

[REDACTED]

18 May 2016

[REDACTED], P.Geo.
Water Management Officer
Ministry of Forests, Lands and Natural Resource Operations
[REDACTED]

Dear [REDACTED]

**Site C Clean Energy Project - Conditional Water Licence 132990
Leave to Construct LTC #1A – Right Bank Side Channel Dikes**

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to start construction of the Right (South) Bank Side Channel Dikes, which are one of the works authorized under LCC #1. BC Hydro's contractor for the proposed works would be [REDACTED]

The following documents have been received:

1. BC Hydro - *Site C Clean Energy Project Request for Leave to Construct -- Installation of Three South Bank Closure Dikes (LTC1A)*, letter from [REDACTED], 11 May 2016.
2. BC Hydro - *Site C Clean Energy Project, South Bank Back Channel Closure Dikes, Technical Specifications*, 16 March 2016.
3. BC Hydro - *Drawing-1020-C09-06101-R1 - Roads - South Bank Back Channel Closure, Plan and Details*.
4. BC Hydro - *Drawing-1020-C09-06102-R1 - Roads - South Bank Back Channel Closure, Profiles and Details*.
5. [REDACTED]

Initial versions of the above documents were reviewed by the IE and by the Independent Environmental Monitor (IEM) as applicable to the roles of each party. The documents listed are the revised versions that address any comments from the IE and the IEM.

Permission to proceed with salvage of fish from the 1.7 km long side channel of the Peace River that will be isolated by the proposed dikes was provided by the IE on 12 May 2016. It is understood that the fish salvage is now in progress by [REDACTED]

The proposed side channel dikes will be approximately 30, 45 and 150 m long and up to about 4 m high, and will be constructed of alluvial materials to be sourced adjacent to the dike locations. These dikes will be temporary structures, in that Dike 1 is located inside of the proposed right bank stage 1 cofferdam and

[REDACTED]

Dikes 2 and 3 are located inside of the proposed starter dike for RSEM Area R6. The dike locations have been adjusted from those shown in BC Hydro's submission for Leave to Commence Construction LCC #1, in order to avoid interfering with the future construction of those other proposed structures.

The dikes have generally been designed and are to be constructed in accordance with BC Ministry of Transportation and Infrastructure Standard Specifications, with additional site-specific requirements. The specifications include inspection and testing requirements that are typical for this type of construction work. The IE considers the design and construction specifications to be appropriate for the proposed works.

The drawings provided have been sealed by a Professional Engineer registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis and the conditions of Conditional Water Licence 132990.

The Environmental Protection Plan and the Construction Safety Plan include details, procedures and methods that would generally be expected for construction work of this type. The Construction Safety Plan includes a Public Safety Management Plan which describes procedures for identifying and addressing potential public safety hazards.

The proposed construction schedule of 11 days should be achievable.

The IE has discussed this work with the IEM and both parties have recently visited the area where the right bank side channel dikes are to be constructed. The IEM has provided the IE with comments and recommendations on the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – Site C Clean Energy Project – Conditional Water Licence C132990 Independent Environmental Monitor Review of the Southbank Backchannel Closure EPP and Relevant Component Plans to Support Issuance of LTC1A, letter to [REDACTED] dated 18 May 2016.

As noted by the IEM, the adjusted locations of the dikes do not match those described in the applicable Fisheries Act Authorization. Based on the IEM's comments, the IE does not consider the adjustment in location to be a material change.

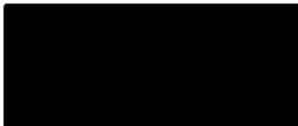
By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the right bank side channel dikes. For reference, this permission is referred to as *Leave to Construct LTC #1A*.

Permission to proceed with construction of the right bank side channel dikes is subject to the following conditions:

1. BC Hydro and/or its contractor must comply with the terms listed in the *Conclusions and Recommendations* section of the above-noted IEM letter; and
2. BC Hydro and/or its contractor must obtain and comply with any necessary permits from other provincial and/or federal regulatory agencies.

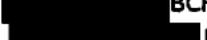
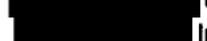


Yours truly,

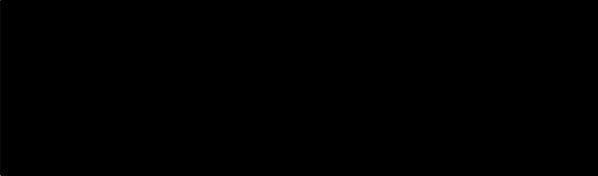


 P.Eng.
Independent Engineer, Site C Clean Energy Project

Attachment: IEM letter dated 18 May 2016

- c:  BCH VP & Project Director (Site C Licensee Representative)
 SNC Lavalin (Site C Design Engineer)
 BCH (Site C Construction Engineer)
 BCH (Environment, Aboriginal Relations and Public Affairs Director)
 BCH (Regulatory Manager)
 Independent Environmental Monitor





May 18, 2016



Attention:  Independent Engineer

RE: Site C Clean Energy Project – Condition Water Licence C132990 Independent Environmental Monitor review of the Southbank Backchannel Closure EPP and relevant component plans to support issuance of LTC1A

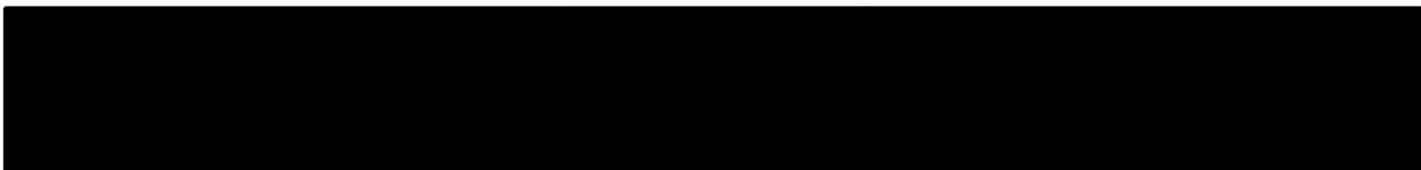
The first Leave to Commence Construction (LCC#1) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of five key components consisting of:

- Right Bank Drainage Tunnel
- Right Bank Sidechannel Closure Dikes
- Left Bank Excavation
- Moberly River Construction Bridge
- Adit and Borehole infilling
- Erosion Protection as needed

Each of these components will require individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they provide appropriate mitigation in advance of construction. This letter has been prepared specifically for the works associated with the Right Bank (South) Sidechannel Closure Dikes associated with LTC1A.

As the issuance of any LTC requires the IEMs review of EPPs and component plans and recommendation for acceptance to the IE, it is the IEMs understanding that any revisions to the EPP or supporting

¹ Conditional Water Licence C132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.



documents, or changes to scopes of work that could require such revisions, would require review by the IEM prior to initiating works, and could be considered a hold point by the IE.

The IEM has reviewed the EPP and relevant component plans through a process of cross referencing with the CEMP, components of BC Hydro supporting documentation/plans, relevant permits/approvals/licenses, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, authorizations and drawings received and reviewed by the IEM as would relate to LTC1A.

- [REDACTED]
- [REDACTED]
- [REDACTED]

- [REDACTED]

BC Hydro Plans

- Construction Environmental Management Plan (CEMP) dated April 7, 2016.
- Construction Safety Management Plan (CSMP) dated June 5, 2015.

Provincial Permits/Approvals

- Conditional Water Licence C132990.
- *Wildlife Act* Permit FJ15-161318 – Fish Collection and Fish Salvage.
- Approval A703710 – Short Term Use issued under the *Water Act*.
- Licence No.: 815646 issued under the *Land Act*

Federal Authorizations/Documentation

- *Fisheries Act* Authorization 15-HPAC-00170 dated September 30, 2015.
 - DFO Application for Authorization dated February 23, 2015.

Conclusions and Recommendations

An initial review of the EPP and supporting documentation for the works was conducted and comments provided back to BC Hydro. Changes to the documents were undertaken by [REDACTED] with additional information provided directly [REDACTED]

by BC Hydro, to address comments provided by the IEM. Upon review of the original and revised submission documents and related correspondence, the IEM has the following comments:

- The Federal *Fisheries Act* Authorization is in place for the works.
 - It must be noted IFC drawings and the EPP are not in alignment with the description of work described in the *Fisheries Act* Application for Authorization, however based on a response provided by BC Hydro, the overall footprint of the works associated with the Right Bank Sidechannel Closure will not change, and that the original Application for Authorization (dated February 23, 2015) included a margin of error of $\pm 5\%$. The IEM will require that BC Hydro provide as-built information to properly inform the habitat compensation process associated with the *Fisheries Act* Authorization.
- The presence of beaver lodges and/or bank dens were noted on the environmental features maps, and it is our understanding that removal works have occurred previously under *Wildlife Act* permit FJ14-154005. Any new evidence of beaver or other fur bearing species within the project area must be immediately communicated to BC Hydro. Works must not proceed until additional guidance is provided by the appropriate parties.
- Pre-construction surveys for birds (nesting), amphibians, or other wildlife features must occur in advance of construction.
 - The presence of any active bird nest, or ones protected under the *Wildlife Act*, will require establishing adequate buffers under the direction of an appropriately qualified professional.
 - Fish and amphibian salvage works must be completed within any wetted area prior to construction of the dikes, and these areas must remain isolated to prevent reintroduction of fish or amphibians to the active work site(s). All salvage works must occur under the appropriate permits. It is our understanding that BC Hydro has made application for an amphibian salvage permit.
- In the event that works associated with the dike construction cannot remain compliant with the more stringent BC Water Quality Guidelines as described in the EPP, works will immediately cease until such time as a Total Suspended Solids monitoring program can be developed as described in the *Fisheries Act* Application for Authorization.
- Confirmation that the appropriate notifications have been made to Aboriginal Groups, as per the Aboriginal Group Communication Plan appended to the CEMP, must be provided in advance of construction.

Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, Conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.



Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC1A for the works associated with the Right Bank Sidechannel Closure.

Yours truly,

[Redacted signature block]

R.P.Bio.

Independent Environmental Monitor

- cc. [Redacted] Water Management Branch, Engineer
- [Redacted] BC Hydro, Environment Manager
- [Redacted] BC Hydro, Regulatory Manager



[REDACTED]

08 June 2016

[REDACTED], P.Geo.
Water Management Officer
Ministry of Forests, Lands and Natural Resource Operations
[REDACTED]

Dear [REDACTED]

**Site C Clean Energy Project - Conditional Water Licence 132990
Leave to Construct LTC #1B – Left Bank Excavation Benches 5 & 6**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to start construction of the Left Bank Excavation Benches 5 & 6, which is part of one of the works authorized under LCC #1. Most of the excavated material would be moved to Relocated Surplus Excavated Material area RSEM L3. The proposed works would be the first component of construction by [REDACTED]

[REDACTED] For reference, these works are to be authorized under *Leave to Construct LTC #1B*.

2.0 DESCRIPTION OF THE WORKS

The natural high overburden slope located above the left abutment of the proposed earthfill dam is to be cut back to a lower angle to improve its long term static and seismic stability. Excavation of the left bank overburden slope must be completed before the portal excavations for the diversion tunnels can be started on the underlying bedrock abutment. A road that will be incorporated into the left bank excavation slope would provide future maintenance access and is also intended to be a post-seismic access route to the future dam.

An initial portion of the upper left bank excavation, located on land owned by BC Hydro, was completed during 2015-16 as part of the Site C Early Works. The excavated material was moved to RSEM L3, which was authorized by Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) under Section 9 Approval A703714 dated 06 July 2015. That Approval did not require an IE, but did require an Independent Environmental Monitor (IEM). Accordingly, the Site C IEM has monitored the progress of construction of RSEM L3 to date and has reported to the MFLNRO Regional Water Manager on the observed compliance with the environmental requirements.

RSEM L3 infills the upstream end of a natural ravine with an ephemeral creek that drains into the Peace River about 3.5 km downstream of the proposed dam axis. Prior to placing material, an underdrain was installed along the original base of the ravine to maintain drainage of the upstream area under the RSEM L3 fill.

[REDACTED]

Initial versions of the above documents were reviewed by the IE and by the IEM as applicable to the roles of each party. BC Hydro subsequently provided responses to the IE and IEM (item 11 above), and in some cases updated the applicable documents.

As noted above, RSEM L3 is authorized under a Section 9 Approval and is not a component authorized by the Conditional Water Licence. However, considering that some of the material from the left bank excavation will be moved to RSEM L3 and that non-contact water will be diverted into the L3 ravine, BC Hydro has provided the following documents for information:

- 12. [REDACTED]
- 13. [REDACTED]

4.0 REVIEW OF SUBMISSIONS

4.1 Construction Drawings

The drawings provided have been sealed by Professional Engineers registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis and the conditions of Conditional Water Licence 132990.

4.2 Construction Implementation Plan and Schedule

[REDACTED] intends to excavate benches nos. 5 and 6 from the top down, in a single stage extending to the final [REDACTED]

[REDACTED]

[REDACTED]

The IE considers the construction methodology to be appropriate to the work and that the schedule is reasonable.

4.3 Quality Management

[REDACTED]

4.4 Management and Care of Water

[REDACTED]

[REDACTED] Water Plan provides details of plans for collection and management
[REDACTED]

[REDACTED]

4.5 Environmental Protection

The IE has discussed the work with the IEM and both parties are familiar with the area where the left bank excavation is to be constructed.

The IEM has provided the IE with comments and recommendations on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED]. – *Site C Clean Energy Project – Conditional Water Licence C132990 Independent Environmental Monitor Review of the Left Bank Excavation EPP and Relevant Component Plans in Consideration of LTC1B*, letter to [REDACTED] dated 08 June 2016.

As summarized in the above letter, the IEM has reviewed [REDACTED] and has noted several outstanding comments that have not yet been addressed. BC Hydro and [REDACTED] have committed to addressing those comments in an updated version of the EMP by 16 June 2016, which will comply with LCC #1.

[REDACTED]

The IEM has also noted a number of details that have not yet been fully addressed by the [REDACTED]

4.6 Safety

In its earlier submission for LCC #1, BC Hydro indicated that it was in compliance with all of the conditions of Environmental Assessment Certificate #E14-02 that applied to the then-current status of the project. EAC conditions nos. 35 and 38 require BC Hydro to prepare a Traffic Management Plan and a Public Safety Management Plan, and to submit those plans to various external agencies, local communities and Aboriginal communities. BC Hydro indicated that its Construction Safety Management Plan (CSMP) dated 05 June 2015 included both of those required plans and met the requirements of the EAC conditions.

With respect to construction safety, BC Hydro's CSMP (Section 5.3) requires that each prime contractor for the Site C project must conduct a public safety risk assessment and implement appropriate mitigation measures. It is also noted that Contractor Public Safety Management Plans will be provided to Aboriginal groups and to local and regional governments for information.

[REDACTED]

[REDACTED]

4.7 RSEM Area L3

[REDACTED]

Although RSEM L3 is not a component of the works authorized by the conditional water licence, these documents are relevant to understanding the overall water management infrastructure for construction of the north bank components of the Main Civil Works.

These documents were not reviewed in detail, but the IE notes that they include the same types of information as other similar documents for other components of the Main Civil Works and that RSEM L3 will be integrated into the north bank construction water management infrastructure.

The IEM will be reviewing the EPP as per the process outlined in the CEMP and will continue to report to the MFLNRO Regional Water Manager on the observed compliance with the environmental requirements for RSEM L3 in accordance with Section 9 Approval A703714.

[REDACTED]

23 June 2016

[REDACTED]
Engineer under the Water Sustainability Act
Ministry of Forests, Lands and Natural Resource Operations
[REDACTED]

Dear [REDACTED]

**Site C Clean Energy Project - Conditional Water Licence 132990
Leave to Construct LTC #1C – Right Bank Drainage Tunnel Portal**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to start construction of the Right Bank Drainage Tunnel Portal, which is part of one of the works authorized under LCC #1. The proposed works would be constructed by [REDACTED]. For reference, these works are to be authorized under *Leave to Construct LTC #1C*.

The tunnel portal works included in this LTC are required to provide stable and safe access for constructing the underground works. It is intended that construction of the underground works for the tunnel will be authorized under a separate future LTC, once [REDACTED] has received Worksafe BC approval for the design of the underground ventilation system.

Following completion of the underground works, a permanent tunnel access structure will be constructed at the portal, consisting of a Structural Plate Corrugated Steel Pipe (SPCSP) embedded in compacted backfill. Construction of the SPCSP works will be authorized under a future LTC.

2.0 DESCRIPTION OF THE WORKS

The Right Bank Drainage Tunnel will be approximately 975 m long and will be constructed within the shale bedrock below the proposed roller-compacted concrete (RCC) buttress. The tunnel and drain holes to be drilled from it will provide drainage of the bedrock foundation of the RCC structure. The tunnel will also house instrumentation which will serve as a tool to assess the behaviour of the RCC buttress foundation during construction and later, to monitor long term performance of the buttress. It is intended that the tunnel is to be completed prior to excavating the foundation for the RCC buttress, in order to gain the maximum benefit of pre-draining the foundation and to establish instrument baseline readings before the foundation excavation is started.

The tunnel is to be constructed in a single heading starting from a portal to be located on the south side of the existing right bank side channel, on the southern side of the future RSEM area R6. The portal will be constructed by excavating a notch into the natural slope, through the existing overburden and

[REDACTED]

colluvium cover and into the bedrock. The final portal excavation will be up to about 25 m high and will consist of shale overlain by overburden, all of which will be supported with rock anchors and shotcrete.

Some of the natural material to be excavated at the portal is shale, which is potentially acid generating (PAG). A suitable RSEM area for PAG materials is not yet available. [REDACTED]

3.0 LTC #1C SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #1C:

1. BC Hydro - *Site C Clean Energy Project Request for Leave to Construct – Right Bank Drainage Tunnel (LTC-1C)*, letter from [REDACTED] 19 May 2016.
2. BC Hydro [REDACTED] – *Issued for Construction Drawings*- see Table 1.
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. BC Hydro - *Site C Right Bank Drainage Tunnel Surface Works Water Management*, letter from [REDACTED] 01 June 2016.

4.0 REVIEW OF SUBMISSIONS

4.1 Construction Drawings

The drawings provided include details for both the right bank drainage tunnel and its portal. All of the drawings have been sealed by Professional Engineers registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis and the conditions of Conditional Water Licence 132990.

As noted below, Issued for Construction drawings of temporary water management infrastructure for the tunnel portal works have not yet been received.

4.2 Construction Implementation Plan and Schedule

All of the facilities for construction of the tunnel portal will be located within the footprint of the future RSEM area R6. Access to the tunnel portal will be across the existing right bank side channel. The proposed tunneling laydown work area would be constructed adjacent to the tunnel portal and would also infill part of the side channel. Construction of three dikes at the upstream end of the side channel and salvage of fish within the channel were previously authorized under LTC #1A. Two of the dikes have since been completed and the third is currently under construction. It is intended that the fish salvage will be

completed prior to infilling a portion of the side channel for construction of the access to the tunnel portal and the adjacent laydown area.

█ plans to construct the portal from the top down. Access to the top of the slope will be gained by constructing a temporary ramp across the existing right bank side channel and against the existing natural slope. From the top of the access ramp, the upper portion of the portal excavation will be completed to the final outline, and shotcrete and rock dowels will be installed. Excavation and installation of ground support will then progress downwards, by incrementally removing the access ramp to provide benches for equipment and labour to work from. This process will be repeated until the full portal excavation has been constructed.

█

The IE considers the construction methodology to be appropriate to the work and that the schedule is reasonable.

4.3 Quality Management

█

4.4 Management and Care of Water

█ to divert any surface water from the area upslope of the portal (defined as “non-contact water”) away from the excavation. Surface water within the limits of the excavation (defined as “contact water”) is to be collected and conveyed via ditches to a nearby temporary sediment pond.

The temporary PAG stockpile will be constructed on a low permeability layer of compacted soil, with a surrounding ditch to collect and divert any runoff into the temporary sediment pond. The temporary PAG stockpile and all contact water management works will be located within the footprint of the future RSEM area R6.

█

█ However, BC Hydro and Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) have not yet finalized water quality criteria and monitoring requirements for the Site C project. In the interim, █ implement a “zero discharge” approach to the right bank tunnel portal construction, with all contact water to be collected and transported off-site to a recognized water disposal facility, rather than being discharged into the river.

BC Hydro has advised that for the zero-discharge design, the temporary sediment pond and all ditches will have low permeability linings. The sediment pond system will be designed in accordance with MELP (2015) guidelines, and will be able to safely withstand the peak flow resulting from the 1 in 200-year, 24-hour rainfall event while maintaining 500 mm of freeboard, or alternatively by isolating the pond with a berm

█

to provide additional storm storage containment. The pond will be designed to contain the 100-year 24-hour runoff and will be protected against the 10-year flood level in the Peace River. Water collected in the pond is to be transported offsite by truck to an appropriate disposal facility.

The IE considers that water management works constructed and operated in accordance with these criteria will pose a low risk to the environment.

4.5 Environmental Protection

The IE has discussed the work with the IEM and both parties are familiar with the area where the right bank drainage tunnel portal is to be constructed.

The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – Site C Clean Energy Project – Conditional Water Licence 132990
IEM review of the Right Bank Drainage Tunnel EPP for works associated with the portal construction and relevant component plans in consideration of LTC#1C, [REDACTED]
[REDACTED] 23 June 2016.

The IEM has listed several requirements and the relevant timing for their completion. The IEM has also identified a number of revisions that are required to the Environmental Protection Plan (EPP) and/or Care of Water (CoW) Plan. In advance of BC Hydro/[REDACTED] providing a revised EPP and/or CoW Plan, the IEM will accept a memo that provides responses to the outstanding comments on those documents.

4.6 Safety

5.0 LEAVE TO CONSTRUCT

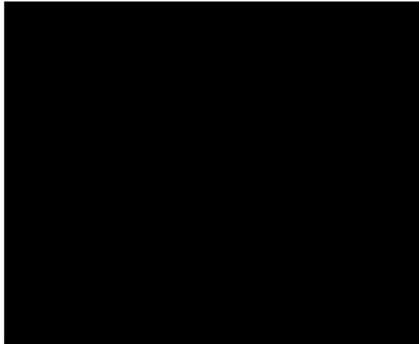
By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the Right Bank Drainage Tunnel Portal. For reference, this permission is referred to as *Leave to Construct LTC #1C*.

Leave to Construct LTC #1C for the Right Bank Drainage Tunnel Portal is subject to the following conditions:

1. BC Hydro and/or its contractor [REDACTED] must comply with the terms listed in the *IEM Requirements* section of the above-noted IEM letter dated 23 June 2016;
2. The water management system for contact water is to be designed for zero discharge to the Peace River as described above. All contact water is to be collected and transported to an appropriate off-site disposal location, unless otherwise approved by MFLNRO.

3. The water management system for the portal works, including the contact water collection facilities, the temporary PAG stockpile and the temporary sediment pond, must be constructed before any PAG materials are exposed in the portal excavation. Construction of the water management system must not proceed until the issued for construction drawings and supporting design information have been submitted to and accepted by the IE.
4. Construction of the right bank drainage tunnel underground works must not proceed until authorized by an LTC for those works.
5. BC Hydro and/or its contractor must obtain and comply with any necessary permits from other provincial and/or federal regulatory agencies.

Yours truly,

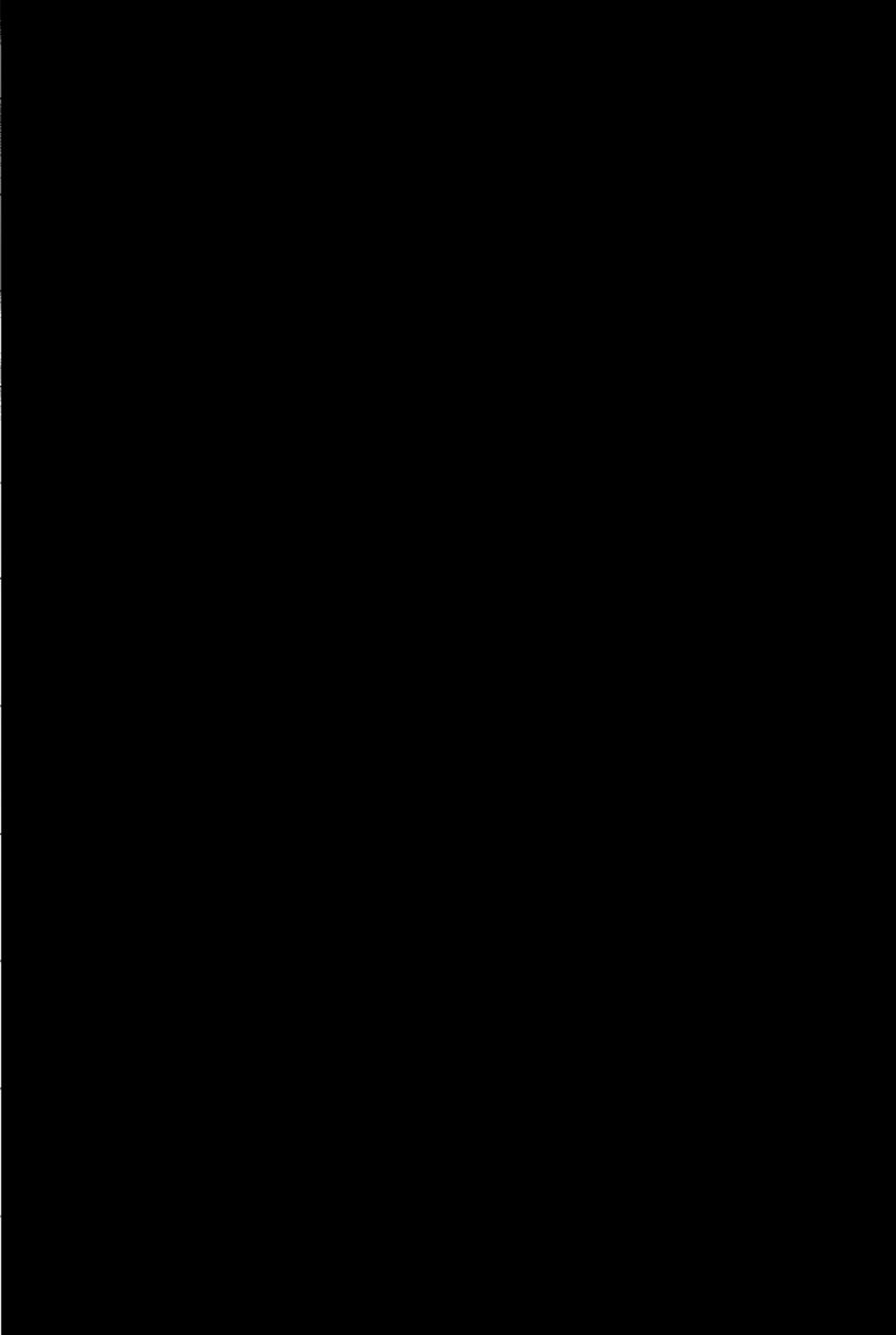


 P.Eng.
Independent Engineer, Site C Clean Energy Project

Attachment: IEM letter dated 23 June 2016

- c:  BCH VP & Project Director (Site C Licensee Representative)
 (Site C Design Engineer)
 BCH (Site C Construction Engineer)
 (Environment, Aboriginal Relations and Public Affairs Director)
 BCH (Regulatory Manager)
 Independent Environmental Monitor

TABLE 1 - LTC #1C – Right Bank Drainage Tunnel Portal – Issued for Construction Drawings

Drawing No.	Revision	Title
		



[REDACTED]

[REDACTED]

June 23, 2016

[REDACTED]

[REDACTED]

Attention: [REDACTED] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Right Bank Drainage Tunnel EPP for works associated with the portal construction and relevant component plans in consideration of LTC#1C

The first Leave to Commence Construction (LCC#1) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of five key components consisting of:

- Right Bank Drainage Tunnel
- Right Bank Sidechannel Closure Dikes
- Left Bank Excavation
- Moberly River Construction Bridge
- Adit and Borehole infilling

Each of these components require individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the works associated with the Right Bank Drainage Tunnel (RBDT) portal which is a component of LTC#1C. Future works associated with the RBDT beyond that described for the portal, will occur under a separate LTC.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]



The IEM has reviewed the EPP provided by [redacted] and relevant component plans including but not limited to the Environmental Management Program (EMP). The review included cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, authorizations and drawings received and reviewed by the IEM, which are related to LTC#1C.



