Comox Valley REGIONAL DISTRICT

Agenda

Notice of Meeting # 4 of the
LIQUID WASTE MANAGEMENT PLAN
JOINT TECHNICAL AND PUBLIC ADVISORY COMMITTEES (TACPAC)
Thursday, January 24, 2019
CVRD Boardroom, 600 Comox Road
9:00 a.m. -3:00pm

ITEM, TIME	DESCRIPTION	OWNER
4.1 9:00	Call to Order	Allison Habkirk
4.2 9:00-9:10	Review of Minutes of Meeting #3	Allison Habkirk
4.3 9:10-10:00	Turning the Goals into an Evaluation System - Treatment Component (continuation of unfinished agenda item from meeting #3) • Proposed evaluation system and weightings • Review, discussion and finalization ***Make a recommendation to the Comox Valley Sewage Commission about goals and evaluation for treatment***	Paul Nash & Allison Habkirk
4.4 10:00 – 10:30	Turning the Goals into an Evaluation System – Resource Recovery Component (continuation of unfinished agenda item from meeting #3) • Proposed evaluation system and weightings • Review, discussion and finalization ***Make a recommendation to the Comox Valley Sewage Commission about goals and evaluation for resource recovery***	Paul Nash & Allison Habkirk
10:30-10:40	Break	
4.5 10:40-10:50	Operational Update • Wet weather flows in December and January	Mike Imrie
4.6 10:50-11:10	Technical Update • Understanding dry and wet weather flows for wastewater planning	WSP
4.7 11:10-11:15	Review of the Options Study and Evaluation Process • Long list for conceptual study, to select short list • Short list for detailed study • Evaluate to select preferred option	Paul Nash
4.7 11:15 – 12:00	Long List Options – Treatment • Presentation of conceptual treatment options • Discussion • Additions? • Finalize list for public review	WSP
4.8 12:00-12:30	Long List Options – Resource Recovery • Presentation of conceptual resource recovery options o Resource types - water, heat, etc o Potential resource users	WSP

ITEM, TIME	DESCRIPTION	OWNER
4.8 12:00-12:30	• Discussion • Additions? • Finalize list for public review	WSP
12:30-1:00	Lunch Break	
4.9 1:00-2:40	Long List Options – Conveyance • Presentation of conceptual conveyance options • Discussion • Additions? • Screening for non-viable options Finalize list for public review	WSP
4.10 2:40-2:45	Preview of TACPAC #5, February 8, 2019 • Review of public feedback • Finalizing the long list(s) for conceptual study • Recommendation of long list(s) to Comox Valley Sewerage Commission.	Paul Nash
4.11 2:45-3:00	Round Table Discussion	Allison Habkirk
4.12 3:00	Adjournment	Allison Habkirk

Attachments

1. Minutes of TACPAC Meeting #3, December 11, 2018
2. Long List Options – Conveyance
3. Long List Options – Treatment
4. Long List Options – Resource Recovery

Comox Valley REGIONAL DISTRICT

Minutes

Minutes of the meeting of the Liquid Waste Management Plan (LWMP) Joint Technical and Public Advisory Committees (TACPAC) Meeting #3 held on Tuesday, December 11, 2018 at the Native Sons Hall located at 360 Cliffe Ave, Courtenay, BC, commencing at 9:00am

PRESENT:

A. Habkirk, Chair and Facilitator	
P. Nash, LWMP Project Coordinator	
M. Rutten, General Manager of Engineering Services	CVRD
M. Imrie, Manager of Wastewater Services	CVRD
C. Wile, Manager of External Relations	CVRD
J. Boguski, Branch Assistant – Engineering Services	CVRD
A.Idris, Engineering Analyst	CVRD
A. Bennett	WSP
W. Bayless	WSP
M. Swift, Town of Comox Councillor	PAC
A. Hamir, Lazo North (Electoral Area B) Director	PAC
C. McColl, K'ómoks First Nation	PAC/TAC
T. Ennis, Comox Valley Conservation Partnership	PAC
D. Winterburn, BC Shellfish Growers Association	PAC
S. Wood, Comox Business Improvement Association	PAC
S. Carey, Courtenay Resident Representative	PAC
T. Serviz, Courtenay Resident Representative	PAC
K. vanVelzen, Comox Resident Representative	PAC
D. Jacquest, Comox Resident Representative	PAC
R. Craig, Comox Resident Representative	PAC
M. Holm, Area B Resident Representative	PAC
M. Lang, Area B Resident Representative	PAC
L. Aitken, Area B Resident Representative (Observer)	PAC
D. Cherry, VIHA	TAC
R. O'Grady, City of Courtenay Engineering	TAC
S. Ashfield, Town of Comox Engineering	TAC
G. Bonekamp, Department of National Defence Engineering	TAC

ITEMS:

ITEM	DESCRIPTION	OWNER
3.1	Call to Order.	Allison Habkirk
3.2	Presentation by WSP – Planning Horizons Walt Bayless presented on effluent discharge criteria and regulations, reclaimed water regulations and planning horizons. The floor opened for questions after the presentation • Why not build to over-capacity? (P. Nash) o Too large of pipe creates flow issues where the waste cannot flow fast enough to keep solids in suspension, also the sewage can become septic. The operational costs of building to over-capacity are also greater. (W. Bayless)	Walt Bayless

ITEM	DESCRIPTION	OWNER

3.2	• Are costs the reason for not twinning the sewer transmission mains? (T. Servizi)
	  o Typically that decision is driven by money, also necessity.
	• At what point does climate change rising sea levels take over Jane Place and Beaufort Ave? (D. Jacquest)
	  o A possible solution is to intercept earlier in the conveyance and move Jane Place to higher elevation. Then Beaufort properties may need to be locally serviced.
	• Would locally servicing Beaufort Ave be the municipality of Comox's issue? How long until sea levels rise? (D. Jacquest)
	  o Yes it would be Comox's issue to locally service Beaufort Ave. We don't know the exact timeline or effect of the sea level rising to Jane Place. However, potential effects of climate change should be considered. (W. Bayless)
	• Courtenay may be worse off with climate change because of the rivers leading to the sea. Moving forward we need to consider those risks. (D. Jacquest)
	City of Courtenay is currently working on climate change mitigation and asset protection. In conjunction with this, the City is working to obtain provincial grant funding for these projects. (R. O'Grady)
		Walt Bayless

3.3	Presentation by Paul Nash – Goals and Options Results
	• Is this weighting process fair? Because one person could put all their votes on one topic. (K. van Velzen)
	  o The results are being reported to you as they were recorded.
	  o If the committee feels it is warranted, we can refine the results today as a group. (P. Nash)
	• There are more PAC votes than TAC votes, are they equally represented? (T. Servizi)
	  o The TAC and PAC votes were recorded and kept separately on purpose. It is true that there were more PAC members who voted than there were TAC members. Considerations were made in terms of which committees vote should carry more weighting depending on goal category when the proposed percentages for each goal and goal category was developed. For instance, the votes from the TAC members' carry more weight than the PAC members' votes for the Technical goals. On the other hand, PAC members' votes carry more weight for the Social Benefits goals as they better understand the community's needs and interests. (P. Nash)
	• Will we amend Official Community Plans if necessary to obtain goals? (D. Jacquest)
	  o Potentially, but that does not seem necessary at this point. (P. Nash)
	• Is asset management required for the LWMP? (A. Gower)
	  o No, but it is a requirement to obtain grant funding in the future. (R. O'Grady)
		Paul Nash

ITEM	DESCRIPTION	OWNER
3.3	• How does governance fit in to the LWMP? (R. O'Grady) o Those issues sit outside of the LWMP. Whether or not changes happen may or may not affect this process. (P. Nash) • The LWMP should clearly outline the scope and boundary of the service. (R. O' Grady) • If we have to plan for 50 years, should we not be planning for new governance structure and boundary expansions? Should the LWMP consider long term flows from outside the current sewer service such as Area B and South Sewer project area?(R. Craig) o The adaptability goal would be critical for the system whereby it can easily be expanded in the future should capacity expansion be required for service area expansion or to accommodate growth. Expansions would have to be known for reasonable planning. (W. Bayless) • The Regional Growth Strategy outlines expansion nodes. Council members need to push the agenda of community expansion in order to more accurately plan. (A. Gower) • This committee should remain technical and focused on the current service area not attempt to predict the future. (M. Rutten) • Consultants determine the size of pipes, pumps and the treatment plant. My understanding is that this committee's mandate was to explore options for best solutions for conveyance, treatment and resource recovery aspects of the wastewater treatment system and not to concern itself with the technical and governance structure details. (M. Imrie)	Paul Nash
3.4	Christianne Wile presented – Public Feedback on the Goals • Were there any goals identified in the public sessions? (K. Van Velzen) o Yes, but there were no goals that differed significantly from what was presented. Some participants wanted to bring forward potential solutions but the time for gathering that input will be at the next round of workshops when we discuss the long list. • Are the public engagement results expected to improve? Should we be doing anything different?(S. Wood) o PAC members can connect with their networks to help engage the public. We are utilizing our online engagement tools along with public workshops and promoting through online, radio and newspaper., (C. Wile) • What would you consider a significant sample of public engagement? (M. Swift) o There is no industry standard for this type of community engagement. However, PAC members are representative of their communities and we look to you to tell us if you are comfortable with these results based on what you are hearing in your networks.	Christianne Wile

ITEM	DESCRIPTION	OWNER
3.4	• How often are we going to engage the community? (A. Hamir) o We have planned to have three more engagement opportunities, for the long list results, short list results, and preferred option. (C. Wile) • This may be too much of a time commitment to ask the public to attend multiple workshops and take part in online consultation activities. Is it possible to skip the long list development stage and engage the public only in the shortlist stage? (A. Hamir) o Engaging the public only in the shortlisting of goals is something we can certainly consider if that is what the committee wants. However, we advise that we allow the public an opportunity to engage with us on the long list in the event there are options that may be brought forward which have not been considered. We have had lots of input from the public so far, it is expected that more responses will come further along in this process. (C. Wile) o Public input is screened in the same manner as input from the committee. (P. Nash) In terms of numbers, it is important to keep in mind that regardless of how many people take part in these public workshops or online consultation, the sample is not totally random and therefore cannot be projected as a representative of the general public. (D. Jacquest)	Christianne Wile
3.5	Break	
3.6	Evaluation of the Goals Matrix - Conveyance Paul Nash presented the initial results from scoring of the treatment, conveyance and resource recovery goals. • It is important from the Chamber of Commerce's perspective to look at the affordability goal category from the lens of economic benefits as local consultants and contractors contribute to affordability of the system through localized equipment and staff, property taxes, utility taxes, etc. (A. Gower) • The significant bump up of the affordability weightings is concerning. (M. Lang) • Under the environmental group, it should be considered that there are some regulated requirements set in place. (A. Gower) • We are concerned about bumping up the proposed weighting of affordability goal category while down grading the proposed weighting for environmental benefits category. (D. Winterburn) o This matrix is a guideline and should not be viewed as set in stone. We need to come to an agreement in advance to determine what is considered to be a tie (example: +/- 20 per cent). (A. Habkirk) • Should we add a goal to emphasize benefit to local businesses? One example being local construction/consulting jobs. The committee engaged in a discussion about how to redistribute the weightings of the conveyance goals. Proposed changes were voted on by a show of hands. The proposed weightings, as presented, and the final weightings, as decided, are shown in the attached tables.	Paul Nash

