

**DATE:** February 10, 2022

**FILE:** 5330-20/CVSS LWMP

**TO:** Chair and Members  
Sewage Commission

**FROM:** Russell Dyson  
Chief Administrative Officer

Supported by Russell Dyson  
Chief Administrative Officer

*R. Dyson*

**RE: Sewer System Conveyance Project – Scope Confirmation Decisions**

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### **Purpose**

To recommend the final Sewer System Conveyance Project (SSCP) design-build component scope, including construction of a new Courtenay Pump Station (CPS), alignment from CPS to K'ómoks First Nation (KFN) IR#1, construction methodology through KFN IR#1, cut and cover through Comox Hill, horizontal direction drill (HDD) alignment through Lazo Hill and Lazo Marsh cut and cover alignment; and to recommend the revised project cost estimate. Please note that the delivery of the Sewer System Conveyance Project through the Town of Comox is by a separate design-bid-build procurement method.

### **Recommendation from the Chief Administrative Officer:**

THAT the design-build components of the Sewer System Conveyance Project noted in the staff report dated February 10, 2022 be fully endorsed, including:

- Replacing the Courtenay Pump Station
- Upgrading the Jane Place and K'ómoks First Nation pump stations
- Installing a new sanitary sewer forcemain via:
  - Cut and cover from the Courtenay pump station to the west boundary of the Town of Comox on Comox Road
  - Horizontal directional drilling from the corner of Torrence Road and Lazo Road to the unopened Baron Road right of way off Morland Road
  - Cut and cover from Baron Road down Morland Road
  - Cut and cover across Lazo Marsh to the Comox Valley Water Pollution Control Centre
- Pre-digging of the cut and cover forcemain alignment from the west side of K'ómoks First Nation IR#1 to just east of Bayside Road to allow for due care and attention to all archeologically sensitive materials in this ancient settlement site;

AND FURTHER THAT Comox Valley Regional District staff be directed to complete negotiations for the project agreement with the Town of Comox, embedding the final alignment for the conveyance project through the Town of Comox and extent of surface restoration and improvements to be included in the project scope, and bring the agreement back to the Sewage Commission for review and approval in March or April 2022 as a design-bid-build procurement;

AND FINALLY THAT the revised Sewer System Conveyance Project capital cost estimate of \$82 million be incorporated within the recommended 2022-2026 financial plan, including \$30 million from reserves and \$52 million from debt.

## Executive Summary

Through the Liquid Waste Management Plan process, the Comox Valley Regional District's (CVRD) engineering firm WSP developed a preliminary concept for the optimal HDD solution for evaluation by the Technical and Public Advisory Committees (TACPAC). This option, which included a forcemain with three HDD sections—through Comox Hill, Lazo Hill and Lazo Marsh—was shortlisted and then selected by the TACPAC as the preferred conveyance solution.

Following selection of the preferred conveyance solution, the CVRD has retained HDR Inc. as the Owner's Engineer for the design-build portion of the SSCP, including completion of several key project assessments to facilitate confirmation of the SSCP scope. Key outcomes based on the work completed to date are discussed below. Additional information can be found in the background section of this report and within the attached technical memorandums.