- [redacted]

BC Hydro Plans/Documents

- CEMP, dated April 7, 2016.
- Construction Safety Management Plan (CSMP), dated June 5, 2015.
- Letter from [redacted] - Site C Right Bank Drainage Tunnel Surface Works Water Management, dated June 1, 2016.

Provincial Permits/Approvals

- Conditional Water Licence 132990.
- Conditional Water Licences 132990 and 132991 Leave to Commence Construction No. 1 (April 1, 2016).
- Approval A703710 – Short Term Use issued under the *Water Act*.



- Licence No.: 815646 issued under the *Land Act*.

Federal Permits/Authorizations

- *Fisheries Act* Authorization 15-HPAC-00170

An initial review of the EPP and supporting documentation for the works was conducted and comments were provided to BC Hydro.

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans were provided as required.

It is our understanding that works under this LTC are to include the following:

- Establishment of RBDT facilities area including site offices, waste storage, materials and fuel storage.
- Construction of an access ramp across the southbank side channel.
- Establishment of a temporary Potentially Acid Generating (PAG) stockpile and temporary sediment pond using a “zero discharge” approach for contact water (as described in the CEMP) to be collected and transported to an appropriate off-site waste disposal facility. The temporary pond may also be used to collect contact water from the portal works, in addition to the temporary PAG pile. The PAG pile, temporary sediment pond and associated ditches will be constructed of low permeability linings.
- Excavation of the portal surface.
- Removal of material from the portal surface to a temporary PAG pile.
- Application of shotcrete to the portal surface and related portal materials.

The IEM also notes that the southbank side channel has been cut off as per LTC#1A by a temporary sandbag structure, with permanent works associated with Dike #1 underway. Dikes #2 and #3, mid-island have been completed. Works are ongoing for the purpose of fish salvage within the isolated area.

IEM Requirements

Upon review of the submitted documents for RBDT portal works and related correspondence, the IEM has identified a number of items requiring revision within the EPP and/or COW plans. In the interim, the IEM will accept a response memo to the comments provided June 10, 2016 in advance of a revised EPP, however the responses must provide a degree of clarity as to the intended action.

- This response memo must be provided to the IEM prior to commencement of any work which may result in the management of contact waters or any instream works, such as the construction of the southbank side channel access ramp.

The revised EPP/COW Plan (as appropriate) must be provided in advance for review and acceptance by the IEM prior to initiating any works associated with the temporary sediment pond, PAG pile, ditches and related water management strategies for the site which will result in the collection of water and/or waste water products resulting from the works. These revisions must include the following:

- Accepted design drawings (as provided to the Independent Engineer) for the temporary sediment pond, temporary PAG pile and related water management systems for all associated portal works.
- Construction and operational procedures for the temporary pond based on final design, including identification of any relevant mitigation measures related to erosion and sediment control and details regarding water management associated with the portal works.
- A clear description of the work within the appropriate documents based on the current scope, with removal of all unrelated elements such as reference to discharge to RSEMs or directly to the Peace River.
- Confirmation that water quality compliance criteria will be as per BC Water Quality Guidelines for Aquatic Life for activities within the southbank side channel and any other discharge of non-contact waters.

Furthermore, the IEM requires that:

- Prior to initiating any works within the southbank side channel, confirm with the appropriate parties that the fish and amphibian salvage has been completed within the activity footprint. This confirmation is to also be provided to the IEM in writing prior to starting works associated with the access ramp.
- Given the presence of water within the southbank side channel and potential for fish adjacent to the work area, the IEM believes that the ramp construction be considered a high risk activity if water is present at the time of construction, and as such requires monitoring at the 100% level for this phase of the work.
- Confirmation is to be provided to the IEM within **7 days** of the issuance of this letter that those First Nations identified in the Aboriginal Group Communication Plan of the CEMP have been appropriately notified of the works.

Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC#1C for the works associated with the RBDT portal.

Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Right Bank
Drainage Tunnel EPP for works associated with the portal construction and relevant component
plans in consideration of LTC#1C
Jun 23, 2016

Yours truly,

Original copy signed.

[REDACTED] R.P.Bio.
Independent Environmental Monitor

cc. [REDACTED] Water Management Branch, Engineer
[REDACTED] BC Hydro, Manager, Project Environmental Risk Management
[REDACTED] BC Hydro, Regulatory Manager

[REDACTED]

11 July 2016

[REDACTED], P.Geo.
Water Management Officer
Ministry of Forests, Lands and Natural Resource Operations
[REDACTED]

Dear [REDACTED]:

**Site C Clean Energy Project - Conditional Water Licence 132990
Leave to Construct LTC #1D – Right Bank Shoreline Erosion Protection Works**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to start construction of the Right Bank Shoreline Erosion Protection Works, which is part of one of the works authorized under LCC #1. BC Hydro's contractor for the proposed works would [REDACTED]. For reference, these works are to be authorized under *Leave to Construct LTC #1D*.

Similar shoreline erosion protection works could be required at other project locations in the future, and would be authorized under separate LTCs.

2.0 DESCRIPTION OF THE WORKS

The proposed works comprise two sections of shoreline erosion protection works along the south bank of the Peace River, approximately 210 m and 700 m long respectively. The shorter section is located just upstream of the existing Peace River construction bridge and would protect a section of eroding shoreline adjacent to the future RSEM R6 starter dike. The longer section is located several hundred metres upstream, adjacent to the downstream end of the future right bank Stage 1 cofferdam.

The erosion protection will consist of a layer of riprap, placed on a bedding/filter layer, on a prepared slope. Depending on the level of the Peace River at the time of construction, the lower portion of the shoreline protection works may be constructed in water.

3.0 LTC #1D SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #1D:

1. BC Hydro - *Site C Clean Energy Project Request for Leave to Construct – South Bank Shoreline Erosion Protection Works (LTC 1D)*, letter from [REDACTED], 26 May 2016.
2. BC Hydro – *Issued for Construction Drawings*:
 - a. Dwg. 1020-C11-00412 R0: Right Bank – Excavation, Emergency Erosion Protection, Plan & Section.

[REDACTED]

-
- b. Dwg. 1020-C11-00413 R0: Right Bank - Shoreline Protection, Erosion Protection, Plan & Sections.
3. BC Hydro - *Site C Clean Energy Project, Emergency Riverbank Erosion Protection, Technical Specifications and Inspection and Test Plan, 20 May 2016.*
 4. [REDACTED]
 5. [REDACTED]
 6. [REDACTED]
 7. BC Hydro - *Site C Clean Energy Project - Request for Leave to Construct South Bank, South Bank Shoreline Erosion Protection Works (LTC 1D), BC Hydro Responses to IE Comments/Questions, on Documents Submitted via Sharepoint on 26 May 2016, 14 June 2016.*

Initial versions of the above documents were reviewed by the IE and by the IEM as applicable to the roles of each party. BC Hydro subsequently provided responses to comments and questions (item 7 above), and in some cases updated the applicable documents.

4.0 REVIEW OF SUBMISSIONS

4.1 Technical Specifications and Construction Drawings

The technical specifications provide the requirements for construction materials and implementation of the work. The specifications are typical for earthworks of this type.

The drawings provided show plans and sections of the proposed shoreline protection works. The drawings have been sealed by a Professional Engineer registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis and the conditions of Conditional Water Licence 132990.

4.2 Construction Implementation Plan and Schedule

[REDACTED] plans to excavate the river shoreline to the design profile, followed by installation of a geotextile filter and riprap. Where required, locally eroded areas will be backfilled with granular bedding material before placing the geotextile filter. To minimize the potential for erosion, any riverbank excavation or fill is to be protected by riprap within the same work shift. The work will be performed with conventional earthmoving equipment.

Riprap will be sourced from the Wuthrich Quarry. Granular aggregate will be hauled from a stockpile on the north bank.

Any surplus excavated materials will consist of natural alluvial materials and will be temporarily stockpiled within RSEM area R6 at least 15 m from any drainage or watercourse.

The estimated duration of construction is 33 days. The IE notes that BC Hydro has advised that increased river flows from tests at the upstream Peace Canyon Dam are anticipated on 26 July 2016. Those

temporary higher flows may influence the sequencing of construction activities to complete the shoreline protection works.

The IE considers the construction methodology to be appropriate to the work and that the schedule is reasonable.

4.3 Quality Management

The Inspection and Test Plan includes several standard tests to confirm material properties and inspection hold points for verification of installation details.

This Plan is consistent with the typical requirements for work of this nature.

4.4 Environmental Protection

The Environmental Protection Plan (EPP) includes details, procedures and methods that would generally be expected for construction work of this nature, carried out near or partially in water. In particular, the work is to be carried out to minimize the potential for erosion and release of sediment into the river.

The IE has discussed the work with the IEM and both parties are familiar with the area where the shoreline protection works are to be constructed.

The IEM has provided the IE with comments and recommendations on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – *Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Shoreline Protection EPP and relevant component plans in consideration of LTC#1D, [REDACTED] dated 11 July 2016.*

The IEM has listed several requirements for these works that BC Hydro and/or the contractor must comply with.

4.5 Safety

The Construction Safety Plan is comprehensive and includes details, procedures and methods that would generally be expected for construction work of this type. The Plan includes a Public Safety Management Plan which describes procedures for identifying and addressing potential public safety hazards.

5.0 LEAVE TO CONSTRUCT

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the Right Bank Shoreline Erosion Protection Works. For reference, this permission is referred to as *Leave to Construct LTC #1D*.

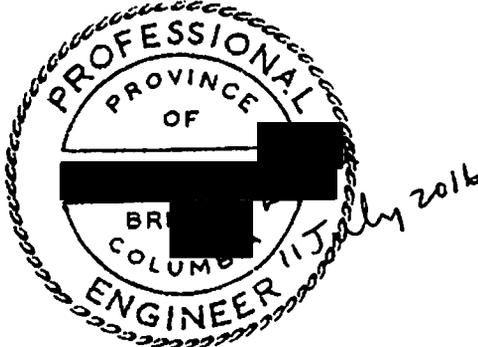
Leave to Construct for the Right Bank Shoreline Erosion Protection Works is subject to the following conditions:

1. BC Hydro and [REDACTED] must comply with the terms listed in the *IEM Requirements* section of the above-noted IEM letter dated 11 July 2016. In particular, the Severity of Ill Effects (SEV) approach for monitoring turbidity in the Peace River must be provided to the IEM before instream/in water works commences, and
2. BC Hydro and/or its contractor must obtain and comply with any necessary permits from other provincial and/or federal regulatory agencies.

As noted by the IEM, construction of RSEM R6 has not yet been authorized by an LTC. If any surplus excavated material from the shoreline protection works needs to be stored within the footprint of RSEM R6, such storage will be considered temporary, recognizing that temporarily stored materials may be subject to removal or reconfiguration once construction of RSEM R6 is authorized.

Yours truly,

[REDACTED]



[REDACTED]

Independent Engineer, Site C Clean Energy Project

Attachment: IEM letter dated 11 July 2016

- c: [REDACTED] BCH VP & Project Director (Site C Licensee Representative)
[REDACTED] (Site C Design Engineer)
[REDACTED] BCH (Site C Construction Engineer)
[REDACTED] (Environment, Aboriginal Relations and Public Affairs Director)
[REDACTED] BCH (Environmental/Regulatory)
[REDACTED] Independent Environmental Monitor

[REDACTED]

[REDACTED]

[REDACTED]

July 11, 2016

[REDACTED]

[REDACTED]

Attention: [REDACTED] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Shoreline Protection EPP and relevant component plans in consideration of LTC#1D

The first Leave to Commence Construction (LCC#1) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of six key components consisting of:

- Right Bank Drainage Tunnel
- Right Bank Sidechannel Closure Dikes
- Left Bank Excavation
- Moberly River Construction Bridge
- Adit and Borehole infilling
- Erosion Protection as needed

Each of these components requires individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the works associated with a component of erosion protection works along the right (south) bank of the Peace River and identified as a LTC#1D.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]



The IEM has reviewed the EPP provided by [REDACTED]. The review included cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, authorizations and drawings received and reviewed by the IEM, which are related to LTC#1D.

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

BC Hydro Plans/Documents

- *CEMP*, dated April 7, 2016.
- *Construction Safety Management Plan (CSMP)*, dated June 5, 2015.
- E-mail provided by [REDACTED], BC Hydro (July 8, 2016) summary of communications with Fisheries and Oceans Canada and self-assessment approach.

Provincial Permits/Approvals

- Conditional Water Licence 132990.
- Conditional Water Licences 132990 and 132991 Leave to Commence Construction No. 1 (April 1, 2016).
- Approval A703710 – Short Term Use issued under the *Water Act*.
- Licence No.: 815646 issued under the *Land Act*.

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans were provided as required.

It is our understanding that works under this LTC are to include the following:

- Pull back of the existing bank to a suitable slope.
- Keying in and placement of a rip rap protected surface that will mimic adjacent bank slopes.
- Rip rap will be placed individually to ensure appropriate positioning.



Furthermore, the contractor has proposed the use of the Severity of Ill-Effects (SEV) approach for monitoring turbidity in the Peace River during instream work elements. This procedure was described in the DFO Application of Authorization, prepared by BC Hydro (February 23, 2015) and formed the basis of previously authorized works under *Fisheries Act* Approval 2015-HPAC-00170 and *Water Act* Approval A703715. These shoreline protection works are not a component of either of these approvals, however, are regulated under Conditional Water Licence 132990. It is our understanding that BC Hydro will make their data loggers available to the contractor for the duration of the works for monitoring of turbidity values at the compliance point.

Based on the information provided, BC Hydro has also concluded through the self-assessment process, that the works do not require approval under the *Fisheries Act*.

The IEM understands that there may be a requirement to temporarily stock pile material within RSEM R6 resulting from the bank pull back. Any temporary stockpile must be a minimum of 15 m from the top of bank or other ditch/drainage with the potential to convey water in addition to other appropriate mitigation measures to reduce the potential for erosion and/or sedimentation. These temporarily stockpiled materials may be subject to removal/reconfiguration once the LTC is issued for RSEM R6.

As a note, the IEM is aware of the presence of active swallow nests in and around the proposed work area, in addition to a number of other actively nesting bird species adjacent to other right bank works.

IEM Requirements

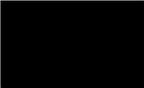
Upon review of the submitted documents for LTC#1D, and based on communications and information provided by BC Hydro and the contractor, the IEM identified a number of items requiring revision within the EPP and/or COW plans. The majority of these comments have been addressed in the EPP (Revision 5) provided to the IEM on July 8, 2016.

The IEM accepts the use of the SEV approach to turbidity monitoring for this specific work element, based on the information provided, scope of work and perceived level of risk. The IEM also acknowledges that BC Hydro will make available to the contractor their data loggers at the compliance point. It is our understanding that at this point in time, the contractor has not fully completed the development of their SEV monitoring tools for implementation of the field program. It is the requirement of the IEM that:

- Until such time as the SEV monitoring approach for in situ data collection is provided, there will be no instream/in water works.
 - This must be provided to the IEM for review and acceptance.

Once the SEV monitoring approach has been accepted by the IEM, the IEM will require that:

- Data collected at the compliance point for the monitoring of turbidity as per the SEV model will be made available by BC Hydro to the contractor daily basis (end of each day) at a minimum, or more frequently if possible.



- Compliance point data and in situ data collected by the contractor will be provided to the IEM on a daily basis.

Furthermore,

- No materials may be stored within RSEM R6 until such time as an LTC is issued for the work.
- Ensure that the QEP confirms that there are no active bird nests within the work zone, and that other pre-clearing sweeps for potential wildlife resources have been completed.

The IEM also requires that the contractor recognize that as per the Site C DFO Application for Authorization (February 23, 2015), which describes the SEV program requirements, “project sediment releases must not cause the 30-day SEV index to exceed 9.0. However, if SEV 9.0 is exceeded under background conditions, up to 10% of the background TSS concentration may be released by Project works, provided that SEV 10.0 is not exceeded”.

Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC#1D for the works associated with shoreline protection as described.

Yours truly,

[Redacted signature]

Original copy signed.

[Redacted name]

Independent Environmental Monitor

cc. [Redacted], Water Management Branch, Engineer
[Redacted], Manager, Project Environmental Risk Management
[Redacted], Senior Environmental Coordinator

[Redacted]

14 December 2016

[Redacted] P.Eng.
[Redacted]

Ministry of Forests, Lands and Natural Resource Operations

[Redacted]
Via email: [Redacted]

Dear [Redacted]:

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #1D – Right Bank Shoreline Erosion Protection Works
Amendment #1 – Additional Right Bank Stage 1 Cofferdam Shoreline Erosion Protection Works**

Right Bank Shoreline Erosion Protection Works were authorized by Leave to Construct LTC #1D dated 11 July 2016. The authorized works comprised two sections of shoreline erosion protection along the south bank of the Peace River, approximately 210 m and 700 m long respectively. The shorter section is located just upstream of the existing Peace River construction bridge and protects a section of shoreline adjacent to the RSEM R6 starter dike. The longer section is located several hundred metres upstream, adjacent to the downstream end of the right bank Stage 1 cofferdam.

BC Hydro's contractor for the authorized shoreline protection works was [Redacted]. It was intended that both sections of shoreline protection would be completed prior to the start of construction of the right bank Stage 1 cofferdam and RSEM R6 [Redacted]. However, due to nesting birds in the work area, [Redacted]

Construction of the right bank Stage 1 cofferdam [Redacted] was authorized by LTC #3A dated 26 July 2016. The authorized works included shoreline erosion protection along the upstream end of the cofferdam, which has been completed. It has been intended by BC Hydro that [Redacted]. The IE understands that [Redacted]

Peace River flows have recently increased due to releases from the upstream power plants and BC Hydro has determined that some erosion is occurring in the unprotected sections and along the toe of previously-completed sections. BC Hydro now considers that the shoreline protection along the cofferdam needs to be completed on a priority basis, and that the toe of the riprap protection should be extended further into the river at the same time.

The Independent Engineer (IE) considers the expanded footprint of the shoreline protection works to be a material change from the construction plans originally submitted for LTC #1D. The proposed works will also require construction activities adjacent to and in the Peace River, which will require diligent environmental management.

[Redacted]

The IE and the Independent Environmental Monitor (IEM) have received the following information from BC Hydro regarding the additional erosion protection works:

1. BC Hydro - *Site C Clean Energy Project Request for Amendment to LTC1D and LTC3A for Additional Shoreline Erosion Protection Works along Right Bank Cofferdam*, letter from [REDACTED] [REDACTED] 13 December 2016.
2. BC Hydro – *Drawing SK-627: Right Bank Shoreline Protection, Application for Amendment to LTC#1D and 3A, Plan*, 12 December 2016.
3. BC Hydro – *Issued for Construction Drawing 1020-C11-00415: Right Bank Shoreline Protection, Erosion Protection, Plan and Sections - Sheet 2, R0*.
4. [REDACTED]
5. BC Hydro - *Self-assessment under DFO process for completion of south bank erosion protection*, internal memorandum [REDACTED], 13 December 2016.

BC Hydro's drawing SK-627 shows four local sections of previously-authorized, uncompleted shoreline protection works, as well as the extent of the proposed additional works along the right bank Stage 1 cofferdam [REDACTED]

The Issued for Construction drawing provided has been sealed by a Professional Engineer registered in British Columbia. The drawing indicates that the additional riprap to be placed along the shoreline will extend further into the river by up to about 4 m horizontally and with a height of up to about 2.1 m. Depending on local topography, the toe of the extended riprap will vary between approximately El. 408 m to 413 m. The outer slope of the riprap will typically be at about 2H:1V. The riprap will be sandstone from Wuthrich quarry, which is being widely used for erosion protection across the project site.

The construction method described in the EPP Addendum indicates that access to place the riprap will be created by initially constructing a riprap toe berm wide enough for an excavator along the cofferdam, starting from either end. Once the toe berm is placed, the excavator will then work back towards the end of the cofferdam, removing the toe berm and placing that riprap on the outer slope in accordance with the design. [REDACTED] BC Hydro expects that the Peace River level could range from El. 410.0 m to 412.5 m during December, so at least some of the works will be constructed in water.

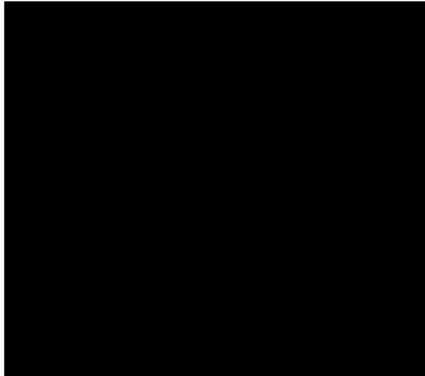
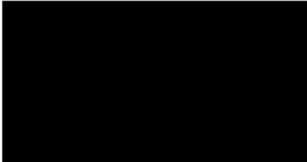
BC Hydro has performed a self assessment of the potential effects on fish and fish habitat and has concluded that this work, following the measures in the CEMP, will not result in serious harm or require further review by the Department of Fisheries and Oceans for construction. BC Hydro has also advised that the proposed works will not extend into the navigable portion of the river and do not require further review by Transport Canada. The necessary warning signs upstream and downstream of the project construction site are already in place.

The IE has discussed the work with the IEM and both parties are familiar with the proposed work area. As summarized in the attached letter the IEM is satisfied that the EPP Addendum, in addition to supporting documentation provided, appropriately addresses the proposed works. Both parties consider that the proposed works are consistent with the conditions of Conditional Water Licences 132990 and 132991 and with BC Hydro's CEMP (R4, 27 July 2016).

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the additional right bank Stage 1 cofferdam shoreline erosion protection works adjacent to the area previously authorized by LTC #1D dated 11 July 2016. For reference, this permission is referred to as *Leave to Construct LTC #1D, Amendment #1*.

Please note that a separate authorization is being issued for construction of the additional right bank Stage 1 cofferdam shoreline erosion protection works adjacent to the area previously authorized by LTC #3A dated 26 July 2016.

Yours truly,

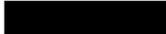
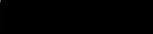


December
2016

 P.Eng.

Independent Engineer, Site C Clean Energy Project

Attachment: IEM Letter dated 14 December 2016

- c:  FLNRO Water Management Officer
-  BCH VP & Project Director (Site C Licensee Representative)
-  SNC Lavalin (Site C Design Engineer)
-  BCH (Site C Construction Engineer)
-  BCH (Environment, Aboriginal Relations and Public Affairs Director)
-  BCH (Regulatory Manager)
-  Independent Environmental Monitor



[Redacted]

December 14, 2016

[Redacted]

Attention: [Redacted] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Right Bank Cofferdam EPP Addendum for Emergency Riprap Placement under LTC#3A and LTC#1D

[Redacted]

BC Hydro is requesting approval for additional riprap protection works along the right bank of the Peace River, adjacent to the right bank coffer dam and RSEM area R6. Significant components of these shoreline protection works were completed in the summer of 2016 under LTC#1D, under a separate contract, but were not fully constructed due to the presence of nesting birds. [Redacted]

As a result of high winter flows, erosion concerns have resulted in an immediate need to complete armouring works along the south bank of the Peace River. In some areas, this will be restricted to the completion of works previously authorized under LTC#1D. In other areas, additional riprap will be added, or the toe extended into the river beyond that originally proposed/constructed. Immediate armouring work will now be undertaken by [Redacted] and will be conducted as per [Redacted]

BC Hydro has confirmed through the self-assessment process that the works will not result in serious harm to fish and fish habitat as proposed, and as such do not require any further review by the Department of Fisheries and Oceans [Redacted]. BC Hydro has also confirmed that *Navigation Protection Act* requirements have been met, as the proposed works will not extend into the navigable portion of the river [Redacted]

Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

[Redacted]



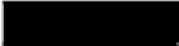
Based on our understanding of the works proposed, and provided the works as described are acceptable to the Independent Engineer, we have no objections to your issuance of an amendment to LTC#3A and LTC#1D for the works associated with shoreline protection as described.

Yours truly,



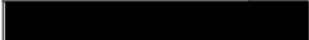
Independent Environmental Monitor

cc.

 Water Management Branch, Manager of Water Allocation

 Water Management Branch, Engineer

 BC Hydro, Manager, Project Environmental Risk Management

 BC Hydro, Senior Environmental Coordinator



[REDACTED]

26 July 2016

[REDACTED], P.Geo.
Engineer under the Water Sustainability Act
Ministry of Forests, Lands and Natural Resource Operations
[REDACTED]

Dear [REDACTED]:

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #1E – Moberly River Construction Bridge**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to start construction of the Moberly River Construction Bridge, which is one of the works authorized under LCC #1. The proposed works would be constructed by BC Hydro's [REDACTED]. For reference, these works are to be authorized under *Leave to Construct LTC #1E*.

The Moberly River construction bridge is required to provide construction access across the lower Moberly River to RSEM area R5a, which will be located southwest of the Peace River/Moberly River confluence. The bridge will be utilized until RSEM R5a is closed and is then to be dismantled prior to reservoir filling. Dismantling of the bridge will be authorized under a future LTC.

A temporary debris boom is to be constructed across the Moberly River, immediately downstream of the Bridge, prior to the 2017 freshet. The debris boom design cannot be completed until access to the bridge site is available, and the boom will be authorized under a future LTC.

2.0 DESCRIPTION OF THE WORKS

The Moberly River construction bridge will consist of four simple spans of 18.3 m each, with a total deck length of 73.2 m and deck width of 7.9 m. Each span will consist of 4 lines of steel plate girders with non-composite precast post-tensioned concrete deck panels, supported on steel foundation piers. Each pier will comprise four steel pipe piles with steel bracing and pile caps. The piles will be driven into bedrock.

The existing ground surface at the east bridge abutment is at approximately the same elevation as the proposed bridge deck. The west end of the bridge deck will be about 15 m above the existing grade, which requires construction of an approach causeway, approximately 500 m long. The causeway will be constructed with granular material to be sourced initially from RSEM area R5a and later from the location of the proposed approach channel. Much of the causeway will cross the floodplain of the lower Moberly River, which includes several ephemeral braided channels. Culverts are to be installed where the causeway crosses three of those channels. The bridge abutments and the upstream side of the causeway will be protected by riprap.

[REDACTED]

The bridge is designed for one-way haul truck traffic, with loaded trucks heading westerly into RSEM R5a, and empty trucks returning to the dam site. Both bridge approaches are designed to accommodate two-way truck traffic. Traffic flow will be controlled by “yield control”, supported by signage and radio call procedures, with loaded trucks having the right-of-way.

3.0 LTC #1C SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #1E:

1. BC Hydro - *Site C Clean Energy Project Request for Leave to Construct – Moberly River Construction Bridge (LTC 1E)*, letter from [REDACTED] 22 June 2016.

2. [REDACTED]

4.0 REVIEW OF SUBMISSIONS

4.1 Design Basis and Construction Drawings

The contractor is responsible for design, construction, maintenance and partial dismantling of the Moberly River construction bridge in accordance [REDACTED]

Field investigations comprising several exploratory drill holes are to be carried out prior to construction, primarily to verify the depth to bedrock at the locations of the pipe piles for the bridge. The drawings submitted also show several exploratory holes along the alignment of the causeway, although [REDACTED] has advised the IE that those holes may not be required.

The bridge design complies with the [REDACTED]. The bridge has been designed in general compliance with the S6-14 Canadian Highway Bridge Design Code. Materials and welding requirements shown on the drawings are based on commonly-used industry standards. The channel under the bridge is designed to pass the 200-year Moberly River flood and the bridge deck elevation and clear spans between piers exceed the specified minimums.

The approach causeway embankment will be constructed of compacted granular fills. The design and construction requirements are based on the [REDACTED]

Culverts through the causeway embankment are being provided to maintain fish passage and habitat along three ephemeral braided channels during the project construction period. The culverts are not required for passage of the design flood and the IE understands that the culvert locations will be field fitted to suit the conditions in those channels at the time of construction.

The drawings provided include details for both the bridge and the west side approach causeway. All of the design memos and drawings have been sealed by Professional Engineers registered in British Columbia. The drawings are marked as Issued for Construction by the contractor.

It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis and the conditions of Conditional Water Licence 132990.

