



# Local Infrastructure Mitigation Plan

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Site C Clean Energy Project

*Revision 2: August 14, 2023*

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## Appendix A: Summary of Local Infrastructure Mitigation and Monitoring Measures

## Revision History

<b>Version</b>	<b>Date</b>	<b>Comments</b>
Rev 0	June 21, 2022	Draft Plan, Revision 0 – Issued to the Peace River Regional District, City of Fort St. John, District of Hudson’s Hope, District of Taylor, and Aboriginal Groups for review.
Rev 1	May 14, 2023	Final Plan – for Implementation
Rev 2	August 14, 2023	Plan revised in response to Environmental Assessment Comments

## Table of Acronyms

<b>BCEAA</b>	British Columbia Environmental Assessment Act
<b>BGC</b>	BGC Engineering Inc.
<b>CEAA</b>	Canadian Environmental Assessment Act
<b>CEC</b>	Community Engagement Committee
<b>CMA</b>	Community Measures Agreement
<b>EAC</b>	Environmental Assessment Certificate
<b>EAO</b>	Environmental Assessment Office
<b>EIS</b>	Environmental Impact Statement
<b>FDS</b>	Federal Decision Statement
<b>FLNRO</b>	BC Ministry of Forest, Lands and Natural Resource Operations
<b>JRP</b>	Joint Review Panel
<b>LIMP</b>	Local Infrastructure Mitigation Plan
<b>MOE</b>	BC Ministry of Environment
<b>MW</b>	Megawatt
<b>MOU</b>	Memorandum of Understanding
<b>MWR</b>	Municipal Wastewater Regulation
<b>PRA</b>	Partnering Relationship Agreement
<b>PRRD</b>	Peace River Regional District
<b>RCLC</b>	Regional Community Liaison Committee
<b>RLGC</b>	Regional and Local Government Liaison Committee
<b>WSER</b>	Wastewater Systems Effluent Regulation
<b>WWTF</b>	Wastewater Treatment Facility

## 1.0 Introduction

The Site C Clean Energy Project (the Project) will be the third dam and generating station on the Peace River in northeast BC. The Project will provide 1,100 megawatts (MW) of capacity and about 5,100 gigawatt hours of energy each year to the province's integrated electricity system.

In October 2014, the Provincial Ministers of Environment (MOE) and Forests, Lands and Natural Resource Operations (FLNRO) issued the Environmental Assessment Certificate (EAC) for the Project. In November 2014, the Federal Minister of the Environment issued a Federal Decision Statement (FDS) for the Project. Both the EAC and FDS set out conditions under which the Project can be constructed and operated.

The purpose of this document is to fulfil Condition 47 of the EAC which requires BC Hydro to prepare a Local Infrastructure Mitigation Plan (LIMP) to mitigate the effects of the Project on the functionality of local water and sewage systems. The plan is described below and includes:

- A strategy for ongoing communication with local municipalities.
- Specific mitigation measures (system relocation, replacement, monitoring) that may be required to ensure the functionality of existing municipal water and sewer systems.
- Identification of resources and funding arrangements associated with specific mitigation measures that may be required to ensure functionality of existing municipal water and sewer systems.

In accordance with EAC Condition 47, BC Hydro shared a copy of the draft LIMP to the Peace River Regional District (PRRD), City of Fort St. John (Fort St. John), District of Hudson's Hope (Hudson's Hope), District of Taylor (Taylor), and Aboriginal Groups for review a minimum of 360 days prior to reservoir filling. The draft plan was released on June 22, 2022, with a request for comment by September 23, 2022. The comment period was later extended to November 1, 2022, due to wildfire activity in the area.

Annual updates on the status of all mitigation and monitoring measures will be provided to the Environmental Assessment Office (EAO) through the Project's Annual Compliance Reports.

## 2.0 Impacts to Local Infrastructure

Volume 4, Section 30 (Community Infrastructure and Services) of BC Hydro's Environmental Impact Statement (EIS) for the Project considers potential displacement to, or effects on, local government infrastructure, such as water and sanitary sewer systems, whose functionality may be directly affected by project components. The EIS identifies the following potential impacts and mitigation measures:

### **30.4.3 Effects Assessment – Construction – Infrastructure Displacement**

*Municipal infrastructure along the Peace River would be displaced, either as a result of Site C reservoir inundation or long-term slope erosion within the erosion impact line. These are known locations.*