- **Courtenay Pump Station (CPS):** Construction of a new CPS is preferred over retrofitting the existing facility, and staff are working with HDR and a property negotiator to undertake detailed assessment and secure approvals from the subject property owner and the Agricultural Land Commission
- **Alternate Alignment from CPS to KFN IR#1:** To protect cultural and archaeological interests, an alternate alignment from Urquhart Creek to KFN IR#1 was developed. The alternate alignment was developed with input from Dr. Jesse Morin and Baseline Archaeological Services and includes installation of the forcemain along Farmview Road and through farmers' fields to limit impacts to known high-potential archaeological areas along Comox Road. Review and approval from the Agricultural Land Commission and private property owners for work through agricultural land is required and underway.
- **Alternate Installation Methodology within KFN IR#1:** Also considering archaeological risks, analysis of HDD instead of cut and cover between the west side of IR#1 and Bayside Road was completed and compared to the previously developed cut and cover option. CVRD staff have met several times with KFN Chief and Council on this matter and recommend proceeding with cut and cover installation instead of HDD. Proceeding with cut and cover will require a "pre-dig" through KFN IR#1 in advance of the main construction. Total cost for the pre-dig and cut and cover installation is projected to be less than installation via HDD.
- **Comox Hill Forcemain Installation:** This section of forcemain is now planned to be installed using traditional cut and cover construction methods instead of the previously recommended HDD. The additional cut and cover work from the boundary of KFN IR#1 to Rodello Street will be included within the design-bid-build project scope to allow for collaboration with the Town of Comox throughout design.
- **Lazo Hill HDD:** HDR and their sub-consultants for HDD installations have reviewed a number of HDD options for Lazo Hill. Staff have engaged with residents of the Lazo area through six information sessions. Their concerns and interests have helped to inform alignment and future policy. Following extensive review of the system hydraulics, a single, shorter HDD through Lazo Hill, as compared to one longer HDD, is the preferred path forward. This approach allows the Lazo Hill HDD to remain above the aquifer and be installed using HDPE pipe, which is not susceptible to corrosion and far more resistant to internal erosion than other pipe materials. A preferred alignment has also been developed, which includes a minimum 20-metre offset from all deep groundwater wells within the Lazo Hill area as recommended by CVRD's hydrogeology consultant, GW Solutions. The revised cost estimate for this section of HDD is approximately 75 per cent higher than previously carried based on results from a recent HDD procurement in Metro Vancouver.
- **Lazo Marsh Crossing:** Further consideration and review of non-HDD options for crossing Lazo Marsh are ongoing. The area surrounding the marsh has been identified as a unique

location in the aquifer where installation via HDD would be problematic. A Crown Land Tenure Application for cut and cover through the marsh has been made to FrontCounterBC and staff have reached out to the Manager of the Vancouver Island Conservation Land Management Program to further discuss the project.

- **Total Updated Capital Cost Estimate:** There are many factors impacting the costs associated with this project, staff have been working with or consultants to ensure we assess and accurately reflect the projects. An updated total cost estimate has been developed, based on the scope confirmation components summarized in the bullets above. HDR has developed an updated Class C/D cost estimate and the revised forecasted total project cost is \$82 million; this represents a 12 per cent increase over the previous budget. This increase will be funded through a combination of DCC and capital works reserves. Primary drivers of the increase in costs are the increase in HDD costs, inclusion of fibre optic to ensure continued communications and connectivity between the pump stations and the wastewater treatment plant, anticipated archaeological costs, inclusion of a return forcemain from the KFN PS to the CPS and incorporation of odour management systems at key locations along the alignment.
- **Updated Project Schedule:** Provided within Appendix G, is an updated detailed project schedule showing anticipated project timing moving forward. Highlights of this detailed schedule are also on page 9 of this report.

The scope for the alignment through the Town of Comox is still under assessment and will be brought forward for Sewage Commission review and approval at a subsequent meeting. The updated project cost estimate includes a conservative allowance for Town of Comox road improvements, and a conservative rate and contingency for cut and cover.

This is a very complex project, one that is costly and affects many different interests within our community. However, the project is essential for the future of the sewer system, protection of the environment and support of our institutions, businesses and citizens that rely on the service. Staff have done their utmost to manage risk, and apply due diligence and consideration to the many factors that will affect a timely cost-effective solution. The Sewage Commission is presented with the required information to make critical decisions to move the project forward.

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#### **Government Partners and Stakeholder Distribution (Upon Agenda Publication)**

City of Courtenay	✓
Town of Comox	✓
K'ómoks First Nation	✓
Department of National Defence	

#### **Background/Current Situation**

Several key assessments have been completed by HDR, these being evaluation of the feasibility of reusing the existing CPS, analysis into alternate alignments and methodologies for installation of the forcemain from CPS through KFN IR#1, analysis of the Comox Hill forcemain installation methodology and analysis of the Lazo Hill alignment. Further discussion on the planned path

forward stemming from the completed reports, attached as Appendix A, C, D and E respectively, can be found in the sections below.