4.2 Construction Implementation Plan and Schedule

[REDACTED]

The bridge will be constructed starting from the east abutment, where the existing ground surface is at approximately the same elevation as the proposed bridge deck. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The IE notes that the proposed design and construction approach for the bridge structure are similar to those for the temporary Peace River construction bridge which was successfully completed earlier in 2016. The causeway will be a compacted earthfill embankment constructed using conventional equipment and techniques. The IE considers the construction methodology to be appropriate to the work and that the schedule is reasonable, subject to receipt of necessary permitting approvals.

4.3 Quality Management

[REDACTED]

. The Inspection and Test Plans for the bridge and earthworks components of the works are consistent with the CQMP and include requirements for the activities that would typically be expected for works of these types.

4.4 Environmental Protection

[REDACTED]

[REDACTED]

The Environmental Protection Plan (EPP) includes details, procedures and methods that would generally be expected for construction work of this nature, carried out near or partially in water.

The IE has discussed the work with the IEM and both parties are familiar with the area where the Moberly River construction bridge is to be constructed.

The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Moberly River construction bridge EPP and relevant component plans in consideration of LTC#1E, [REDACTED], 26 July 2016.

In particular, the IEM has highlighted requirements for Federal permits for the in-stream components of the works.

4.5 Safety

[REDACTED]

[REDACTED]

[REDACTED]

5.0 LEAVE TO CONSTRUCT

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the Moberly River construction bridge. For reference, this permission is referred to as *Leave to Construct LTC #1E*.

Leave to Construct LTC #1E for the Moberly River construction bridge is subject to the following conditions:

1. BC Hydro and/or [REDACTED] must comply with the terms listed in the *IEM Requirements* section of the attached IEM letter dated 26 July 2016;

[REDACTED]

-
2. BC Hydro and/or its contractor must obtain and comply with any other necessary permits from other provincial and/or federal regulatory agencies.

Yours truly,

[Redacted]

[Redacted] 2016

[Redacted]

Independent Engineer, Site C Clean Energy Project

Attachment: IEM letter dated 26 July 2016

- c: [Redacted] BCH VP & Project Director (Site C Licensee Representative)
[Redacted] SNC Lavalin (Site C Design Engineer)
[Redacted] BCH (Site C Construction Engineer)
[Redacted] BCH (Environment, Aboriginal Relations and Public Affairs Director)
[Redacted] BCH (Acting Regulatory Manager)
[Redacted] Independent Environmental Monitor

[Redacted]

[REDACTED]

[REDACTED]

[REDACTED]

July 26, 2016

[REDACTED]

[REDACTED]

Attention: [REDACTED] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Moberly River construction bridge EPP and relevant component plans in consideration of LTC#1E

Leave to Commence Construction (LCC#1) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of six key components consisting of the following:

- Right bank drainage tunnel;
- Right bank side channel closure dikes;
- Left bank excavation;
- Moberly River construction bridge;
- Backfilling of historic drill holes and exploratory adits;
- Erosion protection as needed.

Each of these components requires individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the works associated with construction of the Moberly River construction bridge and identified as LTC#1E.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

The IEM has reviewed the EPP provided by [REDACTED] and relevant component plans prepared [REDACTED]. The review included cross-referencing with the

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]

various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, and authorizations received and reviewed by the IEM, which are related to LTC#1E.

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

BC Hydro Plans/Documents

- *CEMP* (Revision 3), dated July 8, 2016.
- *Construction Safety Management Plan* (CSMP), dated June 5, 2015.

Provincial Permits/Approvals

- Conditional Water Licence 132990.
- *Conditional Water Licences 132990 and 132991 on Peace River Leave to Commence Construction No. 1*. Letter from [REDACTED], dated April 1, 2016.
- Approval A703710 – Short Term Use issued under the *Water Act*.
- Licence No.: 815646 issued under the *Land Act*.

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans were provided as required.

It is our understanding that works under this LTC are to include the following:

- Exploratory geotechnical drilling along the alignment;
- Pile driving for pier and abutment structures;
- Placement of a precast modular bridge deck;
- Construction of an approach causeway east from RSEM R5a to the west bridge approach;



- Causeway materials will be sourced from the RSEM R5a area in advance of issuance of the LTC for the development of the RSEM R5a;
- Installation of watercourse crossing structures in small braided channels of the Moberly River, through the causeway.

It is our understanding that the works will not include the installation of the debris management booms or the decommissioning of the bridge; both are to be addressed under separate LTCs.

At the time of this review, no other permits were available, such as a potential *Fisheries Act* Authorization or approval under the Navigation Protection Program for the works.

IEM Requirements

Upon review of the submitted documents for LTC#1E, and based on communications and information provided by BC Hydro and the contractor, the IEM identified a number of items requiring revision within the EPP and/or COW plans. The majority of these comments have been addressed in the EPP (Revision 5) provided to the IEM on July 25, 2016. The IEM requires the following as conditions of this LTC:

- No instream works may commence until such time as the appropriate approvals have been issued by Fisheries and Oceans Canada and the Navigation Protection Program. The IEM will require copies of such approvals.
- BC Hydro and the contractor must confirm to the IEM that all project plans and related documents are compliant with any potential conditions related to approvals issued by Fisheries and Oceans Canada and/or the Navigation Protection Program prior to starting any instream works.

Additionally, contact water management must comply with the CEMP Appendix E, currently under revision. Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC#1E for the works associated with the Moberly River construction bridge, as described.

Yours truly,



Independent Environmental Monitor – Delegate



cc. [REDACTED] Water Management Branch, Engineer
[REDACTED], BC Hydro, Manager, Project Environmental Risk Management
[REDACTED], BC Hydro Regulatory Manager (Acting)

[Redacted]

21 April 2017

[Redacted]

Regulatory Manager
Site C Clean Energy Project
Vancouver, BC
Via email: [Redacted]

Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #01G – Left Bank Excavation Phase 2
Left Bank Existing Road Upgrade

Dear [Redacted]

Leave to Construct LTC #1G – Amendment #2, issued 09 March 2017, confirmed that BC Hydro could proceed with construction of initial remedial works to stabilize an area of the lower left bank of the dam site. The initial remedial works comprise two toe buttresses and widening of a 440 m length of an existing temporary access road immediately upstream (west) of the Peace River construction bridge north abutment.

Amendment #2 requested that the IE and IEM be kept informed of the progress of construction of the remedial works and any material changes in the construction approach, any significant changes in behaviour of the slope instability, or any potential impacts on the design of permanent project components.

Based on additional information received, Leave to Construct LTC #1G – Amendment #3, issued 31 March 2017, confirmed that BC Hydro could proceed with backfilling the remainder of the river side channel adjacent to the widened length of access road.

The IE and IEM understand that the toe buttress, road widening and side channel backfilling works are now largely completed and that the contractor wishes to continue with the construction of the left bank existing haul road upgrade that was interrupted by the slope instability. The following documents regarding these works have been received for information:

- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]

The IE has not reviewed the full set of revised IFC drawings, but has compared the road plan and profile shown on Dwg. 1020-C09-06417-302 R8 with the details shown on revision R0 of the same drawing which was received with the request for LTC #01G.

[Redacted]

The IE notes the following:

1. There are no indicated changes to the design of any permanent works.
2. The left bank existing road upgrade is a temporary construction road and [REDACTED] is responsible for its design. [REDACTED] is providing design services to [REDACTED], including the slope stability analyses required for the design.

3. [REDACTED]

Based on the above, the IE does not consider that the proposed left bank existing road upgrade works will require an amendment to LTC #01G.

The IE has discussed the proposed work with the IEM. The IEM requests that BC Hydro provide confirmation that the existing EPPs adequately address the modified design and work approach, or if there would be any changes to environmental impacts and mitigations that would require revisions to an EPP. This confirmation should be provided by 26 April 2017. The IE and IEM understand that [REDACTED] has proposed to commence the local works described in its *Material Handling Plan* as early as 22 April, and have no objection to BC Hydro authorizing [REDACTED] to commence those works if BC Hydro is satisfied that the applicable EPP requirements will be met.

Yours truly,

[REDACTED]

Independent Engineer, Site C Clean Energy Project

c:

[REDACTED]

[REDACTED]

[Redacted]

29 January 2017

[Redacted]

Deputy Comptroller of Water Rights / Manager, Water Allocation and Utility Regulation
Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1
Via email: [Redacted]

Dear [Redacted]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #1G – Left Bank Excavation Phase 2
Amendment #1 – Temporary PAG Stockpile**

Excavation of the natural slope above the left abutment of the proposed earthfill dam was authorized in two phases by Leaves to Construct LTC #1B dated 08 June 2016 and LTC #1G dated 10 August 2016. Overburden excavation by [Redacted] has been ongoing since June 2016. The overburden is non-acid generating and as most of the excavated materials are not suitable as construction materials, they have been placed in RSEM area L3 and Area 25 on the upper left bank.

Potentially acid-generating (PAG) shale and shale colluvium has recently been encountered along the alignment of the temporary haul road being constructed from the left bank excavation down to RSEM area L5. The extent and volume of PAG materials are not yet determined, but the location is apparently within the excavation limits authorized by LTC #1G.

RSEM area L5 is still under construction and not yet ready to receive PAG materials. In the interim, to allow for left bank excavation and construction of the haul road to continue, [Redacted] proposes to temporarily stockpile excavated shale bedrock and colluvium on one of the excavated upper left bank benches at about El. 550 m.

The Independent Engineer (IE) considers the temporary PAG stockpile to be a material change from the construction plans originally submitted for LTC #1G. The IE and the Independent Environmental Monitor (IEM) have received the following information from BC Hydro regarding the temporary PAG stockpile:

[Redacted]

The Issued for Construction drawing has been sealed by a Professional Engineer registered in British Columbia.

[Redacted]

[Redacted]



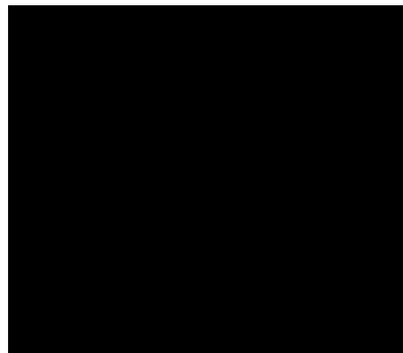
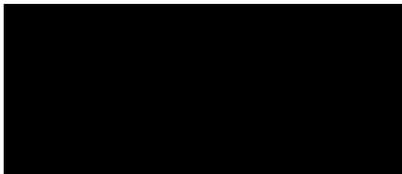
The IE has discussed the work with the IEM, and both parties viewed the left bank excavation area during a site visit on 25 January 2017. The IE and IEM have reviewed the above-noted submissions and consider that the construction approach and water management details described in the submitted documents are consistent with the conditions of Conditional Water Licences 132990 and 132991 and with BC Hydro's CEMP (R4, 27 July 2016).

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the temporary PAG stockpile on the upper left bank excavation bench in accordance with the submitted PRHP plans, including transfer of the stockpiled PAG materials to RSEM L5 when that area is ready to receive such materials.

The IE recommends that adequate water management facilities to divert non-contact water and to collect and manage contact water should be constructed before PAG placement commences.

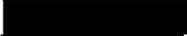
For reference, this permission is referred to as *Leave to Construct LTC #1G, Amendment #1*.

Yours truly,



 P.Eng.

Independent Engineer, Site C Clean Energy Project

- c:
-  BCH VP & Project Director (Site C Licensee Representative)
 -  SNC Lavalin (Site C Design Engineer)
 -  BCH (Site C Construction Engineer)
 -  BCH (Environment, Aboriginal Relations and Public Affairs Director)
 -  BCH (Regulatory Manager)
 -  Independent Environmental Monitor



[Redacted]

09 March 2017

[Redacted]

Deputy Comptroller of Water Rights / Manager, Water Allocation and Utility Regulation
Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1
Via email: [Redacted]

Dear [Redacted]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Left Bank Global Instability Initial Remediation Measures**

- Leave to Construct LTC #1G – Left Bank Excavation Phase 2 – Amendment #2
- Leave to Construct LTC #2B – RSEM Area L5 – Amendment #1
- Leave to Construct LTC #3C – Stage 1 Diversion Inlet Cofferdam - Amendment #1

As described below, this letter is intended to serve as amendments to the following three Leaves to Construct, as construction of the works authorized by these LTCs has been impacted by a common event:

- LTC #1G – Left Bank Excavation Phase 2, issued 10 August 2016
- LTC #2B – RSEM Area L5, issued 18 August 2016
- LTC #3C – Stage 1 Diversion Inlet Cofferdam, issued 26 September 2016

In mid-February 2017 a tension crack about 400 m long developed in fill and colluvium materials along the lower left bank of the dam site. The crack is located above the eastern end of RSEM L5 (under construction) and the future diversion tunnels inlet portal, and below the haul road being constructed from the left bank excavation to RSEM L5. Construction activities in those areas were promptly suspended for safety reasons and monitoring and site investigations were initiated by BC Hydro and [Redacted]. Survey monuments indicated slope movements that accelerated for about a week, peaking in the order of 2 m/day in some locations, then slowed substantially.

It is interpreted by BC Hydro and [Redacted] that all the material within the unstable area was intended to be excavated during construction of the project. However, temporary stability improvements are required to allow the suspended construction activities to safely continue.

[Redacted]

- [Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

The IE has reviewed the proposed initial remedial measures with the IEM.

[Redacted]

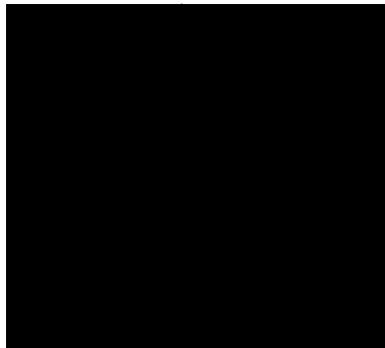
By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the initial remedial works described above, in accordance with the Construction and Environmental Mitigation Plan, including all measures and actions described in the above-noted contract submittal.

The IE and IEM recommend that the Construction and Environmental Mitigation Plan should be revised as soon as possible. Until then, we recommend that the contract submittal document be appended to that Plan to ensure the information required by onsite staff or others is appropriately contained in a single document. Copies of any Plan updates should be provided to the IE and IEM for information.

The IEM also requests that BC Hydro provide confirmation that the appropriate notification is provided to the Ministry of Forests, Lands and Natural Resource Operations as required under the fish salvage permit and as committed to in the contract submittal document, by 10 March 2017.

The IE and IEM request to be kept informed of the progress of construction of the remedial works and any material changes in the construction approach, any significant changes in behaviour of the slope instability, or any potential impacts on the design of permanent project components.

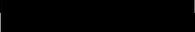
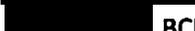
Yours truly,

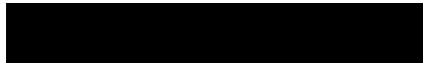


March
2017

 P.Eng.

Independent Engineer, Site C Clean Energy Project

- c:  BCH VP & Project Director (Site C Licensee Representative)
 SNC Lavalin (Site C Design Engineer)
 BCH (Site C Construction Engineer)
 BCH (Environment, Aboriginal Relations and Public Affairs Director)
 BCH (Regulatory Manager)
 Independent Environmental Monitor



[Redacted]

31 March 2017

[Redacted] P.Eng.

Deputy Comptroller of Water Rights
Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1
Via email: [Redacted]

Dear [Redacted]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Left Bank Global Instability Remediation Measures – Side Channel Infilling**

- Leave to Construct LTC #01G – Left Bank Excavation Phase 2 – Amendment #3
- Leave to Construct LTC #02B – RSEM Area L5 – Amendment #2
- Leave to Construct LTC #03C – Stage 1 Diversion Inlet Cofferdam - Amendment #2

As described below, this letter is intended to serve as amendments to the following three Leaves to Construct:

- LTC #01G – Left Bank Excavation Phase 2, issued 10 August 2016
- LTC #02B – RSEM Area L5, issued 18 August 2016
- LTC #03C – Stage 1 Diversion Inlet Cofferdam, issued 26 September 2016

Construction of the works authorized by these LTCs was impacted by slope instability that developed in fill and colluvium materials along the lower left bank of the dam site in February 2017. Previous amendments to these LTCs, issued on 09 March 2017, authorized construction of two toe buttresses as an initial measure to improve stability of the affected slope. To complete those works, construction access improvements were also required, consisting of widening a 440 m length of the existing temporary access road immediately upstream of the Peace River construction bridge north abutment.

During a monthly site visit on 29 March 2017, the Independent Engineer (IE) and the Independent Environmental Monitor (IEM) noted that the road widening was largely completed and construction of the toe buttresses was in progress by BC Hydro's contractor [Redacted]. As planned, the road widening has partially infilled a previously-isolated river side channel.

During the site visit, [Redacted] informed BC Hydro, the IE and the IEM that it proposes to infill the remainder of the river side channel area to provide additional construction work area, which is limited along the river. The IE and the IEM have since received the following plan describing the proposed works:

• [Redacted]

[Redacted]

[Redacted]

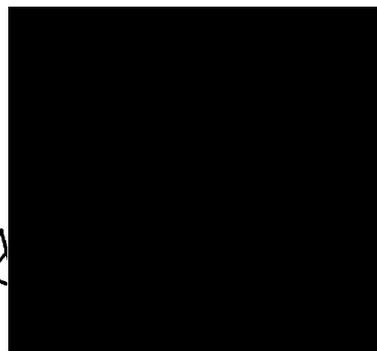
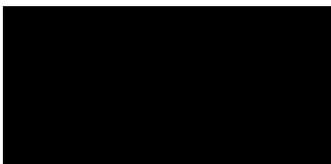
Although it is physically separated from the Peace River, the side channel pond may still be hydraulically connected to the river through alluvial deposits. The Plan also states that amphibian salvage and relocation will be implemented if necessary. Based on those factors, the IEM recommends that to ensure compliance with Section 4.5 of the CEMP, readily biodegradable hydraulic fluids should be used in equipment working above or within the wetted area.

In the previous LTC Amendment dated 09 March 2017, it was requested that copies of updates to the Construction and Environmental Mitigation Plan be provided to the IE and IEM for information. The IE and IEM have received Revision R1 of the Plan, dated 10 March 2017, including BC Hydro's comments on the Plan.

The IEM also requested that BC Hydro provide confirmation that the appropriate notification was provided to the Ministry of Forests, Lands and Natural Resource Operations as required under the fish salvage permit, by 10 March 2017. Confirmation was received by the IEM on the requested date.

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with backfilling the remainder of the river side channel as described above, in accordance with the submitted Construction and Environmental Mitigation Plan. The IE notes that most of the side channel area is located within the footprint of the future RSEM L6 and recommends that BC Hydro should confirm that the infilling will not affect the construction of the RSEM.

Yours truly,



 P.Eng.

Independent Engineer, Site C Clean Energy Project

- c:  BCH VP & Project Director (Site C Licensee Representative)
 SNC Lavalin (Site C Design Engineer)
 BCH (Site C Construction Engineer)
 BCH (Environment, Aboriginal Relations and Public Affairs Director)
 BCH (Regulatory Manager)
 Independent Environmental Monitor
 FLNRO Water Management Officer



[REDACTED]

23 August 2016

[REDACTED] P.Geo.
Engineer under the Water Sustainability Act
Ministry of Forests, Lands and Natural Resource Operations
[REDACTED]

Via email: [REDACTED]

Dear [REDACTED]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #1H – Right Bank Drainage Tunnel Underground Works**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to start construction of the Right Bank Drainage Tunnel Underground Works, which is part of one of the works authorized under LCC #1. The proposed works would be constructed by [REDACTED] BC Hydro's contractor for the Site C Main Civil Works. For reference, these works are to be authorized under *Leave to Construct LTC #1H*.

The portal works for the right bank drainage tunnel were previously authorized under LTC #1C on 23 June 2016 and construction is currently in progress. The tunnel portal works were authorized with a requirement that the water management system for contact water was to be designed for zero discharge to the Peace River. [REDACTED] subsequently submitted a Care of Water Plan and Environmental Protection Plan that included the design details and water management approach for the zero discharge system. Those plans were reviewed and accepted by the IE and the Independent Environmental Monitor (IEM) as per the letter from the IE to [REDACTED] of BC Hydro dated 18 August 2016.

[REDACTED]

The scope of work to be authorized by LTC #1H includes all underground excavation, rock support, tunnel linings, tunnel dewatering and underground completion works. Following completion of the underground works, a permanent tunnel access structure will be constructed at the portal, [REDACTED]

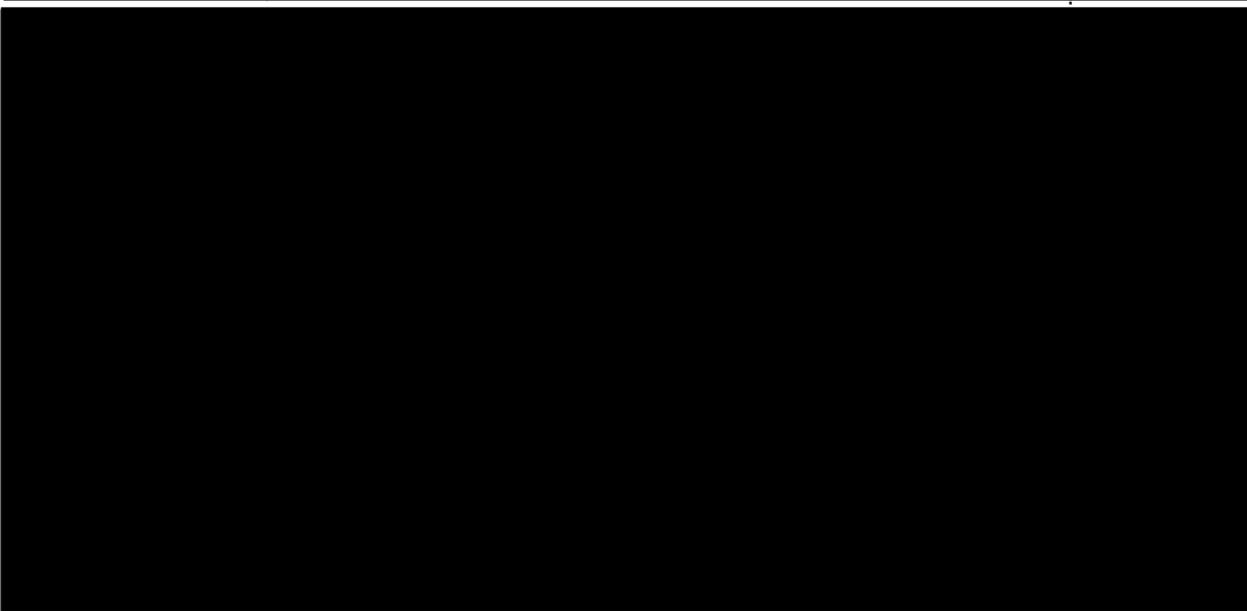
[REDACTED]

2.0 DESCRIPTION OF THE WORKS

The right bank drainage tunnel will be approximately 975 m long and will be constructed within the shale bedrock below the proposed roller-compacted concrete (RCC) buttress. The tunnel and drain holes to be

[REDACTED]

drilled from it will provide drainage of the bedrock foundation of the RCC structure. The tunnel will also house instrumentation which will serve as a tool to assess the behaviour of the RCC buttress foundation during construction and later, to monitor long term performance of the buttress.



3.0 LTC #1H SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #1H:



1. BC Hydro - *Site C Clean Energy Project Request for Leave to Construct – Right Bank Drainage Tunnel, Underground Works – LTC1H*, letter from [REDACTED] 11 August 2016.
2. BC Hydro – *Issued for Construction Drawings*- see Table 1.



8. WorkSafe BC – *Regarding your request for an Acceptance – AR201600087*, letter regarding extended hours of work, from [REDACTED] 13 July 2016.
9. WorkSafe BC – *Regarding your request for an Acceptance – AR201600087*, letter regarding Phase 1 ventilation system, from [REDACTED] 15 August 2016.
10. WorkSafe BC – *Regarding your request for an Acceptance – AR201600087*, letter regarding use of diesel equipment, from [REDACTED] 16 August 2016.

4.0 REVIEW OF SUBMISSIONS

4.1 Construction Drawings

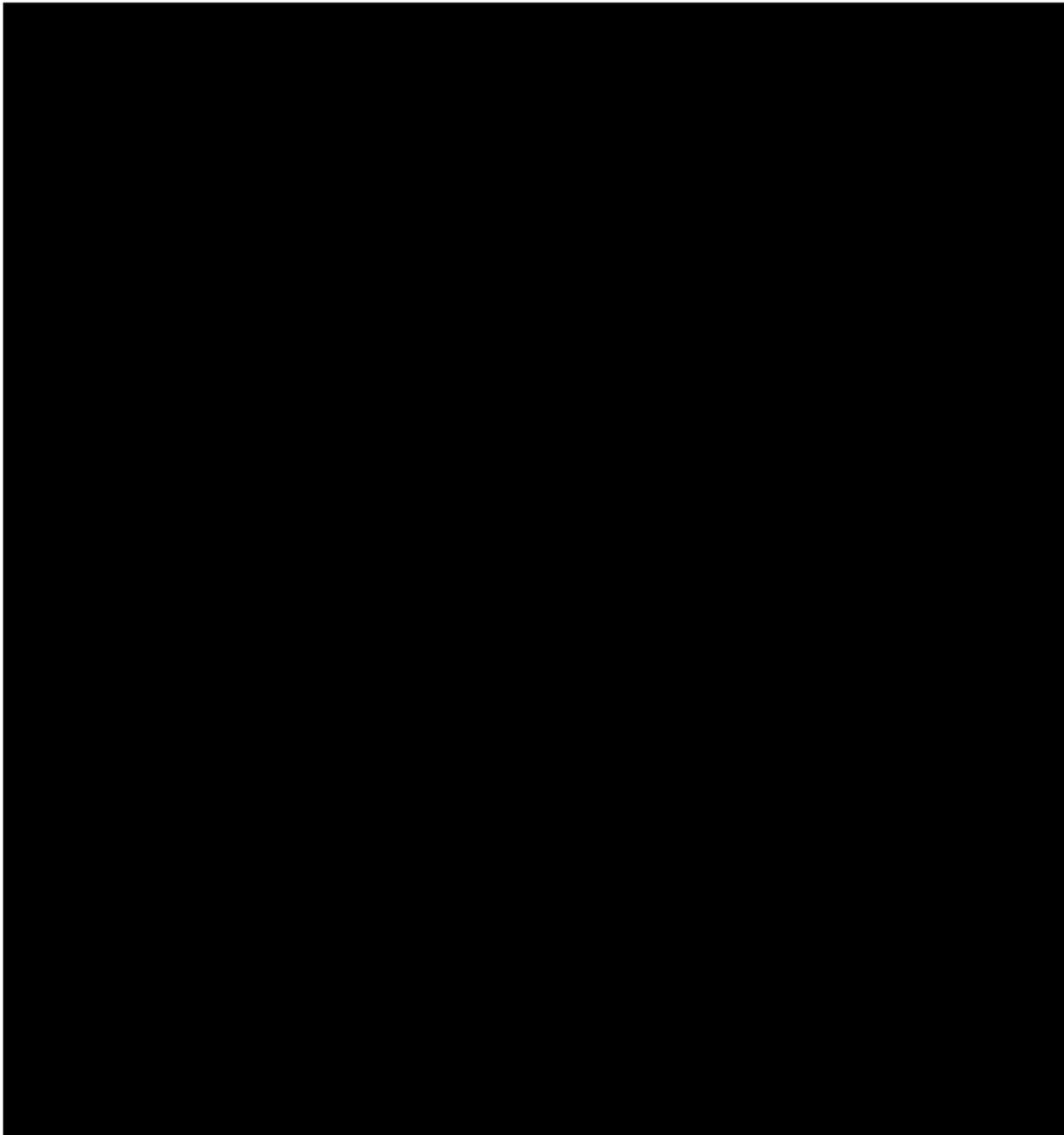
The drawings provided include the information that would typically be expected for tunnelling works including plans, profiles and sections of the right bank drainage tunnel and details of rock support, tunnel linings and drain holes.

All of the drawings have been sealed by Professional Engineers registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis and the conditions of Conditional Water Licences 132990 and 132991.