ITEM	DESCRIPTION	OWNER
3.6	In the discussion about weightings, the technical consultants advised the TACPAC that scoring is not the final arbiter of the "Winning Option". For this system, if two options are within ten per cent, they should be considered as a tie, and then carefully compared to each other to make a decision.	Paul Nash
3.7	Due to running out of time the committee was unable to discuss the weightings of the treatment and resource recovery goals and this task was determined to be completed at the next CVSS LWMP Joint TACPAC meeting commencing January 24, 2018 at the Comox Valley Regional District Boardroom. The January 24, 2018 meeting will be extended to 3:00pm in order to complete all agenda items. There was not sufficient time to visit the compost facility during the December 4 and 7, 2018 sewer system tours. A new tour date of the compost facility will take place Tuesday, January 15, 2019, from 10:00am to 12:00pm. The tour will start and end at the CVRD Boardroom. Members are asked to RSVP by email to jboguski@comoxvalleyrd.ca no later than Monday, January 7, 2019. Delegates were encouraged to consider their ideas for conveyance, treatment and resource recovery over the holidays, and bring them to the January 24 meeting.	
3.8	Meeting adjourned at 12:05pm	

Attachments:
Table of Revised Conveyance Goals
Table of final Conveyance Evaluation System

CONVEYANCE – Consolidation of Goals

Category	Goals and Category	PAC %	TAC %	Proposed Revised Goals	Public %	Proposed Final %	Description, Comment
Technical	Resiliency to climate change, natural disasters and seasonal impacts	11%	12%	Resilience to External Factors	10%	**15%**	Includes climate change, natural disasters, seasonal impact
	Enhance operational resilience	9%	15%	Resilience to Internal Factors	10%	**15%**	Operational simplicity and reliability, minimise risk of failure
	Maximize use of existing infrastructure	9%	10%	Maximize use of existing infrastructure & road ROW's	6%	**0%**	This is not an end goal in itself, but an action to achieve other goals , such as reducing capital cost and project complexity
	Plan for long term	7%	21%	Long term solution	10%	**10%**	Provides asset life, and possibly capacity, beyond the minimum planning horizon.
				Flexibility to accommodate future changes		**5%**	Technical consultants to elaborate
	Innovation in Design	3%	2%	Innovation	8%	**0%**	This not an end goal in itself, but is an action to achieve other goals, such as attract grant funding, or reduce operational complexity.
Technical Total		**38%**	**61%**		**44%**	**45%**	
Affordability	Minimize lifecycle costs	9%	8%	Minimize lifecycle cost	7%	**14%**	Net present value of capital, operational and replacement cost, period is to the planning horizon
	Long Term financial Implications	8%	2%	Long term value	0%	**4%**	Provides asset life and capacity beyond the design planning horizon
				Attract grant funding	8%	**0%**	This is an action to offset capital cost, but needs to be evaluated separately as there is a probability factor involved. Offset = grant% x capital cost x probability
Affordability Total		**17%**	**10%**		**15%**	**18%**	
Economic Benefits	Maximize local economic benefits	3%	1%		0%	**0%**	Not a focus at all of the Conveyance component
Economic Total	**Benefit to local business**	**3%**	**1%**		**0%**	**2%**	
Environment Benefits	Minimize impacts, and risk of impacts, to sensitive environment	12%	7%	Minimize risk of impacts to sensitive environment	10%	**12%**	Example action - remove forcemain from estuary, but must also consider risks/impact of new location
	Mitigate climate change impacts (Energy and GHG's)	7%	9%	Minimize resource consumption and carbon footprint	9%	**6%**	Reduce use of external resources, e.g. energy, chemicals. Most energy reductions reduce GHG's, but not all GHG reductions reduce energy.
Environment Total		**19%**	**16%**		**19%**	**18%**	
Social Benefit	Minimize noise and odour impacts	12%	3%	Minimize noise, odour and visual impacts in operation	6%	**10%**	

				Minimize community disruption during construction	9%	**3%**	
	Maximize community and recreational infrastructure	8%	2%	Maximize community and recreational amenity value	7%	**4%**	Best example is recreational trails above a pipeline, but there might be other opportunities
	Maximize public health benefit	3%	8%	Maximize public health benefit		**0%**	Include this in the specification for this component, relates to Internal resilience- risk of failure
Social Total		**23%**	**13%**		**22%**	**17%**	
Grand Total		**100%**	**100%**		**100%**	**100%**	

Proposed Final Goal and Evaluation Matrix – Conveyance

Component	**Conveyance**	
Category	**Proposed Revised Goals**	**Proposed %**
Technical	Resilience to External Factors	15
	Resilience to Internal Factors	15
	Long term solution	10
	Flexibility to accommodate future changes	5
Technical Total		**45%**
Affordability	Minimize Lifecycle Cost	14
	Long Term Value	4
	Attract Grant Funding (evaluate to offset capital cost)	0
Affordability Total		**18%**
Economic Benefits		0
Economic Total		**2%**
Environmental Benefits	Minimize risk of impacts to sensitive environment	12
	Mitigate climate change impacts (Energy, and GHG's)	6
Environmental Total		**18%**
Social Benefit	Minimize noise, odour and visual impacts in operation	10
	Minimize community disruption during construction	3
	Maximize community and recreational amenity value	4
Social Total		**17%**
Grand Total		**100%**

PRELIMINARY CONVEYANCE LONG LIST OPTIONS
FOR DISCUSSION ONLY

COMOX VALLEY REGIONAL DISTRICT LIQUID WASTE MANAGEMENT PLAN

JANUARY 18, 2019

CONVEYANCE OPTIONS

Overview

The conveyance options presented here were brainstormed based on the location of the existing infrastructure, environmental and regulatory limitations, existing hydraulics of the Comox Valley Sewer System (CVSS) and typical hydraulic constraints associated with sewerage pumping. This is the level of analysis that is appropriate for Stage 1 of a Liquid Waste Management Plan (LWMP). More detailed engineering conceptual analysis such as a feasibility study is then undertaken for the shortlisted options as part of Stage 2 LWMP, to enable selection of the preferred option. After the LWMP, predesign studies are carried out to size and design the components of the infrastructure comprising the system that optimizes conveyance in the CVSS.

The CVSS serves the Town of Comox, the City of Courtenay, and the Canadian Forces Base Comox. It consists of the Comox Valley Water Pollution Control Centre (CVWPCC), six pump stations of varying size and criticality, and the associated piping network. Two sewer main systems discharge at the CVWPCC:

- North Side System consisting of
  - Hudson Trunk
  - Greenwood Trunk
  - CFB Comox gravity main
  - CFB Comox Pump Station
  - Colby Road Pump Station
- Foreshore System consisting of
  - Courtenay Pump Station
  - K'omoks First Nation Pump Station
  - Jane Place Pump Station
  - Foreshore forcemain along Comox Harbour
  - HMCS Quadra Pump Station and forcemain
  - Forceshore forcemain along Willemar Bluffs

Recent upgrades to the North Side system include the design and installation of the Hudson Trunk and Greenwood Trunk. These gravity sewer mains service the northwest corner of the CVSS and tie-in to the existing CFB Comox gravity sewer main.

The foreshore system is currently at capacity and the section of the sewer main along Willemar Bluffs requires abandonment/removal. The objective of the Conveyance Component of this LWMP is to identify the optimal relocation and upgrade plan for the entire Foreshore System for long-term planning purposes.

Existing Infrastructure Capacity and Condition

The existing Courtenay and Jane Pump Stations are approaching their hydraulic capacities and are also reaching the end of their useful life due to aging infrastructure.

As such, regardless of the conveyance option selected, there will likely be a need for renovation and capacity expansion at these two pump stations. However, if the selected alignment has significantly higher discharge pressures than at present, it will trigger a conversion of Courtenay and/or Jane PS to high pressure pumping stations. This brings additional design and cost considerations over and above renovation and capacity expansion, and may lead to a complete replacement pump station, rather than a renovation.

For the purpose of the LWMP, it is essential to consider the above as even a low pressure conveyance system will require some renovations and equipment upgrade to the existing pump stations, however these works would likely be achieved within the existing structure.

Options Boundaries and Limiting Factors

The location and number of pump stations depends on the location of wastewater treatment plant and outfall, which are both fixed, and the hydraulics of the system, which is limited by the topography of the service area.

There are two high elevation sections within the Foreshore system of the CVSS; one at the Comox Road, and one at Lazo Road, as shown on the figure below. For the purpose of the LWMP, any overland conveyance option will need to overcome the two high elevation locations within the CVSS. The overland routes are defined as any option not in the estuary or along the shoreline of the estuary. The hydraulics of the conveyance system will depend on the alignment selected. As such, multiple alignment alternatives are discussed within each option that may significantly vary in hydraulic requirements.

A sub-category of the overland routes involves the use of tunnels to convey the sewer through the hills rather than over them, and thus minimize the elevation of the pipe, compared to conventional overland forcemains. Tunneling alignment also have the advantage of being independent of surface features and road alignments. These options are referred to as “Tunneling Options” and two types have been considered, one using the tunnels as forcemains, and the second using the tunnels as gravity flow tunnels, or combinations of the two.

Source: Google Earth

Long-List Option No. 1	Estuary Alignment

Description

This alignment would involve installation of a new forcemain within or along the Comox harbour foreshore. This pipe could be installed as a seawall structure, direct buried pipe or similar feature. The forcemain would transition to an overland pipe between Comox and the Lazo Road height of land. To convey the sewage over the Lazo Road height of land the following options are suitable:

A. A new pump station facility located somewhere between Comox and the Lazo Road height of land. This would be an inline facility which receives raw sewage from the Courtenay PS discharge forcemain. The new pump station would pump the sewage over the Lazo Road height of land and the sewage would flow to the CVWPCC. The Jane Pl. pump station would tie-in to the Courtenay PS discharge forcemain at a location upstream of the new pump station. The elevation of the new pump station would have to be low enough to permit the Jane Pl. PS to hydraulically connect.

Advantages	Disadvantages
Minimize hydraulic changes to existing Courtenay and Jane Pl. PSs Maximize useful life of existing foreshore forcemain Minimizes construction of a forcemain through Comox	Pump in series and single point of complete failure of sewage conveyance system. Involves operation and maintenance of 3 large pump station, one of high criticality. Involves work along and potentially in the estuary, including environmentally and archaeologically sensitive areas. Elevated maintenance and risk management needs due to proximity to marine environment

B. The forcemain from Courtenay PS would continue directly to the CVWPCC such that there is no in-line pump station. In order to overcome the Lazo Road height of land, Courtenay PS would be upgraded to ensure the forcemain pressure is sufficiently high. As a result, the existing Jane Pl. PS would not be able to cope with this higher hydraulic requirement and therefore a new high head pump station would be required in the general vicinity of the existing Jane Pl. PS. This new facility would convey raw sewage into the forcemain between Courtenay PS and the CVWPCC. The existing Jane Pl. PS would be repurposed as a small subdivision pump station.