#### **30.4.3.1 Hudson's Hope Water and Sewage Facilities**

*With the filling of the Site C reservoir, the Hudson's Hope water intake, pumping station, and treatment plant would be inundated, and would need to be rebuilt in a new location. There could also be potential effects on the sewage settling ponds due to bank erosion, or due to a change in groundwater conditions at the time of reservoir filling. The Hudson's Hope shoreline protection would be designed to address the potential for erosion at this site. Site specific changes to groundwater elevation would be determined through observation and measurement at that location, after reservoir filling, and if required suitable mitigation would be identified.*

#### **30.4.3.2 Charlie Lake Sewage Outfall**

*The lower portion of the Charlie Lake outfall into the Peace River would be inundated by the Site C reservoir. The effects of inundation may result in functional loss and/or a change to discharge requirements. In the portion of the outfall above the inundation of the Site C reservoir, there could be bank erosion within the erosion impact line. Site specific effects on the Charlie Lake outfall infrastructure and function would be determined through further technical analysis, and if required suitable mitigation would be identified, prior to inundation.*

#### **30.4.3.3 Fort St. John Wells and Intake**

*Fort St. John draws water from wells at river level, fed by an aquifer located below in Peace River near the proposed Site C dam site. The well system is connected to the City by a 12 km line to the City. Potential concerns with this water system are associated with Project operations, and include impeded access to the wells at high water levels, ice cover at the site, and potential changes in flow rate and availability from the aquifer. Each of these events can already occur today, without the Project.*

*Ice cover on the Peace River is not predicted to reach the location of the wells, therefore there would be no change in ice cover at the wells due to the Project.*

*BC Hydro is proposing a minimum flow from Site C of 390 m<sup>3</sup>/s. While this is higher than the absolute minimum level experienced at the well sites today, it is expected that the frequency of operations at this low flow / water levels would occur more often than today. Further technical analysis using existing or new well production data, would confirm if a reduction in well capacity and production would be likely, prior to Project operations. If required suitable mitigation would be identified, prior to Project operations.*

*It is expected that the potential for extreme high water levels at this location would be less than today, but typical high flow / water levels would occur more often than today, which could further impede existing access difficulties to the well sites. Further analysis of the conditions under which these water levels would further impede access to the well sites would confirm this effect. If required suitable mitigation would be identified, prior to Project operations*

#### **30.4.3.4 Taylor Wells and Water Intake**

*Taylor has three water supply wells located on a small island in the Peace River opposite the confluence of the Pine River, downstream of the Site C dam site. Potential concerns with this water system associated with the Project include: low water levels could occur more often, which may affect well capacity and production; high water levels could occur more frequently, which limits access to the wells; and increased turbidity during Project construction could affect water quality from the wells (BC Hydro 2012). Each of these events can already occur today, without the Project.*

*A review of information provided by Taylor confirms that well production does appear to decline with low flow in the Peace River. BC Hydro is proposing a minimum flow from Site C of 390 m<sup>3</sup>/s. While this is higher than the absolute minimum level experienced at the well sites today, it is expected that the frequency of operations at this low flow / water levels would occur more often than today, which may reduce well capacity and production. It is expected that the potential for extreme high water levels at this location would be less than today, but typical high flow / water levels would occur more often than today, which could further impede existing access difficulties to the well sites. In the past BC Hydro has considered requests from Taylor to reduce flows from Peace Canyon Dam to facilitate access to the well sites, when operationally or economically feasible. Further analysis of the conditions under which these water levels would further impede access would confirm this effect. If required suitable mitigation would be identified, prior to Project operations.*

*During construction there could be increased levels of turbidity in the Peace River, and water quality would be managed through implementation of a Water Quality Management Plan. Potential effects of a change in sedimentation on well water quality is addressed in the Volume 4 Human Health Assessment.*

#### **30.4.3.5 First Nations Communities**

*The communities of Doig River, Halfway River, Prophet River, and West Moberly are not expected to experience any change in water service or water quality.*

To mitigate effects on municipal infrastructure, BC Hydro is responsible for the following:

- Providing funds for the relocation or replacement of Hudson's Hope water intake, pumping station, and treatment plant to meet the reasonable water supply needs of the residents and the District of Hudson's Hope*
- Developing, with each respective municipality, an approach to determine or monitor effects of the Project on the Hudson's Hope sewage lagoons, Fort St. John water supply, District of Taylor water supply and the PRRD's Charlie Lake outfall. Based on the study or monitoring results, if adverse effects are identified, BC Hydro would implement appropriate mitigation measures to maintain functionality of these municipal systems. Mitigation measures may include relocation, replacement, or repair of the infrastructure as appropriate.*

### **3.0 Regional Engagement**

BC Hydro began consultation on the Project in late 2007, before any decision to advance the Project to an environmental assessment. BC Hydro's consultation with the public, stakeholders, regional and local governments, regulatory agencies, and Aboriginal groups is described in EIS Section 9, Information Distribution and Consultation.

