Comox Valley REGIONAL DISTRICT

Staff report

**DATE:** October 18, 2017

**FILE**: 5340-02

**TO:** Chair and Directors
Comox Valley Sewage Commission

Supported by Russell Dyson
Chief Administrative Officer

***R. Dyson***

**FROM:** Russell Dyson
Chief Administrative Officer

**RE:** **Comox No. 2 Pump Station Project – Pre implementation Phase Results**

**Purpose**
To update the Comox Valley Sewage Commission on the final results of the investigations completed during the Comox No.2 Pump Station (Comox No.2) project pre-implementation phase, and recommend a path forward.

**Recommendations from the Chief Administrative Officer**
THAT a detailed analysis of alternative forcemain alignment options be performed and compared to the Comox No.2 project;

AND THAT the Comox Valley Regional District consult with the local municipalities, the K'ómoks First Nations, the public and other stakeholders regarding alternative forcemain alignments from the Courtenay Pump Station to the Comox Valley Water Pollution Control Center;

AND THAT the Comox Valley Regional District identify and pursue grant funding opportunities to help reduce the financial impact of a solution to decommissioning the Willemar Bluffs forcemain;

AND FINALLY THAT the results of the alternative analysis and consultation on alternative forcemain alignments be brought back to the Comox Valley Sewage Commission to inform a final decision on selection of a solution to decommission the Willemar Bluffs forcemain.

**Executive Summary**
Comox Valley Regional District (CVRD) Staff and Directors have been consistent in their message to the community that, while Beech Street was identified as the leading option for a required new pump station, there were additional investigations required before moving forward with the project. These investigations are now complete and the results, particularly the increased cost and complexity of the Comox No.2 project, warrant investigation as to whether a better long term solution to sewer conveyance exists.

The three potential red flags requiring further investigation were:

1. **Condition of the Foreshore Forcemain**
   - Starting in April 2017 Pure Technologies undertook acoustic leak detection and electromagnetic investigations of the forcemain from the Courtenay Pump Station to the Comox Valley Water Pollution Control Centre (CVWPCC).
   - Attached as Appendix A, the final results indicate that the pipe is in good condition with no leaks or broken reinforcing wires or bars. The results confirm that the section of forcemain from the Courtenay Pump Station to the Goose Spit should last until the end of its expected

lifespan, and indicate that the condition of the Willemar Bluffs section is better than expected.

- In the updated risk assessment attached as Appendix D, Northwest Hydraulics Consultants (NHC) has considered the condition assessment results, gabion basket repair work done and downgraded their assessment of the overall risk of failure of the Willemar Bluffs section of forcemain.
- Although the assessed risk of failure of this section has been reduced, the risk is still elevated and the region should continue to move aggressively towards replacing the Willemar Bluffs section of forcemain.
- In the interim, the depth of cover and gabion basket condition are being closely monitored by CVRD operators, and further repairs will be expedited when necessary. In the event of a leak or break in the line, the CVRD's response time will be minimized by the ongoing implementation of the forcemain emergency spill response plan.

**2. Capital Costs of the Pump Station Project**

- The indicative design is attached as Appendix B, and includes a capital cost estimate of approximately $22 million, 83 per cent higher than what was previously budgeted for the project.
- This significant increase in the estimated costs of the project are attributable to the high level of redundancy required for a pump station of this type, the complexity of the foreshore tie-in to the existing forcemain, the constraints imposed by the small size of the property, and construction cost escalation since the previous estimate.

**3. Risk to Local Groundwater**

- GW Solutions has now completed a survey of local wells, installation of new monitoring wells in the road right of way, and establishment of baseline water quality and groundwater levels.
- In the study attached as Appendix C, GW Solutions concludes that wells near the Beech Street property would be at high risk should there ever be a release of wastewater from the pump station, and could experience a drop in groundwater level depending on the construction methodology.
- Should the Comox No.2 project proceed at the Beech Street location, GW Solutions recommends that the CVRD work to mitigate risks to groundwater and monitor for impacts to water quality and quantity in the area.

Given the importance of decommissioning the Willemar Bluffs section of the forcemain, staff consulted with the Comox Valley Sewage Management Advisory Committee in April 2017 about undertaking a more detailed analysis into alternatives to the Comox No.2 project should any of the red flags remain unresolved after the pre-implementation investigations.

**Alternative Forcemain Risk Assessment**

- In the memo attached as Appendix E, Opus summarizes the analysis into alternative alignments. The memo considers four options and concludes that when the lifecycle costs of infrastructure are considered, the operational costs of an additional pump station likely outweighs the higher upfront capital costs of a new overland forcemain.
- Opus also identified a number of risks inherent to an in-line type pump station like the Comox No.2, which increase the likelihood of a sewer overflow.
- Partial mitigation of these risks is possible, and would require complete redundancy of all critical systems at Comox No.2, which has been a significant cause of the increase in estimated capital costs for the project.