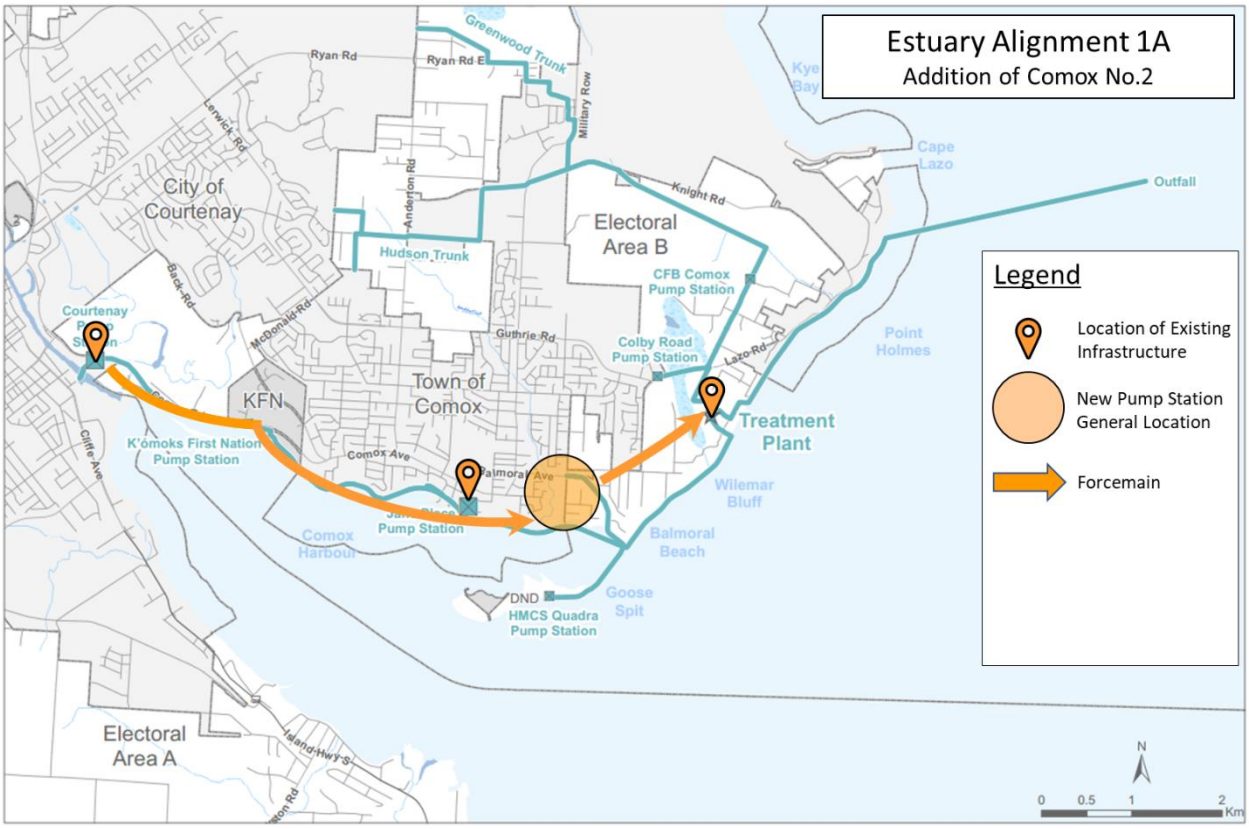
Advantages	Disadvantages
Minimizes construction of a forcemain through Comox Only involves 2 large pump stations (Jane St. PS repurposed as local facility only)	Involves work along and potentially in the estuary, including environmentally and archaeologically sensitive areas. Elevated maintenance and risk management needs due to proximity to marine environment

C. The forcemain from Courtenay PS would continue directly to the CVWPCC such that there is no in-line pump station; however, a tunnel through the Lazo Road height of land would be used to reduce the required pressures in the system. Pending the tunnel elevation, a new pump station may be required in the general vicinity of the existing Jane Pl. PS. In which case, the existing Jane Pl. PS would be repurposed as a small subdivision pump station.

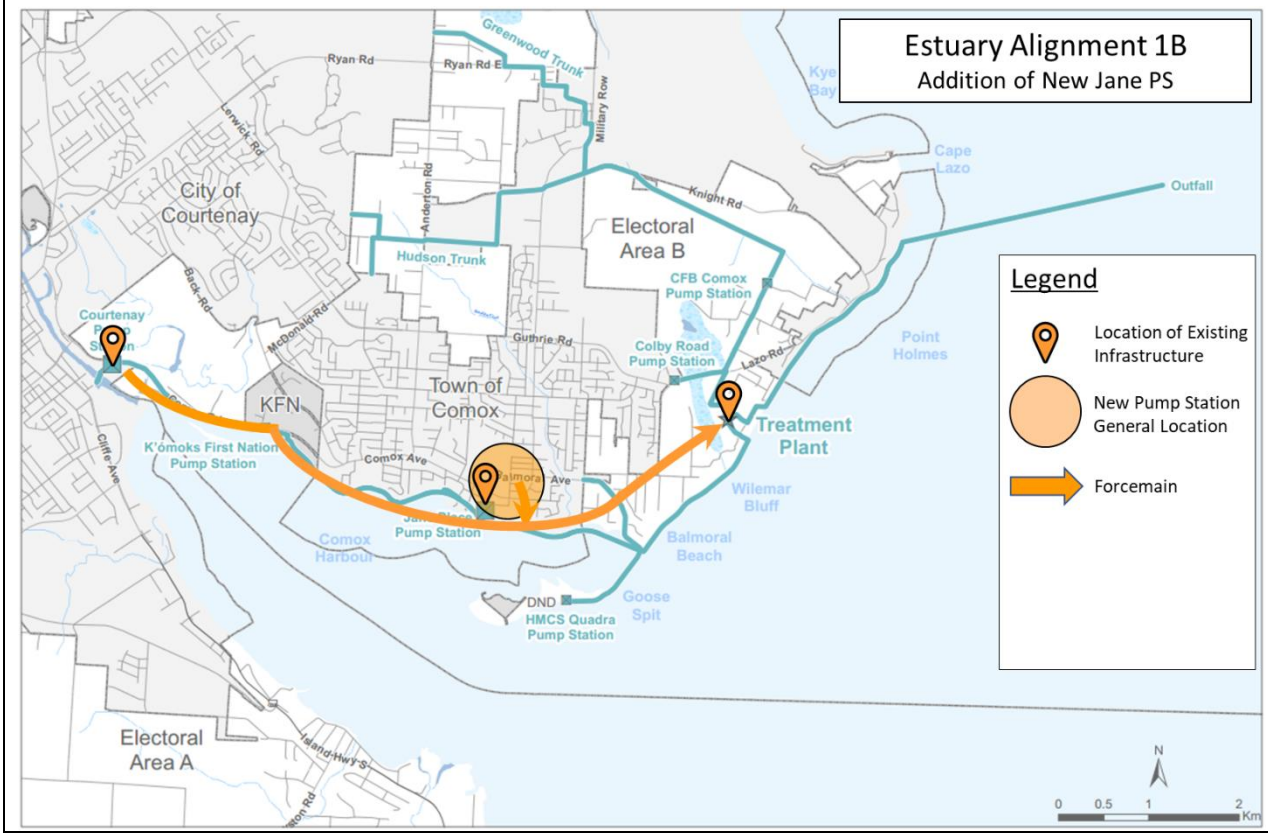
Advantages	Disadvantages
Potentially limited hydraulic changes to existing pump stations hydraulics subject to tunnel elevation. Minimizes construction of a forcemain through Comox Only involves 2 large pump stations	Involves work along and potentially in the estuary, including environmentally and archaeologically sensitive areas. Elevated maintenance and risk management needs due to proximity to marine environment

			Elevated construction and operational risk associated with a tunnel.

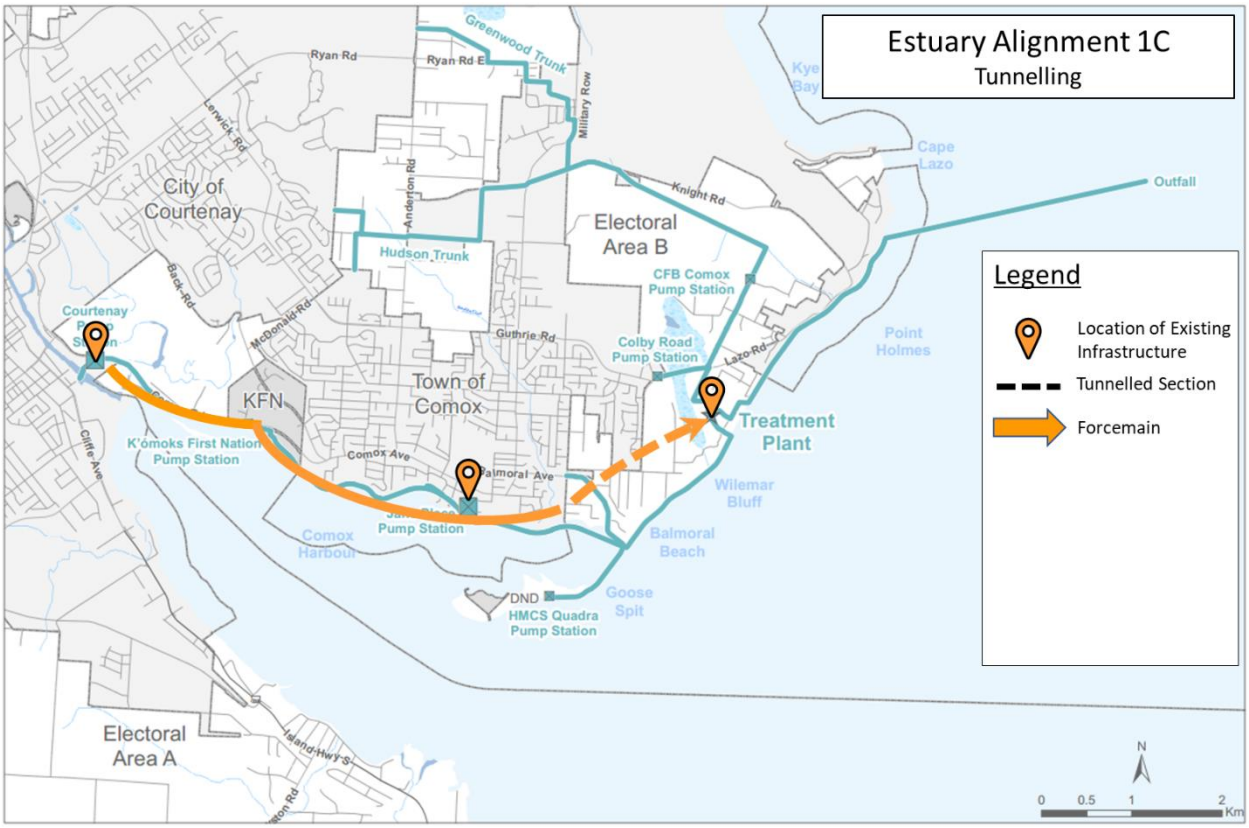
Option 1A



Option 1B



Option 1C


Estuary Alignment 1C
Tunnelling
Legend
Location of Existing Infrastructure
Tunnelled Section
Forcemain
City of Courtenay
Electoral Area B
Town of Comox
KFN
Electoral Area A
Treatment Plant
Outfall
Cape Lazo
Point Holmes
Wilemar Bluff
Balmoral Beach
Goose Spit
Comox Harbour
Ryan Rd
Ryan Rd E
Greenwood Trunk
Military Row
Knight Rd
Anderton Rd
Hudson Trunk
CFB Comox Pump Station
Colby Road Pump Station
Lazo Rd
Guthrie Rd
McDonald Rd
Back Rd
Lewick Rd
Cliffe Ave
Comox Ave
Balmoral Ave
K'omoks First Nation Pump Station
Pump Station
DND
HMCS Quadra Pump Station
Island Hwy S
N
0
0.5
1
2
Km

Long-List Option No. 2	Overland Alignments

Description

This alignment would involve installation of a new forcemain overland from Courtenay pump station towards the CVWPCC. This forcemain would pass over the Comox Rd. hill. Due to the change in discharge pressure a significant upgrade or rebuild would be required at the Courtenay Pump Station. Several routing options are available including:

A. The forcemain from Courtenay PS would convey raw sewage over the Comox Rd. hill and down into a new pump station, connected in series, somewhere between the Glacier View Drive/Comox Rd. and Lazo Road heights of land. The elevation of the new pump station would need to be at an elevation to suit the existing discharge pressures from the Jane Pl. PS. From the new pump station the raw sewage would be conveyed over the Lazo Road height of land to the CVWPCC.