In 2010, BC Hydro established the Regional and Local Government Liaison Committee (RLGC) as an information sharing forum to ensure local governments were consulted on key issues and kept up to date on the status of the Site C project.

Following approval of the Site C Project, the RLGC was replaced by the Regional Community Liaison Committee (RCLC). The RCLC was established to foster dialogue between BC Hydro, Peace region local governments and First Nations during Project construction.



The purpose of the RCLC is:

- To bring representatives from the Peace River region including regional government, local government, MLAs, and First Nations together with BC Hydro project officials in a regular forum to discuss the Project.
- To facilitate timely information exchange to ensure accurate information regarding the Project, in particular construction activities and schedules, mitigation measures, procurement and employment, is available to communities during Project construction.
- To provide a forum for BC Hydro and community representatives to discuss and address local interests, enquiries and concerns in a timely and cooperative manner, subject to financial, technical and schedule constraints.

Construction began on the Project on July 27, 2015 and the RCLC held its first meeting on March 11, 2016.

The RCLC is a key information and notification tool that is identified in the Site C Construction Communication Plan (Construction Environmental Management Plan, Appendix C – Construction Communication Plan, Section 3.2 Information and Notification Tools).

The Site C Construction Communication Plan was developed in accordance with Conditions 39, 43 and 72 of the Project's EAC, and guides construction communications and community relations during the construction phase of the Project. The RCLC has been implemented in order to meet the objectives set out in the Site C Construction Communication Plan.

In addition to the RCLC, BC Hydro also committed to continue direct discussions with local governments toward the establishment of community agreements that included any specific effects on their communities. Where the Project would displace or impair the functioning of municipal infrastructure, appropriate measures would be implemented, funded by BC Hydro, to maintain the functionality of these systems.

BC Hydro will continue to provide each local government with an annual summary report which updates the status of all commitments within their specific community agreement. These summary reports will include the status of all infrastructure monitoring and mitigation measures.

### Hudson's Hope

BC Hydro and Hudson's Hope signed the *Partnering Relationship Agreement* (PRA) on January 10, 2017. The terms of the PRA address measures to mitigate the potential impacts of the Project that are of concern to Hudson's Hope, including the water supply infrastructure and waste water system.

The PRA also established a Community Engagement Committee (CEC). The CEC operates during the term of the PRA and will:

- *be the primary interface between the Parties with respect to the Peace Region*

*Operations, the Site C Project and the implementation of the measures contained in the Agreement;*

- *provide a forum for regular communication and information exchange between the Parties, for effective management of the Community Engagement Committee's duties and for the early resolution of any issues that might arise in the ongoing partnering relationship between the parties: and*
- *facilitate matters between the Parties and the actions and decisions contemplated in this Agreement, including the dispute resolution process as provided for in Article 10.*

As per the PRA, the CEC will remain active until the date all the obligations within the PRA have been performed or BC Hydro and the District of Hudson's Hope agree to terminate the Agreement.

The CEC meets at least two times per year and reviews an update on all obligations within the PRA annually.

In addition to the CEC, BC Hydro remains in regular contact with Hudson's Hope to address specific measures and provide updates and answer questions on the Project and the PRA. Additional information regarding the Project is also provided to Hudson's Hope through construction communications activities.

#### Fort St. John

BC Hydro and Fort St. John signed a *Community Measures Agreement (CMA)* on April 22, 2016. The terms of the CMA address measures to mitigate the potential impacts of the Project that are of concern to Fort St. John, including drinking water supply.

Under the CMA, BC Hydro and Fort St. John established a Community Agreement Monitoring Committee for the Construction Period, which will continue for a period of 1 year following the construction period.

In addition to the CMA, BC Hydro remains in regular contact with Fort St. John to address specific measures and provide updates and answer questions on the Project and the CMA.

Additional information regarding the Project is also provided to the Fort St. John through construction communications activities.

#### Taylor

BC Hydro and Taylor signed the *Site C Clean Energy Project Community Agreement Between BC Hydro and Power Authority and District of Taylor (Community Agreement)* on January 27, 2014. The terms of the Agreement address measures to mitigate the potential impacts of the Project that are of concern to Taylor as set out in the EIS, including drinking water supply.