### ***Courtenay Pump Station Retrofit vs. Rebuild***

The existing CPS was constructed in 1982 and considerable modifications to the facility would be required to increase the hydraulic capacity as part of the SSCP. HDR has completed an assessment comparing construction of a new pump station versus retrofitting the existing one, attached as Appendix A to this report. Construction of a new CPS is preferred due to the following key considerations:

- **Process Mechanical, Electrical and Ventilation:** Retrofits to the existing facility would require complete replacement of these components, in line with what would be required if a new pump station was built with the added constraints/costs of working within an existing and aging building.
- **Operations:** A new station allows for 3+1 pump operation and more pump selection options, including smaller pumps allowing for more consistent flow and reduced energy consumption. No bypass pumping is required during construction if a new pump station is constructed; however, the inlet sewer forcemain at the new pump station will be deeper than if a retrofit at the existing station occurred.
- **Design Considerations:** A new station will be designed to comply with current Hydraulic Institute design recommendations, something that the existing pump station cannot achieve, and that will be instrumental in reducing maintenance effort and cost related to rags clogging pumps.
- **Future Design Considerations:** A new station can be designed to provide expansion flexibility in the future, beyond 2060 flows allowing a new station to have almost double the lifespan. The existing station is not recommended to expand past 2060 flows, triggering the need for a new pump station at that time.
- **Total Costs:** In reviewing the total costs for the two options, cost estimates for a retrofit versus a new build are similar and are summarized in Table No.1.

**Table No.1: Cost Comparison for Courtenay Pump Station.**

<b>Costs</b>	<b>Upgrade CPS</b>	<b>New CPS</b>
Direct Costs	\$8,100,000	\$7,900,000
Indirect Costs	\$4,000,000	\$3,900,000
<b>Total Cost</b>	<b>\$12,100,000</b>	<b>\$11,800,000</b>
Capital Cost for Civil-Structural Works for Screen	N/A	\$210,000
<b>Total Capital Costs</b>	<b>\$12,100,000</b>	<b>\$12,000,000</b>

In addition, construction of a new CPS helps to minimize some identified project risks, including:

- **Flood Protection:** The existing station would require significant flood proofing works and consideration to build resilience to anticipated climate change impacts; flood protection of a new station can readily be achieved by raising the building elevation.
- **Seismic Resiliency:** Geotechnical investigation around the existing CPS determined that during a seismic event the ground surrounding the pump station would liquefy, causing significant damage to the pump station structure. Ground improvements around the facility would reduce this risk, but would still leave the station vulnerable during a large earthquake, and improvements of this nature pose a risk to damage the structure during installation.

Alternately, construction of a new pump station allows the structure to be built to withstand a 2475-year earthquake and not pose risks to operations during construction.

A review of viable potential locations for the new CPS has been completed and two key factors were considered when evaluating potential sites, as summarized below and presented in Appendix B:

- **Land Availability and Connection to Existing Collection System:** The new pump station needs to be near the existing CPS to allow for connection to the City's sewer collection; for every 200m distance away from the existing pump station the lines into the pump station become 1m deeper, resulting in increased costs.
- **Ground Improvements and Seismic Concerns:** The location of the pump station needs to be approximately 300m away from the river, where lateral ground movement caused by a seismic event should not occur. If the pump station is located within 300m of the river, ground improvements need to be completed. Ground improvements are a major construction activity and can risk damage to the existing station.

Taking these factors into account, the preferred location of the new CPS is on the north side of Comox Road. Additional geotechnical investigation and discussions with private property owners and the Agricultural Land Commission are underway to determine the exact site. With the endorsement of the recommendation from the Sewage Commission, staff will confirm the site and secure required approvals in advance of the DB procurement.

#### ***Alternate Alignment from CPS to KFN IR#1 and Alternate Installation Methodology***

The original proposed alignment of the forcemain along Comox Road included construction within several areas having high potential for archaeological sites. Working with HDR, Dr. Jesse Morin and Baseline Archaeological Services, alternate alignments and construction methodologies were reviewed to minimize potential disturbance to archaeological sites.

Following review and discussion of the alternate alignment and installation methodology with KFN Chief and Council, the recommended path forward includes proceeding with the alternate alignment from the CPS to KFN IR#1 and retaining cut and cover installation through IR#1, as summarized below and in the memo attached as Appendix C.

