the basis of how I&I reduction programs were to be undertaken.

2.1 Current Trends in CRD I&I Reduction

As previously mentioned, considerable effort and expense has been expended on I&I reduction and sanitary collection system expansion in the Core area since 2000. Table 2-1 shows the progress that has been achieved in the Core Area.

Table 2-1: Storm Related Overflows: 1995 to 2023 (Sub 5-year Return Period)

	Location	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
SSOs	Western Trunk (sensitive)	13	4	3	3	7	1	0	0	5	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSOs	Eastern Trunk (sensitive)	8	10	13	11	15	5	7	4	12	8	11	12	11	4	0	2	0	0	1	0	0	0	0	0	0	2	0	0	0
SSOs	West/East Trunks (other)	21	28	32	30	50	7	9	19	45	9	18	30	38	13	52	36	25	14	10	6	21	2	10	21	8	10	11	9	1
CSOs	Uplands Combined Sewer	11	20	26	22	25	8	14	7	24	14	21	21	19	6	26	17	14	19	17	20	23	7	6	19	10	19	24	13	7
	Total*	52	62	74	66	97	21	30	30	86	31	50	63	70	23	78	53	39	33	28	26	44	9	16	40	18	31	35	22	8

SSOs up to a 5-year return period only occur at the Clover Point Long Outfall now as of 2023

*All waters including Macaulay, McMicking, Clover, Finnerty

Completion of the Marigold Storm Tank and Macaulay o/f Improvements (2004)

Completion of the Trent Street Pump Station (2009)

Completion of the Arbutus Storm Tank, Macaulay P.S., Clover P.S., Trent Forcemain Extension, and McLoughlin WWTP (2022)

Significant projects include the following:

1. Completion of the Marigold Storm Tank and Macaulay Emergency Overflow improvements in 2004;
2. Completion of the Trent Street Pump Station in 2009; and
3. Completion of the Arbutus Storm Tank, Macaulay P.S., Clover P.S., Trent Forcemain Extension, and McLoughlin WWTP in 2022.

Concurrently, the member municipalities have all formalized their I&I reduction programs and have made progress either by reducing I&I response or not allowing I&I to increase further.

Table 2-2 shows the trend in I&I levels throughout the core area.

Table 2-2: I&I Reduction Trends

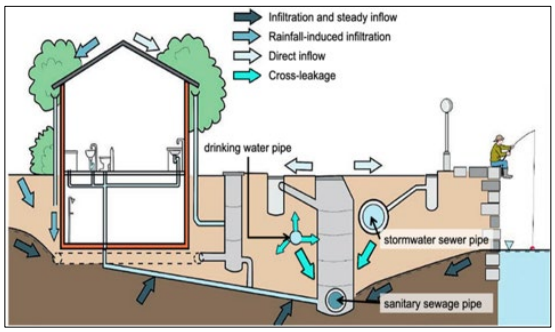
	2010	2012	2014	2016	2019	Trend
Colwood	10,309	8,540	7,965	8,777	8,777	↓
Esquimalt	52,412	52,599	48,727	51,471	48,786	↓
Langford	11,023	9,364	9,222	10,606	8,587	↓
Oak Bay	51,873	48,133	46,600	55,686	56,123	→
Saanich	15,514	13,613	15,427	15,223	14,369	→
Victoria	96,734	94,281	84,650	76,026	73,490	↓
View Royal	12,322	12,294	13,216	14,525	11,541	→

Based on 5-year, 24-hour, volume L/ha/day I&I response

As a result of both the I&I reduction programs and system improvements, sanitary sewer overflows (SSOs) have been reduced substantially such that they only occur at the long overflow at Clover Point for rainfall events less than a 5-year return period. SSOs have been reduced to less than 80 hours annually. The Clover Long Overflow is 1.2 km long and discharges into the Juan de Fuca Straight at a depth of 65 m. The overflow, along with the Macaulay long overflow, were the original outfalls used to discharge screened, raw sewage from the 1970s to the commissioning of the McLoughlin WWTP in 2022.

2.2 Identification of Partially Separated Service Laterals

One of the discoveries of multiple pilot studies has been the identification of partially separated service laterals. These laterals are still a combined storm and sanitary service. Their existence is usually due to the absence of a public storm sewer or storm sewer with sufficient depth for connection. They could also be a result of older homes constructed prior to a public storm sewer, and not separated after the storm sewer was installed.



Shallow storm sewers were constructed as a result of ditch enclosure projects. Ditches were enclosed with storm sewers to provide drainage for street surfaces. However, it was never the intention to connect the houses.

Shallow storm sewers are at an elevation higher than the elevation of the building foundation drains. As a result, the lots in these areas cannot separate their sanitary and storm sewer connections without public-side drainage improvements (See Section 2.3).

Partially separated service laterals (also known as semi-combined service laterals in some parts of North America) are also found in other parts of Canada as well. The consequence of this finding will result in significantly more expensive I&I reduction programs in those areas.

2.3 Need for Drainage System Improvements

To rectify the partially separated laterals, a proper drainage path will need to be created. Possible proper drainage service paths include the following:

- Identification of older, partially connected services that can be separated and connected to newer storm sewers (i.e., for older services that were never connected to new storm sewers);
- Extending existing storm sewers to service lots that do not have adequate drainage alternatives then separating partially separated sanitary services;
- Construction of a new storm sewer system at a lower elevation to connect both the roof and foundation drains;
- Disconnection of roof leaders to drain to pervious areas and construction of foundation drain sump-pump systems to connect to the existing shallow storm sewer system;
- Disconnection of roof leaders and replacement of storm sewer system with bio-infiltration (rain garden) systems with low elevation groundwater collection pipe systems to drain foundation drains; or,
- Rain barrel collection system for roof leaders with directed releases to pervious areas, road-side bio infiltration facilities, and deep perforated drains picking up only foundation piping and trench groundwater.

Depending on the characteristics of each area, different solutions are also possible including rainwater harvesting options. However, existing master drainage plans should be modified to incorporate these changes and implemented over time to provide a proper outlet. The timing of implementation will be a factor of existing storm sewer condition, elevation of downstream connection point, and available budget.

2.4 Impact of Re-Diverting I&I to the Storm Sewer System

Concern was raised at a fall 2023 Technical Advisory Committee (TAC) meeting regarding the impact of diverting I&I to storm sewers and what the resultant impact would be on pipe flows. From an ideological point of view, rainwater and groundwater should not be conveyed in sanitary sewer systems as it is expensive to treat, and it has more beneficial uses elsewhere such as augmenting creek systems for aquatic habitat and recharging local, seasonal groundwater aquifers. Diverting the I&I from rehabilitated sanitary sewers will increase stormwater flows but only marginally.

The amount of water re-diverted into the storm sewer system can be calculated as follows:

Table 2-3: Estimation of Re-Diverted I&I to Storm Sewer System

Component	Volume (L/ha/d)
5-year, 24-hour Rainfall (64.2 mm) [1]	624,000
Average Victoria I&I Rate (from Table 2-2)	73,490
Difference	550,510
I&I Expressed as a % of Total Rainfall	11.8%
Estimated Percentage Split between the I&I Groundwater/ Interflow Components (GWI/RII-Slow) and Faster Runoff Components (SWI/RII-Fast) [2]	50/50
Resulting impact to peak flows in stormwater system	**5.9%**

1. Based on the updated 2020 Gonzales IDF Curves and multiplied by one representative hectare.
2. Assumes that once I&I is removed from the sanitary sewer, only the stormwater inflow (SWI) and rainfall-induced infiltration-fast (RII-Fast) components contribute to stormwater peak flows.