Advantages	Disadvantages
No pipe in the estuary mitigating environmental and archaeological risks All pipe and structures on-land to maximize maintenance accessibility Minimize hydraulic changes to existing Jane Pl. PS	Pump in series and single point of complete failure of sewage conveyance system. Involves operation and maintenance of 3 large pump station, one of high criticality. Significant hydraulic changes to the Courtenay PS Construction of new conveyance system through an area with significant existing infrastructure

B. The forcemain from Courtenay PS would continue directly to the CVWPCC such that there is no in-line pump station. In order to overcome both the Comox Rd. hill and the Lazo Road height of land, the Courtenay PS would be upgraded to ensure forcemain pressure is sufficiently high. As a result, the existing Jane Pl. PS would not be able to cope with this higher hydraulic requirement and therefore a new high head pump station would be required in the general vicinity of the existing Jane Pl. PS. This new facility would convey raw sewage into the forcemain between Courtenay PS and the CVWPCC. The existing Jane Pl. PS would be repurposed as a small subdivision pump station.

Advantages	Disadvantages
No pipe in the estuary mitigating environmental and archaeological risks All pipe and structures on-land to maximize maintenance accessibility Only involves 2 large pump stations (Jane Pl. PS repurposed as local facility only)	Significant hydraulic changes to the Courtenay PS and Jane Pl. PS Construction of new conveyance system through an area with significant existing infrastructure

Option 2A

Option 2B

Long-List Option No. 3	Tunnelling Alignments

Description

This alignment would involve installation of a combination of new forcemains and gravity sewer mains overland from the Courtenay pump station towards the CVWPCC. The tunnel alignments would be selected to either minimize pumping requirements or where possible, utilize gravity sewer mains. The primary areas where tunnelling would be appropriate are under the Comox Rd. and Lazo Rd heights of land. Several combinations of forcemain/gravity sewer mains are described below.

A. Sewage would be pumped from the Courtenay PS to an elevation where a tunnel would be constructed through the Comox Rd. hill. The forcemain would transition to an open cut installation through Comox and back to a tunnel to pass under the Lazo Road height of land and down to the CVWPCC. The Jane Place pump station could connect to the forcemain. To avoid major modifications to the Jane St. PS the tunnel elevations would have to be selected to suit the existing hydraulics of the Jane Pl. PS.

Advantages	Disadvantages
No pipe in the estuary mitigating environmental and archaeological risks Reduces pressures at the existing pump stations Significantly alleviates the high head requirements for the Courtenay PS and Jane Pl PS as compared to other overland options.	Elevated costs and risks due to tunnelling Construction of new conveyance system through an area with significant existing infrastructure

B. A new open cut forcemain would be installed from Courtenay PS and would continue directly to the CVWPCC such that there is no in-line pump station. To reduce pressures a tunnel would be used for the forcemain to pass through the Lazo Rd height of land. The existing Jane Pl. PS would likely not be able to cope with this higher hydraulic requirement and therefore a new high head pump station would be required in the general vicinity of the existing Jane Pl. PS. This new facility would convey raw sewage into the forcemain between Courtenay PS and the CVWPCC. The existing Jane Pl. PS would be repurposed as a small subdivision pump station. If the tunnel elevation is sufficiently low, the existing Jane Pl. PS would be suitable.

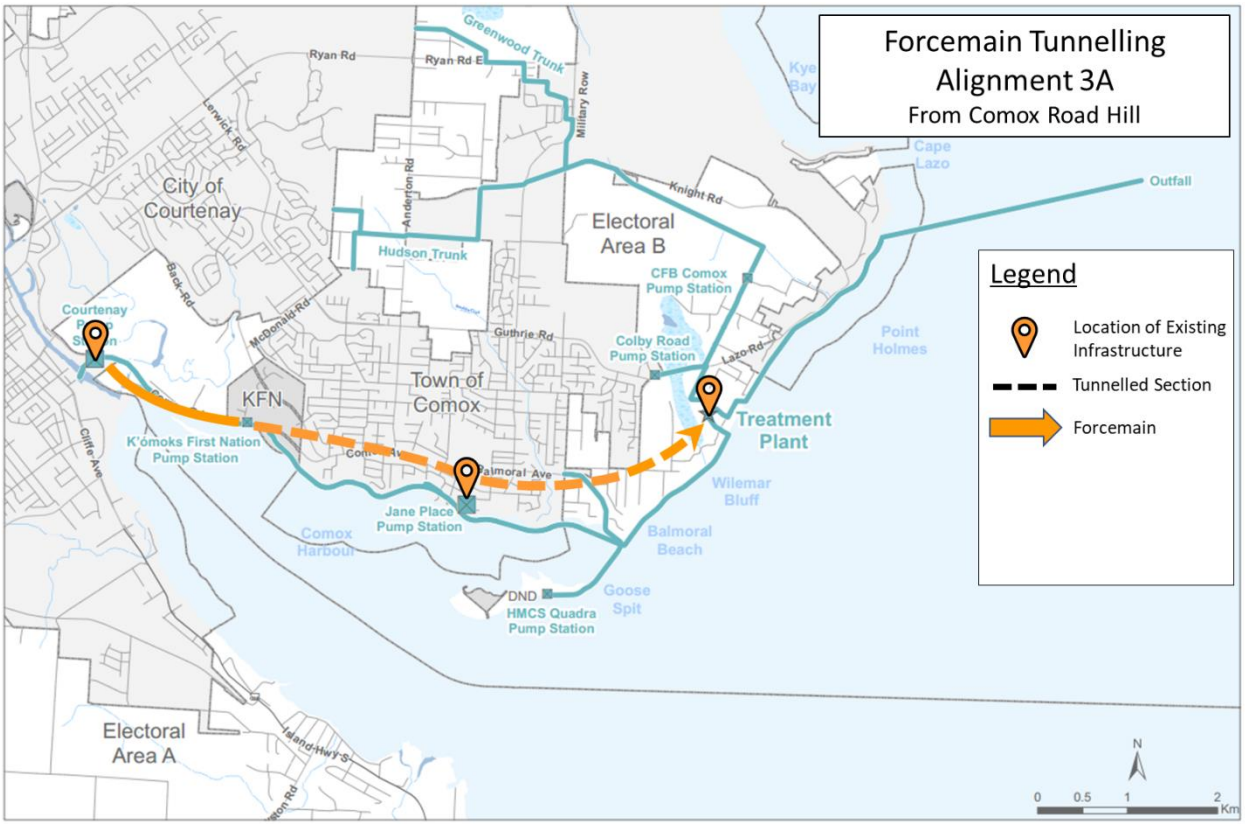
Advantages	Disadvantages
No pipe in the estuary mitigating environmental and archaeological risks All pipe and structures on-land to maximize maintenance accessibility Alleviates some of the high head requirements as compared to other overland options.	Construction of new conveyance system through an area with significant existing infrastructure Higher upgrade requirements at the Jane Pl. PS as compared to the other tunnel options

C. A new open cut forcemain would be installed from Courtenay PS and would continue directly to the CVWPCC such that there is no in-line pump station. To reduce pressures a gravity sewer main tunnel would be used to pass through the Lazo Rd height of land. Depending on the tunnel elevation the existing Jane Pl. PS may not require replacement to a high head pump station. The alignment options for the gravity sewer main would be restricted to those which accommodate the required slope. The Jane Place pump station would connect to the gravity sewer main through a new forcemain. The tie-in location would be governed by the gravity sewer main alignment.

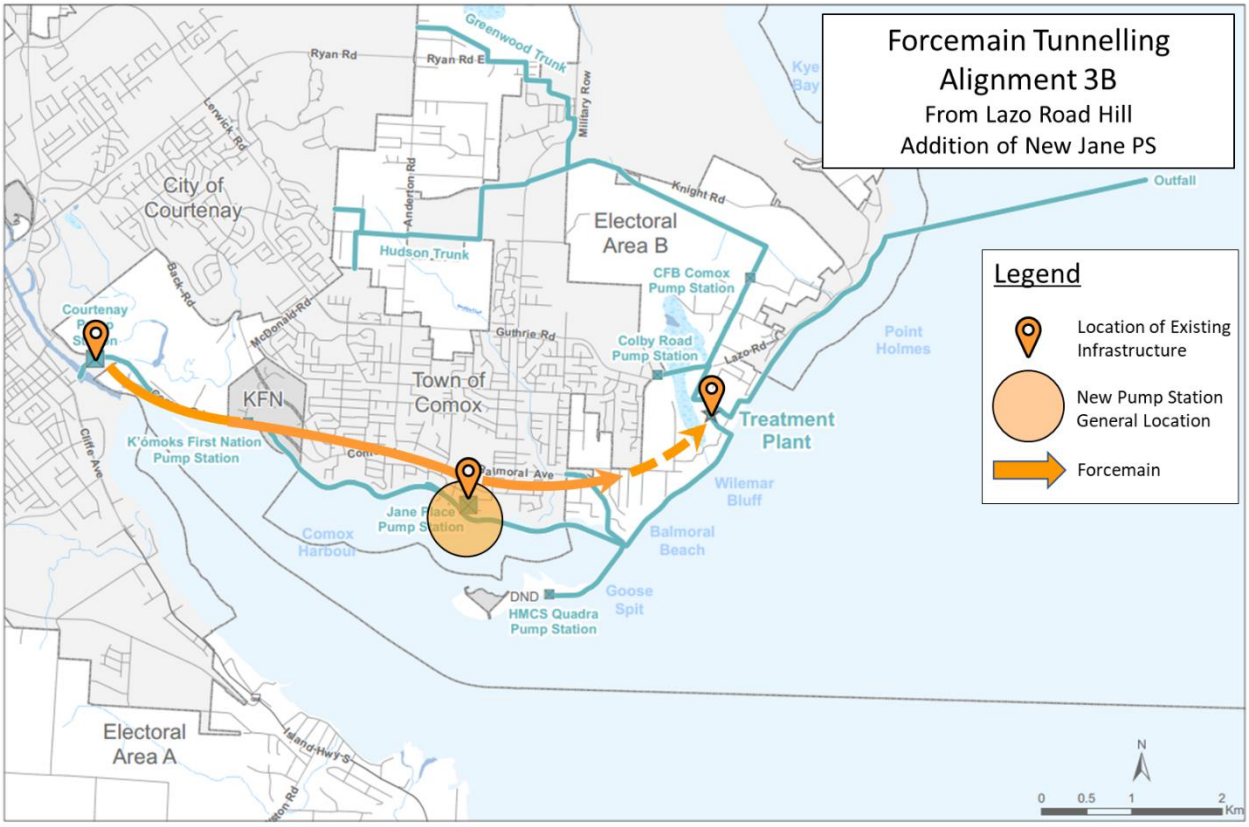
Advantages	Disadvantages

Description		No pipe in the estuary mitigating environmental and archaeological risks All pipe and structures on-land to maximize maintenance accessibility Alleviates some of the high head requirements for the Courtenay PS and and most of the high head requirements for the Jane Pl. PS as compared to other overland options.	Construction of new conveyance system through an area with significant existing infrastructure Gravity sewer main alignment must follow a specific slope which is dependent on the topography. Gravity sewer mains are significantly larger diameter as compared to forcemains for the same flow.