- Even with these expensive mitigation measures, some additional risk of overflow will remain.

**Next Steps**
Given the much higher than anticipated Comox No.2 project capital and lifecycle costs and the risks now understood to be associated with installation of this type of pump station, staff are recommending that a more detailed analysis of alternative options be undertaken and that CVRD staff consult further with municipal staff and other stakeholders regarding possible alternatives to the Comox No.2 project.

In parallel with this further analysis, staff will be investigating options for mitigating risks to groundwater around the Beech Street site should the Comox No.2 project be found to be the best long term solution.

Capacity at the Courtenay Pump Station remains a concern, but installation of the Hudson and Greenwood Trunk lines in 2018 will help to alleviate concerns in the short term.

| Prepared by: | Concurrence: |
|---|---|
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**Stakeholder Distribution (Upon Agenda Publication)**

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| Island Health | ✓ |

**Background/Current Situation**
Wastewater from the City of Courtenay and the Town of Comox is transmitted to the CVWPCC through a large diameter forcemain that follows the shoreline from the Courtenay River estuary to Goose Spit, along Willemar Bluff and then on to the CVWPCC. The section along Willemar Bluff has deteriorated and poses significant environmental and operational risks.

The Comox No.2 project was initially conceived of in 2005 as part of the "Forcemain Re-alignment Study" completed by CH2MHill in response to the uncovering of the forcemain along Willemar Bluffs in 2003. The project was further supported during the sewer master planning process as a way to decommission the Willemar Bluffs section of forcemain by instead redirecting the wastewater flows through a new pump station up and over the Comox peninsula directly overland to the CVWPCC. This project would also serve to address capacity issues at the Courtenay and Jane Place Pump Stations.

The Comox No.2 project is to be delivered as a design-build project. Under the design-build model, a single bid team is responsible for both the design and construction of the project. As part of the design-build process the Comox Valley Sewage Commission at its January 2017 meeting approved the contract award to Opus for phase one of the owners engineer services.
The owners engineer role is divided into four phases with phase one being the pre-implementation phase. The purpose of the first phase was to develop the indicative design for the project, including resolution of potential red flags and development of technical, architectural and urban design criteria.

Investigations to resolve the potential red flags are now complete and are summarized below.

**Forcemain Condition Assessment**
The forcemain is exposed to severe operational conditions (raw wastewater on the inside, exposure to a marine environment on the outside) and to better understand the condition of the forcemain a request for proposals was issued in February 2017. The intent of this work was to gain an improved understanding on the condition of the forcemain including the degree of deterioration, structural integrity of the pipe and future serviceability of each individual section of pipe.

Pure Technologies initiated the project in early April 2017, including acoustical investigation of the forcemain from the Courtenay Pump Station to the CVWPCC (base scope and provisional item one), and an electromagnetic investigation of the forcemain from the Courtenay Pump Station to the Jane Place Pump Station (revised provisional item two). The acoustical investigation provides the CVRD with information on any leaks or gas pockets that may be present within the forcemain. The electromagnetic investigation of the section of pipe from the Courtenay Pump Station to the Jane Place Pump Station provides insight on the condition of the pipe and remaining service life.

The completed condition assessment is attached as Appendix A. Final results indicate that the pipe is in good condition with no leaks or broken reinforcing wires or bars. The results confirm that the section of forcemain from the Courtenay Pump Station to the Goose Spit should last until the end of its expected lifespan, and indicate that the condition of the Willemar Bluffs section is better than expected.

**Indicative Design and Class B Cost Estimate**
Under a design-build project delivery method, the owner's engineer develops an indicative design rather than a detailed design. The indicative design is developed to approximately a 30 per cent level of detail, rather than the 100 per cent detailed design developed under the traditional design-bid-build methodology. The purpose of the indicative design is to lay out a possible solution for the project, which in combination with the project specification, will provide the parameters that the design-build team will use to create their own design for the project.

The level of design performed through the indicative design process allows for a Class B cost estimate to be developed, with an accuracy of +/- 15 per cent. The indicative design prepared by Opus for the Comox No.2 project is attached as Appendix B. Final results from the indicative design indicate that the estimated capital costs for the project have increased by approximately 83 per cent above what was previously budgeted for the project, largely due to the level of redundancy required for a pump station of this type, the complexity of the foreshore tie-in to the existing forcemain, and the constraints imposed by the small size of the property and lack of construction lay down area.