In other words, stormwater flows can be expected to increase approximately 6% (a maximum amount assuming all runoff I&I components are diverted). These increases can be lessened through roof leader disconnection strategies and green infrastructure implementation such as bio-infiltration facilities and rain gardens.

3. Asset Management Programs

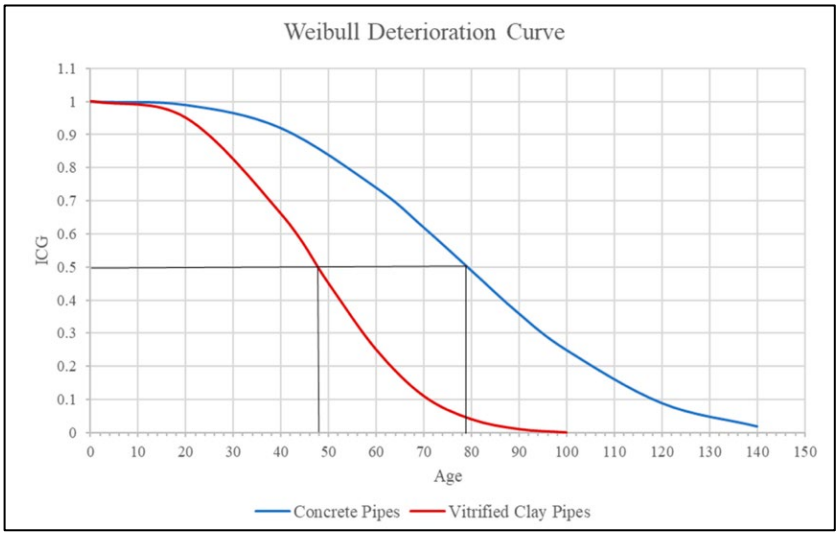
3.1 Background

Most municipalities have development of asset management plans either underway or completed. However, many plans are under-funded as the utility fees charged do not cover the expected asset replacement costs in a timeline that matches the expected service life of the piping systems. Further, there are insufficient funds to also cover interim rehabilitation costs to repair the collection system from structural and I&I related defects (i.e., prior to its ultimate replacement).

For these reasons, many municipalities find it difficult to predict future I&I reduction levels without the certainty of future funding levels. If the Province is being asked to grant an extension to the existing 2030 deadline, the CRD will likely be asked to provide some form of certainty that the 2045 extension is achievable. The decision to balance the funds collected versus the funds required to maintain and replace an asset is political and requires public support.

3.2 Identification of Service Life

All assets will eventually deteriorate to the point of failure or loss of function. It is important that municipalities assign reasonable service lives to their assets then develop financing plans to fund their replacement. Figure 3-1 shows an example of an expected Internal Condition Grade (ICG) probability based on an assumed service life of 60 years for VC pipe and 100 years for concrete pipe. Actual condition assessment data from CCTV inspections can help establish reasonable service lives.



(ICG score out of 5 is divided by 5 to obtain a probability fraction)

Figure 3-1: Internal Condition Grading (ICG) Example [1]

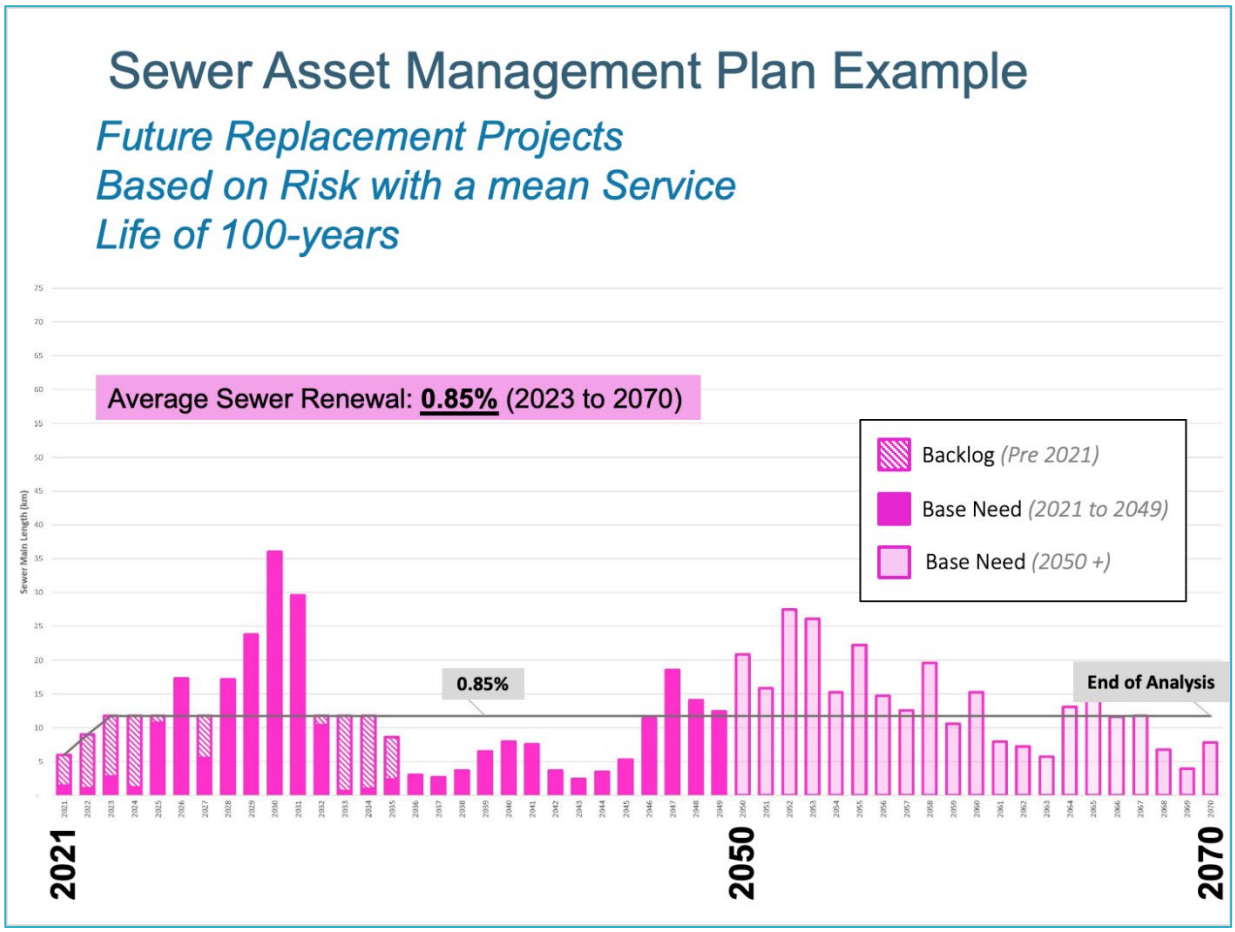
Determining expected service lives of sanitary sewer piping systems, allows the establishment of proper capital replacement levels. Adding inspection/maintenance and interim repair components to the capital replacement levels, yields recommended funding budgets.