BC Hydro remains in regular contact with Taylor to address specific measures and provide updates and answer questions on the Project and the Community Agreement. Additional

information regarding the Project is also provided to Taylor through construction communications activities.

BC Hydro will continue to provide a community agreement summary report to District of Taylor on an annual basis.

### Peace River Regional District

BC Hydro and the PRRD have agreed to address impacts the Charlie Lake wastewater treatment facility (WWTF) outside of a Community Agreement. Additional details on the Charlie Lake Wastewater Treatment System - Change in Receiving Environment and Slope Stability Memorandum of Understanding (MOU) are included in Section 4.4.

In addition to the MOU, BC Hydro remains in regular contact with the PRRD to provide updates and answer questions on the Project. Additional information regarding the Project is also provided to the PRRD through construction communications activities.

## **4.0 Mitigation and Monitoring**

BC Hydro has undertaken the mitigation and monitoring measures described below to address impacts to local infrastructure. Please refer to Appendix A for a summary of these measures.

### **4.1 Hudson's Hope**

BC Hydro and Hudson's Hope signed the PRA on January 10, 2017.

The terms of the PRA include measures to mitigate the potential impacts of the Project that are of concern to Hudson's Hope, as set out in the EAC conditions for the Project, and measures that support other community interests identified by Hudson's Hope.

Section 5.1, 5.2 and 5.3 of the PRA include specific commitments to evaluate, mitigate and monitor potential impacts to the Drinking Water Supply and the Waste Water System.

#### *A. Drinking Water Supply*

Under the PRA, BC Hydro agreed to reconstruct or relocate each of the affected components as required to maintain the functionality of Hudson's Hope's water system to substantially the same standard and capacity.

As an outcome of discussions between BC Hydro and Hudson's Hope, Hudson's Hope made the decision to change from a surface water source (Like for Like Replacement) to a well water system (Preferred Solution).

BC Hydro entered into a Water Agreement with Hudson's Hope in September 2019.

The Water Agreement amended the commitments under section 5.1 and 5.2 of the PRA and established BC Hydro's financial contribution towards the well and water treatment plant project.

- Under the Water Agreement, Hudson's Hope assumed responsibility for all decisions,

tendering, design, and construction of a new well water system. Hudson's Hope is also responsible for all operations, performance, and warranty costs.

- BC Hydro was required to fund construction of the new well water system.

Under the Water Agreement, Hudson's Hope and BC Hydro agreed that by funding the Preferred Solution or the Like for Like Replacement, BC Hydro will satisfy its obligations under 5.1 and 5.2 of the PRA, and EAC condition 47.

Hudson's Hope selected Industra Construction Corporation (Industra) as the contractor for the design-build of the well water system in March 2020.

Hudson's Hope new well water treatment plant became operational on March 05, 2021. The Substantial Completion Certificate was issued to Industra on June 16, 2021.

After the well water system became operational, BC Hydro was advised by Hudson's Hope that it was not functioning as expected and subsequently failed on two occasions in 2022.

In fall 2022, Hudson's Hope initiated a three-phase plan to switch its raw water source from groundwater to surface water. As part of this plan, Hudson's Hope installed a temporary surface water intake in the Peace River as well as a supply line connected to their treatment plant. UV Reactors and a clarifier were also added to the system. . The groundwater well is no longer in use.

BC Hydro also installed a new raw water intake as part of the Shoreline Protection Berm which will allow Hudson's Hope to draw surface water once the reservoir is filled.

BC Hydro and Hudson's Hope have finalized an agreement that will provide additional funding for Phase 1 and Phase 2 of Hudson's Hope's plan. BC Hydro and Hudson's Hope continue to discuss the operations of the water treatment plant to ensure a safe and reliable source of drinking water for the residents of Hudson's Hope.

### *B. Waste Water System / Groundwater Modelling*

Since 2010, BGC Engineering Inc. (BGC) has conducted groundwater modeling for BC Hydro to address specific questions around anticipated changes in groundwater conditions associated with the creation and operation of the Site C reservoir.

In 2020, BC Hydro requested BGC evaluate the water table rise within the serviced area of Hudson's Hope, and how the rise might interact with buried municipal infrastructure: mainly drains, lift stations, and water and sewer mains.

BGC updated and re-calibrated a numerical groundwater flow model that predicted groundwater elevations in the shallow sediments (where buried infrastructure would be located) within the Hudson's Hope serviced area to rise by less than 0.5 m. This suggests there should be no anticipated impact to the existing infrastructure.