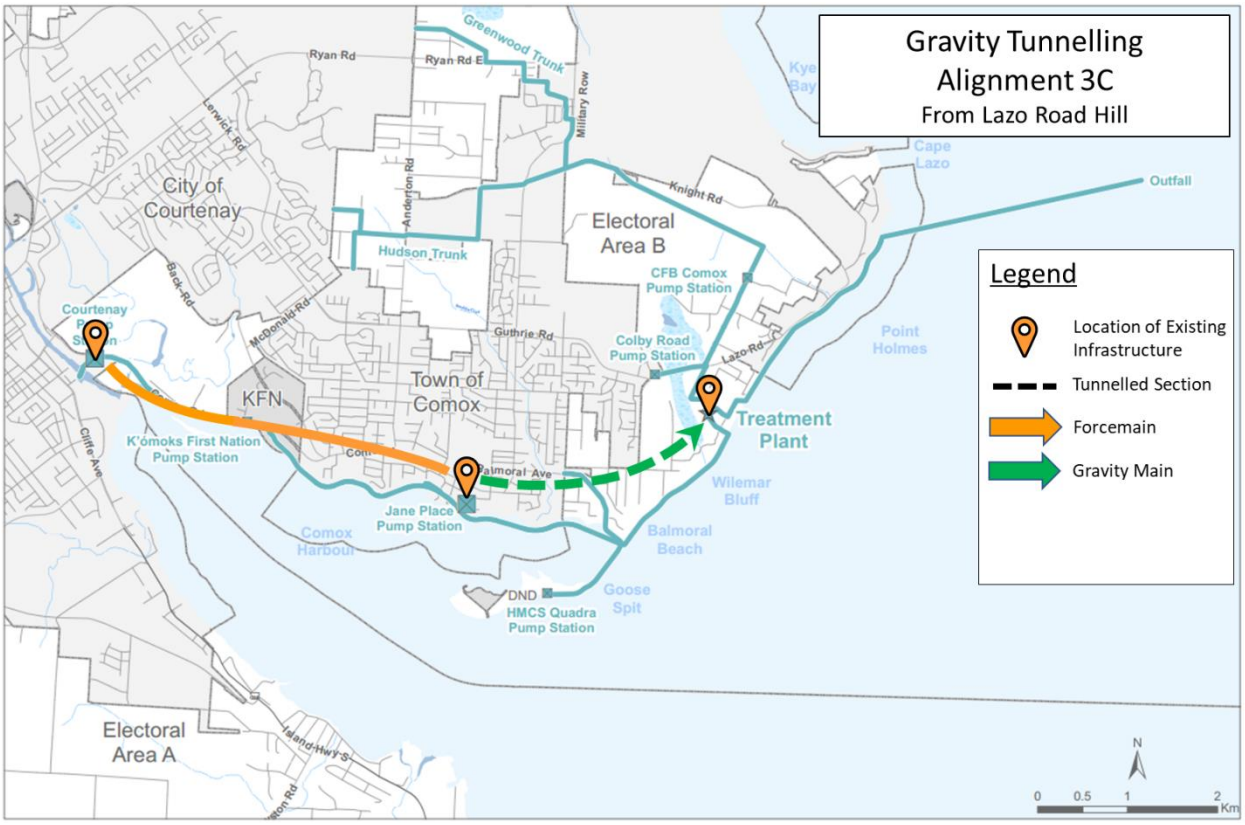
Option 3A



Option 3B



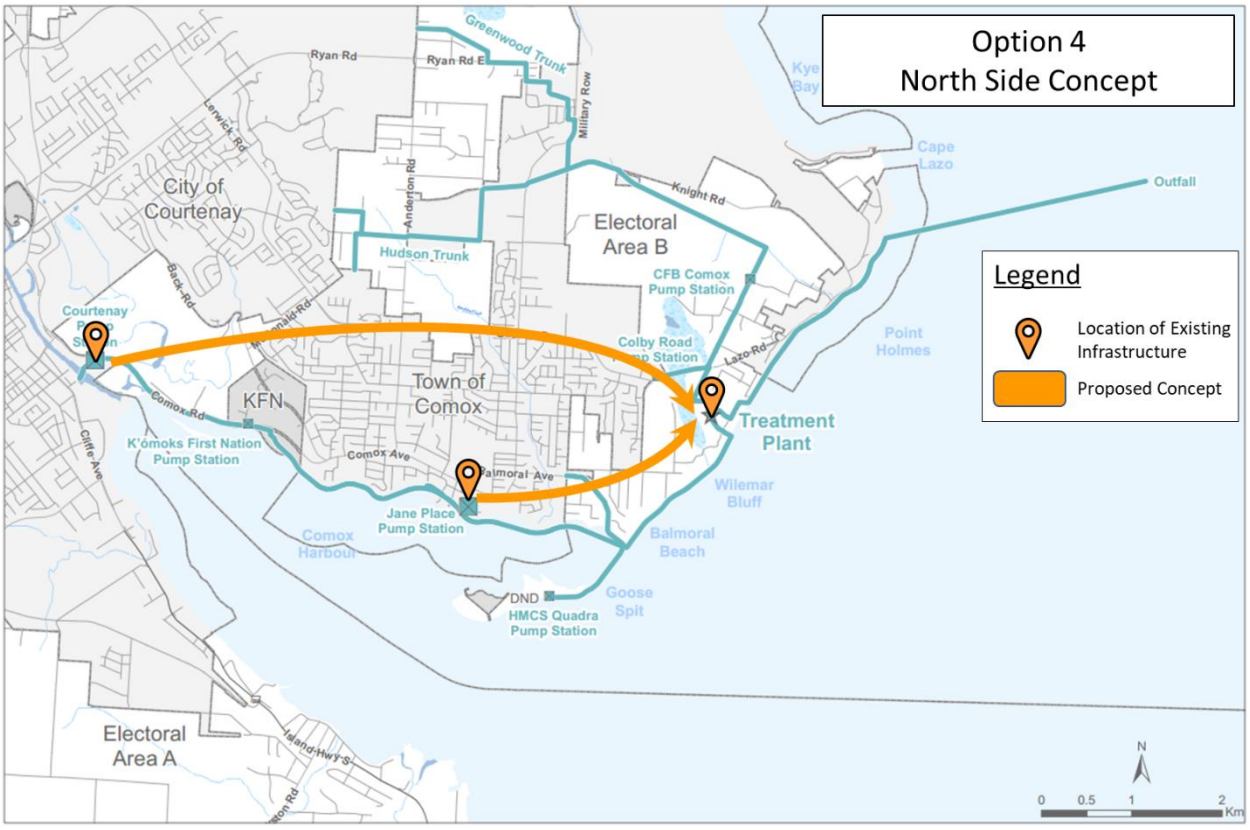
Option 3C



Long-List Option No. 4	North Side Concept
Description	In this concept, raw sewage would be pumped from the location of the existing Courtenay PS along the North side of the CVSS, and directly from the location of the existing Jane Pump Station to the CVWPCC. Courtenay PS would potentially be required to pump sewage to the CVWPCC over the highest elevation of East Courtenay hill (El. 73 m) in a forcemain. Jane PS would be required to pump sewage to the CVWPCC over the Lazo hill (El. 51 m) in a forcemain. The two forcemains will combine west of the Lazo hill and one common forcemain will convey the raw sewage to the CVWPCC. Alternately, the two alignments can continue separately over Lazo hill to the CVWPCC. Regardless of the alignment over Lazo hill, this option would trigger a high head upgrade at both the Courtenay and Jane PS, leading to the requirement for a rebuild of both pump stations.

Advantages	Disadvantages
Only involves 2 large pump stations (Jane St. PS repurposed as local facility only) Pump Stations operating in parallels as opposed to in series, minimizing need for a sophisticated control system Avoids construction in areas with significant infrastructure development No pipe in the estuary mitigating environmental and archaeological risks All pipe and structures on-land to maximize maintenance accessibility	Construction for the linear assets required along two separate alignments within the CVSS, increasing construction disturbance Operating two partially separate high pressure forcemain networks The North Side of Glacier View Drive is at a significant higher elevation than that of the South Side (73 m vs 39 m)

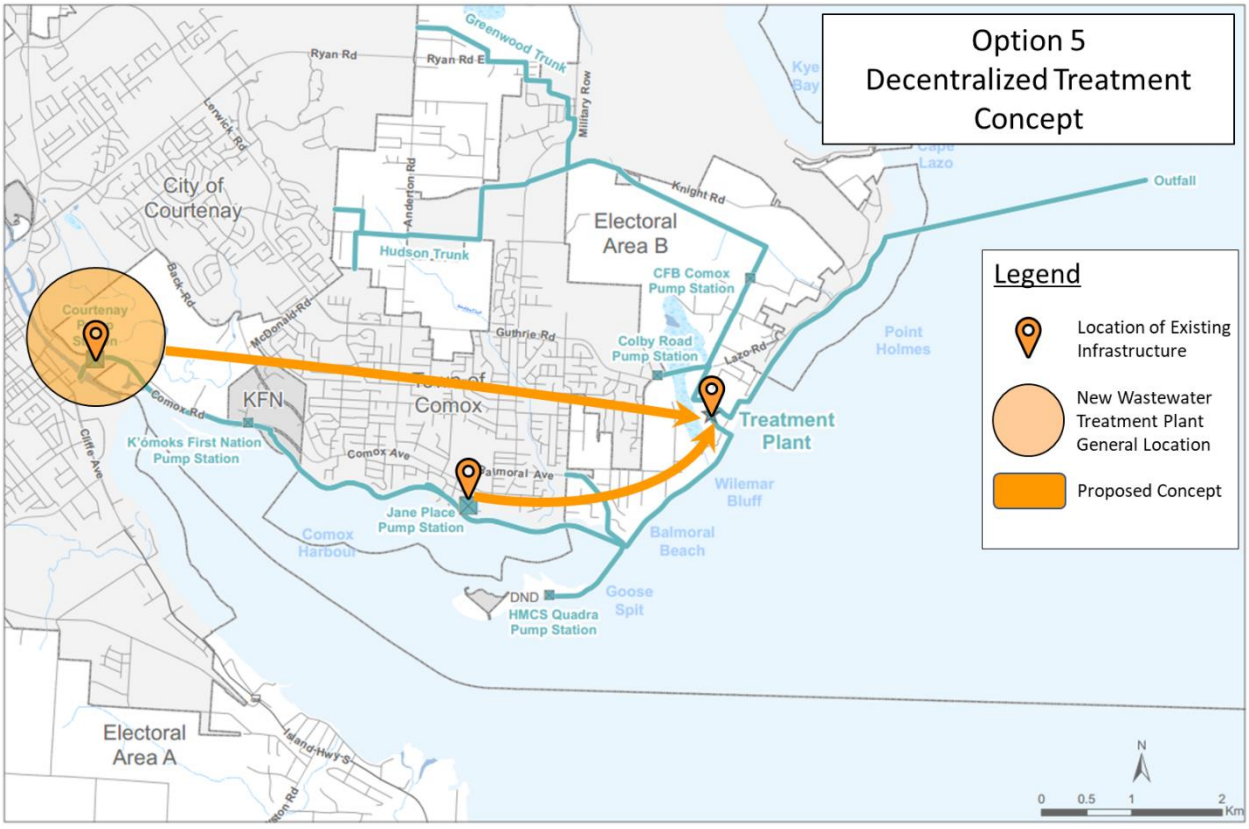
Option 4



Long-List Option No. 5	Decentralized Treatment Concept
Description	In this option, an additional wastewater treatment plant would be constructed in close proximity to the location of the existing Courtenay PS to treat the sewage collected and currently conveyed by the Courtenay PS. Due to the location of the outfall, the effluent of a decentralized wastewater treatment plant would have to be conveyed to the location of the existing outfall for discharge. Alignments for the conveyance of the effluent discharge are similar to those discussed within Options 1, 2, and 4, and include estuary, seawall, overland, tunnelled, and north side alignments. The sewage collected at the Jane PS will be conveyed to the existing CVWPCC for treatment using an overland or tunnelled option. Overland options would still require a new pump station for the Jane St. PS, and subject to the length and depth of the tunnelled option a new Jane St. PS maybe required.