[1] *A Deterioration Model for Sewer Pipes Using CCTV and Artificial Intelligence* by Comfort Salihu 1, Saeed Reza Mohandes 2, Ahmed Farouk Kineber 3ORCID, M. Reza Hosseini 4,*ORCID, Faris Elghaish 5 and Tarek Zayed 1

3.3 Example of Funding Plan

Figure 3-2 shows a simplified example of the cashflows associated with an asset management plan. In this example, the service life of the piping systems was established at 100-years. The figure shows a common scenario where the base needs in the earlier years (2021 to 2035) exceeds the recommended renewal funding as a considerable portion of the pipes were installed in the 1920s and 1930s. Compensating for this, a backlog was established to assist in balancing the replacement schedule.

Figure 3-2: Sewer Asset Management Plan Cashflows



In this example, it was determined that an average sewer renewal of 0.85% of total asset value would be sufficient in the 2021-2070 time horizon to maintain the replacement component of the plan. An additional funding component would then be added to the 0.85% to allow for the interim repair and maintenance components. The cost of the interim repair component can be estimated from I&I management plans identifying I&I levels not representative of their age, and CCTV inspections showing defects needing attention.

4. I&I Reduction Accounting

4.1 Background

The current CRD *I&I Management Plan* shows basic trending of I&I by sewer catchment (See Section 2). Future I&I reduction can be predicted knowing the proposed future programs for rehabilitation and replacement based on adopted funding levels. It is likely that the Province will require some level of re-assurance that the anticipated reductions will meet the new 2045 target. Once the funding levels and I&I reduction programs are established, I&I reduction predictions can be estimated.

4.2 Need for Mass Balance Model/Tool

It is possible to predict the level of I&I reduction based on the specific programs and implementation rates adopted by a municipality. A sub-basin can be split into four components:

1. Rate of replacement of private service laterals due to age and condition;
2. Rate of replacement of partially separated service laterals;
3. Scope and rate of interim rehabilitation projects on the public sewer components (i.e., I&I rates not acting their age); and
4. Rate of replacement projects when public sewers reach the end of their service lives.

The CRD has broken down the Core Area into over 108 sub-catchments. The CRD I&I management plan assigns archetypes of the interim rehabilitation and monitoring programs required in each sub-basin. In most basins, only monitoring and inspection are required. However, in older sub-basins some level of investigation and repair may be required if the sub-basin is not acting its age (see Section 5 of the *Core Area I&I Management Plan* and Figure 4-1 below). Ultimately though, once the sub-basin pipe components reach the end of their service lives, replacement is required.

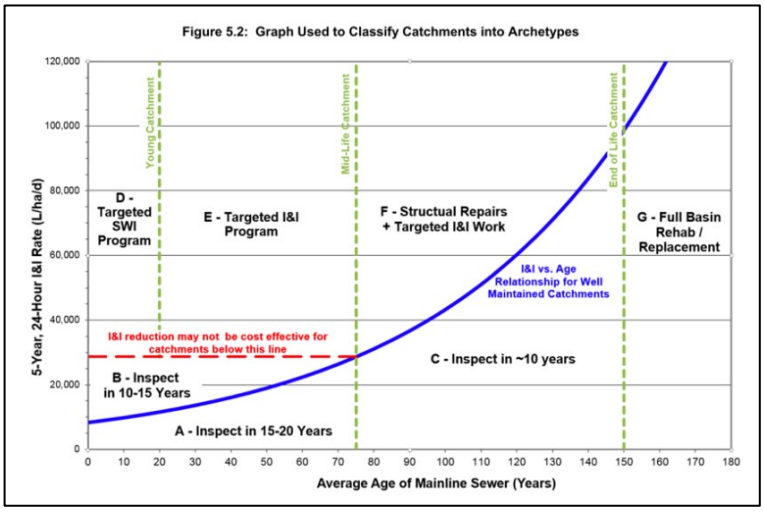


Figure 4-1: CRD I&I Archetypes (from I&I Management Plan)

Using the above four components, an estimate of annual I&I reduction can be predicted for each sub-basin. Reductions in the sub-basins tributary to Clover Point can then be used to show how SSO elimination in 2045 will be achievable.

5. Private Sewer Lateral Replacement Bylaw

5.1 Background

Private sewer laterals include portions of the system not owned by the public utility. Most of the private sewer connections in the CRD are detached residential buildings and are relatively simple systems. Multiple-family residential, residential strata and non-residential buildings may involve more complex systems.

Private sewer laterals generally include the pipe connection from a building sewer to the property line or in Oak Bay's case, the private lateral continues to the mainline connection point.

The private sewer lateral should be considered as part of the system from an I&I perspective. As such, municipalities should adopt a structured private sewer renewal program with proper inspections. Ideally this is a program that can be integrated into standard operating procedures with minimal oversight.

5.2 Possible Options

The CRD and Metro Vancouver have conducted extensive reviews of private sewer lateral programs throughout North America since 2008. [2] This included both regulatory and incentive approaches.

Regulatory Approaches

- Municipal Bylaw – may require that private sewers be kept in good condition and specifies enforcement measures and fees. These are municipal sewer bylaws that forbid cross connections. Orders can/are issued requiring homeowner to correct and bring connection into compliance with the bylaw.
- Provincial Regulation – would be needed to create new powers for local governments to regulate sewer laterals, for instance at point of sale.
- Expropriate Laterals – would involve expropriating all sewer laterals and the municipality assuming responsibilities for maintenance and replacement. Would involve large expense and increase to utility fees.
- Insurance Program – typically focused on covering sewer backup costs and would not reduce I&I on a widespread basis.
- Lateral Condition Certification – would be implemented through bylaw structures and require that a sewer lateral condition certificate be obtained.

[2] Private Sewer Lateral Programs: A Study of Approaches and Legal Authority for Metro Vancouver Municipalities, 2008, The Sheltair Group and West Coast Environmental Law.

Private Property Inflow & Infiltration Management Options for the CRD Core Area (2011, updated in 2014 and 2022). The Sheltair Group

Incentive Approaches

- Subsidies (Rebates and Loans) – similarly to other municipal rebate programs (e.g., low-volume water fixtures), property owners could be incentivized to maintain and replace sewer laterals by accessing rebates or loans from the municipality.
- Property Tax Exemption – property taxes or utility fees could be discounted for qualifying properties, likely requiring some form of certification.
- Provincial Tax Exemption – this could involve a reduction in property transfer taxes or other provincially-administered tax at the time of a property sale for qualifying properties, likely requiring some form of certification.

Some of the above measures have been considered for implementation in several BC municipalities. The City of Vancouver and City of Surrey, for example, have mandatory requirements in place for sewer lateral replacement based on building permit value. The Municipality of Esquimalt recently amended their existing Subdivision and Development Bylaw to achieve the same objective (December 2023).

Potential impediments to successful implementation (other than the City of Vancouver, Surrey, and Esquimalt examples) have included:

- lack of political support for point-of-sale trigger mechanisms;
- provincially regulated issues such as building code may require changes to provincial acts and powers available to local governments; and
- organizational burden to administer any or all of the above measures.