Based on the outcome of this modelling, the following recommendations were also offered:

- *Continue to monitor groundwater levels near the Peace River in the Hudson's Hope area to confirm actual influence of the Site C reservoir on groundwater conditions.*
- *Review monitoring and mitigation plans for Tier 1 sites of interest in the context of these updated water table rise predictions.*

A copy of the BGC report was provided to Hudson's Hope in October 2020.

At the direction of BC Hydro, BGC has developed a groundwater monitoring plan for Hudson's Hope that includes baseline readings immediately prior to reservoir filling and a regular evaluation schedule for a five-year period after the reservoir is filled. BGC will begin with monthly evaluations for a 3-month period immediately following reservoir fill. As time progresses and the effects of reservoir formation slow down, the frequency of data collection will be reduced, first to quarterly and, later, to annually.

BC Hydro will cover the costs of the groundwater monitoring plan and will relay all evaluation reports to Hudson's Hope in the frequency noted above.

## **4.2 Fort St. John**

### *A. Water Supply Monitoring and Mitigation Program*

Fort St. John operates a groundwater supply system on the left (north) bank of the Peace River, downstream from the Project.

BC Hydro and Fort St. John worked collaboratively to develop the Fort St. John Water Supply Monitoring and Mitigation Program (Fort St. John Monitoring Program).

The purpose of the Fort St. John Monitoring Program is to detect changes to water quantity and quality and any changes to the aquifer as a result of scour or sedimentation as a result of the construction or operation of the Project. In the event changes are noted that are a result of the Project, BC Hydro will work with Fort St. John to identify appropriate protection measures.

The Fort St. John Monitoring Program is designed as a component to meet the EAC Condition 47. It also forms part of the CMA signed with Fort St. John in 2016. Water Quality and Quantity is covered under Sec 3.11 of the CMA.

- BC Hydro and the City will each implement the actions required of it under the Fort St. John Water Supply Monitoring and Mitigation Plan during the Construction Period and for the longer of two years after the Construction Stop Date or until the seasonal ground water quality has stabilized as evidenced in a report prepared by one or more qualified persons on behalf of BC Hydro and provided to the City by BC Hydro. The Fort St. John Water Supply Monitoring and Mitigation Plan includes monitoring to determine possible changes in quality and quantity and, if required, to identify appropriate groundwater protection measures.*
- The City will collect and deliver to BC Hydro, in accordance with the Fort St. John Water Supply Monitoring and Mitigation Plan, a groundwater sample from each of its five water supply wells four times in each 12 month period from the Construction Start Date. BC*

*Hydro will provide \$1,800 per year toward the incremental cost to the City of obtaining two sets of samples per year above the City's normal sampling frequency for raw water samples from each of its five wells.*

- c) *In accordance with the Fort St. John Water Supply Monitoring and Mitigation Plan, BC Hydro will transport all samples collected by both BC Hydro and the City to an accredited lab for analysis, and will provide results to the City in an electronic format. BC Hydro will prepare quarterly data reports and an annual monitoring report, and will provide these to the City.*

The Fort St. John Monitoring Program includes:

- **Well performance monitoring** through the Fort St. John's current monitoring programs which include well capacity, efficiency and flow rate monitoring.
- **Water quality monitoring** by conducting quarterly groundwater sampling of the Fort St. John's Five (5) supply wells and surface water sampling in the vicinity of the wellfield and the Site C construction area.
- **Water level monitoring** through continuous real time flow and water level data in the Peace River from the Water Survey of Canada's Peace River above Pine River (07FA004) gauge.
- **Sediment deposition and erosion monitoring** by compiling cross-section surveys and LiDAR data as it is collected. In addition, Fort St. John is also to report any changes to the shoreline during routine visits to the well field. Continuous turbidity and flow data are also collected to determine if any changes to sediment loading or flows are observed that result from Site C construction or operations.

Quarterly water quality monitoring commenced in June 2015, prior to Site C construction and will continue for the longer period of two years after the construction ends or until the seasonal water quality has stabilized as agreed by both Fort St. John and BC Hydro.

As per the community agreement, BC Hydro will continue to fund the monitoring program and report results to Fort St. John on an annual basis.

To date, no significant changes to water quality have been observed during the monitoring period.

#### **4.3 Taylor**

##### *A. Water Supply Monitoring and Mitigation Program*

Taylor operates a groundwater supply system on the left (north) bank of the Peace River, downstream from the Project.

BC Hydro and Taylor worked collaboratively to develop the District of Taylor Water Supply Monitoring and Mitigation Program (Taylor Monitoring Program).