Advantages	Disadvantages
Eliminates the need for conveyance of Courtenay's raw sewage through the CVSS to the CVWPCC Alleviate capacity-driven upgrade requirements at the CVWPCC	Requires the need for conveyance of the decentralized WWTP effluent to the outfall using a new pumping and conveyance system Significant operational burden with two wastewater treatment plants Significant cost associated with the construction of a new wastewater treatment plant, and maintenance and operation of two plants Still requires conveyance of raw sewage overland from Comox.

Option 5



Long-List Option No. 6	Deep Marine Concept
Description	In this option, raw sewage would be pumped from the location of the existing Courtenay and Jane Pump Station to the CWPCC. The forcemain will be sited in deep water, placed on the sea-floor and only buried where there is less than 3m water depth at low tide. This option would require a deeper marine forcemain from Courtenay PS to the CVWPCC, with a forcemain from the Jane PS connecting into the forecemain in the estuary.

Advantages	Disadvantages
Minimizing pumping head and system pressure No new overland piping Eliminate sewage pipes in the Comox Harbour foreshore	Challenging constructability and maintenance Environmental risk in case of a spill as sewage pipes are still in the estuary. Requires pipe from Jane PS to tie-in within the estuary which passes through sensitive environmental, ecological, and archaeological habitat Difficult repair and maintenance as pipe is submerged.

Option 6

PRELIMINARY WASTEWATER TREATMENT LONG LIST OPTIONS
FOR DISCUSSION ONLY

COMOX VALLEY REGIONAL DISTRICT LIQUID WASTE MANAGEMENT PLAN

JANUARY 18, 2019

WASTEWATER TREATMENT OPTIONS

Overview

The wastewater treatment options presented here are based on the level of treatment to be implemented (i.e., the effluent quality that will be produced). This is the level of analysis that is appropriate for a Liquid Waste Management Plan (LWMP). More detailed engineering analysis is then undertaken in feasibility and predesign studies (normally following completion of the LWMP), to select and size the treatment processes that will be used to achieve the recommended effluent standards.

Other aspects of wastewater treatment included in LWMPs typically include identification of wastewater treatment service areas (present and future), and the number and location of treatment facilities. For the CVRD LWMP, the study area is based on the service areas for the existing Comox Valley Water Pollution Control Centre (CVWPCC), namely the Town of Comox, the City of Courtenay, and Canadian Forces Base Comox.

The CVWPCC is a secondary treatment facility located at 445 Brent Road in Comox, that is owned and operated by the Comox Valley Regional District (CVRD). Treated wastewater is discharged from the CVWPCC to the Strait of Georgia through a submerged outfall pipe with diffuser that extends 2,825 metres from shore near Cape Lazo, with the outfall terminus 60 metres below the water surface at low tide.

Location and Number of Treatment Facilities

In some LWMPs, sites for one or more new treatment facilities must be selected. Identifying one or more locations for a new wastewater treatment plant is a challenging undertaking. One of the challenges is to identify a suitable location for a new outfall discharge; among other things, this requires a right-of-way for the land section of the outfall from the treatment plant site to the water's edge, where the marine (submerged) section of the outfall pipe begins. The discharge itself is preferably located far from shore in deep water, so that swimming beaches and shellfish beds are not impacted. It is often practical to begin with identification of one or more feasible locations for an outfall discharge, and then identify potential sites for treatment facilities that are within a reasonable distance of the outfall location, and where a feasible route for the land section of the outfall can be developed. Environmental Impact Studies of the receiving environment are required when selecting the location of the outfall discharge; these studies typically consider receiving water ecology and use (marine flora and fauna, recreational use, etc.), local currents, prevailing winds, expected migration and dilution of the discharge plume, etc. The environmental impacts of construction (e.g. in the intertidal zone) must also be evaluated and mitigated.

The costs and benefits of a single wastewater treatment plant versus several smaller plants located throughout a service area (sometimes referred to as "distributed treatment") have been extensively evaluated in British Columbia at a number of locations (e.g., the Greater Victoria area, North Vancouver, and a number of smaller communities such as Powell River). In general, the evaluations have resulted in selection of the single treatment plant approach, due to the significantly higher costs associated with construction and operation of multiple treatment facilities, and the difficulties associated with finding multiple locations for treatment plants and outfall discharges that are acceptable to local residents and that meet all of the technical and regulatory requirements.

As mentioned earlier, a single existing wastewater treatment facility (located at Brent Road near Cape Lazo) and outfall serves the communities of Courtenay and Comox as well as CFB Comox. The existing treatment plant site has adequate unused area for major expansion of the facilities in future as required. Attempting to locate a site for a second treatment facility within the existing service area would be very difficult, partly due to the challenges associated with finding a suitable location for a second outfall to deep water. In this case, there is no apparent driver for constructing additional treatment plants and outfalls to serve the Comox/Courtenay/CFB area, and consequently this does not form part of the wastewater treatment options analysis.

It is possible that a location may be identified within the service area where there is potential for significant use of reclaimed water (e.g., for irrigation or other purposes); in this case, it may be feasible to locate a water reclamation facility near the user(s) of reclaimed water, and direct a portion of the untreated wastewater to that location, thereby reducing the wastewater load to the CVWPCC at Brent Road. This possibility will be explored in the Resource Recovery part of the LWMP.

Costs of Wastewater Treatment

The costs of constructing wastewater treatment facilities have risen dramatically in recent years. Capital costs for constructing new facilities can sometimes be partially offset by grants from senior government. However, ongoing operating and maintenance (O&M) and replacement (asset management) costs are entirely borne by the local government. In general, the higher the effluent standards, the greater the capital and ongoing O&M costs of treatment. In general, it is more economical to have a single treatment plant, unless the service area is relatively large with development concentrated in nodes that are far apart.

For the purposes of the LWMP, it is important to carefully consider the capital and O&M costs of wastewater treatment, since these costs are borne by taxpayers. Therefore, it is essential to balance the desire for implementing the highest treatment standards possible with the financial resources available to the community; this particularly applies to O&M costs, which are not eligible for grant funding and fall entirely on local taxpayers.

Emerging Contaminants

Emerging Contaminants have been defined as *"Constituents, which have been identified in water, that are considered for regulatory action pending the development of additional information on health and environmental impacts"* (from Metcalf & Eddy, 2014). Examples of Emerging Contaminants may include pharmaceutically active compounds (e.g., antibiotics), endocrine disrupting compounds that affect natural hormones in animals and humans, personal care products, and disinfection byproducts. Many of these products are known to be potentially harmful, but much remains to be learned about their behavior in the environment, and potential methods of treatment. As it stands, domestic wastewater treatment plants are not specifically designed to remove this type of contaminant, although some may be degraded or transformed in the treatment processes, and some may be incorporated into the waste solids.

According to Water Research Foundation Fact Sheet (2016): *Detecting a compound in water does not mean that adverse health effects will occur or are likely. In general, no relationships have been established between pharmaceuticals in water at environmental levels and adverse effects in humans… Strategies for preventing endocrine disrupting compounds (EDCs) and pharmaceuticals and personal care products (PPCPs) from entering water supplies include improved wastewater treatment and other source water protection strategies. Once EDCs and PPCPs have entered a utility's water supply, no single treatment process can remove them all due to their wide range of physicochemical properties. In general, both conventional and advanced water treatment systems have the capability to reduce the concentration of EDCs and PPCPs in water to some degree, though removal by conventional treatment processes is limited. Advanced treatment processes such as nanofiltration, reserve osmosis, and activated carbon are more effective but can be expensive and energy-intensive.*

Metals may also be a concern where they accumulate to toxic concentrations. Domestic wastewater treatment plants are not designed to remove metals from the wastewater stream. However, it has been shown that many of the so-called "heavy metals" tend to associate with solid particles in water. Thus removal of suspended solids from wastewater will result in at least partial removal of these associated metals as well (the solids must also be dealt with but are much less in volume than the wastewater stream).

Microplastics have recently been identified as a concern as well. According to Water Research Foundation (2018): *Studies have found that WWTPs removed between 90-99% of microplastics (<0.5 cm), with most being captured in the sludge. However, when dealing with large volumes of effluent, even a small concentration of microplastics being released can result in a significant contribution to the environment. Current research indicates that the microplastics in the environment has not caused adverse effects on aquatic wildlife as opposed to macroplastics, which can*

cause physical harm to fish-eating birds, aquatic mammals, reptiles and fish. If it is shown that microplastics should be removed from effluent, filtration is likely the best treatment, though more research on removal of microplastics, particularly for sizes smaller than 300 um, is needed.

Options for Treatment

For the purposes of Stage 1 of the LWMP, four options for treatment were identified for discussion with the TAC/PAC. The four options are based on the effluent quality to be produced as stated at the beginning of this discussion, and are presented as concepts for planning of future expansions and/or upgrades. Option 1 would be to meet the provincial and federal discharge standards; these standards have been developed to protect the receiving environment, and the provincial regulation allows the regulating body to impose additional standards in specific cases where this is shown to be needed to protect the environment. Options 2, 3 and 4 are based on voluntarily enhancing effluent quality beyond what is required by the regulations. Options 1 through 4 are described on the following pages. Note that Option 2 describes the current configuration of the CVWPCC, with the addition of disinfection.

Long-List Option No. 1	Meet Regulatory Discharge Standards

Description

Option 1 would meet federal and provincial regulatory requirements for secondary treatment with discharge to open marine waters (the CVWPCC outfall extends 2,825 metres from shore at Cape Lazo into the Strait of Georgia and the discharge diffuser is 60 metres below water at low tide). As with the other options, an updated Environmental Impact Study (EIS) would be required to identify any additional treatment requirements that might be needed to address protection of the receiving environment according to provincial regulations. If the EIS did not identify any additional requirements beyond what is required to meet the secondary treatment discharge standards set out in the B.C. Municipal Wastewater Regulation (MWR) and the Canada Wastewater Systems Effluent Regulations (WSER), the following treatment and discharge standards would apply to Option 1:

MWR

Secondary treatment for flows up to two times average dry weather flow (2xADWF):

- 5-day Biochemical Oxygen Demand (BOD_5): max. day 45 mg/L
- total suspended solids (TSS): max. day 45 mg/L
- pH 6 to 9
- ammonia concentration does not cause chronic toxicity at the edge of the initial dilution zone (IDZ)

Primary treatment for flows in excess of 2xADWF (interim):

- 5-day Biochemical Oxygen Demand (BOD_5): max. day 130 mg/L
- total suspended solids (TSS): max. day 130 mg/L
- note that if flows are > 2xADWF during a storm or equivalent snowmelt event with a less than 5-year return period, a discharger must (have a liquid waste management plan or specific study and implement the plan's or study's measures.