**Further Hydrological Work**
GW Solutions was originally hired by the local neighborhood to evaluate the potential risks to their groundwater wells from the Comox No.2 project. Due to the shallow nature and age of most of the wells in the area, they concluded that there was a risk to the wells in the event of a failure of the pump station or forcemain. Seeking further detail on the matter, the CVRD subsequently hired GW Solutions to undertake further work.
In their December 2016 report GW Solutions concluded that a wastewater leak from a forcemain or pump station in the neighborhood would be likely to impact the quality of water in the local residential wells, but recommended that a survey of the local wells be performed to better understand the method of construction and current condition.

GW Solutions has now completed a survey of local wells, installation of new monitoring wells in the road right of way, and establishment of baseline water quality and groundwater levels. In the study attached as Appendix C, GW Solutions concludes that the four dug wells down gradient from the pump station site are at high risk of negative impact should sewage be accidentally released by a failure of the pump station; that based on their age and location, four drilled wells in close proximity to the pump station and/or forcemain would be at moderate risk of negative impact; and that some shallow wells in the vicinity could experience a drop in groundwater depending on the construction methodology used.

Should the project proceed at the Beech Street location, GW Solutions recommends further assessment of the potential for the forcemain trench to impact flow of groundwater in the area; that the CVRD implement mitigation measures to minimize impacts from the project on water quality and quantity in the area and that a groundwater monitoring program be implemented during and after construction to monitor for impacts to water quality or groundwater levels. In the highly unlikely event that impacts to groundwater are identified, the CVRD commits to ensuring all impacts are addressed, including possible creation of a water local service area for provision of regional water to the neighborhood.

**Updated Forcemain Risk Assessment**

In October 2016 NHC completed a risk assessment of the Willemar Bluffs section of forcemain. The risk assessment concluded that without corrective action there was a 90 per cent probability that the forcemain would become exposed over the next five years and a 50 per cent probability that a failure would occur at least once during the next five years along that section. In their report, NHC recommended that a forcemain condition assessment be carried out; that the risk assessment should be updated with the results of the condition assessment; that additional monitoring and inspection along the forcemain be implemented and that the damaged portions of the protective gabion baskets be repaired. All of these recommendations have since been implemented.

In the updated risk assessment attached as Appendix D, NHC concludes that the condition assessment results have not impacted their assessment of the risk of forcemain failure because the forcemain is in decent condition for its age, but that the repairs of the gabion baskets have allowed them to downgrade their assessment of the overall risk of failure. Although the risk of failure of this section has been downgraded significantly, any risk of failure is unacceptable and the region should continue to move aggressively towards replacing the Willemar Bluffs section of forcemain.

**Alternative Alignment Study**

Given the importance of decommissioning the Willemar Bluffs section of the forcemain, staff consulted with the Comox Valley Sewage Management Advisory Committee in April 2017 about undertaking a more detailed analysis into alternatives to the Comox No.2 project should any of the red flags remain unresolved after the pre-implementation investigations. The Comox Valley Sewage Management Advisory Committee supported undertaking the analysis, and it was subsequently performed with the intention that it be used to inform an implementation decision by the Comox Valley Sewage Commission.

The draft memo attached as Appendix E summarizes the analysis into alternative alignments performed by Opus. The memo considers four options:

1. New forcemain directly from the Courtenay Pump Station to the CVWPCC following the optimal surface hydraulic grade line, with new overland forcemain from Jane Place Pump Station to the closest point of connection to the new trunk forcemain.

2. New Comox No.2 Pump Station, with an overland connection between the Courtenay Pump Station, Jane Place Pump Station and Comox No.2 Pump Station installed in 15 years.
3. New pump station at Comox Marina Park to replace Jane Place Pump Station and negate Comox No.2 Pump Station.
4. New forcemain directly from the Courtenay Pump Station to the CVWPCC including a tunnel under the highest points to reduce the required total pumping pressure and power, with new overland forcemain from Jane Place Pump Station to the closest point of connection to the new trunk forcemain.

Opus compared each of the four options over 50 and 100 year analysis periods, taking into account all capital and operating costs for each option over those timeframes. In the financial analysis summarized in Appendix E, Opus concludes that there is likely a lower cost solution for decommissioning the Willemar Bluffs section of forcemain if lifecycle costs related to the infrastructure are considered. When considered over the lifecycle of the infrastructure, the operational costs of a third pump station significantly outweigh the higher upfront capital costs of a new overland forcemain.

In addition to the financial analysis, Opus also performed a comparative analysis of other risks associated with each of the options and concludes that installation of a booster, in-line type pump station such as Comox No.2 is not best practice because of the following risks/disadvantages:

- Lack of gravity collection system to add to the storage capacity available to buffer incoming flows from Courtenay and Jane Place Pump Stations.
- Minimal storage available on site means that in the event of a failure the inlet to the pump station must be shut to avoid overflow of wastewater to the surrounding neighborhood.
- The prospect of a shutdown at Comox No.2 introduces a single point of failure for the conveyance system.
- This newly introduced single point of pump station failure increases the risk of overflow at the Courtenay and Jane Place Pump Stations and impacts those two communities.