The purpose of the Taylor Monitoring Program is to detect changes to water quantity, and

quality and any changes to the aquifer as a potential result of scour or sedimentation related to construction or operation of the Project. In the event changes are noted that are a result of Site C, BC Hydro will work with Taylor to identify appropriate protection measures.

The Taylor Monitoring Program is designed as a component to meet the Environmental EAC Condition 47. The Taylor Monitoring Program also forms part of the Community Agreement that was signed with Taylor in 2014.

The Taylor Monitoring Program includes:

- **Well performance monitoring** through Taylor's current monitoring programs which may include well capacity, efficiency and flow rate monitoring.
- **Water quality monitoring** by conducting quarterly groundwater sampling of the Taylor's supply wells and surface water sampling in the vicinity of the wellfield and the Site C construction area. Continuous water temperature data are also collected.
- **Water level monitoring** through continuous real time flow and water level data in the Peace River from the Water Survey of Canada's Peace River above Pine River (07FA004) and Peace River near Taylor (07FD002) gauges.
- **Sediment deposition and erosion** monitoring by compiling cross-section surveys and LiDAR data as it is collected. In addition, Taylor is also to report any changes to the shoreline during routine visits to the wellfield. Continuous turbidity and flow data are also collected to determine if any changes to sediment loading or flows are observed that result from Site C construction or operations.

Quarterly water quality monitoring commenced in June 2015, prior to Site C construction, and has continued since.

The Taylor Monitoring Program will be conducted from the onset of construction for the longer of two years after the construction ends or until the seasonal water quality has stabilized as agreed by both the District and BC Hydro.

Four quarterly water quality monitoring events are conducted annually as part of the Program.

As per the community agreement, BC Hydro will continue to fund the monitoring program and report results to Taylor on an annual basis.

To date, no significant changes to water quality have been observed during monitoring period.

#### *B. Shoreline Protection*

As part of the Community Agreement signed in 2014, BC Hydro also agreed to the following commitments related to shoreline protection for Taylor's water treatment plant:

- *At Taylor's agreement and direction, BC Hydro will implement measures to protect the water treatment plant and pumphouse from potential shoreline erosion by the start of reservoir filling.*

- *BC Hydro and Taylor will review the December 17, 2015 Final Work Outline for Shoreline Protection Modelling and update the scope of work to reflect updated information approximately 2 years prior to the start of reservoir filling; and*
- *BC Hydro will then complete the updated modeling based on the new scope of work and will discuss the results with Taylor to determine if shoreline protection measures are needed due to the Project, and if so, what the measures should entail.*

On November 4, 2016, a Supplementary Agreement to the Community Agreement was signed to move the date of the Shoreline Protection measure to later in construction.

BC Hydro and Taylor have since agreed to move the Shoreline Protection measure until after the Project is in operation. A formal amendment is currently in progress.

#### **4.4 Peace River Regional District**

The PRRD owns and operates the Charlie Lake WWTF. The Charlie Lake WWTF serves the community of Charlie Lake and treats trucked waste and gravity sewer main delivered wastewater from throughout PRRD. The WWTF currently discharges treated municipal wastewater through an effluent outfall pipe (the Outfall) to the Peace River, as authorized under the Municipal Wastewater Regulation (MWR; no. 108540).

The Charlie Lake WWTF consists of a primary cell and solids separator system plus two complete mix tanks, two partially aerated lagoons, and the effluent outfall pipe to the Peace River. The wastewater at the Charlie Lake WWTF comes from residential and commercial properties in the Charlie Lake community and trucked-in wastewater from properties not serviced by sanitary sewers.

The Charlie Lake WWTF must also meet the requirements of the federal Wastewater Systems Effluent Regulation (WSER). PRRD carries out regular monitoring and reporting of the final treated effluent and in the Peace River, upstream and downstream of the outfall.

BC Hydro identified two potential impacts to the Outfall resulting from the Project: bank erosion within the erosion impact line and a change in receiving environment.

BC Hydro acknowledged and accepts this responsibility and has been engaging with the PRRD to identify and deliver the necessary mitigation.

##### *A. Geotechnical Monitoring/ Shoreline Erosion*

The Outfall will experience an approximate 50m water depth increase as a result of the Site C reservoir impoundment and is also in the area affected by water level fluctuations during Stage 2 Diversion.

BC Hydro retained BGC to evaluate and describe the existing geotechnical risks to the Outfall and how the creation of the reservoir may or may not change the scope or likelihood of those risks.

The results of the assessment determined that the existing likelihood of a significant landslide will



not change due to the creation of the reservoir. This assessment was shared with the PRRD and also discussed with the PRRD and its consultants.