WSER

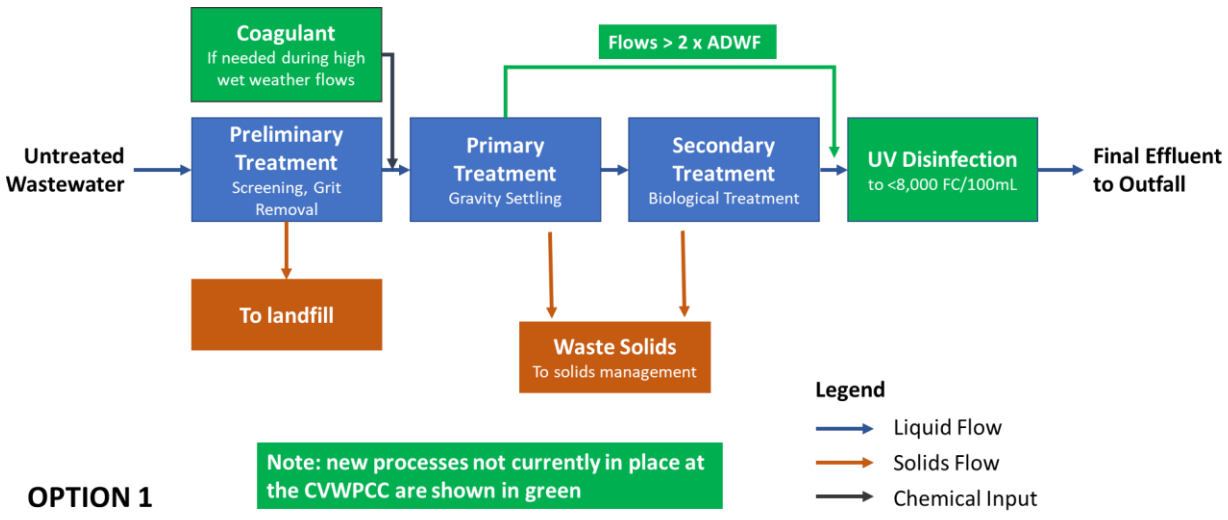
- 5-day Biochemical Oxygen Demand (BOD_5): monthly avg. not to exceed 25 mg/L
- total suspended solids (TSS): monthly avg. not to exceed 25 mg/L
- total residual chlorine < 0.02 mg/L
- un-ionized ammonia < 1.25 mg N/L at 15°C
- note that the WSER standards apply to the combined discharge – this may require chemical addition to enhance primary treatment or other measures to ensure that the secondary treatment bypass does not cause the combined effluent to exceed the WSER discharge standards for BOD_5 and TSS

An EIS was completed for the CVWPCC discharge in 2010; this showed that disinfection of the effluent to achieve a fecal coliform count of less than 8000/100 mL in the CVWPCC discharge would be required to protect local shellfish resources outside the initial dilution zone (IDZ). Disinfection to this standard was assumed for Option 1.

Note that plant data from 2013 to 2017 show that the number of days when flows exceeded 2xADWF ranged from 0 days (2013) to 31 days (2015) – over the 5 years of record, flow exceeded 2xADWF on a total of 58 days (the total volume of flow greater than 2xADWF represented only about 1% of the total plant flow over that period)

Advantages	Disadvantages
• meets regulatory requirements for discharge to open marine waters • avoids the cost of subjecting relatively infrequent high wet weather flows to secondary treatment • coagulating chemicals can be added to enhance primary treatment if needed when flows exceed 2xADWF • includes disinfection to protect shellfish resources outside the IDZ	• flows in excess of 2xADWF would bypass secondary treatment and so would not receive biological treatment

Process Schematic for Option 1



OPTION 1

Long-List Option No. 2	Provide Secondary Treatment for all Flows

Description

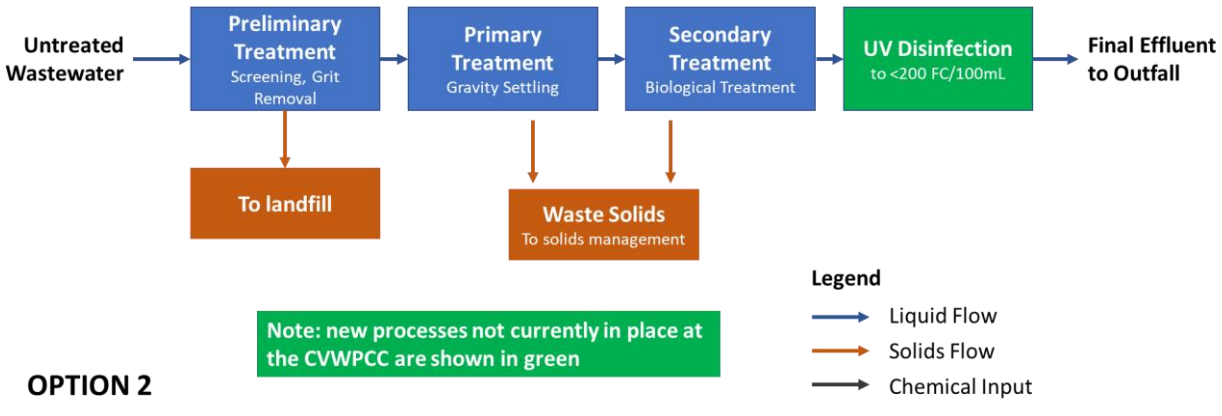
Option 2 is similar to Option 1, except that there would be no wet weather bypass of flows in excess of 2xADWF around secondary treatment. For Option 2, the entire plant influent flow would pass through secondary treatment (this is the current configuration of the CVWPCC). As with the other options, an updated Environmental Impact Study (EIS) would be required to identify any additional treatment requirements that might be needed to address protection of the receiving environment. For Option 2, it was assumed that the disinfection process would be designed to achieve recreational standards (i.e. 200 FC/100 mL) in the undiluted effluent. The following treatment and discharge standards would apply to Option 2.

Secondary treatment for the entire plant flow:

- 5-day Biochemical Oxygen Demand (BOD_5): max. day 45 mg/L, monthly avg. not to exceed 25 mg/L
- total suspended solids (TSS): max. day 45 mg/L, monthly avg. not to exceed 25 mg/L
- pH 6 to 9
- ammonia concentration does not cause chronic toxicity at the edge of the initial dilution zone (IDZ)
- total residual chlorine < 0.02 mg/L
- un-ionized ammonia < 1.25 mg N/L at 15°C
- disinfection - fecal coliforms not to exceed 200 FC/1900 mL

Advantages	Disadvantages
• exceeds regulatory requirements for discharge to open marine waters • entire plant flow is subjected to secondary (biological) treatment • includes enhanced disinfection to protect shellfish resources • effluent meets standards for reclaimed water use for lower exposure potential	• secondary treatment must be sized accommodate all wet weather flows, increasing capital and operating costs compared to Option 1

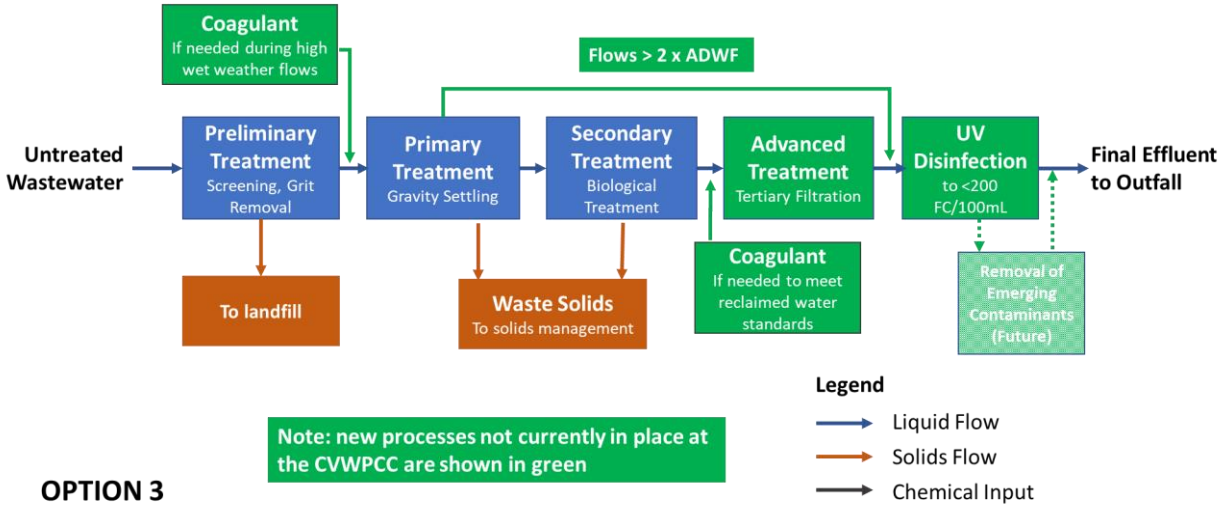
Process Schematic for Option 2



Long-List Option No. 3	Advanced (Tertiary) Treatment for up to 2xADWF
Description	Option 3 would incorporate the same preliminary, primary and secondary treatment processes as Option 2. In addition, Option 3 would include advanced (tertiary) filtration of the secondary treated effluent for flows up to two times the average dry weather flow (2xADWF) to enhance removal of suspended solids. As with the other options, an updated Environmental Impact Study (EIS) would be required to identify any additional treatment requirements that might be needed to address protection of the receiving environment. For Option 3, it was assumed that the disinfection process would be designed to achieve standards for lower exposure potential (i.e. 200 FC/100 mL) in the undiluted (combined) effluent. The following treatment and discharge standards would apply to Option 3. Advanced treatment (tertiary filtration) for flows up to 2xADWF: • 5-day Biochemical Oxygen Demand (BOD_5): max. day 10 mg/L, avg. 5 mg/L • total suspended solids (TSS): max. day 10 mg/L, avg. 5 mg/L • pH 6 to 9 • ammonia concentration does not cause chronic toxicity at the edge of the initial dilution zone (IDZ) • total residual chlorine < 0.02 mg/L • un-ionized ammonia < 1.25 mg N/L at 15°C • future addition of processes that are proven for removal of emerging contaminants at municipal wastewater plants Primary treatment for flows in excess of 2xADWF (interim): • 5-day Biochemical Oxygen Demand (BOD_5): max. day 130 mg/L • total suspended solids (TSS): max. day 130 mg/L • note that if flows are > 2xADWF during a storm or equivalent snowmelt event with a less than 5-year return period, a discharger must (have a liquid waste management plan or specific study and implement the plan's or study's measures. Disinfection of combined effluent - fecal coliforms not to exceed 200 FC/100 mL note that plant data from 2013 to 2017 show that the number of days when flows exceeded 2xADWF ranged from 0 days (2013) to 31 days (2015) – over the 5 years of record, flow exceeded 2xADWF on a total of 58 days (the total volume of flow greater than 2xADWF represented only about 1% of the total plant flow over that period)

Advantages	Disadvantages
• exceeds regulatory requirements for discharge to open marine waters • majority of plant flow is subjected to advanced (tertiary) treatment • includes enhanced disinfection to protect shellfish resources • combined effluent meets standards for reclaimed water use for lower exposure potential • ability to increase coagulation and disinfection to meet standards for moderate or greater exposure potential	• higher capital and operating costs than Options 1 and 2 • flows > 2xADWF do not pass through advanced (tertiary) treatment • higher operational costs if treating reclaimed water to greater exposure potential standard