Given the foregoing, the Metro Vancouver municipalities have adopted the approaches outlined in Sections 5.3 and 5.4 below. It is recommended that one of the following two private lateral replacement measures be adopted as part of an I&I Management strategy for CRD municipalities with the older service connections (see Section 5.5).

5.3 Lateral Replacement – New Construction and Building Permit Trigger

As mentioned above, Esquimalt, Surrey, and Vancouver have adopted this approach. The approach is based on a trigger based on a certain building permit dollar amount. A set of conditions and actions are required to ensure that the service is either operating within reasonable limits or it is replaced.

Table 5-2 highlights the basic attributes of Surrey and Vancouver bylaws.

Information on Esquimalt's modifications to their *Subdivision and Development Bylaw* can be found here:

https://www.esquimalt.ca/sites/default/files/docs/municipal-hall/bylaws/3128_-_Subdivision_and_Development_Servicing_Bylaw_3128_2023.pdf

The staff report supporting the proposed change, can be found here:

https://esquimalt.ca.legistar.com/ViewReport.ashx?M=R&N=Text&GID=5&ID=31032&GUID=317567EC-AF19-4C1B-A9EA-3983DDF26E7E&Title=Legislation+Text

5.4 Lateral Replacement – Certification Method

Based on the noted challenges in implementing a universally applicable sewer lateral certification and replacement program, the following practices are recommended:

1. Incentive-based method with certifications required, which would involve inspection and testing as described in Section 5.2;
2. Base utility rate for non-certified sewer laterals or expired certifications, which could be stepped up over time once a program is in place and property owners have been given time to comply;
3. Utility rate discount for certified sewer laterals. Provide automatic certification for PVC services less than 30-years old;
4. Premiums added to utility rate if City determines private lateral to be in bad condition due to side shot CCTV inspection or observation port inspection;
5. Enhanced premiums added to utility bill for combined connections provided a functional storm sewer is available. Rebates are offered for separation; and
6. Consider working with home insurance companies to provide additional incentives for certified laterals.

Determining an appropriate premium and discount structure would need to be done by each municipality.

5.5 Private Lateral Renewal Bylaw

Since I&I on private sewer laterals can represent 50 to 80% of all I&I, a renewal program will be required on private property to reduce I&I rates. The pipe material will eventually fail. Municipal Renewal Bylaws are considered to be the best practice available.

However, the urgency to implement such a bylaw is not equally shared across all municipalities. The younger sewerage areas will have more time to implement such a bylaw.

Suggested additional LWMP Section 5 commitment:

> *If sanitary municipal sewer flows exceed allocated flows from Bylaw 4304, consider implementing a private sewer lateral replacement bylaw to replace laterals that have exceeded their service life and separate combined storm and sanitary connections.* [3]

Based on the above and referring to Table 5-1 below, the communities of Esquimalt, Oak Bay, and Victoria should consider implementing a private sewer lateral renewal bylaw.

Table 5-1: Actual Flows Versus Allocated Flows by Municipality

Municipality	Allocated Peak Daily Flow (ML/d)	Peak 24-hr Flow		Status
		5-yr Rainfall Event (ML/d)	% of Allocated Capacity	
Colwood	18.80	7.70	41%	✓
Esquimalt	28.36	30.16	106%	✗
Langford	56.48	17.01	30%	✓
Oak Bay	26.48	37.96	143%	✗
Saanich	131.56	83.52	63%	✓
Victoria	153.19	150.64	98%	−
View Royal	14.17	7.10	50%	✓

[3] CRD Bylaw 4304 outlines the maximum flow contribution by each municipality to the regional trunk sewer system and McLoughlin WWTP.

5.6 Key Actions Needed

Municipalities close to or exceeding their sewer capacity allotment should consider adopting a private lateral replacement bylaw and determine what methods and resources will be used to inspect the new service.

Municipalities with partially separated services should also develop public-side stormwater servicing strategies as the bylaw cannot be enforced without a proper drainage connection.

The following actions are required to implement the program described above:

1. Adopt a Lateral Replacement Bylaw: either the Building Permit Trigger Method or the Certification Method in municipalities exceeding or near allocated flows;
2. Determine what methods and resources will be used to inspect the new services;
3. For cities with significant Vitrified Clay (VC) laterals and partially separated connections, consider the Certification Method and/or other tools available to municipalities as laterals may be replaced on a timelier basis; and
4. Develop public-side stormwater servicing plans to address areas with partially separated private sewer-laterals.

Table 5-2: Private Lateral Replacement Bylaws Based on Building Permit Triggers

Excerpts from the City of Vancouver Program

2.2 NEW PUBLIC SEWER CONNECTION FOR CONSTRUCTION - Subject to Section 2.9, a new public sewer connection is required whenever:

(a) **a new house** or building is constructed, or

(b) an existing house or building is renovated, and the estimated construction value is more than:

(i) **100% of the latest building assessment (from the BC Assessment Authority), or**
(ii) **$95,000, whichever is the greater,** and the work involves:
(iii) extensive excavation work,
(iv) enlargement of the plumbing system by adding two or more fixtures,
(v) an increase in the number of bedrooms, or
(vi) a resulting increased demand upon the existing sewer system after renovations are complete.

Excerpts from the City of Surrey Program

39. When there is an application to redevelop a parcel, the following shall apply to the service connection and the building sanitary sewer:

a) If the service connection or the building sanitary sewer is **less than 30 years old**, the owner must provide **a video inspection** from a pipe **assessment certification program (PACP)** certified contractor and recommendation for the City to review. The owner shall repair or replace the service connection or the building sanitary sewer, or both, if the City determines that: it contains defects or deficiencies, including excessive damage; is not in adequate condition for service; does not meet the City's Design and Construction Standards; or is made of materials other than PVC;

b) If the service connection or the building sanitary sewer **is 30 years old or older and is made of materials other than PVC, a replacement or new service connection or building sanitary sewer, or both, is required**;

c) If the service connection or the building sanitary sewer is **30 years old or older and is made of PVC**, the owner must provide **a video inspection from a PACP** certified contractor and recommendation for the City to review. The owner shall repair or replace the service connection or the building sanitary sewer or both, if the City determines that it: contains defects or deficiencies, including excessive damage; is not in adequate condition for service; or does not meet the City's Design and Construction Standards;

d) **Despite Sections 39(a), (b) and (c), all no-corrode, asbestos, cement, clay or otherwise non-standard material pipes of any age or condition shall be replaced with PVC** or an alternate pipe material approved by the City;

e) Despite Sections 39(g) and (h), renovations to an existing building on a parcel **where the combined building value is less than or equal to $120,000 are exempt from the requirements of this Section 39;**

6. Recommendations

6.1 Recommendations

Additional Actions for CRD

1. Comple a study assessing the impacts of storm event overflows from the Clover Long outfall including climate change implications, environmental impacts, social impacts, budget estimates to eliminate 5-year overflows, and impact on taxpayers.
2. Assess storage and treatment options to reduce overflows caused by I&I at the Clover Point Long outfall.
3. Create a mass balance model/tool to assess, document, and improve the effectiveness of municipal asset management plans and CRD I&I Management Plan for eliminating overflows at the Clover Long Outfall by 2045.