Issued for Construction drawings of temporary PAG storage and water management infrastructure were previously provided for the tunnel portal works and accepted by the IE and IEM as noted above in Section 1.0 of this letter.

4.2 Construction Implementation Plan and Schedule







4.3 Quality Management

 Inspection and Test Plan is comprehensive and is consistent with the Main Civil Works Construction Quality Plan. BC Hydro has accepted the Plan as meeting all the requirements of the Main Civil Works contract.

4.4 Management & Care of Water and Environmental Protection



The IE considers that water and PAG management works constructed and operated in accordance with the above will pose a low risk to the environment.

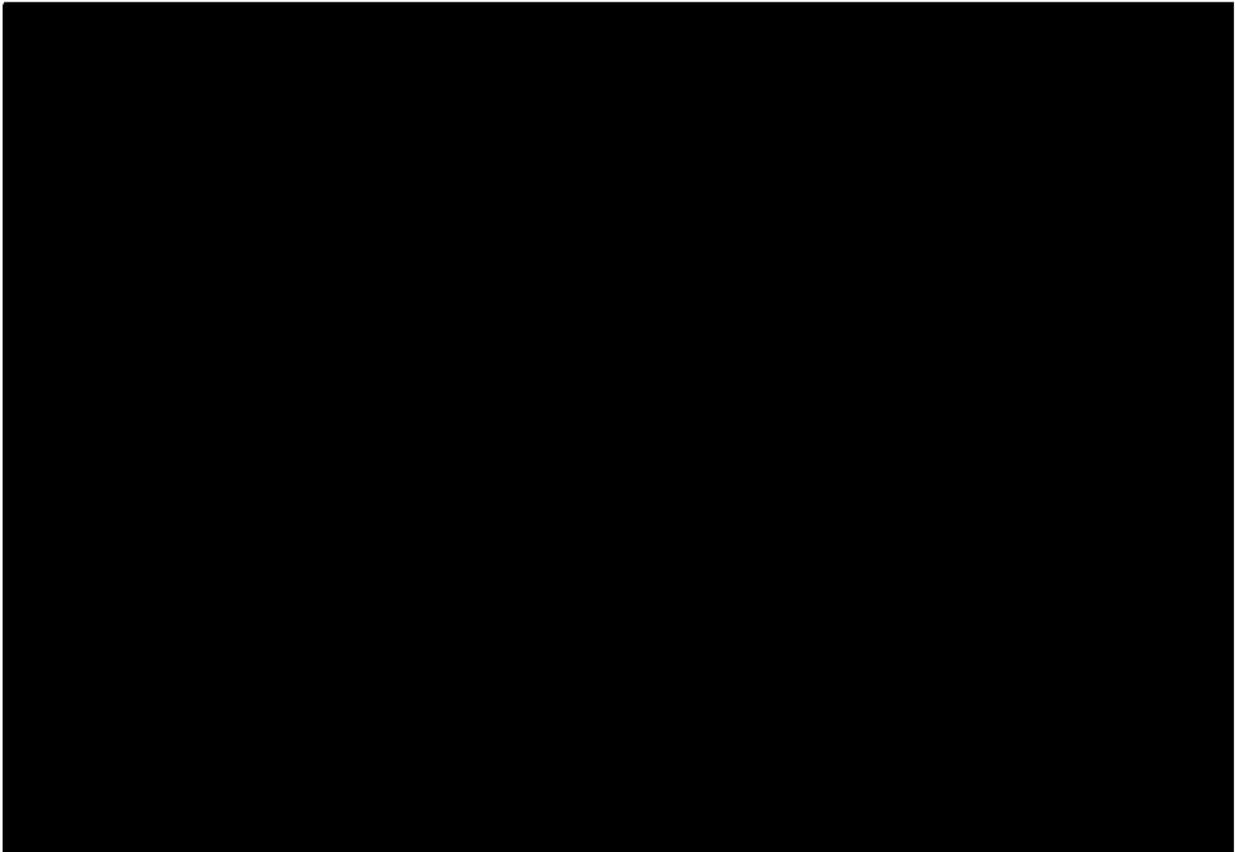
The IE has discussed the work with the IEM and both parties are familiar with the area where the right bank drainage tunnel portal is being constructed and where the tunnel underground construction facilities are to be located.

The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] - *Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Right Bank Drainage Tunnel EPP and relevant component plans in consideration of LTC#1H, letter to [REDACTED] 22 August 2016.*

In addition to the requirement for revised EPP and Care of Water plans prior to discontinuing the zero-discharge water management system, the IEM has noted several other elements of the EPP that must be addressed.

4.5 Safety



5.0 LEAVE TO CONSTRUCT

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the Right Bank Drainage Tunnel Underground Works. For reference, this permission is referred to as *Leave to Construct LTC #1H*.



Leave to Construct LTC #1H for the Right Bank Drainage Tunnel Underground Works is subject to the following conditions:

1. Construction of the tunnel underground works is to be implemented utilizing the zero-discharge water management system established for construction of the tunnel portal works. Prior to discontinuing the zero-discharge system and discharging water from the tunnel works into the Peace River or any other watercourse, a revised EPP and Care of Water Plan that comply with the latest version of the Construction Environmental Management Plan are to be submitted to the IE and IEM for review and acceptance.
2. BC Hydro and [REDACTED] must comply with the terms listed in the *IEM Requirements* section of the above-noted IEM letter dated 22 August 2016.
3. BC Hydro and/or its contractor must obtain and comply with any necessary permits from any other provincial and/or federal regulatory agencies.

Yours truly,

[REDACTED]

[REDACTED]

[REDACTED] P.Eng.

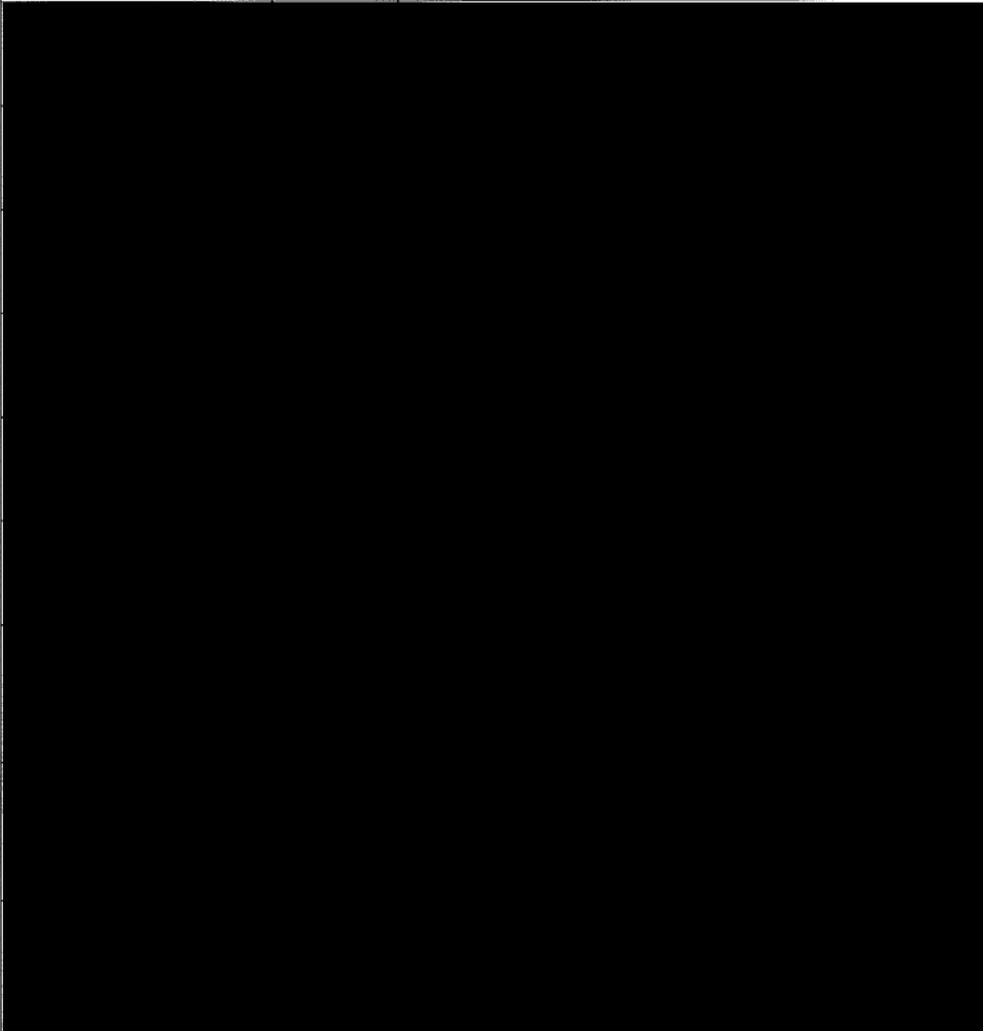
Independent Engineer, Site C Clean Energy Project

Attachment: IEM letter dated 22 August 2016

c: [REDACTED] BCH VP & Project Director (Site C Licensee Representative)
[REDACTED] SNC Lavalin (Site C Design Engineer)
[REDACTED] BCH (Site C Construction Engineer)
[REDACTED] BCH (Environment, Aboriginal Relations and Public Affairs Director)
[REDACTED] BCH (Acting Regulatory Manager)
[REDACTED] Independent Environmental Monitor

[REDACTED]

TABLE 1 - LTC #1H
Right Bank Drainage Tunnel– Issued for Construction Drawings*

Drawing No.	Revision	Title
		

* - These drawings were previously submitted with request for LTC #1C for the right bank drainage tunnel portal.



[REDACTED] [REDACTED]

August 22, 2016

[REDACTED]

[REDACTED]

Attention: [REDACTED] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the Right Bank Drainage Tunnel EPP and relevant component plans in consideration of LTC#1H

The first Leave to Commence Construction (LCC#1) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of six key components consisting of:

- Right Bank Drainage Tunnel
- Right Bank Sidechannel Closure Dikes
- Left Bank Excavation
- Moberly River Construction Bridge
- Adit and Borehole infilling
- Erosion Protection as needed

Each of these components requires individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the underground works associated with the Right Bank Drainage Tunnel (RBDT), herein referred to as LTC#1H. Surface works associated with the development of the RBDT portal were reviewed previously under LTC#1C. It is our understanding that works under LTC#1H are to be conducted using the "zero discharge" approach for the management of water as described in LTC#1C.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]

The IEM has reviewed the EPP provided by [REDACTED] and relevant component plans including but not limited to the Environmental Management Program (EMP). The review included cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, authorizations and drawings received and reviewed by the IEM, which are related to LTC#1H.



BC Hydro Plans/Documents

- *CEMP* (Revision 4), dated July 26, 2016.
- *Construction Safety Management Plan* (CSMP), dated June 5, 2015.

Provincial Permits/Approvals

- Conditional Water Licence 132990.
- *Conditional Water Licences 132990 and 132991 on Peace River Leave to Commence Construction No. 1*. Letter from [REDACTED] dated April 1, 2016.
- Licence No.: 815646 issued under the *Land Act*.

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans were provided as required.

It is our understanding that works under this LTC are to include the following:

- Excavation of materials from within the RBDT;
- Removal of PAG material to the temporary PAG material stockpile location until such time as an RSEM area is available to receive these materials;
- Tunnel surface lining/reinforcement with shotcrete;

- Cast-in-place concrete slab tunnel floor; and,
- Removal of water to a preliminary treatment system, prior to release to the zero-discharge temporary sediment pond to be constructed as per LTC#1C.

IEM Requirements

Upon review of the submitted documents for RBDT works and related correspondence, the IEM requires the following:

- Prior to commencement of underground works or discharge to the Peace River, the comments provided by BC Hydro on Revision 5 of the EPP (dated July 13, 2016) must be addressed. A copy of these revisions must be provided to the IEM.

The IEM also notes that references to *Metal Mine Effluent Regulations* are no longer appropriate for this project, and that prior to any future potential discharge, beyond that of the currently proposed zero discharge approach, additional plans must be provided for review and acceptance that meet the requirements of the revised CEMP (Revision 4), Appendix E.

Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC#1H for the works associated with the RBDT.

Yours truly,

[Redacted Signature]

[Redacted Name]

Independent Environmental Monitor

cc. [Redacted] Water Management Branch, Engineer
[Redacted] BC Hydro, Manager, Project Environmental Risk Management
[Redacted] BC Hydro Regulatory Manager (Acting)

[REDACTED]

29 July 2016

[REDACTED], P. Geo.
Water Management Officer
Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1

Dear [REDACTED]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #2A – RSEM Area R5b**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to commence construction of Relocated Surplus Excavated Material (RSEM) Area R5b. This RSEM area is one of the works authorized under LCC #2 dated 29 June 2016. The proposed works would be constructed by [REDACTED] BC Hydro's contractor for the Site C Main Civil Works. For reference, these works are to be authorized under *Leave to Construct LTC #2A*.

2.0 DESCRIPTION OF THE WORKS

Overburden and shale deposits that must be excavated for construction of the Site C project, and which are either surplus to or unsuitable as construction materials are to be disposed of in RSEM areas located on both sides of the Peace River.

[REDACTED]

The quality of the water discharged from sediment ponds must be monitored and managed in accordance with the requirements of the MFLNRO Water Quality Management Programme (24 June 2016). Once a sediment pond is no longer required, it will be drained, capped and re-vegetated.

RSEM area R5b is to be constructed on the right bank, just downstream of the Moberly/Peace Rivers confluence, with its eastern end abutting the upstream side of the right bank Stage 1 cofferdam.

[REDACTED]

RSEM area R5b is one of the RSEMs that is designated to receive PAG (potentially acid-generating) material, which will typically be shale bedrock from excavations

[REDACTED]

[REDACTED]

[REDACTED]. As required by the MFLNRO Water Quality Management Programme, several wells will be installed to monitor groundwater conditions in the underlying overburden.

Ultimately, RSEM R5b will be situated immediately upstream of the right side of the future earthfill dam and will be permanently inundated by the reservoir. Prior to reservoir filling, RSEM R5b will be contoured and capped with a gravel and cobble substrate to provide fish habitat.

3.0 LTC #2A SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #2A:

1. BC Hydro - *Request for Leave to Construction LTC2A - RSEM R5b*, email from [REDACTED] others, 21 July 2016.
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]

Recognizing that the MFLNRO Water Quality Management Programme requirements are still being implemented, additional submissions are expected at a later date. The IE understands from discussions with BC Hydro and [REDACTED] that a revision to the discharge design details for the RSEM R5b sediment pond is being considered, and that details will be provided in the near future. The final design of groundwater monitoring wells required by the Programme is still in progress and will also be provided shortly.

4.0 REVIEW OF SUBMISSIONS

4.1 Design Details and Construction Drawings

The construction drawings show the information that would typically be expected for works of this nature, including plans, sections and details of the starter dike and sediment pond, and the final profile of the stored materials.

The starter dike will be a compacted earthfull embankment, comprised mostly of impervious fill with zones of granular fill and erosion protection along the outer side. There is periodic natural reconfiguration of the Moberly/Peace river confluence and [REDACTED] has recently performed a topographic survey and adjusted the dike position to maintain at least a 15 m setback from the mainstem of the river. This meets condition no. 4 of EAC Certificate #14-02, which is intended to avoid affecting Peace River fish habitat.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

It is the IE's opinion that the details still to be submitted for the sediment pond discharge outlets and for the proposed groundwater monitoring wells will not affect the location and design of the starter dike.

The drawings provided have been sealed by a Professional Engineer registered in British Columbia and are Issued for Construction status. Other than the above-noted details pertaining to the sediment pond discharge outlets, it is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis, the conditions of Conditional Water Licences 132990 and 132991 and the requirements of the Water Quality Management Programme.

4.2 Construction Implementation Plan and Schedule

The foundation for the starter dike is to be prepared by clearing, grubbing and stripping, then proof-rolling once an acceptable surface has been exposed. Construction materials for the starter dike will be sourced from the excavation for the approach channel, which was authorized by LTC #3B on 28 July 2016.

The starter dike will be constructed in compacted lifts in accordance with the contract technical specifications.

[REDACTED]

[REDACTED] This schedule will depend on the relative timing of the excavations for the approach channel and the RCC buttress, and the underground works for

[REDACTED]

the right bank drainage tunnel, which will be the sources of the surplus materials. Since the schedule for RSEM R5b operations will extend into winter, the IE notes that the contract technical specifications define limits on cold weather construction that apply to the starter dike. Surplus materials can be placed behind the dike during winter conditions.

The IE also notes that the east end of the starter dike cannot be constructed until the west (upstream) end of the adjacent right bank Stage 1 cofferdam embankment authorized by LTC #3A on 26 July 2016 is completed.

[REDACTED]

Construction of the RSEM starter dike and placement of materials inside the dike will be by conventional large capacity excavation and earthmoving equipment. The IE considers the construction methodology to be appropriate to the work and that the baseline schedule is reasonable.

4.3 Quality Management

[REDACTED]

[REDACTED] ITP for RSEM area R5b is comprehensive and includes the relevant work activities that would normally be expected for construction of this type.

4.4 Management & Care of Water and Environmental Protection

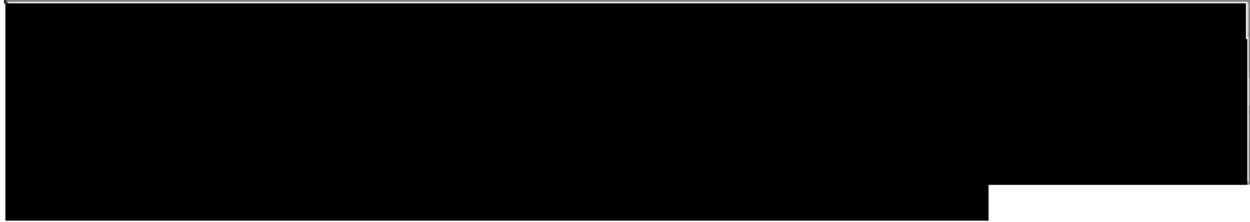
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



The IE has discussed the work with the IEM and both parties are familiar with the area where RSEM area R5b will be constructed. The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – *Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the EPP for Relocated Surplus Excavated Material area R5b and relevant component plans in consideration of LTC#2A*, letter to [REDACTED] dated 29 July 2016.

As summarized in the above letter, the IEM has noted that some aspects of the Care of Water Plan and the EPP will require revision once the implementation details for the Water Quality Management Programme are finalized. It is the IE's opinion that construction of the RSEM R5b starter dike can commence prior to those details being finalized, but the Programme will need to be satisfactorily implemented before the RSEM can be fully utilized.

4.5 Dam Safety

As required by LCC #2, the RSEM R5b sediment pond must comply with the BC Dam Safety Regulation (2016).

4.6 Safety

[REDACTED] is aligned with their Health Safety Management Plan (HSMP) and references many of the HSMP appendices that apply to [REDACTED] entire scope of work. The HSMP includes a hazard registry for right bank Civil construction works.

5.0 LEAVE TO CONSTRUCT

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of RSEM area R5b. For reference, this permission is referred to as *Leave to Construct LTC #2A*.

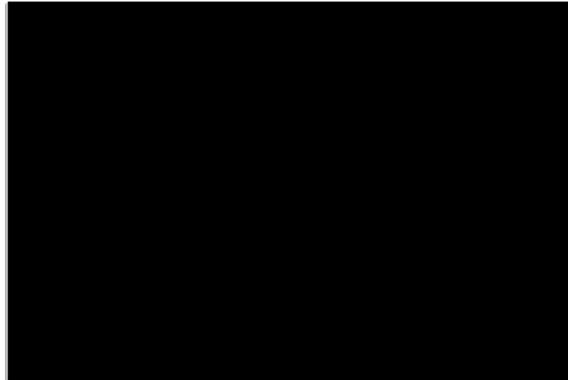
Leave to Construct for RSEM area R5b is subject to the following conditions:

1. BC Hydro and/or its contractor [REDACTED] must comply with the terms listed in the *IEM Requirements* section of the attached IEM letter dated 29 July 2016.



2. Construction of the RSEM area R5b sediment pond must not commence until the IE and IEM have received Issued for Construction drawings for the pond showing details of the means of directing discharge flows into the Peace River, and including any measures designed to prevent fish passage into the discharge works.
3. As per the attached IEM letter, placement of either non-PAG or PAG surplus excavated materials into RSEM R5b and/or discharge of contact water from the sediment pond must not commence until the IEM has received and accepted revised versions of the EPP and Care of Water Plan. As required by LCC #2, a low permeability layer at the base of the RSEM must also be achieved prior to placing any surplus excavated materials.
4. Groundwater monitoring wells meeting the requirements of the Water Quality Management Programme dated 24 June 2016 must be installed and baseline readings collected prior to placing any PAG surplus excavated material into RSEM R5b.
5. Within 60 days of completing construction of the sediment pond, the dam failure consequence classification for the pond must be determined in accordance with the BC Dam Safety Regulation (2016) and submitted to the IE and the MFLNRO Dam Safety Officer. This submission must include an evaluation to determine if Part 3 of the Regulation should apply to the sediment pond.
6. BC Hydro and/or its contractors must obtain and comply with any necessary permits from provincial and/or federal regulatory agencies.

Yours truly,



 P.Eng.

Independent Engineer, Site C Clean Energy Project

Attachment: IEM letter dated 29 July 2016

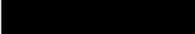
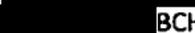
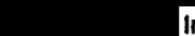
- c:  BCH VP & Project Director (Site C Licensee Representative)
 SNC Lavalin (Site C Design Engineer)
 BCH (Site C Construction Engineer)
 BCH (Environment, Aboriginal Relations and Public Affairs Director)
 BCH (Acting Regulatory Manager)
 Independent Environmental Monitor



TABLE 1

**LTC #2A – RSEM AREA R5b
ISSUED FOR CONSTRUCTION DRAWINGS**

Drawing No.	Revision	Title
[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

July 29, 2016

[REDACTED]

[REDACTED]

Attention: [REDACTED] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the EPP for Relocated Surplus Excavated Material area R5b and relevant component plans in consideration of LTC#2A

Leave to Commence Construction (LCC#2) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of various Relocated Surplus Excavated Materials (RSEM) areas which consist of the following:

- Right bank of the Peace River – RSEMs R5a, R5b, and R6.
- Left bank of the Peace River – RSEMs L5 and L6

Each of these RSEM components requires individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the works associated with construction of RSEM Area R5b which has been identified as LTC#2A.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

The IEM has reviewed the EPP provided by [REDACTED] and relevant component plans. The review included cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]

Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, and authorizations received and reviewed by the IEM, which are related to LTC#2A.



BC Hydro Plans/Documents

- *CEMP* (Revision 3), dated July 8, 2016.
- *Construction Safety Management Plan* (CSMP), dated June 5, 2015.
- *Appendix B – Reference Concept Report RSEM and Excavation Area Water Management*, dated November 2014, prepared by [redacted] for BC Hydro.

Provincial Permits/Approvals

- Conditional Water Licence 132990.
- *Conditional Water Licences 132990 and 132991 on Peace River Leave to Commence Construction No. 2*. Letter from [redacted] dated June 29, 2016.
- *Site C Clean Energy Project Conditional Water Licence 132990 and 132991 on Peace River Water Quality Management Programme*, dated June 24, 2016, prepared by [redacted] Engineer under the *Water Sustainability Act* (herein after referred to as the *Water Quality Management Programme*).
- Approval A703710 – Short Term Use issued under the *Water Act*.
- Licence No.: 815646 issued under the *Land Act*.

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans were provided as required.

It is our understanding that works under this LTC are to include the following:

- Construction of the starter dike with locally sourced earthen materials;
- Construction of the sediment pond within the RSEM R5b area;
- Material placement in the RSEM area behind the starter dike; and,

- Operation of the sediment pond.

IEM Requirements

Upon review of the submitted documents for LTC#2A, and based on communications and information provided by BC Hydro and the contractor, the IEM identified a number of items requiring revision within the EPP and/or COW plans, once the Water Management Programme implementation details are finalized. The IEM requires the following as conditions of this LTC:

- A revised EPP and COW plan must be provided to the IEM for review and acceptance prior to placement of non-PAG or PAG surplus excavated material into the RSEM and/or any discharge of any contact water to any receiving waters. The revised EPP and COW plan must incorporate requirements of LCC#2, the Water Quality Management Programme, and the revised CEMP, Appendix E.
- Confirmation must be provided to the IEM, in advance of placing PAG materials, that ground water monitoring wells have been installed, as required by the Water Quality Management Programme.
- Confirmation must be provided to the IEM in advance of storage of water within and discharge from the RSEM sediment pond that discharge will be to the Peace River and not the Moberly River. The IEM requests that copies of any revised IFC drawings provided to the Independent Engineer also be provided to the IEM.

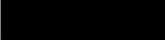
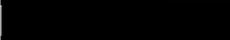
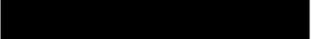
Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC#2A for the works associated with construction of RSEM area R5b, as described.

Yours truly,



Independent Environmental Monitor - Delegate

cc. , Water Management Branch, Engineer
, BC Hydro, Manager, Project Environmental Risk Management
, BC Hydro Regulatory Manager (Acting)



[REDACTED]

18 August 2016

[REDACTED], P. Geo.
Engineer under the Water Sustainability Act
Ministry of Forests, Lands and Natural Resource Operations

Via email: [REDACTED]

Dear [REDACTED]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #2B – RSEM Area L5**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to commence construction of Relocated Surplus Excavated Material (RSEM) Area L5. This RSEM area is one of the works authorized under LCC #2 dated 29 June 2016. The proposed works would be constructed by [REDACTED]. For reference, these works are to be authorized under *Leave to Construct LTC #2B*.

[REDACTED]

[REDACTED]

2.0 DESCRIPTION OF THE WORKS

Overburden and shale deposits that must be excavated for construction of the Site C project, and which are either surplus to or unsuitable as construction materials are to be disposed of in RSEM areas located on both sides of the Peace River. Each RSEM area will be bounded on its lowest sides by a starter dike that will retain the surplus materials to be stored within. The starter dikes will be compacted earthfill embankments designed by BC Hydro [REDACTED] is responsible for the design of placement of surplus materials inside the dikes, and for management of water within and outside of the RSEM areas, in accordance with the technical specifications and drawings. At least one sediment pond will be constructed inside each RSEM area. Water within the RSEM area and contact water from adjacent construction areas will be

[REDACTED]

directed into the sediment ponds. The quality of the water discharged from sediment ponds must be monitored and managed in accordance with the requirements of the CEMP Section 4.14 "Surface Water Quality Management", including Appendix E "Acid Rock Drainage and Metal Leachate Management Plan". Once a sediment pond is no longer required, it will be drained, capped and re-vegetated.

[REDACTED]

[REDACTED] Fish salvage is to be carried out in the isolated section.

The existing lower channel of Garbage Creek is located within the downstream end of the proposed footprint of RSEM area L5 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Ultimately, RSEM area L5 will be permanently inundated by the reservoir. Prior to reservoir filling, the upper portion of RSEM L5 will be contoured and capped with a gravel and cobble substrate to provide fish habitat, as required by condition no. 4 of EAC Certificate #14-02.

3.0 LTC #2B SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #2B:

1. BC Hydro - Site C Clean Energy Project Request for Leave to Construct – RSEM L5 (LTC 2B), letter from [REDACTED] 10 August 2016.

[REDACTED]

2.	[REDACTED]
3.	[REDACTED]
4.	[REDACTED]
5.	[REDACTED]
6.	[REDACTED]
7.	[REDACTED]

It is also noted that the latest *Construction Environmental Management Plan* (R4 dated 26 July 2016) includes an updated Appendix E “*Acid Rock Drainage and Metal Leachate Management Plan*” (R5.2 dated 26 July 2016) that incorporates many of the requirements of the *Site C Water Quality Management Programme* dated 24 June 2016, which was referenced by LCC #2.

4.0 REVIEW OF SUBMISSIONS

4.1 Design Details and Construction Drawings

The construction drawings show the information that would typically be expected for works of this nature, including plans, sections and details of the starter dikes and sediment ponds, and the final profiles of the stored materials. The drawings also show plans, profiles, sections and details of the temporary Garbage Creek diversion channel and the temporary haul road extending from the left bank excavation into RSEM L5.