Process Schematic for Option 3



OPTION 3

Long-List Option No. 4	Advanced (Tertiary) Treatment for all Flows

Description

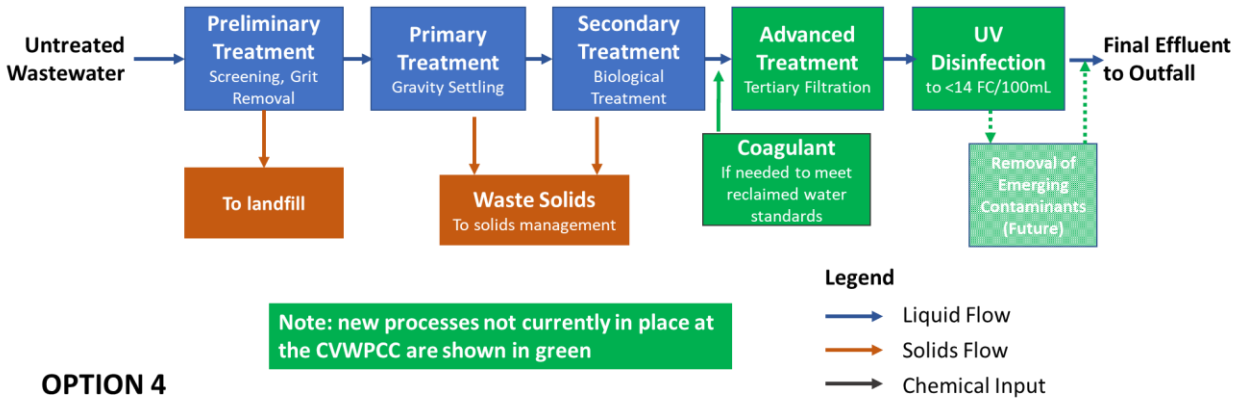
Option 4 would incorporate the same preliminary, primary, secondary, and advanced (tertiary) treatment processes as Option 3. However, for Option 4, the entire plant influent flow would pass through advanced (tertiary) filtration to enhance removal of suspended solids. As with the other options, an updated Environmental Impact Study (EIS) would be required to identify any additional treatment requirements that might be needed to address protection of the receiving environment. For Option 4, it was assumed that the disinfection process would be designed to achieve shellfish standards (i.e. 14 FC/100 mL) in the undiluted effluent, and disinfection could be increased to meet the reclaimed water standards for greater exposure potential (<1FC<100mL) if desired. The following treatment and discharge standards would apply to Option 4.

Advanced (tertiary) treatment for the entire plant flow:

- 5-day Biochemical Oxygen Demand (BOD_5): max. day 10 mg/L, avg. 5 mg/L
- total suspended solids (TSS): max. day 10 mg/L, avg. 5 mg/L
- pH 6 to 9
- ammonia concentration does not cause chronic toxicity at the edge of the initial dilution zone (IDZ)
- total residual chlorine < 0.02 mg/L
- un-ionized ammonia < 1.25 mg N/L at 15°C
- disinfection - fecal coliforms not to exceed 14 FC/100 mL
- future addition of processes that are proven for removal of emerging contaminants at municipal wastewater plants

Advantages	Disadvantages
• exceeds regulatory requirements for discharge to open marine waters • entire plant flow is subjected to advanced (tertiary) treatment • includes enhanced disinfection to protect shellfish resources • effluent meets standards for reclaimed water use for greater exposure potential	• higher capital and operating costs than Options 1, 2 and 3 • higher operational costs if treating reclaimed water to greater exposure potential standard

Process Schematic for Option 4



OPTION 4

PRELIMINARY RESOURCE RECOVERY LONG LIST OPTIONS
FOR DISCUSSION ONLY

COMOX VALLEY REGIONAL DISTRICT LIQUID WASTE MANAGEMENT PLAN

JANUARY 18, 2019

RESOURCE RECOVERY OPTIONS

Overview

In recent years, there has been an increasing emphasis on recovery of resources that can be extracted from the wastewater stream or that can be produced during treatment. In British Columbia, the success of applications for grant funding assistance from senior government for design and construction of wastewater conveyance and treatment facilities often depend in part upon inclusion of resource recovery, which may include the following:

- use of reclaimed effluent for irrigation or other purposes;
- installation of heat exchangers in the wastewater stream for heating and cooling of buildings;
- production of biogas (methane) through treatment of waste solids, which can be used in combustion facilities designed for cogeneration of electrical power and heat or in boilers for hot water heating systems;
- use of digested waste solids as a natural solid conditioner/fertilizer, and/or use of waste solids as a feedstock to produce compost for household or commercial use;
- production of mineral pellets rich in nitrogen and phosphorus (struvite) for use as fertilizer; and
- use of hydroelectric turbines to generate electrical power from the outfall discharge.

The feasibility of the various resource recovery option must be carefully evaluated. The design and installation of resource recovery facilities can add substantially to the capital and operating costs of wastewater treatment facilities. If there are no potential customers for the recovered resources or if those customers are located far from the recovery location, investment in resource recovery may be inadvisable. Each situation must be evaluated on its own merits, beginning with identification of potential uses and users of the reclaimed resources. Brief discussions of each resource recovery option in the context of the CVRD LWMP are presented below.

Reclaimed Water

Some of the wastewater treatment options (namely Options 3 and 4) are designed to produce effluent quality that meets the requirements for use of reclaimed water. For Options 1 and 2, if one or more uses for reclaimed water are identified, the appropriate amount of secondary treated effluent can be diverted to a dedicated filtration and disinfection system to produce reclaimed water. As set out in the Municipal Wastewater regulation, it is required to maintain a chlorine residual in the reclaimed water at the point of use *unless the addition of chlorine will detrimentally impact flora or fauna, or at the point of use fecal coliforms remain below levels set in municipal effluent quality requirements for reclaimed water, and users are adequately informed regarding appropriate use of the reclaimed water.* Disinfection

of reclaimed water is normally accomplished through the addition of sodium hypochlorite (bleach).

Production of reclaimed water adds to the cost of treatment, so it is important to identify the potential market for this resource. It is normally cost effective to use a portion of the treated effluent for non-potable applications within the treatment plant itself (e.g., for equipment sprays, washdown water, landscape irrigation, etc.). This typically represents a relatively small portion of the total wastewater flow, but it does offset use of potable water at the plant. A small amount of reclaimed effluent is currently used at the CVWPCC for washdown in enclosed areas. Opportunities for expanding use of reclaimed water within the plant should be considered during design of future upgrades.

Offsite applications may represent opportunities for use of larger amounts of reclaimed water (irrigation, industrial use, or stream and wetlands augmentation). The economics of offsite use depend heavily on the distance from the reclaimed water production facility to the user. Other factors include the seasonal pattern of demand for water, the cost of alternative water sources, and the water quality requirements of the potential user.

In cases where a significant potential user of reclaimed water has been identified but the distance between the main wastewater treatment plant and the user makes the project unfeasible for economic reasons, it may be possible to locate a relatively small water reclamation plant near the user and divert some of the untreated wastewater to that location for treatment and use. The feasibility of this will depend on the amount of reclaimed water to be produced and other local factors.

Heat Recovery

Extraction of heat from the wastewater stream at pumping stations and treatment facilities for space heating of buildings is becoming more common (the same system can also be used for cooling in summer). As with reclaimed water, heat recovery for use onsite at wastewater treatment facilities is generally the most feasible from a cost standpoint. Use of this type of system can be considered for incorporation into future upgrades at the CVWPCC.

If a potential user or users of heat is located near the pumping station or wastewater treatment plant, it may be feasible to expand the system to export heat to a nearby specific user (an example of such a system is in place at the Saanich Peninsula wastewater treatment plant, where heat is extracted from the effluent for use at an adjacent municipal swimming pool). In some cases, if there is high density development near the treatment plant, it may be feasible to install a District Heating System that circulates recovered heat through a heating loop for use by multiple customers. Due to the cost involved in installing a District Heating System, it is preferred if there is a year-round demand for the recovered heat (e.g., swimming pool, commercial laundry).

Production of Biogas

At larger wastewater treatment plants (service population of at least 50,000 to 100,000 people), it may prove economical to install anaerobic digestion facilities for treatment of waste solids. Anaerobic digesters reduce the amount of solids and produce methane gas that can be scrubbed and then used in cogeneration engines for production of combined heat and electrical power for use at the treatment plant, or the gas may be cleaned to the required standard for sale to the local natural gas utility. Anaerobic digestion is not currently practiced at the CVWPCC, and economies of scale mean that it would not be economical at present. This may be considered in future as a possible resource recovery strategy when the plant service population increases.

Beneficial Use of Treated Solids

Where digestion of waste solids is practiced at wastewater treatment plants, the solids product of digestion can be used as a solid conditioner and natural fertilizer, proved that it meets all of the required regulatory standards. Land spreading of treated biosolids to fertilize agricultural land, for reforestation, and for reclamation of disturbed sites is commonly practiced in British Columbia; however, this can be a costly undertaking, depending on the transportation distance to the biosolids use site and the topography of the site. In some cases there has been public resistance to land spreading of biosolids, due mainly to concerns over odours and the presence of potentially harmful substances.

The CVWPCC dewaters waste solids and transports the dewatered cake to a nearby site for use as a composting feedstock. This does not require digestion prior to composting, and it produces a product called SkyRocket that is much more marketable that dewatered biosolids. Production of Class A compost (SkyRocket) as practiced by the CVRD allows sale of the compost product to householders and commercial users. Proceeds from the sale of compost help to offset operating costs for solids handling. This is a sustainable strategy for beneficial use of treated wastewater solids as long as the local market can absorb the compost.

Extraction of Nitrogen and Phosphorus for Fertilizer Pellets

Depending on the treatment processes used, some wastewater treatment plants produce relatively low-volume side streams of high-strength wastewater that would normally be routed back to join the plant influent wastewater for treatment (e.g., water produced as a result of dewatering digested waste solids or waste biological solids from biological nutrient removal processes). For these high-strength side streams it is in some cases economical to extract nitrogen and phosphorus in a small treatment reactor that causes precipitation of a mineral called magnesium ammonium phosphate, commonly referred to as struvite. The struvite pellets can be marketed as a commercial fertilizer, offsetting the production and use of chemical

fertilizers. This would not be feasible at the CVWPCC at present, due to economies of scale and the treatment processes currently in use; however, it could be considered for use in future.

Hydroelectric Turbine for Generation of Electrical Power at Outfall

In some cases where there is a large elevation difference between the treatment plant and the receiving water (i.e., the land section of the outfall has a steep downward slope), it is possible to install a small hydroelectric turbine to generate electricity. In our experience, this is not cost-effective at smaller plants, even if there is a large head loss available on the discharge to drive the turbine. In the case of the CVWPCC where there is minimal head loss under certain tidal conditions and effluent pumping is required, this type of energy recovery is unlikely to be a viable option.

Summary

In general, the most cost-effective resource recovery option for the LWMP is likely to be ongoing (and possibly expanded) use of reclaimed water for non-potable applications at the CVWPCC, and potentially for offsite use as well, if one or more users can be identified. In future when upgrades to the treatment facilities are undertaken, the addition of other resource recovery processes can be considered; this may include extraction of heat from the effluent for space heating (and cooling), struvite crystallization for fertilizer production, and eventually anaerobic digestion for generation of biogas when the service population grows to make this economically feasible or new technologies make this economically viable for smaller plants. Technologies for treatment of wastewater and waste solids are continually evolving, and research and development are ongoing. Design of future upgrades at the CVWPCC should be undertaken with this in mind, so that new facilities for resource recovery can be added to the plant without major disruptions or modifications to the existing facilities at that time.