Actions for Younger Sewer Collection Systems

1. Continue the investigations as outlined in the CRD Core Area I&I Management Plan.
2. Update Asset Management Plans to show how cashflows support sewer pipe service life selection. (May mean modifying future cashflows)

Actions for Older Sewer Collection Systems

1. Identify partially separated service areas and develop long-term plans for drainage upgrades to these.
2. Update Asset Management Plans to incorporate predicted sewer lifetimes (will result in funding levels to match sewer service lives).
3. Consider implementing/updating a private sewer lateral bylaw if 5-year storm exceeds allocated flows.

7. Report Submission

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Revision History

Revision #	Date	Status	Revision	Author
A	January 12, 2024	For Review by CRD	Draft No.1	CJ
0	February 6, 2024	Final Version 1		CJ

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Appendix A

2019 Consolidated LWMP Section 5 Existing Commitments

CAPITAL REGIONAL DISTRICT
CORE AREA LIQUID WASTE MANAGEMENT PLAN
(Consolidated Version incorporating all applicable amendments, February 2019)

SECTION 5
MANAGEMENT OF INFILTRATION AND INFLOW AND CONTROL OF WASTEWATER OVERFLOWS

GOAL

Condition 17(1)(a) of Schedule 1 of the Municipal Sewage Regulation (MSR) requires that if infiltration and inflow (I&I) causes daily flows to be greater than 2 times the average dry weather flow (ADWF), the discharger must address "how I&I can be reduced as part of a Liquid Waste Management Plan" and condition 17(2) outlines the treatment and discharge requirements for such flows.

The goal of the I&I program is therefore to comply with this requirement of the 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 and eventually eliminate overflows from the system.

How the Capital Regional District (CRD) proposes to substantially meet the requirements of Condition 17(2) is addressed in Sections 4 and 6 and in the draft operational certificate in Section 12.

COMMITMENTS

The CRD and the 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, and submit to the Ministry of Environment, 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 I&I into municipal sanitary sewer systems, including I&I 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. These plans are summarized as follows:

Table 5.1
Prioritized Order of CRD Overflow Reduction Plan
(Updated based on current information)

Priority No.	O/F Name	Action Plan	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Monterey Avenue MH0130	Complete and commission Trent pump station	2008 (Complete)	$500,000
2.	Macaulay Point Pump Station	Complete installation of standby power	2008 (Complete)	$800,000
3.	Harling Pump Station	Install a screen on the overflow pipe	2008 (Complete)	$10,000
4.	Shoreline Drive MH0340	Commence with capacity deficiency study and identify upgrade options	2010	$50,000
5.	Penrhyn Lift Station	Investigate pump and genset capacity	2010	$600,000
6.	Humber Combined Sewers	Oak Bay plans to separate the sewers in the Uplands area	2015	To be determined (Oak Bay cost)
7.	Rutland Combined Sewers	Oak Bay plans to separate the sewers in the Uplands area	2015	To be determined (Oak Bay cost)
8.	Head Street MH0040	Twin the NWT from Macaulay Point to MH0055	2015	$20,000,000
9.	Sea Terrace MH0055	Twin the NWT from Macaulay Point to MH0055	2015	as above
10.	Broom Road	Extend Trent forcemain down to Clover Point	2017	as above

Table 5.2
Prioritized Order of Colwood Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	SCADA Upgrade	Upgrade the SCADA system to collect flow data from all pump stations.	2008 (Complete)	$10,000
2.	CCTV Inspection	Continue to inspect all new sewers that are installed to ensure they are well constructed	Annually	$15,000
3.	Sewer System Maintenance	Continue to clean all mains and manholes, and repair as necessary.	Annually	$50,000
4.	Lift Station Maintenance	Continue to maintain all lift station components to ensure that they run efficiently.	Annually	$72,500

Table 5.3
Prioritized Order of Esquimalt Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Sewer Relining	Relining and repairs to sewer mains rated poor and poorest	Completed	n/a
2.	Combination Manhole Separation	• 148 manholes remain to be separated • 29 manholes to be separated in 2008 • Five manholes separated per year from 2009 to 2025	2025	$950,000
3.	Grafton Pump Station Upgrade	New electrical power supply, kiosk and controls	2008 (Complete)	$38,000
4.	Grafton Pump Station Upgrade	Pump replacement	2012	$40,000
5.	Sewer Main Replacement	Replacement of undersize sewer main on Craigflower Road between Tillicum Road and Lampson Street	2009 (Complete)	$250,000
6.	Municipal Wide Smoke and Dye Testing	Smoke and dye testing underway to identify cross connections in attempts to reduce I&I in the future. The full scope of the project has not yet been determined.	2010	unknown

Table 5.4
Prioritized Order of Langford Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Sewer Master Plan Upgrades	Continue with infrastructure upgrades as identified in the Sewer Master Plan.	Ongoing	$0.2-0.5 Million
2.	CCTV Inspection	Continue to video inspect all new sewers that are installed to ensure that they are well constructed.	Annually	$15,000
3.	Manhole Inspection	Continue to visually inspect manholes to ensure that they do not leak.	Annually	$15,000
4.	Pump Station Maintenance	Continue to maintain all pump station components to ensure that they run efficiently.	Annually	$200,000
5.	Sewer System Maintenance	Continue to keep the sewers clean and free from defects.	Annually	$25,000

Table 5.5
Prioritized Order of Oak Bay Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1a.	Uplands Sewer Separation Humber Catchment	Construction of new storm sewer	To be confirmed by December 31/2019	$5,285,000
1b.	Uplands Sewer Separation Rutland Catchment	Construction of new storm sewer	To be confirmed by December 31/2019	$9,815,000
1c.	Uplands sanitary sewer pipeline rehabilitation	Rehabilitation of the former combined sewer pipeline to address infiltration	To be confirmed by December 31/2019	$3,000,000
2.	Oak Bay Inflow and Infiltration Rehabilitation Project	Continue with phased rehabilitation projects in various catchments	Annually	$500,000
3.	CCTV Inspection	Video inspection of sewer mains	Annually	$25,000
4.	Sewer System Maintenance Program	Maintenance to keep sewers clean and free from defects.	Annually	$240,000

Table 5.6
Prioritized Order of Saanich Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Dysart Pump Station	Complete construction of the new Dysart pump station.	2008 (Complete)	$2,500,000 (est.)
2.	The following pump stations will be upgraded: Vantreight Lift Station Murray #1 Pump Station Murray #2 Pump Station Arundel Pump Station Glenwood Pump Station Ashley Pump Station Dunkirk Pump Station Colquitz Pump Station Gorge Pump Station	Rebuild pump station and add a new standby generator.	2009-2015	$500,000 Annually

Table 5.7
Prioritized Order of Victoria Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	James Bay I&I Pilot Project	Commence with the rehabilitation of sewer mains, laterals and manholes in James Bay.	2010	$3,000,000
2.	Hydraulic Model	Continue to complete a hydraulic model of the City's entire sanitary sewer collection system.	2009	$100,000
3.	Overflow Elimination	Investigate, monitor and abandon, if possible, existing known overflow locations.	2010	$100,000
4.	Combined Manhole Separation	Investigate, monitor and initiate a program to separate combined manholes.	2015	$400,000

Table 5.8
Prioritized Order of View Royal Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Upgrade Pump Stations	Upgrade pump stations where required to improve pump performance, provide standby power and collect better data.	2017	$140,000
2.	CCTV Inspection	Continue to video inspect all new sewers that are installed to ensure that they are well constructed.	Annually	$20,000
3.	Manhole Inspection	Continue to visually inspect manholes to ensure that they do not leak.	Annually	$5,000
4.	Pump Station Maintenance	Continue to maintain all pump station components to ensure that they run efficiently.	Annually	$120,000
5.	Sewer System Maintenance	Continue to keep the sewers clean and free from defects.	Annually	$40,000

APPENDIX C

Excerpt from the Capital Regional District Core Area Liquid Waste Management Plan – Sanitary Sewer Overflow Management Plan, June 2008.