- **Alternate Alignment from CPS to KFN IR#1:** Developed with input from Dr. Jesse Morin and Baseline Archaeological Services and includes construction of the forcemain along Farmview Road and through farmers' fields to limit impacts to known high potential archaeological areas. Review and approval from the Agricultural Land Commission and private property owners for work through agricultural land is also required for the alternate alignment.
- **Alternate Installation Methodology within KFN IR#1:** Also in light of archaeological risks, analysis of HDD instead of cut and cover between the west side of IR#1 and Bayside Road was completed and compared to the previously developed cut and cover option. The ground conditions in this area may include the presence of cobbles and, although HDD in these conditions is still feasible, there is a moderate risk of challenges arising during the HDD installation due to ground conditions along with larger amounts of settlement anticipated due to the shallower depth of the HDD in this area. In light of these risks, the proposed path forward is to proceed with cut and cover through this area.
- **Return Forcemain from KFN PS to CPS:** Instead of the KFN pump station pumping directly into the forcemain as it does now, connection of the KFN PS to the system will be via a small diameter forcemain installed in the same trench as the larger sanitary main to pump wastewater from the KFN pump station to the Courtenay Pump Station. Due to the

higher working pressure of the new sanitary main, not pumping directly into the main mitigates a number of risks, including the potential for overflow of the pump station should the pumps or check valves fail, along with providing several operational benefits.

- **Archaeological Costs:** The estimated range of archaeological costs associated with each option were developed with input and collaboration from Dr. Jesse Morin and Baseline Archaeological. The CVRD has committed to adhering to the KFN’s Cultural Heritage Policy. The range of archaeological costs as presented in Table No.2 reflects the unknown nature of the amount of undisturbed midden and other artifacts that may be encountered along the alignment options.
- **Pre-Digging:** The Community Benefits Agreement commits the CVRD to “pre-digging” across IR#1, previously estimated at \$1.5 million. The pre-digging costs are incorporated into the cut and cover along Comox Road option in Table No.2 below, but were not included in the horizontal directional drill under Comox Road option as that installation method would specifically avoid impact to the sensitive archeological zone through IR#1. The “pre-dig” will occur ahead of construction and CVRD will work closely with KFN on all pre-dig activities.
- **Total Costs:** Summarized within Table No.2 are the description and costs associated with each option.

**Table No.2: Summary of Costs for Alternate Alignments**

Description of Route	Construction Costs	Estimated Range of Archaeological Costs	Total Cost
<i>Urquhart Creek to West Boundary of IR#1</i>			
Farmview Road to Farmers Fields	\$3,640,000	\$141,000-\$216,000	\$3,780,000-\$3,860,000
Comox Road	\$4,798,000	\$156,000-\$2,510,000	\$4,950,000-\$7,310,000
<i>West Boundary of IR#1 to Bayside Road</i>			
Cut and Cover along Comox Road	\$2,259,000	\$1,750,000-\$3,100,000	\$4,000,000-\$5,360,000
Horizontal Directional Drill under Comox Road	\$5,106,000	\$47,000-\$134,000	\$5,374,000-\$5,460,000

Staff are working with a property negotiator to discuss rights-of-way with private property owners and development of an application to the Agricultural Land Commission for crossing through Agricultural Land Reserve is underway. A Heritage Alteration Permit is also required for the project as work will be occurring through known archaeological sites.

### ***Comox Hill Forcemain Installation***

As design has progressed, a number of key considerations for changing the forcemain installation methodology from HDD to traditional cut and cover through Comox Hill have been identified, as summarized in the bullets below and technical memorandum attached as Appendix D.

- **System Hydraulics:** A detailed review of the system hydraulics led to development of an optimized hydraulic grade line by HDR. HDR determined the length of the Comox Hill HDD could be significantly shortened (740 metres to 420 metres) while still achieving the same outcomes as indicated by WSP. Furthermore, the elevation difference between the tunnel entrance pit and the top of the hill is only 4 metres.
- **Pump Selection:** Following optimization of the hydraulic grade line, review of the pump selection determined that only the pump impellers are required to be changed depending on the installation methodology. Pumping an additional 4 metres of static head results in an added power cost of \$156,000 over a 40-year period.

- Total Costs: In reviewing the total costs for the two options, including operating costs, the cost of cut and cover as compared to HDD is estimated to be \$756,000 less as summarized in Table No.3.

**Table No.3: Cost Comparison between HDD and Cut and Cover for Comox Hill**

Cost Benefit	Capital Cost	Added Power Cost*	NPV
420m HDD	\$3,063,000	\$0	\$3,063,000
420m Cut and Cover	\$2,151,000	\$156,000	\$2,307,000

\*Over 40 years

In addition, changing from HDD to cut and cover also helps to minimize some identified projects risks:

- Geotechnical Considerations: Identified by both WSP and HDR, the Comox Hill ground conditions may include the presence of cobbles. Although HDD in these conditions is still feasible, there is a moderate risk of challenges arising during the HDD. Cut and cover installation removes this risk.
- Property Risks: The HDD alignment requires property negotiations for entry and exit pit locations and along the alignment where the forcemain would be crossing underneath private property. The cut and cover installation can be entirely within the public road right-of-way.