RSEM L5 will be partially constructed within the left side of the Peace River channel. This RSEM area is not subject to the part of condition no. 4 of EAC Certificate #14-02 which requires areas R5a, R5b and R6 to be at least 15 m from the mainstem of the river to avoid affecting fish habitat.

The starter dikes will be compacted earthfull embankments, comprised mostly of impervious fill with zones of granular fill and erosion protection along the outer side. The top of the Phase 1 starter will provide about 3.5 m of freeboard above the Diversion Stage 1 design flood level. The outer toe of the Phase 2 starter dike will be about 4.1 m above the Diversion Stage 2 design flood level.

Erosion protection design is based on river flow velocities derived from computational fluid dynamics modeling. For the Phase 1 starter dike, velocities at the upstream and downstream ends of the dike are greater than 2 m/s and erosion protection will consist of riprap. In the central section of the dike, velocities are lower and erosion protection will be provided by select coarse granular material. Since it will be above the design flood level, erosion protection for the Phase 2 starter dike will consist of granular material.

Sediment pond design criteria were previously described in [REDACTED] submitted with the request for LCC #2. Those criteria are based on the 2015 MOE guidelines for sediment ponds.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The drawings provided for these works have been sealed by Professional Engineers registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis, the conditions of Conditional Water Licences 132990 and 132991 and the requirements of the CEMP.

4.2 Construction Implementation Plan and Schedule

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Construction of the Phase 2 starter dike is scheduled to start in early 2019, in advance of diversion of the Peace River later that year.

Once in operation, RSEM L5 will receive surplus materials until mid-2020 when the RSEM will be closed, including construction of future fish habitat on its upper surface. Placement and compaction of materials within the RSEM are to be in accordance with Section 13 40 00, Part 3 of the MCW contract. The procedures are intended to minimize the potential for acid-generating conditions to develop in any PAG materials in the RSEM.

Construction of the [REDACTED] diversion works, the RSEM L5 haul road, the starter dike and placement of materials inside the dike will be by conventional excavation and earthmoving equipment and methods.

[REDACTED]

The IE considers the construction methodologies to be appropriate to the work and that the baseline schedule is reasonable.

4.3 Quality Management

Details of [REDACTED] were previously submitted and reviewed with the request for LCC #1. As part of that program, [REDACTED] has developed standard Inspection and Test Plans (ITPs) for specific types of work, which can be incorporated into the overall ITP for a larger work component. Other ITPs for unique work activities are developed as required.

[REDACTED] ITP for RSEM area L5 is comprehensive and includes the relevant work activities that would normally be expected for construction of this type.

4.4 Management & Care of Water and Environmental Protection

[REDACTED] Care of Water Plan and Environmental Protection Plan (EPP) describe water management measures for RSEM L5.

Non-contact surface water from the area upslope of RSEM L5 will be intercepted by a diversion channel and directed into the Peace River upstream of the RSEM.

Inside RSEM area L5, a temporary sump will be excavated during the initial period until the sediment ponds are operational. The sump will have capacity to attenuate the 1:2-year, 24-hour storm event. If the water level in the sump needs to be lowered and the water does not meet water quality requirements for discharge into the Peace River, it will be pumped and piped to the temporary sediment pond at the base of the left abutment.

Once the sediment ponds are operational, perimeter ditches along the inside of the starter dike will direct contact water from within the RSEM area into the ponds. Material being placed within the RSEM area will be compacted to limit infiltration and contoured such that contact water is directed into the perimeter ditches.

The Care of Water Plan indicates that contact water from the left bank excavation will also be directed into the L5 sediment ponds. The IE notes that [REDACTED] that were previously submitted with the request for LCC #2 indicate that the RSEM L5 sediment ponds will also receive contact water from other left bank excavations for the diversion tunnel inlet, the diversion tunnels and the left side of the earthfill dam.

The effects of freezing temperatures are an important seasonal consideration for water management. The EPP indicates that the sediment ponds are to be drained prior to freeze-up and kept clear of snow during the winter. It is noted that a site-wide snow management plan is under development and will be submitted to BC Hydro for approval prior to 31 October 2016.

The IE has discussed the work with the IEM and both parties are familiar with the general area where RSEM L5 will be constructed. The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

[REDACTED]

1. [REDACTED] – Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the EPP for Relocated Surplus Excavated Material area L5 and relevant component plans in consideration of LTC#2B, [REDACTED] dated 18 August 2016.

As summarized in the above letter, the IEM requires that a revised EPP and Care of Water plan must be provided to the IEM for review and acceptance prior to placement of PAG surplus excavated material into RSEM L5 and/or any discharge of any PAG contact water to any receiving waters. The IE understands that similar plans are currently being finalized for RSEM area R5b, and will provide a model for the plans for all other RSEM areas. It is the IE's opinion that there is adequate time for these plans to be revised prior to the placement of any PAG materials in RSEM L5.

4.5 Dam Safety

As required by LCC #2, the RSEM L5 sediment ponds must comply with the BC Dam Safety Regulation (2016).

4.6 Safety

[REDACTED]

5.0 LEAVE TO CONSTRUCT

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of RSEM area L5. For reference, this permission is referred to as *Leave to Construct LTC #2B*.

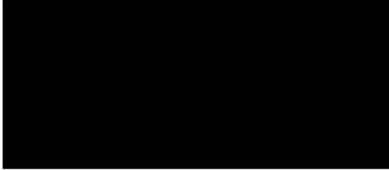
Leave to Construct for RSEM area L5 is subject to the following conditions:

1. BC Hydro and/or its contractor [REDACTED] must comply with the terms listed in the *IEM Requirements* section of the attached IEM letter dated 18 August 2016.
2. As per the attached IEM letter, placement of PAG surplus excavated materials into RSEM L5 and/or discharge of PAG contact water from the sediment ponds must not commence until the IEM has received and accepted revised versions of the EPP and Care of Water Plan. As RSEM L5 will receive some PAG materials, a low permeability layer at the base of the RSEM must also be achieved prior to placing any surplus excavated materials, as required by LCC #2.
3. It is expected that a further revision of the EPP and possibly the Care of Water Plan will be required for Phase 2 construction of RSEM L5. The revised documents must be submitted to the IEM for review and acceptance in advance of Phase 2 construction being started.
4. Within 60 days of completing construction of the Phase 1 sediment ponds, the dam failure consequence classification for the ponds must be determined in accordance with the BC Dam Safety Regulation (2016) and submitted to the IE and the MFLNRO Dam Safety Officer. This submission must include an evaluation to determine if Part 3 of the Regulation should apply to the sediment ponds. A similar submission will be required for the Phase 2 sediment ponds.

[REDACTED]

5. BC Hydro and/or its contractors must obtain and comply with any other necessary permits from provincial and/or federal regulatory agencies.

Yours truly,



 P.Eng.
Independent Engineer, Site C Clean Energy Project

Attachment: IEM letter dated 18 August 2016

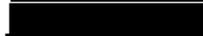
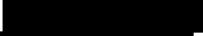
- c:  BCH VP & Project Director (Site C Licensee Representative)
 SNC Lavalin (Site C Design Engineer)
 BCH (Site C Construction Engineer)
 BCH (Environment, Aboriginal Relations and Public Affairs Director)
 BCH (Acting Regulatory Manager)
 Independent Environmental Monitor



TABLE 1

LTC #2B – RSEM AREA L5 - ISSUED FOR CONSTRUCTION DRAWINGS

[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

TABLE 3

LTC #2B – RSEM AREA L5 HAUL ROAD - ISSUED FOR CONSTRUCTION DRAWINGS

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]

August 18, 2016

[REDACTED]

[REDACTED]

Attention: [REDACTED] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the EPP for Relocated Surplus Excavated Material area L5 and relevant component plans in consideration of LTC#2B

Leave to Commence Construction (LCC#2) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of various Relocated Surplus Excavated Materials (RSEM) areas which consist of the following:

- Right bank of the Peace River – RSEM areas R5a, R5b, and R6.
- Left bank of the Peace River – RSEM areas L5 and L6

Each of these RSEM components requires individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the works associated with construction of RSEM Area L5 which has been identified as LTC#2B.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

The IEM has reviewed the EPP provided by [REDACTED] and relevant component plans. The review included cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]

Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, and authorizations received and reviewed by the IEM, which are related to LTC#2B.

[REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]

BC Hydro Plans/Documents

- *CEMP* (Revision 4), dated July 26, 2016.
- *Construction Safety Management Plan* (CSMP), dated June 5, 2015.
- *Conceptual RSEM and Excavation Area Water Management Work Plan* (Revision 1), dated April 27, 2016.

Provincial and Federal Permits/Approvals

- Conditional Water Licence 132990.
- *Conditional Water Licences 132990 and 132991 on Peace River Leave to Commence Construction No. 2.* Letter from [REDACTED] dated June 29, 2016.
- *Fisheries Act* Authorization 15-HPAC-01160
- *Navigation Protection Act* Approval File Number 2008-500822 and 2015-500399
- *Wildlife Act* Amphibian Salvage Permit FJ16-226024
- *Wildlife Act* Fish Salvage Permit FJ16-225327
- Approval A703710 – Short Term Use issued under the *Water Act*.
- Licence No.: 815646 issued under the *Land Act*.

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans were provided as required.

It is our understanding that key components under this LTC are to include the following:

- Crossing and diversion of Garbage Creek;
- Construction of L5 haul road;

- Stage 1 construction of the starter dike with riprap and/or locally sourced alluvial materials;
 - The Stage 1 starter dike will cut off the left bank side channel to the Peace River, which is required to complete the construction of RSEM area L5.
 - Fish and amphibian salvage will be required as a component of the river isolation associated with the starter dike.
 - Isolated work area within the starter dike will be dewatered.
- Construction of the sediment pond(s) within the RSEM area L5;
- Material placement in the RSEM area behind the starter dike;
- Operation of the sediment pond(s) and,
- Construction of the Stage 2 dike.

The IEM has the following expectations for works under this LTC:

- Only non-PAG materials will be placed within RSEM area L5 at this time.
- Fish salvage works will be conducted as per *Fisheries Act* Authorization condition 2.3.4 throughout all instream works associated with RSEM area L5.
 - Condition 2.3.4 states that “fish salvage and relocation shall be conducted prior to the start of construction activities so as to avoid and minimize adverse impacts to fish.”
- In situ water quality monitoring for the SEV program will be implemented as per the [REDACTED]

IEM Requirements

Upon review of the submitted documents for LTC#2B, and based on communications and information provided by BC Hydro and the contractor, the IEM requires the following as conditions of this LTC:

- Revised EPP and COW plans must be provided to the IEM for review and acceptance prior to placement of PAG surplus excavated material into the RSEM and/or any discharge of any PAG contact water to any receiving waters. The revised EPP and COW plans must incorporate requirements of LCC#2, and the revised CEMP (Appendix E).
- Confirmation must be provided to the IEM in advance of flocculant use that the proposed flocculant (IPAFLOC PLUS C) is non-toxic to the aquatic environment. Product information and specifications for any flocculant used must also be provided to the IEM.
- Confirmation must be provided to the IEM in advance of instream works that all *Navigation Protection Act* conditions related to signage/markers around the dam site area have been satisfied (File No. 2008-500822, Appendix A, Condition 4).
- Revised EPP must be provided to the IEM for review and acceptance prior to stage 2 construction of the RSEM area L5 berm and development of fish habitat on the top surface of the completed RSEM area. If a revised COW plan is required, it must also be provided to the IEM.

Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC#2B for the works associated with construction of RSEM area L5, as described.

Yours truly,

[Redacted Signature]

[Redacted Name]

[Redacted Title]

Independent Environmental Monitor - Delegate

cc. [Redacted] Water Management Branch, Engineer
[Redacted] BC Hydro, Manager, Project Environmental Risk Management
[Redacted] BC Hydro Regulatory Manager (Acting)

[REDACTED]

09 March 2017

[REDACTED], P.Eng.

Deputy Comptroller of Water Rights / Manager, Water Allocation and Utility Regulation
Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1
Via email: [REDACTED]

Dear [REDACTED]:

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Left Bank Global Instability Initial Remediation Measures**

- Leave to Construct LTC #1G – Left Bank Excavation Phase 2 – Amendment #2
- Leave to Construct LTC #2B – RSEM Area L5 – Amendment #1
- Leave to Construct LTC #3C – Stage 1 Diversion Inlet Cofferdam - Amendment #1

As described below, this letter is intended to serve as amendments to the following three Leaves to Construct, as construction of the works authorized by these LTCs has been impacted by a common event:

- LTC #1G – Left Bank Excavation Phase 2, issued 10 August 2016
- LTC #2B – RSEM Area L5, issued 18 August 2016
- LTC #3C – Stage 1 Diversion Inlet Cofferdam, issued 26 September 2016

In mid-February 2017 a tension crack about 400 m long developed in fill and colluvium materials along the lower left bank of the dam site. The crack is located above the eastern end of RSEM L5 (under construction) and the future diversion tunnels inlet portal, and below the haul road being constructed from the left bank excavation to RSEM L5. Construction activities in those areas were promptly suspended for safety reasons and monitoring and site investigations were initiated by BC Hydro and [REDACTED]. Survey monuments indicated slope movements that accelerated for about a week, peaking in the order of 2 m/day in some locations, then slowed substantially.

It is interpreted by BC Hydro and [REDACTED] that all the material within the unstable area was intended to be excavated during construction of the project. However, temporary stability improvements are required to allow the suspended construction activities to safely continue.

Site investigations have determined that the toe of the unstable area is located near the edge of the Peace River. [REDACTED]

[REDACTED] The Independent Engineer (IE) and the Independent Environmental Monitor (IEM) have received the following plan, including drawings, describing the proposed works:

- [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The IE understands that construction will commence on 10 March 2017.

[REDACTED]

[REDACTED] describes how the existing Environmental Protection Plans for the affected works will be applied in the construction of the initial remedial works, including provisions for water quality and turbidity management and monitoring. The plan also includes a fish salvage plan for those portions of the road widening and buttress works that will be constructed in water, as required. Fish salvages have previously been completed in the RSEM L5 area where the west buttress will be constructed, and in the isolated side channel that will be partially infilled by the road widening works.

Monitoring of the slope instability will continue through and after construction of the initial remedial works. Once the buttresses are completed, construction of the temporarily-suspended works will restart when authorized by the engineer of record.

[REDACTED] does not anticipate that the design of the left bank excavation, RSEM L5 or the diversion inlet cofferdam works authorized by LTCs #1G, 2B and 3C will be significantly revised as a result of the slope instability or the initial remedial measures. The west buttress will remain permanently within RSEM L5. The east buttress will be removed following unloading of the slope above during left bank and diversion inlet portal excavation, and will not interfere with construction of the inlet cofferdam.

The IE has reviewed the proposed initial remedial measures with the IEM. Both parties provided BC Hydro with comments on [REDACTED], and also received BC Hydro's comments on that plan, as well as [REDACTED] responses to all comments.

[REDACTED]

[REDACTED]

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the initial remedial works described above, in accordance with the Construction and Environmental Mitigation Plan, including all measures and actions described in the above-noted contract submittal.

The IE and IEM recommend that the [REDACTED] should be revised as soon as possible. Until then, we recommend that the contract submittal document be appended to that Plan to ensure the information required by onsite staff or others is appropriately contained in a single document. Copies of any Plan updates should be provided to the IE and IEM for information.

The IEM also requests that BC Hydro provide confirmation that the appropriate notification is provided to the Ministry of Forests, Lands and Natural Resource Operations as required under the fish salvage permit and as committed to in the contract submittal document, by 10 March 2017.

The IE and IEM request to be kept informed of the progress of construction of the remedial works and any material changes in the construction approach, any significant changes in behaviour of the slope instability, or any potential impacts on the design of permanent project components.

Yours truly,

[REDACTED]

[REDACTED]

[REDACTED] P.Eng.
Independent Engineer, Site C Clean Energy Project

- c: [REDACTED] BCH VP & Project Director (Site C Licensee Representative)
[REDACTED] SNC Lavalin (Site C Design Engineer)
[REDACTED] BCH (Site C Construction Engineer)
[REDACTED] BCH (Environment, Aboriginal Relations and Public Affairs Director)
[REDACTED] BCH (Regulatory Manager)
[REDACTED] Independent Environmental Monitor

[REDACTED]

[Redacted]

31 March 2017

[Redacted], P.Eng.
Deputy Comptroller of Water Rights
Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1
Via email: [Redacted]

Dear [Redacted]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Left Bank Global Instability Remediation Measures – Side Channel Infilling**

- Leave to Construct LTC #01G – Left Bank Excavation Phase 2 – Amendment #3
- Leave to Construct LTC #02B – RSEM Area L5 – Amendment #2
- Leave to Construct LTC #03C – Stage 1 Diversion Inlet Cofferdam - Amendment #2

As described below, this letter is intended to serve as amendments to the following three Leaves to Construct:

- LTC #01G – Left Bank Excavation Phase 2, issued 10 August 2016
- LTC #02B – RSEM Area L5, issued 18 August 2016
- LTC #03C – Stage 1 Diversion Inlet Cofferdam, issued 26 September 2016

Construction of the works authorized by these LTCs was impacted by slope instability that developed in fill and colluvium materials along the lower left bank of the dam site in February 2017. Previous amendments to these LTCs, issued on 09 March 2017, authorized construction of two toe buttresses as an initial measure to improve stability of the affected slope. To complete those works, construction access improvements were also required, consisting of widening a 440 m length of the existing temporary access road immediately upstream of the Peace River construction bridge north abutment.

During a monthly site visit on 29 March 2017, the Independent Engineer (IE) and the Independent Environmental Monitor (IEM) noted that the road widening was largely completed and construction of the toe buttresses was in progress by BC Hydro’s contractor [Redacted]. As planned, the road widening has partially infilled a previously-isolated river side channel.

During the site visit, [Redacted] informed BC Hydro, the IE and the IEM that it proposes to infill the remainder of the river side channel area to provide additional construction work area, which is limited along the river. The IE and the IEM have since received the following plan describing the proposed works:

• [Redacted]

[Redacted]

[Redacted]

Although it is physically separated from the Peace River, the side channel pond may still be hydraulically connected to the river through alluvial deposits. The Plan also states that amphibian salvage and relocation will be implemented if necessary. Based on those factors, the IEM recommends that to ensure compliance with Section 4.5 of the CEMP, readily biodegradable hydraulic fluids should be used in equipment working above or within the wetted area.

In the previous LTC Amendment dated 09 March 2017, it was requested that copies of updates to the Construction and Environmental Mitigation Plan be provided to the IE and IEM for information. The IE and IEM have received Revision R1 of the Plan, dated 10 March 2017, including BC Hydro's comments on the Plan.

The IEM also requested that BC Hydro provide confirmation that the appropriate notification was provided to the Ministry of Forests, Lands and Natural Resource Operations as required under the fish salvage permit, by 10 March 2017. Confirmation was received by the IEM on the requested date.

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with backfilling the remainder of the river side channel as described above, in accordance with the submitted Construction and Environmental Mitigation Plan. The IE notes that most of the side channel area is located within the footprint of the future RSEM L6 and recommends that BC Hydro should confirm that the infilling will not affect the construction of the RSEM.

Yours truly,

[Redacted Signature]

[Redacted Signature]

ch
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[Redacted] P.Eng.
Independent Engineer, Site C Clean Energy Project

- c: [Redacted] BCH VP & Project Director (Site C Licensee Representative)
[Redacted], SNC Lavalin (Site C Design Engineer)
[Redacted] BCH (Site C Construction Engineer)
[Redacted] BCH (Environment, Aboriginal Relations and Public Affairs Director)
[Redacted] BCH (Regulatory Manager)
[Redacted] Independent Environmental Monitor
[Redacted] FLNRO Water Management Officer

[Redacted]

[Redacted]

26 May 2017

[Redacted], P.Eng.
Deputy Comptroller of Water Rights
Ministry of Forests, Lands and Natural Resource Operations

Via email [Redacted]

Dear [Redacted]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #02B – RSEM Area L5
Amendment #3 – Left Bank Haul Road PAG Management**

Construction of Relocated Surplus Excavated Material (RSEM) Area L5 was authorized under Leave to Construct LTC #02B dated 18 August 2016. The scope of work under LTC #02B includes construction of the lower, western portion of a temporary haul road from the left bank excavation into RSEM L5.

Construction of RSEM L5 and the temporary haul road are currently in progress by BC Hydro's [Redacted]. [Redacted] Potentially acid-generating (PAG) shale bedrock is being encountered along the haul road alignment within and immediately adjacent to the RSEM L5 footprint. [Redacted] plans to [Redacted] which is a change to the construction plan. BC Hydro has no objection to the use of compacted shale in the road fill.

The IE and the IEM have received the following plan describing the proposed works:

1. [Redacted]

The plan refers to the following documents, which have also been received by the IE and the IEM:

2. [Redacted]

3. [Redacted]

[Redacted]

[Redacted]

[Redacted]

[REDACTED]

It is likely that PAG shale bedrock will be exposed on the uphill side of the haul road. [REDACTED]

[REDACTED]

The plan indicates that the western portion of the road fill is entirely located above RSEM L5 and the Stage 1 diversion inlet cofferdam. [REDACTED]

[REDACTED]

BC Hydro has accepted [REDACTED] plan for incorporating PAG materials into the haul road fill, subject to [REDACTED] providing some additional details regarding erosion and sediment control and water management.

The Independent Engineer hereby recommends to the Deputy Comptroller of Water Rights that BC Hydro can proceed with PAG management for construction of the haul road as described above and in accordance with the submitted Environmental Protection Plan Addendum. This recommendation is copied to BC Hydro and is sufficient for construction of these works to proceed. For reference, this recommendation is referred to as *Leave to Construct LTC #02B, Amendment #3*.

Leave to Construct LTC# 02B, Amendment #3 is subject to the following conditions:

1. BC Hydro must provide the IE and IEM with a copy of the additional details regarding erosion and sediment control and water management, and any revisions to the EPP Addendum, once received from [REDACTED].
2. The constructed works and water management must comply with the CEMP, Appendix E, and the IE and IEM must be kept informed of any changes to the constructed works.

Yours truly,

[REDACTED]

[REDACTED]

[REDACTED] P.Eng.

Independent Engineer, Site C Clean Energy Project

- c: [REDACTED], BCH VP & Project Director (Site C Licensee Representative)
[REDACTED], BCH (Environment, Aboriginal Relations and Public Affairs Director)
[REDACTED], BCH (Regulatory Manager)
[REDACTED], SNC Lavalin (Site C Design Engineer)
[REDACTED], BCH (Site C Construction Engineer)
[REDACTED], Independent Environmental Monitor
[REDACTED], FLNRO Water Management Officer
[REDACTED], FLNRO Water Management Officer

[Redacted]

30 June 2017

[Redacted] P.Eng.
Deputy Comptroller of Water Rights
Ministry of Forests, Lands and Natural Resource Operations

[Redacted]
Via email: [Redacted]

Dear [Redacted]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #02B – RSEM Area L5
Amendment #4 – Additional Temporary PAG Management**

Construction of Relocated Surplus Excavated Material (RSEM) Area L5 was authorized under Leave to Construct LTC #02B dated 18 August 2016. The scope of work under LTC #02B includes construction of the lower, western portion of a temporary haul road from the left bank excavation into RSEM L5. These works are currently in progress by BC Hydro's contractor [Redacted]

Completion of RSEM L5 and the temporary haul road have been delayed for various reasons, most recently due to a slope instability on the upstream left bank of the dam site that restricted construction access to these areas for several months. At the same time, potentially acid-generating (PAG) shale bedrock has been encountered in several left bank excavations, in advance of a completed left bank RSEM area being available to receive this material. [Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

3

Until construction of RSEM L5 and its sediment pond is completed, there is a continuing need to dispose of PAG materials in temporary or interim locations. It is expected that additional shale and other PAG materials will be encountered along other sections of the haul road and in other left bank excavations.

[Redacted]

[Redacted]

[Redacted]

[Redacted]

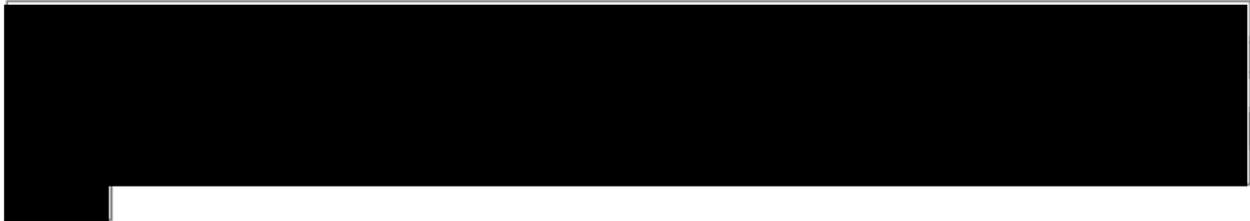
[Redacted]

[Redacted]

[Redacted]



Erosion and sediment control measures and PAG monitoring will be in accordance with the CEMP. A qualified environmental professional will develop an ESC plan for the work, including provisions for field-fit changes if required.



The Independent Engineer hereby recommends to the Deputy Comptroller of Water Rights that BC Hydro can proceed with construction of the additional temporary PAG management as described above and in accordance with the submitted PAG Management Plan and Environmental Protection Plan Addendum. This recommendation is copied to BC Hydro and is sufficient for construction of these works to proceed. For reference, this recommendation is referred to as *Leave to Construct LTC #02B, Amendment #4*.

The IE and the IEM recommend that non-PAG contact ditching, perimeter ditches and collection ponds should be constructed prior to any placement of PAG material. The IEM also requests a copy of the ESC work plan that is to be prepared in advance of the work.



Yours truly,

[Redacted]

[Redacted]

me
017

[Redacted] P.Eng.

Independent Engineer, Site C Clean Energy Project

- c:
- [Redacted] BCH VP & Project Director (Site C Licensee Representative)
 - [Redacted] BCH (Regulatory Manager)
 - [Redacted] SNC Lavalin (Site C Design Engineer)
 - [Redacted] BCH (Site C Construction Engineer)
 - [Redacted] Independent Environmental Monitor
 - [Redacted] FLNRO Water Management Officer
 - [Redacted] FLNRO Water Management Officer

[Redacted]

[REDACTED]

14 October 2016

[REDACTED]
Deputy Comptroller of Water Rights
Ministry of Forests, Lands and Natural Resource Operations

[REDACTED]
Via email: [REDACTED]

Dear [REDACTED]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #2C – South Bank Initial Access Road**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to commence construction of the South Bank Initial Access Road (SBIAR). The SBIAR will provide part of the containment for Relocated Surplus Excavated Material (RSEM) area R6, and as such is part of one of the works authorized under LCC #2 dated 29 June 2016. The proposed works would be constructed by [REDACTED] BC Hydro's contractor for the Site C Main Civil Works. For reference, these works are to be authorized under *Leave to Construct LTC #2C*.

The SBIAR will provide access from the south end of the Peace River construction bridge up to the top of the natural terrace above the right bank of the river, where it will merge into an existing road. The Site C approach channel works are to be constructed at the upstream end of the terrace, and the roller compacted concrete batch plant, other construction facilities and excavations for construction materials are or will be located downstream of the approach channel location. BC Hydro had originally planned to have the SBIAR constructed by another contractor in advance of the Main Civil Works contract, but now plans to have [REDACTED] undertake construction of this road.

The SBIAR has been designed so that a portion of the road embankment will also serve as part of the containment dike for the east side of RSEM area R6. When completed, the starter dike for RSEM R6 and the northern end of the SBIAR will form a continuous embankment.

The SBIAR embankment will also form a permanent barrier across the right bank side channel of the Peace River. Under LTC #1A issued 18 May 2016, the upstream end of the side channel has already been isolated by construction of upstream dikes and a temporary downstream barrier, and fish and amphibian salvage have also been conducted. The portion of the side channel within the footprint of RSEM area R6 has either already been infilled by construction of the access ramp to the right bank drainage tunnel portal, or will be infilled later by surplus materials to be placed in RSEM R6.

2.0 DESCRIPTION OF THE WORKS

Overburden and shale deposits that must be excavated for construction of the Site C project, and which are either surplus to or unsuitable as construction materials are to be disposed of in RSEM areas located

[REDACTED]

on both sides of the Peace River. Each RSEM area will be bounded on its lowest sides by a starter dike that will retain the surplus materials to be stored within.