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Appendix B

2024 LWMP Section 5 Updates (April 2022 Draft)

SECTION 5
MANAGEMENT OF INFILTRATION AND INFLOW AND CONTROL OF WASTEWATER OVERFLOWS

REGULATORY REQUIREMENT

The Municipal Wastewater Regulation (MWR), ***Part 3, Division 2 – Overflows, and Inflow and Infiltration Requirements,*** sets out the conditions for overflows and inflow and infiltration.

With respect to Overflows, MWR Article 42 (1) (a) states: "A discharger must ensure that an overflow does not occur during storm or snowmelt events with a less than 5-year return period, unless the person responsible for the municipal wastewater collection system develops and implements, as part of a liquid waste management plan, measures to eliminate overflows" .

And with respect to Inflow and Infiltration, MWR Article 44 (1) (a), states that: "a discharger must ensure that inflow and infiltration does not occur such that the maximum daily flow exceeds 2 times the ADWF at the treatment plant during storm or snowmelt events with a less than 5-year return period, unless the person responsible for the municipal wastewater collection system addresses, as part of a liquid waste management plan, how inflow and infiltration can be reduced".

On March 24, 2022 The CRD was directed to "complete the separation of combined sewers in the Humber Catchment area by December 31, 2025" and to propose a new timeline for the separation of the Rutland Catchment that is "in line with the overarching commitment to reduce inflow and infiltration to below four times average dry weather by 2030."

GOAL

The goal of the Core Area Liquid Waste Management Plan is to meet the intent of the MWR by preparing Inflow, Infiltration and Overflow Management Plans to achieve the following:

The primary objective is to reduce inflow and infiltration to eliminate overflows for storm events with less than a 5-year return period from all CRD facilities by 2030, except the Clover Point Long outfall. The next key objective would be to eliminate overflows for storm events with less than a 5-year return period from all CRD facilities including the Clover Point Long outfall by year 2045.

COMMITMENTS

To achieve the goals and objectives noted above, the CRD and participants discharging into the CRD wastewater system commit to the following actions:

CRD Commitments:

1) Monitoring municipal sewer flows into the core area trunk sewer system and assessing compliance with the peak flow allocations in CRD Bylaw 4304 (Table 1).

2) Analyzing available flow data for I&I on a periodic basis including flow data from the CRD cost sharing meters and municipal pump stations (when suitable).

3) Completing a study assessing the impacts of storm event overflows from the Clover Long outfall including: environmental impacts, social impacts, budget estimates to eliminate 5-year overflows, and impact on taxpayers.

4) Establishing an education program for homeowners and key stakeholders (i.e. home inspectors, realtors, plumbers) that promotes repair and maintenance of private property sewer laterals.

5) Assisting municipalities with catchment specific studies designed to address high I&I and/or overflows (as budget allows).

6) Periodically assessing options to reduce overflows caused by I&I.

7) Reviewing and updating, if appropriate, the CRD model bylaw for private sewer lateral laterals (2015) for municipalities to consider adopting or incorporating into existing bylaws.

8) Submitting 5-year updates of the I&I Management Plan to the Province.

The Participants who discharge into the CRD wastewater system commit to the following actions:

1) Performing detailed catchment investigations and preparing compliance plans for participant area inputs to the core area sewer system that both (1) exceeds their sewer allocations and (2) contribute to sub 5-year overflows.

2) Preparing asset management plans identifying sewer asset life span, when sewer assets will be replaced, the level of funding required, and how that will help to reduce inflow and infiltration over time as infrastructure is renewed.

3) Applying for grants targeted specifically to address catchment areas contributing to overflows less than a 5-year return period.

4) Carrying out additional flow monitoring in catchments with elevated I&I, as appropriate.

5) Carry out the recommendations outlined in the I&I Management Plan that relate to their specific participant area or collection system.

Table 1: Allocated Sewer Flows from Bylaw 4304

Allocation Point	Allocated Average Dry Weather Flow (ML/day)	Allocated Peak Daily Flow (ML/day)
COLWOOD		
Total (Parson's minus Meaford)	**4.70**	**18.8**
ESQUIMALT		
Esquimalt Panhandle	0.12	0.48
Lang Cove Pump Station	1.28	5.12
Dockyard	1.01	4.04
Kinver	0.44	1.76
Pooley Place	0.06	0.24
Devonshire	1.85	7.40
Wilson	0.37	1.48
Head	1.68	6.72
Anson	0.24	0.97
Total	**7.09**	**28.36**
LANGFORD		
Total *(Meaford)*	**14.12**	**56.48**
OAK BAY		
Windsor	2.92	11.68
Humber *(combined sewers)*	0.60	2.40
Rutland *(combined sewers)*	0.37	1.48
Currie Net	0.97	3.88
Currie Lift Station	1.62	6.48
Harling Point Pump Station	0.20	0.79
Total	**6.62**	**26.48**
SAANICH		
Marigold PS	13.19	52.76
City Boundary	5.88	23.52
Harriet	3.27	13.08
Townley	0.61	2.44
Haultain	0.57	2.27
Arbutus	7.08	28.31
Haro	0.79	3.17
Penrhyn Lift Station	0.93	3.73
Total	**32.89**	**131.56**
VICTORIA		
Cecelia	3.14	12.57
Chapman & Gorge	0.35	1.40
Selkirk	0.28	1.11
Langford - Vic West	0.19	0.77

Allocation Point	Allocated Average Dry Weather Flow (ML/day)	Allocated Peak Daily Flow (ML/day)
Hereward	1.91	7.65
Sea Terrace	0.33	1.32
Trent Net	7.33	29.32
Hollywood	0.54	2.16
Olive	23.06	92.24
Clover Net	1.50	6.01
Total	**38.30**	**153.19**
VIEW ROYAL		
Craigflower Pump Station	3.54	14.16
Shoreline Trunk	0.14	0.55
Total	**3.54**	**14.16**
ESQUIMALT NATION		
Total	0.07	0.28
SONGHEES NATION		
Songhees Nation	0.59	2.36
Maplebank	0.010	0.04
Total	**0.63**	**2.52**

KERR WOOD LEIDAL
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Appendix C

2024 LWMP Section 5 Updates (Proposed KWL Suggestions)

SECTION 5
MANAGEMENT OF INFILTRATION AND INFLOW AND CONTROL OF WASTEWATER OVERFLOWS

REGULATORY REQUIREMENT

The Municipal Wastewater Regulation (MWR), ***Part 3, Division 2 – Overflows, and Inflow and Infiltration Requirements,*** sets out the conditions for overflows and inflow and infiltration.

With respect to Overflows, MWR Article 42 (1) (a) states: "A discharger must ensure that an overflow does not occur during storm or snowmelt events with a less than 5-year return period, unless the person responsible for the municipal wastewater collection system develops and implements, as part of a liquid waste management plan, measures to eliminate overflows" .