### ***Lazo Hill Forcemain Installation***

As part of the Liquid Waste Management Plan process, WSP developed a preliminary concept of a HDD solution for evaluation by the Technical and Public Advisory Committees. The solution developed by WSP was a forcemain with three HDD sections—through Comox Hill, Lazo Hill and under Lazo Marsh.

Since the work was completed by WSP, HDR and McMillen Jacobs Associated, HDR’s sub-consultant and expert on HDD installations, have reviewed several HDD options for Lazo Hill. Following extensive review of the system hydraulics, the length and associated viability of a single, longer HDD spanning from the corner of Torrence and Balmoral to the Comox Valley Water Pollution Control Centre (CVWPCC) is no longer considered viable. As design has progressed, several key considerations for selecting a single, shorter HDD through the Lazo Hill have been identified, and are summarized here and within the memo attached as Appendix E. The finalized alignment has a number of benefits including refining the route to avoid wells, reducing the number of property impacts, and reducing lay-down impacts.

- System Hydraulics: A detailed review of the system hydraulics included development of an optimized hydraulic grade line by HDR. HDR determined that a single, shorter HDD running from the corner of Balmoral Avenue and Torrence Road to the Baron Road unopened road right-of-way off Morland Road provides a number of benefits, including the ability for the forcemain to flow by gravity under Lazo Hill—eliminating the presence of a pressurized pipe above the Quadra Sands aquifer. In addition, this option allows for improved control on the locations of the transition from gravity to pressurized flow, allowing these transitions to occur under roadways for easier inspection and repair.
- Pipe Selection: The shorter HDD allows for the forcemain to be constructed using corrosion resistant HDPE, whereas a single longer HDD would have to utilize steel for the pipe material, which is much more susceptible to internal erosion and corrosion.



- **Aquifer and Groundwater Considerations:** The proposed alignment avoids penetration of the aquifer, therefore reducing risk for groundwater contamination in the very unlikely event of a leak. With the optimized hydraulics, the pipe will also be flowing via gravity, greatly reducing the likelihood and impact of a leak. A 20-metre offset can be maintained from all existing deep groundwater wells in the area, as recommended by GW Solutions and detailed in the report attached as Appendix F.
- **Pipe Laydown:** In conjunction with the proposed move to cut and cover through Lazo Marsh, McMillen Jacobs and HDR have identified the opportunity to minimize traffic impacts to the Town by allowing for the pipe laydown to follow the forcemain alignment to the east through the CVWPCC, eliminating the laydown along Balmoral Avenue
- **Settlement:** McMillen Jacobs anticipates some settlement along the HDD alignment because of the installation. The order of magnitude of the expected settlement is 23-25mm at the surface in a zone of approximately 30m wide, centered on the forcemain within the areas where the forcemain is close to or under residences. A more detailed analysis into settlement will be completed as part of the project. Depending on the results of this study, measures to monitor for these impacts could include comprehensive pre-construction surveys and ongoing monitoring during and after construction.
- **Total Lazo Hill HDD Costs:** After two months of analysis and review of the implications of Metro Vancouver's recent HDD procurement process, HDR and their HDD sub-consultant provided revised HDD unit rates approximately 75 per cent higher than previously carried. While some uncertainty remains about how the market will respond to the conveyance project competitive procurement process, CVRD staff and advisors believe the updated HDD unit rates are a good basis for project cost estimating and they have been included within the updated project budget.
- **Lazo Marsh Considerations:** A review of non-HDD options for crossing Lazo Marsh are ongoing. The area surrounding the marsh has been identified as a unique location in the aquifer where installation via HDD is not a desirable approach due to artesian groundwater conditions experienced during the geotechnical drilling program. A Crown Land Tenure Application for cut and cover through the marsh has been made to FrontCounter BC and staff have reached out to the Manager of the Vancouver Island Conservation Land Management Program to further discuss the project.

The preferred alignment is shown in the memo attached as Appendix E. CVRD staff are working with a property negotiator and have reached out to all impacted properties along the proposed alignment to develop right-of-way agreements.