BC Hydro's understanding of the key findings of the Charlie Lake Outfall Slope Stability Hazard Scenarios Report (August 21, 2020) is as follows:

- The headpond and the reservoir are not expected to materially affect the likelihood of subsurface land instability that may pose moderate to high risk of service outage for the Outfall. In other words, the potential for a deep-seated landslide near the Outfall will not be materially changed by the creation of the reservoir.
- As the PRRD already manages the infrastructure taking into account the existing likelihood of the subsurface land instability occurring, the headpond and creation of the reservoir should not trigger any requirement for the PRRD to change its current response plans and monitoring program.
- Headpond diversion and the creation of the reservoir will give rise to some shoreline surface erosion due to wave action.
- The Slope Stability Report... describes the characteristics that might indicate the unlikely scenario that a future slide was linked to the creation of the reservoir and could inform the assessment of any future slide to determine if it was likely caused by the creation of the reservoir.
- BC Hydro's planned reservoir monitoring program will capture geotechnical information that may be of use to the PRRD in managing their infrastructure.

Using geotechnical information provided by BGC, R. Radloff & Associates (Radloff) prepared a memo outlining specific work in relation to the Outfall that was recommended to be completed ahead of the river diversion phase of the Project. Based on the recommendations in this memo, BC Hydro, in collaboration with the PRRD, requested Radloff prepare a detailed design for this work.

As part of the detailed design process, Radloff extended mitigation measures to also address some of the shoreline erosion impacts associated with reservoir operations. This work included additional erosion protection around reservoir operating levels in addition to weighting the outfall main from the existing river level to above the flood impact line.

Construction of mitigation works began on September 25, 2020 and was completed on October 21, 2020.

This additional mitigation work ensured that the Outfall would be permanently protected from erosion impacts associated with the river diversion and reservoir operation phases of the Project.

BC Hydro is actively monitoring slope stability along the future reservoir, including specific monitoring and analysis of the Charlie Lake WWTF site, and shares relevant updates with the PRRD.

BC Hydro and the PRRD have signed a Memorandum of Understanding (MOU) which commits BC Hydro to, at its own expense, undertake a reservoir monitoring program and will share regular updates with the PRRD which are relevant to slope stability at the Outfall.

BC Hydro also agreed to enter into one or more further agreements (or memoranda of understanding which will identify:

- How BC Hydro will share information from the reservoir monitoring program with the PRRD for their use in managing their infrastructure; and
- If a slide occurs and causes damage to the Outfall, how BC Hydro and will work with the PRRD to determine cause, share information, and support the PRRD in responding to the damage.

#### *B. Receiving Environment*

The boundaries of the future Site C Clean Energy Project reservoir includes the current location of the PRRD's Charlie Lake effluent outfall pipe. Once filled, the reservoir will be 83 km's long and approximately one kilometre wide with a maximum depth of 55m near the earthfill dam. As such, the point of discharge from the Outfall will change from a river to a reservoir.

Radloff was retained by BC Hydro in February 2021 to provide engineering and environmental assistance to meet BC Hydro's commitment to the PRRD with respect to regulatory authorization of the change in the Charlie Lake WWTF discharge location.

BC Hydro discussed a draft copy of the Report (Charlie Lake Treated Effluent Outfall: Environmental Overview & Preliminary Effluent Dispersion Modelling) with the PRRD in July 2021 and provided a final copy of the Report in September 2021.

The PRRD submitted a preliminary application for changes to their MWR registration to ENV in April 2022.

BC Hydro and the PRRD are working collaboratively in support of the PRRD's provincial re-registration process for the Charlie Lake WWTF. To this end, BC Hydro and the PRRD have signed an MOU which commits BC Hydro to, at its own expense, complete an EIS as requested by ENV in support of the PRRD's application process. The PRRD will submit a copy of this EIS to ENV as part of their application process.

if the EIS demonstrates that the change from river to reservoir will materially change the ecological impact of the waste discharged at the Outfall, BC Hydro and the PRRD will enter into one or more further agreements (or memoranda of understanding) which will address the identification and implementation of measures to mitigate those impacts in accordance with Condition #47 of the EAC, including potential modifications which may be required to the Charlie Lake WWTF system

The MOU also commits BC Hydro to reimburse the PRRD for costs associated with the MWR amendment application process.

## 5.0 References

BGC Engineering Inc. (BGC). 2020. Updated Groundwater Flow Model for Hudson's Hope. Prepared for BC Hydro. July 1, 2020.