And with respect to Inflow and Infiltration, MWR Article 44 (1) (a), states that: "a discharger must ensure that inflow and infiltration does not occur such that the maximum daily flow exceeds 2 times the ADWF at the treatment plant during storm or snowmelt events with a less than 5-year return period, unless the person responsible for the municipal wastewater collection system addresses, as part of a liquid waste management plan, how inflow and infiltration can be reduced".

On March 24, 2022 The CRD was directed to "complete the separation of combined sewers in the Humber Catchment area by December 31, 2025" and to propose a new timeline for the separation of the Rutland Catchment that is "in line with the overarching commitment to reduce inflow and infiltration to below four times average dry weather by 2030."

GOAL

The goal of the Core Area Liquid Waste Management Plan is to meet the intent of the MWR by preparing Inflow, Infiltration and Overflow Management Plans to achieve the following:

The primary objective is to reduce inflow and infiltration to eliminate overflows for storm events with less than a 5-year return period from all CRD facilities by 2030, except the Clover Point Long outfall. The next key objective would be to eliminate overflows for storm events with less than a 5-year return period from all CRD facilities including the Clover Point Long outfall by year 2045.

COMMITMENTS

To achieve the goals and objectives noted above, the CRD and participants discharging into the CRD wastewater system commit to the following actions:

CRD Commitments:

1. Monitoring municipal sewer flows into the core area trunk sewer system and assessing compliance with the peak flow allocations in CRD Bylaw 4304 (Table 1).

2. Analyzing available flow data for I&I on a periodic basis including flow data from the CRD cost sharing meters and municipal pump stations (when suitable).

3. Completing a study assessing the impacts of storm event overflows from the Clover Long outfall including: climate change implications, environmental impacts, social impacts, budget estimates to eliminate 5-year overflows, and impact on taxpayers.

4. Establishing an education program for homeowners and key stakeholders (i.e. home inspectors, realtors, plumbers) that promotes repair and maintenance of private property sewer laterals.

5. Assisting municipalities with catchment specific studies designed to address high I&I and/or overflows (as budget allows).

6. Assessing storage and treatment options to reduce overflows caused by I&I at the Clover Point Long outfall.

7. Reviewing and updating, if appropriate, the CRD model bylaw for private sewer lateral laterals (2015) for municipalities to consider adopting or incorporating into existing bylaws.

8. Creating a mass balance model/tool to assess, document, and improve the effectiveness of the municipal asset management plans and CRD I&I Management Plan for eliminating overflows at the Clover Long Outfall by 2045.

9. Submitting 5-year updates of the I&I Management Plan to the Province.

The Participants who discharge into the CRD wastewater system commit to the following actions:

1. Performing detailed catchment investigations and preparing compliance plans for participant area inputs to the core area sewer system that both (1) exceeds their sewer allocations and (2) contribute to sub 5-year overflows.

2. Preparing asset management plans identifying sewer asset life span, when sewer assets will be replaced, the level of funding required, and how that will help to reduce inflow and infiltration over time as infrastructure is renewed.

3. Preparing drainage improvement plans for those areas where building foundation drains are unable to connect to the storm drainage system.

4. Applying for grants targeted specifically to address catchment areas contributing to overflows less than a 5-year return period.

5. Carrying out additional flow monitoring in catchments with elevated I&I, as appropriate.

6. Carry out the recommendations outlined in the I&I Management Plan that relate to their specific participant area or collection system.

7. If sanitary municipal sewer flows exceed allotted flows from Bylaw 4304, consider implementing a private sewer lateral replacement bylaw to replace laterals that have exceeded their service life and separate combined storm and sanitary connections.

Table 1: Allocated Sewer Flows from Bylaw 4304

Allocation Point	Allocated Average Dry Weather Flow (ML/day)	Allocated Peak Daily Flow (ML/day)
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Total (Parson's minus Meaford)	**4.70**	**18.8**
ESQUIMALT		
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SONGHEES NATION		
Songhees Nation	0.59	2.36
Maplebank	0.010	0.04
Total	**0.63**	**2.52**

6.3 Options Evaluation

The results of the options evaluations using the proposed evaluation criteria are summarized in Table 6.4 below:

Table 6.4 General Option Pathway Evaluation Results

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
Economic	CAPEX and OPEX	Low CAPEX given no investment for additional infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, public outreach, etc.			Low CAPEX given no investment for additional infrastructure. Higher OPEX due to increased costs from bagging protocol and materials.	Low CAPEX given no investment for additional infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, public outreach, etc.	Low to medium CAPEX depending on contract agreement. Some vendors may require investment for additional feedstock storage infrastructure. Medium OPEX due to labour, transport, materials handling, maintenance, storage, etc.	High CAPEX due to capital investment for on-site facility. OPEX induced from labour, utility demands (natural gas, electricity, and water), and the transport of biochar. In comparison to off-site alternatives, OPEX will be low in the long-term due to lack of tip-fees for biosolids. However, OPEX may be higher during the early commercial facility commissioning stage until the process becomes optimized.	
	Potential for revenue generation	Low potential for revenue generation as there are no residual products from this process.			Potential for revenue generation through the distribution of bagged biosolids fertilizer product to partially offset processing costs.	Low potential for revenue generation as CRD may not own the rights to the BGM/composting/soil-products.	Low potential for revenue generation as CRD may not own the rights to the value derived products (electricity, cement, heat, etc.).	Potential for revenue from value derived products (biochar, bio-oil) to partially off-set processing costs.	Potential for revenue from value derived product (biochar) to partially off-set processing costs.
	Estimated cost per tonne (CAPEX and OPEX estimate based on information available at the time of this report)	<$250/tonne	<$400/tonne	<$500/tonne	<$500/tonne	<$500/tonne	<$500/tonne	$500-4,500/tonne[1]	
Environmental Impacts	Odour	Potential for nuisance odour emissions at application site(s). May be mitigated via biosolids stabilization and mixing with soil. Application sites are generally far from population centres.					Minimal odour due to installation of an odour abatement system at the facility.		
	Noise	Noise emitted from land application equipment. However, mines/quarries are generally located far from population centres.			Noise potentially emitted from bagging equipment. However, site is located far from population centres	Noise emitted from land application equipment. However, application sites are generally	Minimal noise due to installation of noise abatement system at the facility.		