RSEM area R6 is for permanent storage of only non-PAG (non potentially acid-generating) materials. In plan, the outer containment for RSEM area R6 is U-shaped with a total length of approximately 1200 m. Of this, containment on the west (upstream) side will be provided by a portion of the Stage 1 right bank cofferdam and on the east (downstream) side, part of the containment will be provided by the SBIAR embankment. A starter dike approximately 4 m high will span the central (north) section along the river between these other two embankments.

Construction of the Stage 1 right bank cofferdam and RSEM area R6 were authorized by LTC #3A issued 26 July 2016 and LTC #2D issued 26 August 2016, respectively. The SBIAR was not included in LTC #2D, as it was not part of [REDACTED] original scope and was not incorporated in the relevant LTC submission documents at that time.

BC Hydro has subsequently prepared a Preliminary Change Instruction to [REDACTED] to construct the SBIAR, a 720 m length of road extending from road Sta. 20+100 to Sta. 20+820. The SBIAR will be used by all project contractors for access from river level up to the right bank terrace area and will have a surface width of 8.0 to 12.8 m. In addition, [REDACTED] will construct a 15 m wide haul road parallel to the SBIAR to be used only by [REDACTED] high-frequency heavy-haul vehicle traffic. The SBIAR and the [REDACTED] haul road will be constructed on a common embankment with a separating ditch. At a later date, the [REDACTED] haul road will connect to the access for the proposed twinned Peace River construction bridge.

Excavations for construction of the SBIAR will encounter shale, which is considered to be PAG material. [REDACTED] intends that PAG contact water from the SBIAR will utilize the zero-discharge water management system previously authorized for the right bank drainage tunnel portal and underground works. PAG materials from the SBIAR excavations are to be disposed of in RSEM R5a or R5b, but may have to be temporarily stockpiled if one of those RSEM areas is not available when required.

3.0 LTC #2C SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #2C:

1. BC Hydro - *Site C Clean Energy Project Request for Leave to Construct – South Bank Initial Access Road (LTC2C)*, letter from [REDACTED] 12 August 2016.
2. BC Hydro - *LTC2C - South Bank Initial Access Road - Revised Documents*, email from [REDACTED] & others, 05 October 2016
3. [REDACTED] – *Site C Clean Energy Project, Implementation Design, Design Basis Memorandum, Dam Site Roads, R2*, November 2015.
4. BC Hydro [REDACTED] – *Issued for Construction Drawings* - see Table 1.
5. BC Hydro - *Specifications for Preliminary Change Instruction 005, South Bank Initial Access Road Construction*, undated.
6. BC Hydro - *Site C Clean Energy Project, South Bank Initial Access Road Construction Implementation Plan*, 27 September 2016.
7. BC Hydro - *Site C Clean Energy Project Main Civil Works, South Bank Initial Access Road – Inspection and Test Plan, R1*, 27 September 2016.

8. [REDACTED] - Site C Clean Energy Project Main Civil Works, South Bank Initial Access Road (SBIAR) Care of Water Plan, R0, 14 September 2016.
9. [REDACTED] - Site C Clean Energy Project Main Civil Works, South Bank Initial Access Road EPP, R0, 24 September 2016.

4.0 REVIEW OF SUBMISSIONS

4.1 Design Details and Construction Drawings

The SBIAR was not included in the scope of work for the Main Civil Works (MCW) contract. However, BC Hydro's technical specifications for the SBIAR (submission item 5) require that the standard specifications, standards and reference documents in MCW Specification 34 50 00, Clause 1.4.6, will apply to the SBIAR. The referenced specification applies to all other project roads being constructed by [REDACTED] and is largely based on *BC Ministry of Transportation and Infrastructure 2012 Standard Specifications for Highway Construction, and the Special Provision Amendments to those Specifications*.

The SBIAR has been designed in accordance with the *Design Basis Memorandum for Dam Site Roads* (submission item 3). Road construction materials are to be obtained from Area 23 or Area A on the right bank terrace. Riprap for ditch lining and armouring purposes will be limestone from the West Pine quarry. The construction drawings show the information that would typically be expected for roadworks of this nature, including plan, profile, sections and details of the road and associated drainage, ditches, surfacing and safety barriers. The road will rise a vertical height of about 49 m from the right bank island to the terrace above, with a maximum gradient of 10%.

The technical specifications include requirements for inclinometers and survey toe pegs to be used for monitoring the performance of the road embankment during and after construction.

BC Hydro has also requested [REDACTED] to design and construct a section of shared access road between the northern end of the SBIAR at Sta. 20+820 and the adjoining road on top of the RSEM R6 starter dike. This design work will be carried out in parallel with design and construction of the approach to the proposed twinned Peace River construction bridge and [REDACTED] other haul roads on the right bank island. [REDACTED] is responsible for design and construction of their own haul road network and are in the best position to design and construct this length of shared access to provide a favorable connection with their roads. The IE considers that this approach is appropriate and that there will be no material impact on the design intent for these embankments to provide part of the containment for RSEM R6.

The design of the SBIAR is consistent with the design of other project roads and is based on well-established industry standards. The drawings provided for these works have been sealed by a Professional Engineer registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis, the conditions of Conditional Water Licences 132990 and 132991 and the requirements of the CEMP.

4.2 Construction Implementation Plan and Schedule

BC Hydro has prepared a construction implementation plan (CIP) on behalf of [REDACTED] (submission item 6) which it is expected that [REDACTED] will accept and follow. The IE notes that the work activity description in [REDACTED] is consistent with the CIP.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Construction of the SBIAR will be by conventional excavation and earthmoving equipment and methods. The IE considers the construction methodologies to be appropriate to the work and that the proposed schedule is reasonable.

4.3 Quality Management

BC Hydro's technical specifications require that construction of the SBIAR must follow the quality management requirements of the MCW contract. Details of [REDACTED] were previously submitted and reviewed with the request for LCC #1.

BC Hydro has prepared an Inspection and Test Plan (ITP) for construction of the SBIAR, for acceptance and implementation by [REDACTED] in accordance with their quality management program. The ITP is similar to ITPs previously adopted on other project roads and includes the types of tests and other quality management activities that would normally be expected for road construction.

4.4 Management & Care of Water and Environmental Protection

[REDACTED] describe water management measures for construction of the SBIAR.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The effects of freezing temperatures are an important seasonal consideration for water management. The EPPs for the sediment ponds to be utilized for the SBIAR works indicate that the ponds are to be drained prior to freeze-up and kept clear of snow during the winter. It has been noted in previous LTCs that a site-wide snow management plan is under development by PRHP and will be submitted to BC Hydro for approval prior to 31 October 2016.

The IE has discussed the work with the IEM and both parties are familiar with the general area where the SBIAR will be constructed. The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – *Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the South Bank Initial Access Road EPP and relevant component plans in consideration of LTC#2C*, letter to [REDACTED] dated 14 October 2016.

As summarized in the above letter, the IEM requires that all comments provided by [REDACTED] be addressed as requested by BC Hydro no later than 28 October 2016. These comments must be addressed to the satisfaction of BC Hydro and the IEM.

4.5 Public Safety

Construction safety for the SBIAR will be covered by PRHP's *Health Safety Management Plan (HSMP)*. The work activities required for construction of this road are already being conducted by PRHP at various locations on the project site. The IE notes that the *HSMP* has been accepted by BC Hydro and includes a *Public Safety Management Plan* that applies to construction of the entire Main Civil Works.

5.0 LEAVE TO CONSTRUCT

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the South Bank Initial Access Road. For reference, this permission is referred to as *Leave to Construct LTC #2C*.

[REDACTED]

Leave to Construct for the South Bank Initial Access Road is subject to the following conditions:

1. All comments provided by BC Hydro on [REDACTED] must be addressed to the satisfaction of BC Hydro and the IEM by no later than 28 October 2016.
2. BC Hydro and/or its contractors must obtain and comply with any other necessary permits from provincial and/or federal regulatory agencies.

Yours truly,

[REDACTED]

[REDACTED]

[REDACTED] P.Eng.
Independent Engineer, Site C Clean Energy Project

Attachment: IEM letter dated 14 October 2016

c: [REDACTED] FLNRO Water Management Officer
[REDACTED] BCH VP & Project Director (Site C Licensee Representative)
[REDACTED] SNC Lavalin (Site C Design Engineer)
[REDACTED] BCH (Site C Construction Engineer)
[REDACTED] BCH (Environment, Aboriginal Relations and Public Affairs Director)
[REDACTED] BCH (Regulatory Manager)
[REDACTED] Independent Environmental Monitor

[REDACTED]

TABLE 1

LTC #2C – SOUTH BANK INITIAL ACCESS ROAD - ISSUED FOR CONSTRUCTION DRAWINGS

Drawing No.	Revision	Title
[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]

[REDACTED]

October 14, 2016

[REDACTED]

[REDACTED]

Attention: [REDACTED] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the South Bank Initial Access Road EPP and relevant component plans in consideration of LTC#2C

Leave to Commence Construction (LCC#2) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of three key components consisting of the following:

- Right bank of the Peace River – RSEMs R5a, R5b, and R6.
- Left bank of the Peace River – RSEMs L5 and L6.
- South Bank Initial Access Road (SBIAR).

Each RSEM component requires an individual Leave to Construct (LTC), in addition to the SBIAR. While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the works associated with the SBIAR, herein referred to as LTC#2C.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

The IEM has reviewed the EPP provided by [REDACTED] and relevant component plans. The review included cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]

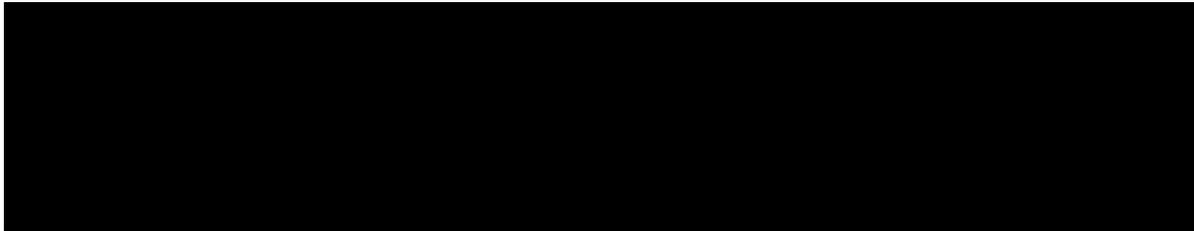


Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, and authorizations received and reviewed by the IEM, which are related to LTC#2C.



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BC Hydro Plans/Documents

- *CEMP* (Revision 4), dated July 26, 2016.
- *Construction Safety Management Plan* (CSMP), dated June 5, 2015.
- *South Bank Initial Access Road Construction Implementation Plan*, dated September 27, 2016.

Provincial Permits/Approvals

- Conditional Water Licence 132990.
- *Conditional Water Licences 132990 and 132991 on Peace River Leave to Commence Construction No. 1*. Letter from , dated June 29, 2016.
- Licence No.: 815646 issued under the *Land Act*.

Federal Permits/Approvals

- *Fisheries Act* Authorization 15-HPAC-00170
- Navigation Protection Program File No.: 2014-500338

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans are in place as required.

It is our understanding that works under this LTC are to include the following:

- Construction of a temporary access trail to facilitate material placement.
- Placement of Phase 1 fill (NPAG) materials from the toe to mid-slope (northern portion of the road works).





- o A portion of this work will include the infilling of the previously isolated portion of the south bank side channel.
- o Contact waters (NPAG) are to be directed to the temporary sediment ponds at the River Island Laydown.
- Phase 2 will consist of cut slope preparation of the upper (southern) portion of the road, which includes PAG materials.
 - o PAG materials are to be removed to RSEM Area R5b or other approved temporary stockpile location.
 - o PAG contact water is to be diverted to the right bank drainage tunnel temporary sediment pond.

IEM Requirements

The IEM requires that all comments provided by BC Hydro be addressed as requested by no later than October 28, 2016. These comments must be addressed to the satisfaction of BC Hydro and the IEM.

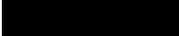
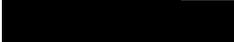
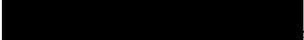
Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, we have no objections to issuing LTC#2C for the works associated with the SBIAR, as described.

Yours truly,



Independent Environmental Monitor

- cc.  Water Management Branch, Deputy Comptroller of Water Rights
 Water Management Branch, Engineer
, BC Hydro, Manager, Project Environmental Risk Management
, BC Hydro Regulatory Manager (Acting)



[REDACTED]

26 August 2016

[REDACTED]
[REDACTED]
Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1

Via email: [REDACTED]

Dear [REDACTED]

Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #2D – RSEM Area R6

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to commence construction of Relocated Surplus Excavated Material (RSEM) Area R6. This RSEM area is one of the works authorized under LCC #2 dated 29 June 2016 for permanent storage of only non-PAG (non potentially acid-generating) materials. The proposed works would be constructed by [REDACTED] BC Hydro's contractor for the Site C Main Civil Works. For reference, these works are to be authorized under *Leave to Construct LTC #2D*.

A portion of the east side of RSEM area R6 will be contained by the South Bank Initial Access Road (SBIAR) embankment. BC Hydro had planned to have the SBIAR constructed by another contractor in advance of works to be constructed by [REDACTED], but now plans to have [REDACTED] undertake construction of the SBIAR. Construction of the SBIAR will be authorized by a separate LTC.

The south side of RSEM area R6 will infill a portion of the right bank side channel of the Peace River. Under LTC #1A issued 18 May 2016, that portion of the side channel has already been isolated by construction of upstream dikes and a temporary downstream barrier, and fish salvage has also been conducted. Further, under LTC #1C issued 23 June 2016, a portion of the side channel within the footprint of RSEM area R6 has already been infilled by construction of the access ramp to the right bank drainage tunnel portal. The future SBIAR embankment will form a permanent barrier across the downstream end of the isolated section of channel and surplus materials will infill the remainder of the upstream section of channel within the RSEM R6 footprint.

2.0 DESCRIPTION OF THE WORKS

Overburden and shale deposits that must be excavated for construction of the Site C project, and which are either surplus to or unsuitable as construction materials are to be disposed of in RSEM areas located on both sides of the Peace River. Each RSEM area will be bounded on its lowest sides by a starter dike that will retain the surplus materials to be stored within. The starter dikes will be compacted earthfill embankments designed by BC Hydro. [REDACTED] is responsible for the design of placement of surplus materials inside the dikes, and for management of water within and outside of the RSEM areas, in accordance with

[REDACTED]

the technical specifications and drawings. At least one sediment pond will be constructed inside each RSEM area. Water within the RSEM area and contact water from adjacent construction areas will be directed into the sediment ponds. The quality of the water discharged from sediment ponds must be monitored and managed in accordance with the requirements of the CEMP Section 4.14 “*Surface Water Quality Management*”, including Appendix E “*Acid Rock Drainage and Metal Leachate Management Plan*”. Once a sediment pond is no longer required, it will be drained, capped and re-vegetated.

RSEM area R6, to be located on the right bank of the Peace River downstream of the future spillway, is designed to store approximately 872,000 m³ of surplus non-PAG materials. These materials will comprise overburden from excavations for the RCC buttress, the approach channel and the foundation for the earthfill dam.

The outer containment for RSEM area R6 is U-shaped with a total length of approximately 1200 m. Of this, containment on the west (upstream) side will be provided by a portion of the right bank Stage 1 cofferdam and on the east (downstream) side, containment will be provided by the SBIAR embankment. A starter dike approximately 4 m high will span the central (north) section along the river between these other two embankments.

There will be one sediment pond constructed along the inside edge of the starter dike. Contact water from the area inside RSEM R6 will be routed into this pond for settlement of suspended sediments prior to discharge to the Peace River. It is noted that the portal of the right bank drainage tunnel, now under construction, is located above the south side of RSEM area R6. Contact water from the portal, including potential PAG contact runoff, will be directed to a temporary sediment pond located within RSEM R6. Those water management works were authorized under LTC #1C with the condition that the system be designed for zero discharge to the Peace River, until otherwise approved. Similarly, construction of the right bank drainage tunnel underground works was authorized by LTC #1H issued 23 August 2016 with the condition that the tunnel utilize the same zero-discharge water management system, until otherwise approved. The IE understands that [REDACTED] may wish to direct the PAG contact water from the zero-discharge system into the RSEM R6 sediment pond once it is available. This approach would be subject to the IE and IEM receiving and accepting a revised EPP and Care of Water Plan that comply with the latest version of the Construction Environmental Management Plan.

Once RSEM area R6 is filled to capacity, the sediment pond will be decommissioned and infilled when it is no longer required. A permanent access road to the right bank drainage tunnel will be constructed over the south side of the RSEM and the IE understands that most of the remaining surface area will be made available as a contractor laydown area. Ultimately, the surface of the RSEM will be capped with a layer of topsoil and vegetation will be planted.

3.0 LTC #2D SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #2D:

1. BC Hydro - *Site C Clean Energy Project Request for Leave to Construct – RSEM Area R6 (LTC2D)*, letter from [REDACTED] to [REDACTED], 16 August 2016.
2. [REDACTED]
3. [REDACTED]

4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]

It is also noted that the latest *Construction Environmental Management Plan* (R4 dated 26 July 2016) includes an updated Appendix E “*Acid Rock Drainage and Metal Leachate Management Plan*” (R5.2 dated 26 July 2016) that incorporates many of the requirements of the *Site C Water Quality Management Programme* dated 24 June 2016, which was referenced by LCC #2.

4.0 REVIEW OF SUBMISSIONS

4.1 Design Details and Construction Drawings

The construction drawings show the information that would typically be expected for works of this nature, including plans, sections and details of the starter dike and sediment pond, and final profiles of the stored materials. When completed, the top of the RSEM fill will be at [REDACTED] and will provide level access to the portal of the right bank drainage tunnel, which has the same elevation at its invert. The RSEM fill will slope down toward the starter dike and other containment embankments at a uniform gradient of [REDACTED]. The top of the starter dike along the Peace River will be at [REDACTED] and will be [REDACTED] wide, sufficient for two-way construction haul traffic.

The outer toe of the RSEM R6 starter dike will be set back at least 15 m from the mainstem of the river, as required by condition no. 4 of EAC Certificate #14-02. A portion of the natural shoreline along this section of the Peace River has already been protected against erosion with riprap under works authorized by LTC #1D issued 11 July 2016.

The starter dike will be a compacted earthfill embankment, comprised mostly of impervious fill with zones of granular fill and erosion protection along the outer side. Erosion protection along the section of dike closest to the river will be riprap, and elsewhere it will be select coarse granular material. Riprap for this RSEM is designated as permanent and will be sourced from the West Pine quarry.

The toe of the [REDACTED] will be about [REDACTED] above the Diversion Stage 2 design flood level. Under maximum potential ice jam conditions during construction, there would be [REDACTED] of freeboard to the top of the [REDACTED]. Once the project is completed and river channel scour has occurred from spillway operation, the top of the starter dike would have [REDACTED] of freeboard at the Inflow Design Flood (IDF) release. The riprap will extend up to the [REDACTED] level.

The portion of the right bank Stage 1 cofferdam that provides the upstream side of the RSEM R6 containment will remain in place permanently. Once the spillway outlet channel is constructed at a later date, the riprap cover along the starter dike will be extended upstream along the adjoining section of cofferdam embankment.

Sediment pond design criteria were previously described in [REDACTED] [REDACTED] *Work Plan*, submitted with the request for LCC #2. Those criteria are based on the 2015 MOE guidelines for sediment ponds.

The sediment pond will be located along the inside of the central portion of the starter dike, with the impervious dike fill providing one side of the pond and a parallel deflection berm forming the other side. The pond will be about [REDACTED] long, with a surface width of about [REDACTED] and depth of [REDACTED] at normal operating level.

The drawings indicate that pond freeboard provided by the starter dike will be [REDACTED] at normal operating level, [REDACTED] at a [REDACTED] flood level, and [REDACTED] at a [REDACTED] flood level. Discharge from the sediment pond up to the [REDACTED] year flood event will be via a [REDACTED] pipe to be installed through the starter dike. [REDACTED] additional [REDACTED] pipes will be installed [REDACTED] higher as an emergency spillway that will provide capacity up to the [REDACTED] flood event. The drawings indicate that riprap-protection will be installed on the [REDACTED] locations, which will be about [REDACTED] above the toe of the dike, which in turn is set back from the river and is several metres above normal river level.

The drawings provided for these works have been sealed by a Professional Engineer registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis, the conditions of Conditional Water Licences 132990 and 132991 and the requirements of the GEMP.

4.2 Construction Implementation Plan and Schedule

Construction of the RSEM R6 starter dike will need to be coordinated with construction of the right bank Stage 1 cofferdam and the SBIAR. It is likely that construction of all three embankments will progress simultaneously.

Construction access to the RSEM R6 area is already available from works completed or in progress. The foundation for the starter dike is to be prepared by clearing, grubbing and stripping, then proof-rolling once an acceptable surface has been exposed. Any surplus surficial materials removed during this operation will be placed in the southern side of the RSEM area.

The starter dike will be constructed in a linear manner starting at the upstream end. [REDACTED] plans to first place the entire zone of impervious fill, followed in sequence by each of the outer layers of granular fills and erosion protection. The technical specifications define the requirements for placement and compaction of each type of material.

The remaining open sections of the Peace River right bank side channel located within RSEM R6 will be infilled concurrent with the starter dike construction.

[REDACTED] will manage the placement of surplus non-PAG materials within the RSEM to suit their construction needs, subject to the requirements of the technical specifications. Fill in the southern part of RSEM R6 is to be placed and compacted in accordance with a specified maximum lift thickness and a minimum number of passes with a vibratory compactor. In the northern part of the RSEM, which is closest to the

river and which will later serve as a contractor laydown area, more stringent placement requirements are specified, which will result in a higher degree of compaction and fill density.

The IE notes that temporary stockpiling of PAG materials within the footprint of RSEM R6 has previously been authorized by LTC #1C and LTC #1H for the construction of the right bank drainage tunnel portal and underground works. The PAG materials are being placed on a low-permeability pad, and any runoff is to be collected by the zero-discharge water management system. The stockpiled PAG materials are to be removed for permanent disposal once a suitable RSEM area becomes available.

█ baseline schedule indicates that construction of the starter dike will be completed in less than 2 months. The duration of this work could depend on the relative timing of construction of the adjacent cofferdam and the SBIAR which the starter dike will tie into. The schedule also indicates that placement of surplus materials in RSEM R6 will be completed over a period of about 6 months, with closure of the RSEM about 2 months later.

The IE notes that this schedule will extend through the winter season. The contract technical specifications define limits on cold weather earthworks construction that apply to the starter dike. However, surplus materials can be placed behind the dike during winter conditions. Assuming a prompt start to the construction, the starter dike should be readily completed prior to the onset of cold weather. Placement of surplus materials will then depend on the rate of progress of the excavations that will be the source of those materials.

Construction of the RSEM R6 starter dike and placement of materials inside the dike will be by conventional excavation and earthmoving equipment and methods. The IE considers the construction methodologies to be appropriate to the work and that the baseline schedule is reasonable.

4.3 Quality Management

Details of PRHP's quality management program were previously submitted and reviewed with the request for LCC #1. As part of that program, █ has developed standard Inspection and Test Plans (ITPs) for specific types of work, which can be incorporated into the overall ITP for a larger work component. Other ITPs for unique work activities are developed as required.

PRHP's ITP for RSEM area R6 is comprehensive and includes the relevant work activities that would normally be expected for construction of this type.

4.4 Management & Care of Water and Environmental Protection

█ Care of Water Plan and Environmental Protection Plan (EPP) describe water management measures for RSEM R6.

█ This berm should already be in place as part of the construction works for the right bank drainage tunnel portal.

Inside RSEM area R6, temporary sumps will be excavated as required during the initial period until the sediment pond is operational. Each sump will have capacity to attenuate the [REDACTED] storm event. If the water level in a sump needs to be lowered and the water does not meet water quality requirements for discharge into the Peace River, it will be pumped and piped to the adjacent area inside the right bank Stage 1 cofferdam.

Once the sediment pond is operational, perimeter ditches along the inside of the starter dike will direct contact water from within the RSEM area into the pond. Material being placed within the RSEM area will be compacted to limit infiltration and contoured such that contact water is directed into the perimeter ditches.

The effects of freezing temperatures are an important seasonal consideration for water management. The EPP indicates that the sediment pond is to be drained prior to freeze-up and kept clear of snow during the winter. It is noted that a site-wide snow management plan is under development and will be submitted to BC Hydro for approval prior to 31 October 2016.

The IE has discussed the work with the IEM and both parties are familiar with the general area where RSEM R6 will be constructed. The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – *Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the EPP for Relocated Surplus Excavated Material area R6 and relevant component plans in consideration of LTC#2D*, letter to [REDACTED] dated 26 August 2016.

As summarized in the above letter, the IEM requires that a revised EPP and Care of Water plan must be provided to the IEM for review and acceptance prior to discharge of any contact water to any receiving waters. The IE understands that similar plans are currently being finalized for RSEM area R5b, and will provide a model for the plans for all other RSEM areas. It is the IE's opinion that there is adequate time for these plans to be revised prior to the RSEM R6 sediment pond works being completed and ready to discharge water.

4.5 Dam Safety

As required by LCC #2, the RSEM R6 sediment pond must comply with the BC Dam Safety Regulation (2016).

4.6 Safety

[REDACTED] RSEM Area R6 Safety Plan is aligned with their Health Safety Management Plan (HSMP) and references many of the HSMP appendices that apply to PRHP's entire scope of work. The HSMP includes a hazard registry for right bank Civil construction works.

5.0 LEAVE TO CONSTRUCT

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of RSEM area R6. For reference, this permission is referred to as *Leave to Construct LTC #2D*.

Leave to Construct for RSEM area R6 is subject to the following conditions:

1. BC Hydro and/or its contractor [REDACTED] must comply with the terms listed in the *IEM Requirements* section of the attached IEM letter dated 26 August 2016.
2. As per the attached IEM letter, discharge of any contact water to any receiving waters must not commence until the IEM has received and accepted revised versions of the EPP and Care of Water Plan. As the RSEM R6 sediment pond may receive some PAG contact water, a low permeability layer at the base of the sediment pond must also be achieved, as required by LCC #2.
3. Within 60 days of completing construction of the sediment pond, the dam failure consequence classification for the pond must be determined in accordance with the BC Dam Safety Regulation (2016) and submitted to the IE and the MFLNRO Dam Safety Officer. This submission must include an evaluation to determine if Part 3 of the Regulation should apply to the sediment pond.
4. BC Hydro and/or its contractors must obtain and comply with any other necessary permits from provincial and/or federal regulatory agencies.

Yours truly,

[REDACTED]

[REDACTED]

[REDACTED]

Attachment: IEM letter dated 26 August 2016

c:

[REDACTED]

[REDACTED]

TABLE 1

LTC #2D – RSEM AREA R6 - ISSUED FOR CONSTRUCTION DRAWINGS

Drawing No.	Revision	Title
		



[REDACTED] [REDACTED]

August 26, 2016

[REDACTED]

[REDACTED]

Attention: [REDACTED]

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the EPP for Relocated Surplus Excavated Material area R6 and relevant component plans in consideration of LTC#2D

Leave to Commence Construction (LCC#2) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of various Relocated Surplus Excavated Materials (RSEM) areas which consist of the following:

- Right bank of the Peace River – RSEM areas R5a, R5b, and R6.
- Left bank of the Peace River – RSEM areas L5 and L6

Each of these RSEM area components requires individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the works associated with construction of RSEM Area R6 which has been identified as LTC#2D.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

The IEM has reviewed the EPP provided by [REDACTED] and relevant component plans. The review included cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch, Dated February 26, 2016.