### ***Total Cost Estimate***

An updated project cost estimate has been developed, based on the scope confirmation components summarized in the bullets above. HDR has developed an updated Class C/D cost estimate and the revised forecasted total project cost is \$82 million; this represents a 12 per cent increase over the previous budget. This increase will be funded through a combination of DCC and capital works reserves and no additional borrowing over the previously approved \$52 million is required.

Primary drivers of the cost increase are the ancillary elements which were not previously accounted for and contingency allowance. These include the higher than expected HDD unit rates, a fibre optic line to ensure communications between the treatment plant and the pump stations, evaluation of anticipated archaeological costs, a return forcemain from the KFN pump station to the CPS wet well, and recognizing the need for odour management along the alignment. Table No.4 provides a summary on the updated capital costs as compared to the previously presented 2021 estimate.



**Table No.4: Capital Cost Estimate Comparison**

Project Component	Previous Estimate (\$M)	Updated Project Cost Estimate (\$M)
Pump Stations	\$10.4	\$11.2
Cut and Cover	\$18.1	\$23.4
HDD	\$12.8	\$8.0
Ancillary Projects	\$7.8	\$12.5
Escalation	\$1.9	\$2.1
Engineering	\$6.2	\$7.0
Land/ Legal/ Other	\$1.2	\$1.4
Contingency	\$14.5	\$16.4
<b>Total Project Costs</b>	<b>\$72.9</b>	<b>\$82.0</b>

**Schedule**

Provided as Appendix G is an updated project schedule, defining the approximate timeline for the implementation of the project. Some highlights of this schedule moving forward include:

**Design-Build Scope (Pump Stations, Cut and Cover and HDD)**

February 2022	Sewage Commission approves scope
Nov 2021– June 2022	SRW planning and negotiations
Dec 2021 – Aug 2022	Design-Build procurement
Fall/ Winter 2022	IR#1 pre-dig
Sep 2022 – Apr 2023	Design phase (DB Team)
Mar 2023 – Aug 2024	Construction

**Design-Bid-Build (Cut and Cover through Comox)**

Feb 2022 – Aug 2022	Detailed design
April 2022	Town of Comox conveyance project agreement
Sep 2022 – Nov 2022	Construction tender
Nov 2022 – Summer 2023	Pipe procurement
May 2023 – Aug 2024	Construction

**Citizen/Public Relations**

Two webinars were held for Lazo Area residents on February 2 (noon) and February 3 (evening). The sessions included a presentation by CAO Russell Dyson, which included information about the sewer pipe route and design through Lazo Hill, statutory right-of-way for impacted properties, groundwater monitoring and a proposed groundwater protection policy. The sessions were well attended with 55 participants and 49 questions asked and answered by the project team and supporting technical consultants. Videos of both webinars, as well as the draft groundwater policy, are posted online and all registered attendees have received a follow-up email with links to the videos, presentation slides and answers to outstanding questions.

Themes have remained fairly consistent from previous engagements with the Lazo Area community. The top concern continues to be water quality and protection of the aquifer. Additional issues about leak detection were addressed, along with how a repair would take place and the risk to soil and water should a leak occur. Many of these issues are addressed in the draft groundwater policy, which has been made available to the community. Questions about the alignment, along with the rationale for choosing a tunnelled Lazo Hill alignment rather than following Lazo Road arose in both sessions.

Follow-up engagement is planned with the broader community in April 2022 to present the final scope of the conveyance project. This will include updates to the conceptual route map that was first approved by the Sewage Commission in February 2021. These sessions will be offered online and in-person (should public health protocols allow) and will include an overview of the Liquid Waste Management Plan process and planned next steps. Residents and businesses along all points of the conveyance route will be consulted as part of the pre-construction planning process in fall 2022.

Attachments: Appendix A – “TM#2 Courtenay Pump Station Evaluation & Options,” HDR Inc., September 15, 2021  
Appendix B – “Initial Review of Courtenay Pump Station Siting Options”, HDR Inc., January 24, 2022  
Appendix C – “TM#7 KFN Alternate Alignment,” HDR Inc., November 10, 2021  
Appendix D – “TM#8 Comox Hill Installation Options,” HDR Inc., September 8, 2021  
Appendix E – “TM#1&4 – Lazo Hill Alignment Evaluation,” HDR Inc., February 9, 2022  
Appendix F – "HDD FM Alignment- Assessment of a Safe Setback from Water Wells," GW Solutions Inc., February 2022  
Appendix G – “Updated Project Schedule and Milestones”