Partial mitigation of these risks is possible, and would require complete redundancy of all critical systems at Comox No.2, which has been a significant cause of the increase in estimated capital costs for the project.

**Next Steps**

Given the much higher than anticipated Comox No.2 project capital costs coming out of the Opus indicative design process; the results of the analysis into alternative alignments concluding that there is likely a lower cost option to decommission the Willemar Bluffs forcemain; and the risks associated with installation of a pump station in series with the existing pump stations, staff are recommending that a more detailed analysis of alternative options be undertaken and that CVRD staff consult further with municipal staff and other stakeholders regarding possible alternatives to the Comox No.2 project. Capacity at the Courtenay Pump Station remains a concern, but installation of the Hudson and Greenwood Trunk lines in 2018 will help to alleviate concerns in the short term.

If the analysis and consultation concludes that the Comox No.2 project is the best long term solution, staff will recommend proceeding with implementation of the Comox No.2 project at the Beech Street location.

**Policy Analysis**
The CVRD operates a sewerage service primarily for the City of Courtenay and Town of Comox, established by Bylaw No. 2541, being the "Comox Valley Sewerage Service Establishment Bylaw No. 2451, 2003".

At its January 21, 2017 meeting, the Comox Valley Sewage Commission approved the following recommendation:

> *THAT as a result of a competitive process, the contract for the owners engineer services for the pre-implementation phase of the Comox No. 2 Pump Station project be awarded to Opus International Consultants (Canada) Ltd. in the amount of $168,496 excluding GST;*
>
> *AND FURTHER THAT subsequent phases of the work including the implementation, construction and post-construction phases be awarded to Opus International Consultants (Canada) Ltd. at the Comox Valley Regional Districts discretion for a total overall cost of $491,336 excluding GST;*
>
> *AND FINALLY THAT the Chair and Corporate Legislative Officer be authorized to execute the contract.*

At its March 28, 2017 meeting, the CVRD Board approved the following recommendation:

> *THAT as a result of a competitive process, the contract for the investigation and condition assessment of the raw wastewater forcemain be awarded to Pure Technologies Ltd. in the amount of $449,123 excluding GST.*

**Options**
The Comox Valley Sewage Commission has the following options:

1. Direct staff to undertake a detailed analysis of alternative forcemain alignment options and consultation with stakeholders to understand if a lower cost, lower risk alternative to the Comox No.2 project exists.
2. To proceed with implementation of the Comox No.2 project.

With the better than expected forcemain condition and risk assessment results, and the analysis suggesting that there is likely a more cost effective solution to decommissioning the Willemar Bluffs forcemain, staff recommend proceeding with option No.1. The significantly higher than expected capital costs associated with the Comox No.2 project warrant a closer look at the alternatives to ensure that the best solution is chosen.

**Financial Factors**
The 2017-2021 financial plan for the Comox Valley Sewerage Service includes an allowance of $925,000 for the Comox No.2 project and forcemain project in 2017, $7,615,250 in 2018 and $3,841,000 in 2019. The budgeted allowances include consulting services for design engineering, tender assistance, construction oversight and construction contract management and also the construction contract. The Comox No.2 project indicative design recently completed by Opus includes a Class B cost estimate of approximately $22 million for the new pump station, associated upgrades at the Courtenay and Jane Place Pump Stations, and new forcemain from Comox No.2 to the CVWPCC. This new cost estimate represents an 83 per cent increase in capital costs over what has been included in the existing financial plan.

**Legal Factors**
None.

**Citizen/ Public Relations**

CVRD Staff and Directors have been consistent in their message to the community that, while Beech Street was identified as the leading option for a required new pump station, there was additional investigation and assessment required before moving forward with the project. The results of these studies, and a decision by the Comox Valley Sewage Commission and CVRD Board to review alternatives, demonstrates the CVRD's commitment to completing its due diligence and ensuring outstanding questions were addressed before proceeding with construction. These reports will speak to some of the ongoing questions/issues raised by community members with answers and insight.

To relay this information and potential next steps, an open house has been scheduled for Thursday, November 9, 2017 at the Comox Golf Club. The public will be invited by way of advertising, a press release and residents in the Croteau Beach neighbourhood will receive a newsletter with details about the event. Updates will be made via newsletter, media and the project's webpage as additional information becomes available.

**Attachments:** Appendix A – "Pure Technologies – Forcemain condition assessment"
Appendix B – "Opus – Comox 2 indicative design report"
Appendix C – "GW Solutions – Comox 2 groundwater risk assessment"
Appendix D – "Northwest Hydraulics – Willemar Bluffs forcemain risk assessment"
Appendix E – "Opus – Forcemain alignment review"