[REDACTED]

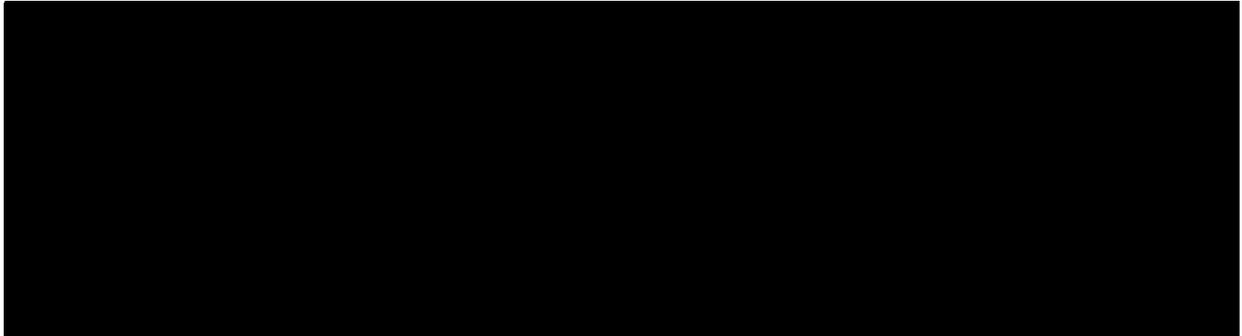


Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, and authorizations received and reviewed by the IEM, which are related to LTC#2D.

 (including relevant design drawings)

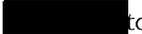
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BC Hydro Plans/Documents

- *CEMP* (Revision 3), dated July 8, 2016.
- *Construction Safety Management Plan* (CSMP), dated June 5, 2015.

Provincial Permits/Approvals

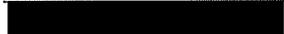
- Conditional Water Licence 132990.
- *Conditional Water Licences 132990 and 132991 on Peace River Leave to Commence Construction No. 2.* Letter from  to  dated June 29, 2016.
- Approval A703710 – Short Term Use issued under the *Water Act*.
- Licence No.: 815646 issued under the *Land Act*.

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans were provided as required.

It is our understanding that works under this LTC are to include the following:

- Construction of the starter dike with locally sourced earthen materials;
- Material placement in the RSEM area behind the starter dike;
- Construction of the sediment pond within the RSEM R6 area;
- Operation of the sediment pond; and,
- Decommissioning of the RSEM area.



It is the understanding of the IEM that only non-PAG materials will be permanently placed within RSEM area R6; however, there is potential that PAG contact water may be diverted into and treated within the sediment pond prior to discharging to the Peace River.

IEM Requirements

Upon review of the submitted documents for LTC#2D, and based on recent communications and information provided by BC Hydro and the contractor regarding other RSEM areas, the IEM requires the following as conditions of this LTC:

- A revised EPP and COW plan must be provided to the IEM for review and acceptance prior to any discharge of any contact water to any receiving waters. The revised EPP and COW plan must incorporate requirements of LCC#2 and the revised CEMP, Appendix E.
- As per section 6.8 of the RSEM Area R6 EPP, Rev. 1, dated July 28, 2016, a revised EPP must be provided to the IEM for review and acceptance prior to start of the closure phase of the RSEM area, including the sediment pond.

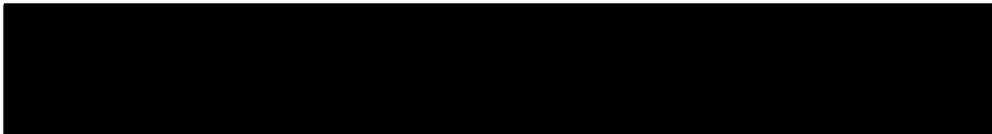
Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC#2D for the works associated with construction of RSEM area R6, as described.

Yours truly,



cc.



[REDACTED]

08 November 2016

[REDACTED]

Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1

[REDACTED]

Dear [REDACTED]:

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #2E – RSEM Area R5a**

1.0 INTRODUCTION

As Independent Engineer (IE) for the Site C Clean Energy Project (Site C), I have received a submission from BC Hydro requesting permission to commence construction of Relocated Surplus Excavated Material (RSEM) Area R5a. This RSEM area is one of the works authorized under LCC #2 dated 29 June 2016. The proposed works would be constructed by [REDACTED] BC Hydro's contractor for the Site C Main Civil Works. For reference, these works are to be authorized under *Leave to Construct LTC #2E*.

RSEM area R5a is one of the primary areas designated to store PAG (potentially acid-generating) materials. Both non-PAG and PAG materials will be placed in RSEM area R5a, most of which will be from right bank overburden and bedrock excavations for the roller compacted concrete (RCC) buttresses, the earthfill dam, the approach channel and the right bank drainage tunnel. As required by the Construction Environmental Management Plan (CEMP), several wells will be installed to monitor groundwater conditions in the overburden beneath the RSEM.

RSEM area R5a will be located on the south (right) bank of the Peace River, west (upstream) of the Moberly River confluence. Access from the construction excavations to RSEM R5a will be via the temporary Moberly River Construction Bridge, currently under construction as authorized by LTC #1E which was issued on 26 July 2016.

In addition, [REDACTED]

[REDACTED]

[REDACTED]

[Redacted]

2.0 DESCRIPTION OF THE WORKS

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

Ultimately, RSEM area R5a will be permanently inundated by the reservoir. Prior to reservoir filling, the upper portion of RSEM R5a will be contoured and capped with a gravel and cobble substrate to provide fish habitat, as required by condition no. 4 of EAC Certificate #14-02.

3.0 LTC #2E SUBMISSION

The following documents have been received from BC Hydro in support of the request for LTC #2E:

1. BC Hydro - *Site C Clean Energy Project Request for Leave to Construct – RSEM R5a (LTC2E)*, letter from [REDACTED] to [REDACTED] 24 October 2016.
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]

4.0 REVIEW OF SUBMISSIONS

4.1 Design Details and Construction Drawings

The construction drawings show the information that would typically be expected for works of this nature, including plans, sections and details of the starter dikes and sediment ponds, and the final profiles of the stored materials.

[REDACTED]

The drawings provided for these works have been sealed by Professional Engineers registered in British Columbia and are Issued for Construction status. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis, the conditions of Conditional Water Licences 132990 and 132991 and the requirements of the CEMP.

[REDACTED]

4.2 Construction Implementation Plan and Schedule

Construction access to RSEM R5a will be via the temporary Moberly River Construction Bridge, which is now under construction. [REDACTED]

The proposed temporary Bailey bridge is scheduled to be installed in November 2016. The IE has been advised by PRHP that once that bridge is in place, [REDACTED]

The EPP also indicates that the upstream and downstream ends of the side channel slough will be blocked as one of the initial activities, and fish and amphibian salvage carried out, if required.

By the time bridge access to RSEM R5a is available, weather conditions will likely be cold and unfavourable for starter dike embankment construction. [REDACTED]

Up to [REDACTED] of [REDACTED] materials will be placed behind the toe berm in the interim storage area. Placement and compaction of materials within the interim area will be the same as required for the entire RSEM area, in accordance with [REDACTED] the MCW contract, including a low permeability layer at the base of the fill.

[REDACTED]

Once the Phase 1 starter dike and water management facilities are sufficiently completed, placement of PAG and non-PAG materials can progress beyond the interim area and across the full RSEM area.

[REDACTED]

[REDACTED]

The IE considers the construction methodologies to be appropriate to the work and that the baseline schedule is reasonable.

4.3 Quality Management

Details of [REDACTED] were previously submitted and reviewed with the request for LCC #1. As part of that program, [REDACTED] has developed standard Inspection and Test Plans (ITPs) for specific types of work, which can be incorporated into the overall ITP for a larger work component. Other ITPs for unique work activities are developed as required.

[REDACTED] ITP for RSEM area R5a is comprehensive and includes the relevant materials and work activities that would normally be expected for construction of this type.

4.4 Management & Care of Water and Environmental Protection

[REDACTED] Care of Water (CoW) Plan and Environmental Protection Plan (EPP) describe water management measures for RSEM R5a.

As noted above, non-contact surface water from the area upslope of RSEM R5a will be intercepted by the west and east diversion channels and directed into the Peace and Moberly Rivers.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The effects of freezing temperatures are an important seasonal consideration for water management. The EPP indicates that the sediment ponds are to be drained prior to freeze-up if practical and the water levels kept below the outlet pipes to avoid ice blockages. The EPP also notes that snow will be managed in accordance with the site-wide snow management plan, which is intended to reduce environmental risks associated with snow accumulation and melt. PRHP has just submitted this plan to BC Hydro for review.

The IE has discussed the work with the IEM and both parties are familiar with the general area where RSEM R5a will be constructed, although neither party has yet had ground access to the area. The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – *Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the EPP for Relocated Surplus Excavated Material area R5a and relevant component plans in consideration of LTC#2E*, letter to [REDACTED] dated 08 November 2016.

As summarized in the above letter, the IEM has several expectations related to beaver dam removal, interim ponds and sumps and non-acute toxicity testing for PAG-contact water.

The IE notes that Section 1.2 of PRHP's EPP states that the scope is limited to Phase 1 construction of RSEM Area R5a and that a revised EPP will be prepared and approved before commencing Phase 2. Accordingly, the IEM requires that a revised EPP and, if necessary, a revised Care of Water plan must be provided to the IEM for review and acceptance prior to construction of the RSEM area R5a stage 2 dike.

4.5 Dam Safety

As required by LCC #2, the RSEM R5a sediment ponds must comply with the BC Dam Safety Regulation (2016).

4.6 Public Safety

The IEM has not reviewed [REDACTED] *RSEM R5a Safety Plan* in detail except to note that it is aligned with [REDACTED] *Health Safety Management Plan (HSMP)*. The IE notes that the *HSMP* has been accepted by BC Hydro and includes a *Public Safety Management Plan* that applies to construction of the entire Main Civil Works. The IE also notes that [REDACTED] *RSEM R5a Safety Plan* references a hazard registry for right bank Civil construction works. The work activities required for construction of RSEM area R5a are already being conducted by [REDACTED] at various locations on the project site.

5.0 LEAVE TO CONSTRUCT

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of RSEM area R5a. For reference, this permission is referred to as *Leave to Construct LTC #2E*.

Leave to Construct for RSEM area R5a is subject to the following conditions:

1. BC Hydro and/or its contractor [REDACTED] must comply with the IEM expectations related to beaver dam removal, interim ponds and sumps and non-acute toxicity testing for PAG-contact water, as per the attached letter from the IEM dated 08 November 2016.

-
2. Also as per the attached letter from the IEM, a revised EPP and, if necessary, a revised Care of Water plan must be provided to the IEM for review and acceptance prior to construction of the RSEM area R5a stage 2 dike.
 3. Within 60 days of completing construction of the Phase 1 sediment ponds, the dam failure consequence classification for the ponds must be determined in accordance with the BC Dam Safety Regulation (2016) and submitted to the IE and the MFLNRO Dam Safety Officer. This submission must include an evaluation to determine if Part 3 of the Regulation should apply to the sediment ponds. A similar submission will be required for the Phase 2 sediment ponds.
 4. BC Hydro and/or its contractors must obtain and comply with any other necessary permits from provincial and/or federal regulatory agencies.

Yours truly,

ORIGINAL SIGNED BY:

[Redacted signature]

Attachment: IEM letter dated 08 November 2016

c:

[Redacted distribution list]

[Redacted footer]

TABLE 1

LTC #2E – RSEM AREA R5a - ISSUED FOR CONSTRUCTION DRAWINGS

Drawing No.	Revision	Title
[REDACTED]	■	[REDACTED]

TABLE 1 - CONTINUED

LTC #2E – RSEM AREA R5a - ISSUED FOR CONSTRUCTION DRAWINGS

Drawing No.	Revision	Title
[REDACTED]	■	[REDACTED]

[REDACTED]

November 08, 2016

[REDACTED]

Attention: [REDACTED]

RE: Site C Clean Energy Project – Conditional Water Licence 132990 IEM review of the EPP for Relocated Surplus Excavated Material area R5a and relevant component plans in consideration of LTC#2E

Leave to Commence Construction (LCC#2) was issued by the Engineer as identified in the Conditional Water Licence 132990¹ for the construction of the following components:

- Right bank of the Peace River – RSEM areas R5a, R5b, and R6.
- Left bank of the Peace River – RSEM areas L5 and L6.
- South Bank Initial Access Road.

Each of these components requires individual Leaves to Construct (LTCs). While it is the role of the Independent Engineer (IE) to issue the LTCs, the Independent Environmental Monitor's (IEM's) role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction. This letter has been prepared specifically for the works associated with construction of RSEM area R5a, herein referred to as LTC#2E.

As the issuance of each LTC requires the IEM's review and recommendation for acceptance to the IE, it is the IEM's understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

The IEM has reviewed the EPP provided by [REDACTED] and relevant component plans. The review included cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]

Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, and authorizations received and reviewed by the IEM, which are related to LTC#2E.

Peace River Hydro Partners (including relevant design drawings)

- [REDACTED]

BC Hydro Plans/Documents

- CEMP (Revision 4), dated July 26, 2016.
- Construction Safety Management Plan, dated June 5, 2015.

Provincial and Federal Permits/Approvals

- Conditional Water Licence 132990.
- Conditional Water Licences 132990 and 132991 on Peace River Leave to Commence Construction No. 2. Letter from [REDACTED] to [REDACTED], dated June 29, 2016.
- Fisheries Act Authorization 15-HPAC-01160.
- Wildlife Act Amphibian Salvage Permit FJ16-226024.
- Wildlife Act Fish Salvage Permit FJ16-225327.
- Wildlife Act Beaver and Muskrat Permit FJ14-154005.
- Beaver Dam Removal - Water Sustainability Act Notification - 9000138, which supersedes Water Act Notification – Beaver Dam Removal File: 120106-176588 (referenced in the RSEM Area R5a Environmental Protection Plan (Revision 2)).
- Water Act Approval A703710 – Short Term Use issued under the Water Act.
- Licence No.: 815646 issued under the Land Act.

Review Summary

Safety plans were not reviewed in detail; the review was only to confirm that the plans were provided as required.

It is our understanding that key components under this LTC are to include the following:

- Interim measures for placement of PAG material prior to the starter dike construction;



- Stage 1 construction of the starter dike, which bypasses the Rocky Mountain Fort site;
- Construction of the sediment pond(s) within the RSEM area R5a;
- Material placement in the RSEM area behind the starter dike;
- Operation of the sediment pond(s) and,
- Construction of the Stage 2 dike.

The IEM has the following expectations for works under this LTC:

- *Water Act* Notification – Beaver Dam Removal File: 120106-176588, listed in the RSEM Area R5a EPP (Rev. 2), Appendix K has been superseded by the Beaver Dam Removal - *Water Sustainability Act* Notification – 9000138 and as such, the superseding Notification will be followed.
- Non-acute toxicity tests (96 hour LC50 tests) will be completed by BC Hydro for any PAG contact water prior to discharge to the environment, as per CEMP Rev. 4, Appendix E, Rev. 5.2.
- Interim ponds or sumps must comply with the CEMP Rev. 4, Appendix E, Rev. 5.2.

IEM Requirements

Upon review of the submitted documents for LTC#2E, and based on communications and information provided by BC Hydro and the contractor, the IEM requires the following condition of this LTC:

- A revised EPP must be provided to the IEM for review and acceptance prior to construction of the RSEM area R5a stage 2 dike and development of fish habitat on the top surface of the completed RSEM area. If a revised COW plan is required, it must also be provided to the IEM.

Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEEA Decision Statement, appropriate regulations, and the CEMP.

Based on our understanding of the works proposed, and provided the preceding items are acceptable to the Independent Engineer, we have no objections to issuing LTC#2E for the works associated with construction of RSEM area R5a, as described.

Yours truly,

[Redacted signature]

[Redacted signature]

[Redacted signature]

cc.

[Redacted distribution list]

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[REDACTED]

15 March 2017

[REDACTED]

Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1
Via email: [REDACTED]

Dear [REDACTED]

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #2E – RSEM Area R5a
Amendment #1 – Phase 1 Starter Dike Design Revision**

Construction of Relocated Surplus Excavated Material (RSEM) Area R5a was authorized by Leave to Construct LTC #2E dated 08 November 2017. RSEM R5a, located on the right bank of the Peace River just upstream of the confluence with the Moberly River, is designed to ultimately hold approximately [REDACTED] m³ of surplus materials. Most of those materials will be from right bank overburden and bedrock excavations for the approach channel, the roller compacted concrete (RCC) buttresses, the earthfill dam and the right bank drainage tunnel. Much of the material to be placed in [REDACTED] will be [REDACTED]

RSEM R5a will be constructed in two phases. The [REDACTED] will be about [REDACTED] m long with a maximum height of about [REDACTED] and set back at least 15 m from the mainstem of the Peace River. Phase 2 will commence prior to diverting the river through the diversion tunnels, when the elevated backwater level will inundate much of the RSEM R5a material placed during Phase 1. In Phase 2, a [REDACTED] about [REDACTED] m long and [REDACTED] m high will be constructed on top of the already-placed [REDACTED] fill. In both phases, there will be [REDACTED] constructed along the inside edge of the [REDACTED]

However, as described in LTC #2E, placement of surplus materials in RSEM R5a was scheduled to start during winter weather conditions that are unfavourable for starter dike embankment construction. As an initial step the contractor, [REDACTED], was authorized under LTC #2E to start placing [REDACTED] material behind a [REDACTED] about [REDACTED] m high and [REDACTED] m long, to be constructed inside the future [REDACTED] at the western end of [REDACTED]. Up to [REDACTED] m³ of [REDACTED] materials could be placed behind the [REDACTED]

The [REDACTED] with a collection pond along its entire outer perimeter, was constructed and placement of [REDACTED] material has been in progress since late December 2016. Prior to starting [REDACTED] placement, five groundwater monitoring wells for [REDACTED] were installed, as per the Acid Rock Drainage and Metal Leachate Management Plan (Appendix E of CEMP, R4, 26 July 2016). The IE has received a copy of the following memorandum describing the well installations and understands that the wells are being monitored as per the Environmental Protection Plan (EPP):

- [REDACTED] – *Summary of R5a Monitoring Well Installations*, Technical Memorandum from [REDACTED] and [REDACTED] to [REDACTED] Project #: A416-2, 09 December 2016.

[REDACTED]

Construction of the [REDACTED] is scheduled to start soon. PRHP has revised the design of the [REDACTED] cross section, and the IE has received the updated IFC drawings listed in Table 1 which show the design change. The drawings have been sealed by a Professional Engineer registered in British Columbia. BC Hydro has confirmed that it has accepted the revised drawings.

In the original design, the [REDACTED] was to be a [REDACTED] embankment, comprised of [REDACTED] fill with an [REDACTED] on the inside slope and erosion protection along the outer side. The [REDACTED] would be a [REDACTED] embankment, comprised mostly of [REDACTED] on the outer sides.

In the revised design, the [REDACTED] is replaced with a zone of [REDACTED] fill, referred to as Zone 1e in the contract specifications. Zone 1e could include [REDACTED] material on the inner side of the [REDACTED] covered on the top and outer side with [REDACTED] material. The [REDACTED] Zone 1e material will meet the modified specifications described in the IE's 02 March 2017 letter to BC Hydro on this subject. The outer [REDACTED] zones and erosion protection are the same as in the original design.

There are no changes to the location and height of the [REDACTED]. The locations, dimensions and details of the [REDACTED] are the same except for details for the installation of the discharge pipes through the revised [REDACTED] and minor changes to the erosion protection at the discharge outlets. There are no changes to the design for [REDACTED] or [REDACTED].

The IE notes that the revised design for the [REDACTED] reverts to BC Hydro's original reference design concept and is similar to the design already authorized for construction of RSEM L5 under LTC #2B.

The IE has discussed this design change with the IEM and concludes that no EPP revisions are required.

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the RSEM R5a Phase 1 starter dike utilizing the revised design described above.

Yours truly,

[REDACTED]

[REDACTED]

c:

[REDACTED]

[REDACTED]

TABLE 1

**LTC #2E – RSEM AREA R5a – AMENDMENT #1
ISSUED FOR CONSTRUCTION DRAWINGS**

Drawing No.	Revision	Title
[Redacted Table Content]		



[REDACTED]

30 March 2017

[REDACTED]

Ministry of Forests, Lands and Natural Resource Operations
PO Box 9340 Stn. Prov Govt
Victoria, BC, V8W 9M1
Via email: [REDACTED]

Dear [REDACTED]:

**Site C Clean Energy Project - Conditional Water Licences 132990 & 132991
Leave to Construct LTC #02E – RSEM Area R5a
Amendment #2 – Temporary Non-Contact Water Management**

Relocated Surplus Excavated Material (RSEM) R5a, located on the right bank of the Peace River just upstream of the confluence with the Moberly River, is designed to ultimately hold approximately [REDACTED] m³ of surplus materials. Most of those materials will be from right bank overburden and bedrock excavations for the approach channel, the roller compacted concrete (RCC) buttress, the earthfill dam and the right bank drainage tunnel. Much of the material to be placed in [REDACTED] will be [REDACTED]

Construction of [REDACTED] was authorized by Leave to Construct LTC #02E dated 08 November 2016 and placement of [REDACTED] materials behind an interim toe berm commenced in December 2016. A revised Phase 1 starter dike cross section design was authorized by Amendment #1 to LTC #02E dated 15 March 2017, and foundation preparation for the [REDACTED] is now in progress.

The design for [REDACTED] includes a [REDACTED] water diversion channel located just above the full length of the RSEM. The channel will have a high point near the middle of the RSEM, with the western and eastern ends draining into the Peace River and the Moberly River, respectively.

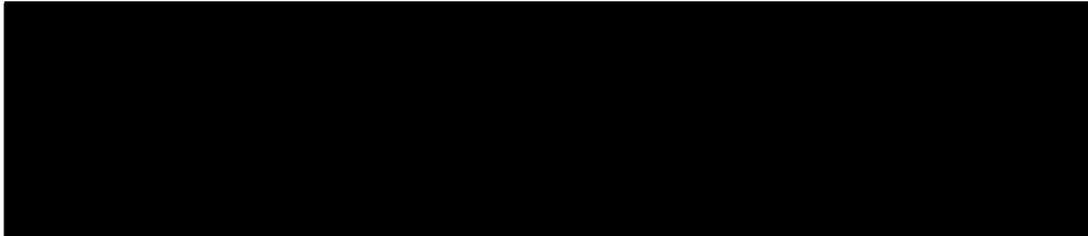
Construction of the non-contact water diversion channel is in progress, but will not be completed prior to construction of the eastern end of the starter dike embankment. BC Hydro's contractor, [REDACTED] plans to complete the eastern section of dike prior to the Moberly River freshet, when high water levels could otherwise impact its construction. To [REDACTED] water away from the RSEM work area in the interim, [REDACTED] PRHP estimates that these [REDACTED] works will be required for up to about [REDACTED] weeks until the non-contact water diversion channel along the upper side of RSEM R5a is completed. The temporary works are considered to be a material interim change to the care of water details submitted with the request for LTC #02E.

The IE and the IEM have received the following information on the plans for and design of the proposed temporary non-contact water collection channel and pond:

1. [REDACTED]

[REDACTED]

- 2.
- 3.

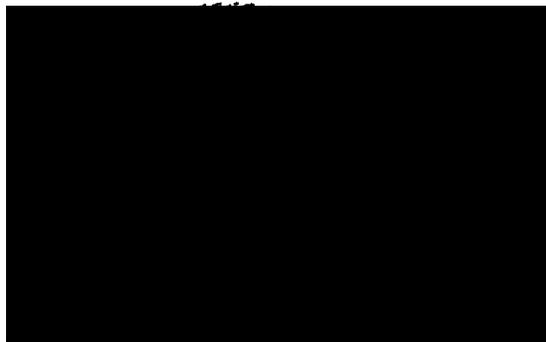


The collection channel will be about [redacted] m long, lined with geotextile and temporary riprap, and constructed along the southern edge of the existing alluvial terrace on which RSEM R5a is located. The channel will slope to the east and drain into a collection pond located just inside the east end of the [redacted] on the upstream side of the Moberly River construction bridge access ramp. The pond will be sized for a [redacted] precipitation event, with a capacity of [redacted] m³. It is intended that the pond will be dewatered by pumping to the Peace River, after water quality is confirmed to be acceptable by a Qualified Environmental Professional.

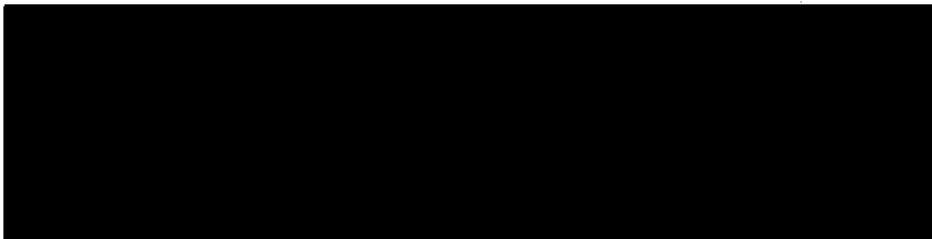
The IE and the IEM consider the proposed short-term works to be consistent with the conditions of Conditional Water Licences 132990 and 132991 and with BC Hydro's CEMP (R4, 27 July 2016), and that no EPP revisions are required. The drawings are Issued for Construction status and have been sealed by a Professional Engineer registered in British Columbia.

By copy of this letter, the Independent Engineer hereby confirms that BC Hydro can proceed with construction of the temporary non-contact water collection channel and pond as described above. For reference, this permission is referred to as *Leave to Construct LTC #02E, Amendment #2*.

Yours truly,



c:



[REDACTED]

30 June 2017

[REDACTED], P.Eng.

Deputy Comptroller of Water Rights
Ministry of Forests, Lands and Natural Resource Operations

[REDACTED]
Via email: [REDACTED]

Dear [REDACTED]

Site C Clean Energy Project - Conditional Water Licences 132990 & 132991

- Recommendation for Leave to Construct LTC #05B - Diversion Outlet Works
- Recommendation for Leave to Construct LTC #02F – RSEM L6
- Recommendation for Leave to Construct LTC #03F – Stage 1 Diversion Outlet Cofferdam

1.0 INTRODUCTION

Conditional Water Licences (CWLs) 132990 and 132991 dated 26 February 2016 authorize construction of works for the storage, diversion and use of water from the Peace River for power purposes at the Site C Clean Energy Project (Site C). Leave to Commence Construction of the works comprising LCC #01 under CWLs 132990 and 132991 was granted to BC Hydro and Power Authority (BC Hydro) on 01 April 2016.

Leave to Commence Construction LCC #05 was granted to BC Hydro, with conditions, on 25 April 2017. The project components included in LCC #05 are located on the left bank and in the river channel of the dam site and comprise:

- Diversion inlet & outlet portal and channel excavations
- Diversion tunnel inlet & outlet portal structures
- Diversion tunnels
- Stage 1 left bank cofferdam
- Left bank earthfill dam core trench excavation
- Left bank drainage adit
- In-river excavations for tailrace and downstream river channel

As Independent Engineer (IE) for the Site C project, I have received a submission from BC Hydro requesting permission to commence construction of the diversion tunnel outlet works consisting of:

- Excavation of the diversion outlet portal, including rock support, and
- In-river excavation, including mid-river island, tailrace and downstream river channel, and the portion of the bar island within the Dam Site Area Boundary.

The submission also requests permission to commence construction of:

- RSEM L6, authorized under LCC #02 dated 29 June 2016, and
 - Stage 1 diversion outlet cofferdam, authorized under LCC #03 dated 20 July 2016.
-
- [REDACTED]

These works are to be constructed by BC Hydro's Main Civil Works contractor, [REDACTED]

Recognizing the inter-related construction aspects of these works, this letter provides recommendations for the following Leaves to Construct:

- *Leave to Construct LTC #05B* - Diversion outlet works, including in-river excavations
- *Leave to Construct LTC #02F* – RSEM L6
- *Leave to Construct LTC #03F* – Stage 1 diversion outlet cofferdam

The scope of LTC #05B includes the portions of the diversion outlet channel located inside and outside of the Stage 1 diversion outlet cofferdam. [REDACTED]

The portion of the bar island downstream of the Dam Site Area Boundary is excluded from the scope of LTC #05B. This area is not authorized by CWL 132990 and the IE understands that BC Hydro will apply for the necessary provincial permit to allow that excavation. [REDACTED]

2.0 DESCRIPTION OF THE WORKS

Diversion of the Peace River, which is required to construct the Site C project, occurs in two stages. In Stage 1, the Peace River is confined to its main channel by three cofferdams on the left bank of the river and one cofferdam on the right bank.