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
Environmental Sustainability					and a noise abatement system would be designed as the bagging protocol is developed.	located far from population centres.			
	Estimated Truck Traffic	Truck traffic associated with transport of biosolids from site: Approximately one truck every three days (122 trucks each year)						Truck traffic associated with transport of biochar from site: – Approximately one truck every nine days (41 trucks each year)	
	Air Emissions and Dust	Generally low potential for particulate air emissions/dust.					Minimal air emissions/dust due to installation of advanced capture and treatment systems at facility, though residues from these capture and treatment systems need to be disposed of.		
	Contaminant mass balance	Potential accumulation of contaminants. However, class A biosolids have undergone contaminant reduction processes as per OMRR quality standards.					Contaminants have shown to be reduced through thermal processing. However, the level of reduction and ultimate environmental fate are still under investigation.		
	Production of value derived products e.g., biochar, biocrude, etc.	Biosolids may be considered a fertilizer product derived from a waste stream in the context of land-application, with the added benefit of reducing the need for energy-intensive synthetic fertilizer production.				Produces BGM, compost, soil-products which may be beneficially re-used in various applications and reduces the need for energy-intensive synthetic fertilizer production.	Produces energy which may be beneficially re-used for electricity/heating applications assuming nearby end-users.	Produces steam, syngas, , and bio-oil, which can be beneficially re-used in various applications such as heating, electricity, etc. Also produces biochar, however the potential beneficial applications of this product as a soil amendment are still under investigation.	Produces steam, syngas, and which can be beneficially re-used in various applications such as heating, electricity, etc. Also produces biochar, however the potential beneficial applications of this product as a soil amendment are still under investigation.
	GHG Emission Implications[2]	In comparison to landfilling, GHG emissions are significantly reduced due to lesser methane/nitrous-oxide emissions, carbon sequestration into soil, and an offset usage of synthetic fertilizers. In comparison to alternative beneficial use options, biosolids application to degraded areas (mines, quarries, forests, lands, etc.) presents the lowest potential for GHG emission reduction. Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of			In comparison to landfilling, GHG emissions are significantly reduced due to lesser methane/nitrous-oxide emissions, carbon sequestration into soil, and offset usage of synthetic fertilizers. In comparison to alternative beneficial use options, the production and sale of biosolids as a soil fertilizer product through bagging, compost, or BGM, presents medium potential for GHG emission reduction, assuming it has greater potential to offset the usage of synthetic fertilizers.		In comparison to landfilling, GHG emissions are significantly reduced (lesser methane/nitrous-oxide emissions, non-renewable fuel usage offsets). Thermal processing options will have increased GHG implications from the oxidization of any gases produced.	In comparison to landfilling, GHG emissions are significantly reduced (lesser methane/nitrous-oxide emissions, non-renewable fuel usage offsets). Advanced thermal processing options will have increased GHG implications from the oxidization of any gases produced. Like combustion/incineration, pyrolysis and gasification present high potential for GHG emission reduction, if biosolids-derived energy (heat, syngas, or bio-oil from	

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
		biosolids, resulting in increased non-renewable fuel usage.			Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of biosolids, resulting in increased non-renewable fuel usage.		In comparison to land application options, utilizing biosolids as renewable fuel for cement combustion or energy production via incineration presents high potential for GHG emission reduction, assuming it offsets the usage of non-renewable fuel sources. Any off-site option will have higher GHG emission implications due to the transport distances and trucking frequency associated with the transport of biosolids, resulting in increased fuel usage.	pyrolysis) is beneficially used to offset the usage of non-renewable fuel sources. Depending on process design, this derived energy may not be reused or recycled, and may result in lower GHG emission reductions. On-site options will have lesser GHG emissions associated with transport, as the trucking frequency of hauling biochar will be less than that required of biosolids.	
	Potential to recover energy and reduce dependence on electric grid and natural gas	No potential to recover energy.					High potential to recover energy from products (steam, heat) to offset dependence on electric grid and natural gas. Fulsome energy recovery would depend on presence of nearby end-users.	High potential to recover energy from products (syngas, steam, heat) to offset dependence on electric grid and natural gas onsite. Fulsome energy recovery would depend on presence of nearby end-users.	
	Potential to co-process additional waste streams	No potential for co-processing.				Potential for co-processing via blending of biosolids with compost generated from organic waste streams.	Low potential to co-process mixed waste streams as CRD would not have control over off-site facility operations.	Potential to co-process mixed waste streams. However, co-processing may increase maintenance/operational costs due to added complexity of feedstock.	
	Soil/groundwater impacts	Supplementing soil cover and improving soil health via biosolids application reduces erosion into lakes and streams. Potential negative impact to soil/groundwater if application plan is not followed correctly as per OMRR.			Bagging process presents minimal impacts to soil/groundwater. End-use of the bagged product may present potential negative impact to soil/groundwater if applied in quantities greater than one bag ($5m^3$) per parcel of land. OMRR does not require a land application plan for application quantities less than or equal to $5m^3$ per parcel of land.	End-use of the products may present potential negative impact to soil/groundwater if application plan is not followed correctly as per OMRR.	Process presents minimal impact to soil/groundwater. End-use of the products (biochar, bio-oil, ash) may present potential negative impact to air/soil/groundwater if proper consideration not taken.		

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
CRD Owned	Yes or no	No. Biosolids would be sent to vendors who would own risk and land application responsibility.			Yes.	No. Biosolids would be sent to vendors who would own risk and responsibility.	No. Biosolids would be sent to off-site facility.	Yes.	
Experience and Reputation	Type of application	Mines/quarries are required by the government to eventually reclaim and close to minimize the long-term environmental effects of operations. Biosolids have shown to be an effective measure in the restoration of former mines/quarries by adding nutrients to promote vegetation growth in their barren soils. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Biosolids have shown to be an effective measure in the fertilization of forests to increase tree production, reduce soil erosion, and improve soil health. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Land application has demonstrated commercial success and is one of the commonly used management options worldwide. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	It is unclear if there is a local market for bagged biosolids fertilizer product. A pilot trial would be required to assess demand and feasibility. Biosolids as a bagged product is allowed under OMRR in packages of <5m^3. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	Land application has demonstrated commercial success and is one of the commonly used management options worldwide. However, general public acceptance regarding land application varies due to concerns on noise, odour, contaminants, etc.	High technological readiness as combustion/incineration is a commercially proven and widely used biosolids management process. However, the market for biosolids as fuel does not currently exist. Additionally, public acceptance of waste incinerators varies due to concerns regarding intensive energy usage and potential for air pollutant emissions.	Reputation of pyrolysis is gaining interest as an innovative technology which produces value added products from waste streams, however it has demonstrated low technological readiness as there are a limited number of operational facilities which use biosolids as a sole feedstock. In North America, pyrolysis is ahead of gasification with regards to technological readiness based on the number of operational facilities.	Reputation of gasification is gaining interest as an innovative technology which produces value added products from waste streams, however it has demonstrated low technological readiness as there are a limited number of operational facilities which use biosolids as a sole feedstock. In North America, gasification is below pyrolysis with regards to technological readiness based on the number of operational facilities.

Evaluation Criteria	Description	Mine/Quarry Reclamation	Forest Fertilization	Land Improvement	Direct Land Application	BGM/Composting/Soil-Product	Fuel for Combustion/Incineration (Off-Site)	Pyrolysis (On-Site)	Gasification (On-Site)
Regulatory	New permitting requirements and impacts to existing permits	May require approvals from: - ENV to ensure land application is carried out safely and does not pose a risk to human health or the environment.					Changes to boiler air mass permits may be required. May require approval from Environmental Management Act Air Quality Permit for any emissions associated with thermal process.	May require approval from Environmental Management Act Air Quality Permit for any emissions associated with thermal process.	

1. Due to pyrolysis and gasification being considered emerging technologies in the biosolids industry there are a number of unknown risks associated with these technologies which have the potential of increasing both CPAEX and OPEX associated these types of projects.
2. GHG Emission Implications are based on the 2022 BEAM Model developed by the Northeast Biosolids and Residuals Association, Northwest Biosolids, Northern Tilth LLC.