BGC Engineering Inc. (BGC). 2020. Charlie Lake Outfall Slope Stability Hazard Scenarios. Prepared for BC Hydro. August 21, 2020.

R. Radloff & Associates Inc. (Radloff). 2020. Charlie Lake Sanitary Outfall Diversion Mitigation Works – Completion Report. Prepared for BC Hydro. December 1, 2020.

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Ecofish Research Ltd. and Aski Reclamation LP. 2022. City of Fort St. John and Peace River Quarterly Water Quality Monitoring: 2021 Annual Report. Prepared for BC Hydro. February 24, 2022.

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## Appendix A: Summary of Local Infrastructure Mitigation and Monitoring Measures

Community	Impact to Local Infrastructure	Mitigation and Monitoring
District of Hudson's Hope	Drinking Water Supply	<p>Hudson's Hope new water treatment plant, funded by BC Hydro, became operational on March 05, 2021. The Substantial Completion Certificate was issued on June 16, 2021.</p> <p>After the well water system became operational, BC Hydro was advised by Hudson's Hope that it was not functioning as expected and subsequently failed on two occasions in 2022.</p> <p>In fall 2022, Hudson's Hope initiated a three-phase plan to switch its raw water source from groundwater to surface water. As part of this plan, Hudson's Hope has installed a temporary surface water intake in the Peace River as well as a supply line connected to their treatment plant. Hudson's Hope is now working to refine the operation of this temporary system including the installation of UV Reactors and a clarifier. The groundwater well is no longer in use.</p> <p>BC Hydro has also completed the installation of a raw water intake as part of the Shoreline Protection Berm which will allow Hudson's Hope to draw surface water once the reservoir is filled.</p> <p>BC Hydro and Hudson's Hope have finalized an agreement that will provide additional funding for Phase 1 and Phase 2 of Hudson's Hope's plan. BC Hydro and Hudson's Hope continue to discuss the operations of the water treatment plant to ensure a safe and reliable source of drinking water for the residents of Hudson's Hope.</p>
	Waste Water System / Groundwater Modelling	<p>Modelling suggests there should be no anticipated impact to the existing infrastructure.</p> <p>BGC has developed a groundwater monitoring plan to verify the results of this modelling after the reservoir is filled, including monthly evaluations immediately following reservoir fill. BC Hydro will relay all evaluation reports to the District of Hudson's Hope.</p>
City of Fort St. John	Wells and Intake	No significant changes to water quality have been observed during the monitoring period.

Community	Impact to Local Infrastructure	Mitigation and Monitoring
		Water quality monitoring will continue for the longer period of two years after the construction ends or until the seasonal water quality has stabilized as agreed by both the City of Fort St. John and BC Hydro.
District of Taylor	Wells and Water Intake	<p>No significant changes to water quality have been observed during monitoring period.</p> <p>Water quality monitoring will continue for the longer period of two years after the construction ends or until the seasonal water quality has stabilized as agreed by both the District of Taylor and BC Hydro.</p>
	Shoreline Protection	BC Hydro and the District of Taylor have agreed to move the Shoreline Protection measure until after the Project is in operation. A formal amendment is currently in progress.
Peace River Regional District	Charlie Lake Sewage Outfall - Geotechnical Monitoring/ Shoreline Erosion	<p>Outfall diversion mitigation works were completed on October 21, 2020.</p> <p>BC Hydro is actively monitoring slope stability along the future reservoir, including specific monitoring and analysis of the Charlie Lake WWTF site, and shares relevant updates with the PRRD.</p> <p>As part of BC Hydro's broader reservoir monitoring plan, BGC has developed a 5-year slope stability and erosion monitoring plan specific to the Charlie Lake WWTF site. BC Hydro will share regular updates with the PRRD as part of this plan.</p> <p>BC Hydro and the PRRD agree there is a need to formalize the information sharing process and, if a slide occurs and causes damage, establish how BC Hydro will work with the PRRD to determine the cause, share information, and support the PRRD in responding to the damage.</p>
	Charlie Lake Sewage Outfall - Receiving Environment	BC Hydro retained R. Radloff & Associates Inc. in February 2021 to provide engineering and environmental assistance to meet BC Hydro's commitment to the PRRD with respect to regulatory authorization of the change in the Charlie Lake WWTF discharge location.

Community	Impact to Local Infrastructure	Mitigation and Monitoring
		<p>The PRRD submitted a preliminary application for changes to their MWR registration to ENV in April 2022.</p> <p>BC Hydro and the PRRD are working collaboratively in support of the PRRD's provincial re-registration process for the Charlie Lake WWTF.</p>