On the right bank, the Stage 1 cofferdam is completed and in service and construction of the RCC buttress works has commenced inside the dewatered interior area. On the left bank, construction of the diversion inlet and outlet portal works and diversion tunnel works will be carried out inside the Stage 1 diversion inlet and outlet cofferdams. Construction of the inlet cofferdam was authorized by LTC #03C dated 26 September 2017; the embankment has been completed and construction of the slurry cutoff wall is now in progress. Construction of the Stage 1 left bank cofferdam was authorized by LTC #05C dated 16 June 2017 and foundation stripping and preparation have started. The upstream and downstream legs of this cofferdam will connect to the Stage 1 diversion inlet and outlet cofferdams to enclose the area where the left side of the earthfill dam will be constructed.

In Stage 2, portions of the Stage 1 cofferdams will be removed, the river will be diverted through two tunnels in the north bank, and the river channel will be closed off with upstream and downstream Stage 2 cofferdams. The central portion of the earthfill dam will be constructed inside the area enclosed by those cofferdams.

2.1 Stage 1 Diversion Outlet Cofferdam

[REDACTED]

[REDACTED]

[REDACTED]

2.2 Outlet Portal & Channel and In-River Excavations

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[Redacted]

[Redacted]

2.3 RSEM L6

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

3.0 SUBMISSION FOR LTC #05B, LTC #02F & LTC #03F

The following documents have been received from BC Hydro in support of the request for LTCs #05B, #02F and #03F:

1. BC Hydro - *Site C Clean Energy Project Request for LCC5 Component Authorization, Leave to Construct 5B (LTC5B) – Diversion Outlet Works, including In-River Excavation*, letter from [REDACTED] to [REDACTED] 12 May 2017.
2. BC Hydro – *Issued for Construction Drawings for Diversion Outlet Works and In-River Excavations* (see Table 1)

3. [REDACTED]
4. [REDACTED]

4.0 REVIEW OF SUBMISSIONS

4.1 Design Details and Construction Drawings

BC Hydro provided reference designs for the project cofferdams in the Main Civil Works contract, but the contractor is responsible for the final design, construction and maintenance of all project cofferdams during construction of the project works.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The outlet channel and portal excavations have been designed by BC Hydro, except for the overburden slopes which are to be designed by the contractor. The construction drawings by BC Hydro show the information that would typically be expected for works of this nature, including plans, sections and details of the diversion outlet portal and outlet channel. The design of the outlet portal excavation is very similar to that for the inlet portal excavation, which was authorized under LTC #05A.

[Redacted]

[Redacted]

[Redacted]

Drawings for the contractor-designed overburden slopes have not yet been received because the final design of those slopes will be influenced by the design of the construction access road to the top of the outlet portal excavation.

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[REDACTED]

[REDACTED]

The drawings provided for these works have been sealed by Professional Engineers registered in British Columbia and are Issued for Construction status. BC Hydro has accepted the contractor's drawings, except for minor revisions and clarifications. It is the IE's opinion that the drawings are consistent with the Site C project general arrangement drawings, the design basis and the conditions of Conditional Water Licences 132990 and 132991.

4.2 Construction Implementation Plan and Schedule

[REDACTED]

The IE considers the work plan to be appropriate to the work, and that the proposed schedule is reasonable.

[REDACTED]

4.3 Quality Management

Details of [REDACTED] were previously submitted and reviewed with the request for LCC #01. As part of that program, [REDACTED] has developed standard Inspection and Test Plans (ITPs) for specific types of work, which are reviewed by BC Hydro in accordance with the Main Civil Works contract.

The application for LTCs #05B, #02F and #03F lists ITPs for the types of work included in construction of the outlet cofferdam and portal works, RSEM L6, and the in-river excavations.

4.4 Environmental Protection

The Environmental Protection Plan (EPP) is included in the application document for LTCs #05B, #02F and #03F, and includes descriptions of anticipated work activities and applicable mitigation measures to reduce potential environmental impacts. BC Hydro has accepted the EPP.

Most of the portal excavations will occur above or inside the diversion outlet cofferdam, which should allow PAG contact water to be readily collected and managed.

The work includes substantial in-river excavations and construction that will require fish salvage to be carried out in a staged manner as construction progresses. [REDACTED]

The IE has discussed the work with the IEM and both parties are familiar with the area where the diversion outlet portal and cofferdam works, RSEM L6 and in-river excavations will be constructed.

The IEM has provided the IE with comments on environmental aspects of the proposed construction in the following letter, a copy of which is attached for reference:

1. [REDACTED] – *Site C Clean Energy Project – Conditional Water License 132990 IEM review of the Diversion Outlet Works, including In-River Excavation and relevant component plans*, letter to [REDACTED] dated 30 June 2017.

As noted by the IEM, future modifications to the in-river excavation methodology described in the LTC submission could require revisions to the EPP and could also require additional regulatory permits, which in turn could result in additional permit conditions.

The IEM has no objections to issuing LTCs #05B, #02F and #03F.

4.5 Dam Safety

The FLNRO Dam Safety Officer has reviewed the submissions for the Stage 1 diversion outlet cofferdam, as documented in the following:

1. [REDACTED] Senior Dam Safety Officer - *Site C Clean Energy Project, Conditional Water Licences 132990 and 132991 on Peace River, Request for Leave to Construct – Diversion Outlet Works, Including In-River Excavation, (LTC 5B)*, letter to [REDACTED] dated 30 June 2017.

The Dam Safety Officer accepts the submitted information.

The lower portion of the outlet portal works and the upstream end of the outlet channel will be constructed inside the Stage 1 diversion outlet cofferdam. The *Operations Maintenance and Surveillance Plan* and *Emergency Response Plan* for the Stage 1 cofferdams are in place and have been accepted by the FLNRO Dam Safety Officer.

As required by LCC #02, the RSEM L6 sediment pond must comply with the BC Dam Safety Regulation (2016). [REDACTED]

2. [REDACTED]

The Dam Safety Officer has accepted the submitted information.

4.6 Public Safety

The works to be constructed on land will be located within areas with no public access, however there will likely be public boat traffic along the river during the in-river excavation and construction activities.

BC Hydro has received Navigation Protection Act (NPA) approvals that define requirements for warning signs, lights and high visibility markers for construction equipment and activities in the river. Navigation warning signs are already in place upstream and downstream of the site, and [REDACTED] will install other lights and markers at the work site as required during the work.

The NPA approvals also require that a safe passage way must be maintained for public navigation through the work area, although the required width and depth of passage are not specified. [REDACTED]



5.0 RECOMMENDATION FOR LEAVES TO CONSTRUCT LTC #05B, LTC #02F & LTC #03F

The Independent Engineer hereby recommends to the Deputy Comptroller of Water Rights that BC Hydro can proceed with construction of the works as described above, and referred to as:

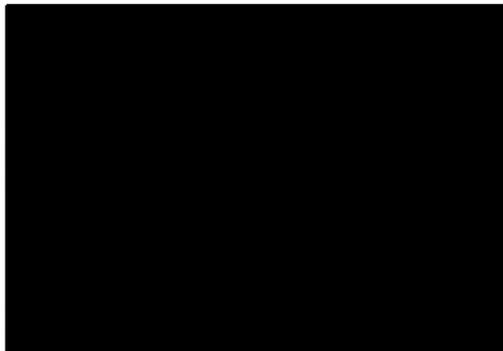
- *Leave to Construct LTC #05B* - Diversion outlet works, including in-river excavations
- *Leave to Construct LTC #02F* – RSEM L6
- *Leave to Construct LTC #03F* – Stage 1 diversion outlet cofferdam

As per LCC #05 dated 25 April 2017, this recommendation is copied to BC Hydro and is sufficient for construction of these works to proceed.

Leaves to Construct LTC# 05B, LTC #02F and LTC #03F are subject to the conditions of LCC #05, LCC #02 and LCC #03 which are attached to this letter as Appendices A, B and C for reference. In addition:

1. The Issued for Construction drawings and any supporting information for the contractor-designed overburden excavation at the diversion outlet portal must be submitted to the IE, and the IE must issue an LTC Amendment before construction of the final overburden excavation can proceed.
2. If a temporary PAG stockpile is required, the Issued for Construction drawing(s) and details of related PAG contact water management must be submitted to the IE and the IEM, and the IE must issue an LTC Amendment before construction of the stockpile can proceed.
3. As noted in the attached letter from the IEM, the IEM requests that:
 - a. Notice be provided to the IE/IEM in advance of any modified construction approaches for in-river excavation, and
 - b. Requirement for such notice should be added as an environmental hold point in EPP Table 9-1.
4. The IE requests that a copy of the designer-of-record certification for the Stage 1 outlet cofferdam be provided to the IE for information before excavation inside the cofferdam advances below river level.

Yours truly,



P.Eng.

Independent Engineer, Site C Clean Energy Project



Attachments:

1. Table 1 – LTC #05B – Diversion Outlet Works Including In-River Excavations - IFC Drawings
2. Table 2 – LTC #02F – RSEM L6 - IFC Drawings
3. Table 3 – LTC #03F – Stage 1 Diversion Outlet Cofferdam - IFC Drawings
4. Appendix A – LCC #02 Conditions (Applicable to RSEM L6)
5. Appendix B – LCC #03 Conditions (Applicable to Stage 1 Diversion Outlet Cofferdam)
6. Appendix C – LCC #05 Conditions (Applicable to Diversion Outlet Works)
7. IEM letter dated 30 June 2017

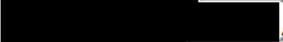
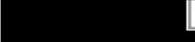
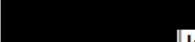
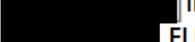
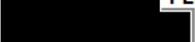
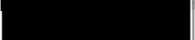
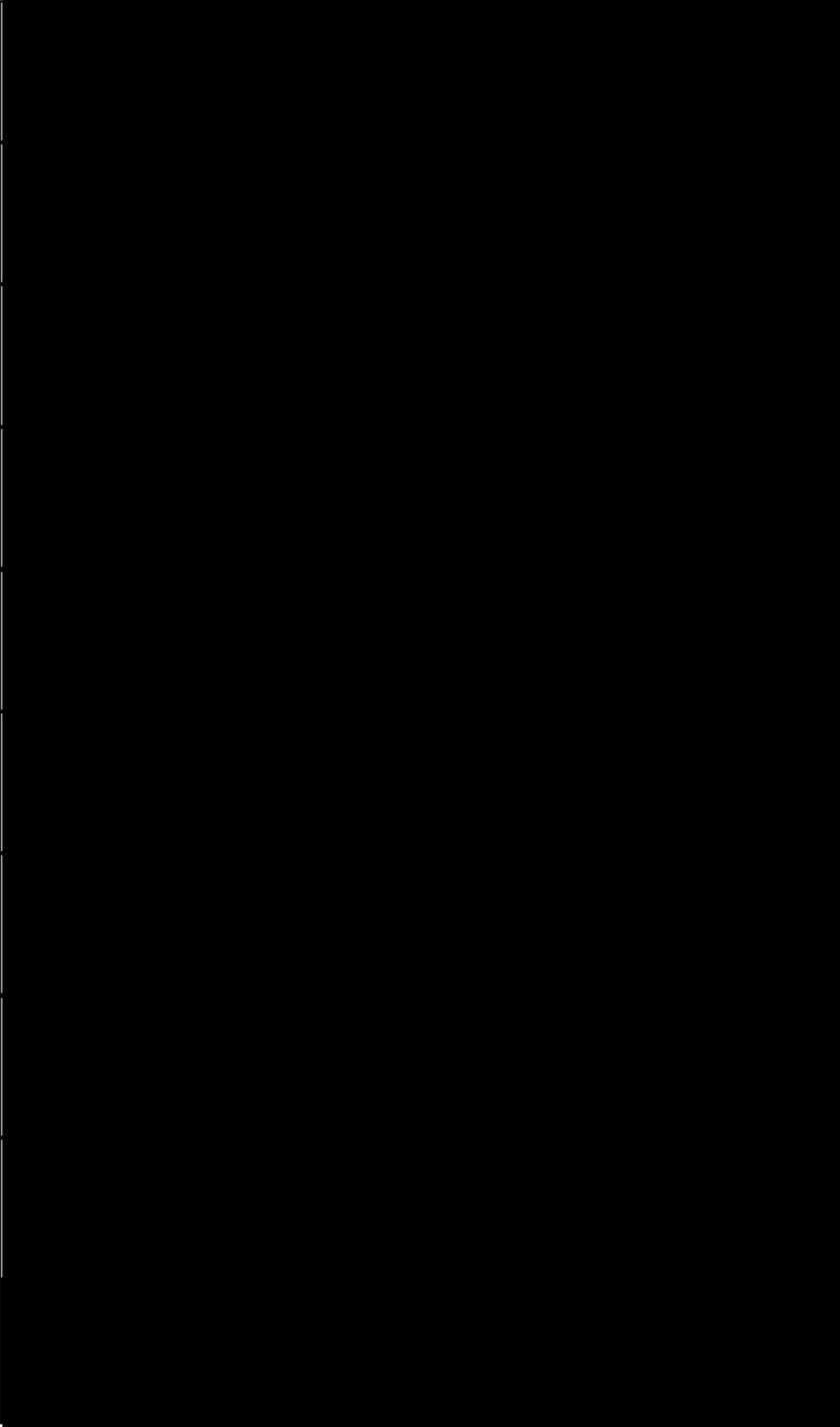
c:  BCH VP & Project Director (Site C Licensee Representative)
, BCH (Regulatory Manager)
 SNC Lavalin (Site C Design Engineer)
 BCH (Site C Construction Engineer)
 Independent Environmental Monitor
 FLNRO Water Management Officer
 FLNRO Water Management Officer
 FLNRO Dam Safety Officer

TABLE 1
LTC #05B – DIVERSION OUTLET WORKS INCLUDING IN-RIVER EXCAVATIONS
ISSUED FOR CONSTRUCTION DRAWINGS

Drawing No.	Revision	Title
		



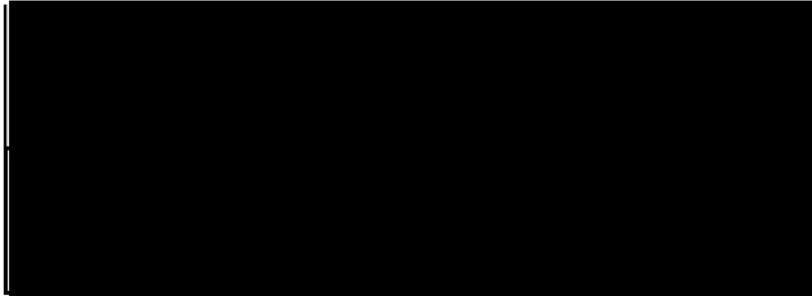
	

TABLE 2
LTC #02F – RSEM L6
ISSUED FOR CONSTRUCTION DRAWINGS

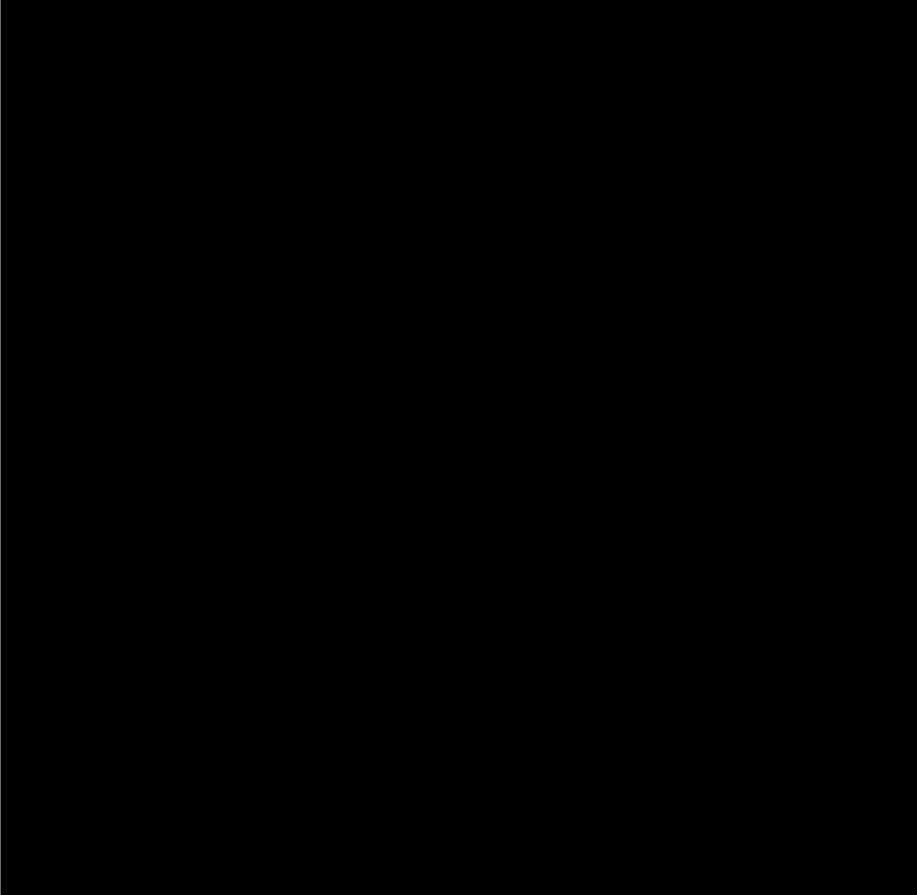
Drawing No.	Revision	Title
		

TABLE 3
LTC #03F – STAGE 1 DIVERSION OUTLET COFFERDAM
ISSUED FOR CONSTRUCTION DRAWINGS

Drawing No.	Revision	Title
[REDACTED]	■	[REDACTED]

**APPENDIX A
 LCC #02 CONDITIONS (APPLICABLE TO RSEM L6)**

No.	Condition	Status for LTC #02F
1	The Contractor can begin construction of any component of the works only after the relevant design drawings signed and sealed by the Design Engineer, have been submitted to [REDACTED] in his capacity as IE, for review, and permission to begin construction is received from the IE. The permission will be in the form of a letter from the IE to the Engineer under the Water Sustainability Act, with copies to the Licensee, Design Engineer and the Construction Engineer.	Completed.
2	Construction of works shall be supervised by the Construction Engineer and the Design Engineer.	Ongoing.
3	Any revisions to CEMP sections that are applicable to the construction of works authorized by the Water Licences, including temporary works in support of constructing the named permanent works, must be reviewed and accepted by the IEM and the Engineer.	If and as required.
4	The assessment approach for evaluating juvenile Rainbow Trout and Arctic Grayling in tributaries, including the design of their respective monitoring programs, must be completed and submitted by January 31, 2017;	Compliance assessed by CWR office.
5	The licensee shall adhere to and implement the Site C Water Quality Management Programme as ordered by my letter of June 24, 2016;	Ongoing.
6	All sediment ponds must be designed and operated in accordance with Technical Guidance 7 Environmental Management Act – Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining – Version 1.0, dated December 2015, and Technical Guidance 3 Environmental Management Act – Developing a Mining Erosion and Sediment Control Plan – Version 1.10, dated February 2015, both prepared by Ministry of Environment;	L6 pond design complies.
7	All sediment ponds that discharge to the aquatic environment must be designed to include any water routed to the ponds from other Project construction areas;	L6 pond design complies.
8	All sediment pond discharge structures must be designed to be impassable to fish at all times;	L6 pond design complies.
9	A low permeability layer must be achieved, as described in section 3.5.7 of [REDACTED], for the base layer of each of the RSEM areas that will contain PAG material, including the associated sediment ponds as well as the pond walls and/or starter dikes.	To be completed.



	Furthermore, the same low permeability layer must be installed beneath any other temporary or permanent area on top of which PAG material will be placed	
10	All sediment ponds must comply with the BC Dam Safety Regulation (2016);	L6 pond design complies.
11	Weekly progress reports on contract construction shall be submitted by the licensee to the IE and the Engineer;	Ongoing.
12	Permits, licences, and approvals under enactments other than the Water Act or Water Sustainability Act for the construction of works may be required in addition to the leave to commence construction, and you should ensure the appropriate authorizations are in place.	If and as required.



**APPENDIX B
 LCC #03 CONDITIONS (APPLICABLE TO STAGE 1 DIVERSION OUTLET COFFERDAM)**

No.	Condition	Status for LTC #05B
1	The Contractor can begin construction of any component of the LCC3 works only after the relevant design drawings signed and sealed by the Design Engineer, have been submitted to [REDACTED] in his capacity as IE, for review, and permission to begin construction is received from the IE. The permission will be in the form of a letter from the IE to the Engineer under the Water Sustainability Act, with copies to the Licensee, Design Engineer and the Construction Engineer.	Completed.
2	Construction of works shall be supervised by the Construction Engineer and the Design Engineer, as per Water Licences clause (k) 1) and 2).	Ongoing.
3	Any revisions to CEMP sections that are applicable to the construction of works authorized by the Water Licences, including temporary works in support of constructing the named permanent works, must be reviewed by the IEM and accepted by the Engineer.	If and as required.
4	Revisions to the Acid Rock Drainage and Metal Leachate Plan, Section 4.14 of the CEMP, incorporating the Site C Water Quality Management Programme, are to be completed and submitted to the satisfaction of the IEM and the acceptance of the Engineer by September 30, 2016.	Completed; further revisions pending.
5	Revisions to the schedule of LCCs and LTCs must be completed to the satisfaction of the IE and submitted to the Engineer by September 30, 2016.	Completed.
6	All cofferdams must comply with the BC Dam Safety Regulation (2016).	Design complies.
7	The Operations, Maintenance and Surveillance Plan as well as the Emergency Response and Preparedness Plan must be finalized prior to excavation activities within the cofferdams that will result in the dams holding back water.	Completed.
8 to 13	CWL Schedule A milestones.	Compliance assessed by CWR office.
14	Weekly progress reports on contract construction shall be submitted by the licensee to the IE and the Engineer.	Ongoing.
15	Permits, licences, and approvals under enactments other than the Water Act or Water Sustainability Act for the construction of works may be required in addition to the leave to commence construction, and you should ensure the appropriate authorizations are in place.	If and as required.



**APPENDIX C
 LCC #05 CONDITIONS (APPLICABLE TO DIVERSION OUTLET WORKS)**

No.	Condition	Status for LTC #05A
a)	Before the construction of any component of LCC #5 may proceed, the Licensee must: <ul style="list-style-type: none"> • submit relevant design drawings signed and sealed by a professional engineer registered in the province of British Columbia to [REDACTED] P. Eng. to review in his capacity as IE, and • receive a copy of a report (the “Recommendation Report”) submitted by the IE to the DCWR under the Water Sustainability Act, which recommends that construction of that component of LCC #5 may proceed. The Recommendation Report is in the form of a letter and is sufficient for construction of that component to proceed. 	Completed, except for drawings for contractor-designed overburden slopes.
b)	In-river works for the tailrace and downstream river channel that are outside the area shaded grey on DWG NO 1016-C14-B6158-22 dated November 8, 2012 (attached in Appendix D of LCC #5) are not authorized for construction under LCC #5.	Not applicable.
c)	The Licensee may request the DCWR to review any of the IE’s Recommendation Reports and make alterations to the Leave to Construct.	If and as required.
d)	If during construction material changes to the works of LCC #5 are proposed, the changes must be authorized through the process described in No. a) above.	If and as required.
e)	Any revisions to sections of the CEMP that are applicable to the construction of works authorized by the Water Licences, including temporary works in support of constructing the named permanent works, must be reviewed by the IEM and accepted by the Deputy Comptroller of Water Rights	If and as required.



[REDACTED]

[REDACTED]

June 30, 2017

[REDACTED]

[REDACTED]

Attention: [REDACTED] Independent Engineer

RE: Site C Clean Energy Project – Conditional Water License 132990 IEM review of the Diversion Outlet Works, including In-River Excavation and relevant component plans

Leave to Commence Construction (LCC#5) was issued by the Deputy Comptroller of Water Rights as identified in the Conditional Water Licence (CWL) 132990¹ for the Left Bank Cofferdams and Diversion Tunnel Works involving the following key components:

- Inlet Works Portal and Channel Including in-River Portion of Channel.
- Outlet Works Portal and Channel Including In-River Works for the Tailrace and Downstream River Channel.
- Stage 1 Left Bank Cofferdam Including Slurry Cut-off Wall and Grouting and Left Bank Earthfill Dam Core Trench Excavation
- Left Bank Drainage Adit including Portal Works.
- Diversion Tunnels Excavation and Rock Support.
- Diversion Tunnels Lining and Inlet & Outlet Concrete Structures.
- Diversion Tunnel Gates and Electro-Mechanics Installation and Testing.

While it is the role of the Independent Engineer (IE) to issue the LTCs, the IEMs role is to review Environmental Protection Plans (EPPs) and associated component plans provided by contractors to verify they adequately address the potential environmental impacts in advance of construction.

This letter has been prepared specifically for three inter-related LTC work elements associated with the diversion outlet, including in-river excavation activities. It is our understanding that works under this LTC are to include the following:

- Excavation of the diversion outlet portal (LTC#5B), including:

¹ Conditional Water Licence 132990. Prepared by the Ministry of Forests, Lands and Natural Resource Operations, Office of the Comptroller of Water Rights, Water Management Branch. Dated February 26, 2016.

[REDACTED]

- rock stabilization.
- in-river excavation, including mid-river island, bar island (portion within the dam site area boundary), and in-river tailrace.
- Construction of the outlet cofferdam (LTC#3F); and
- Construction of RSEM area L6 (LTC#2F).

It is the Independent Environmental Monitor's (IEMs) understanding that the scope of this request does not include:

- Forest clearing – completed previously by other contractors; and
- Diversion outlet cofferdam removal at the start of Stage 2 flow diversion.

Furthermore, BC Hydro will be seeking approval for in-river excavation of the portion of bar island outside the dam site area boundary under a *Land Act* Licence of Occupation and *Water Sustainability Act* Section 11 application, with works expected to take place in 2018.

As the issuance of each LTC requires the IEMs review and recommendation for acceptance to the IE, it is the IEMs understanding that any revisions to the EPP or supporting documents, or changes to scopes of work that could require such revisions, would require review and acceptance by the IEM prior to initiating works, and could be considered a hold point by the IE.

The IEM has reviewed the EPP provided by BC Hydro including cross-referencing with the various applicable project requirements found within the Construction Environmental Management Plan (CEMP), components of BC Hydro supporting documentation/plans, relevant permits/approvals/licences, and related drawings for the works. In addition, the review was conducted in consideration of the Environmental Assessment Certificate (EAC) Schedule B Table of Conditions and Decision Statement issued by the Canadian Environmental Assessment Agency (CEAA) for the Project.

The following is a summary of plans, permits, and authorizations received and reviewed by the IEM team, which are related to LTC#5B.

BC Hydro Plans/Documents

- *Construction Environmental Management Plan* (Revision 4), dated July 26, 2016.
- *Site C Clean Energy Project Request for LCC5 Component Authorization, Leave to Construct 5B (LTC5B) – Diversion Outlet Works, including In-River Excavation*, letter from [REDACTED] to [REDACTED] [REDACTED] 12 May 2017.

Relevant Design and Conceptual Drawings

- *Clean Energy Project – Site C – Diversion Tunnels Outlet Portal Excavation and Rock Support Sections and Details – 1020-C17-00465_HS_ES_RO-20170517*
- *Clean Energy Project – Site C – Diversion Tunnels Outlet Erosion Protection Sections Sheet 1 – 1020-C17-00472-HS-ES-RO-20170517*
- *Clean Energy Project – Site C – Diversion Tunnels Outlet Erosion Protection Sections Sheet 2 – 1020-C17-00475-HS-ES-RO-20170517*
- *Clean Energy Project – Site C – Cofferdams Outlet Cofferdam – Stage 1 – 1020-C17-00762_R5 Sealed*
- *Clean Energy Project – Site C – Diversion – Cofferdams Outlet Cofferdam – Stage 1 – Sections, Profile and Details – 1020-C17-00763_R6 Sealed*

Provincial Permits/Approvals

- Conditional Water Licence 132990.

Federal Permits/Approvals

- *Fisheries Act* Authorization 15-HPAC-00170 and 15-HPAC-01160
- *Navigation Protection Act* Approval 2008-500822 and 2016-500328

IEM Requirements

- Based on our understanding of the information provided and communications to date, it is the IEM's understanding that [REDACTED] may still modify their in-stream excavation methods beyond those presently described. [REDACTED]
[REDACTED] It is the IEMs expectation that this information would be provided in advance of implementing any modified construction approaches, ensuring all appropriate permits/approvals are in place for the works, along with any relevant EPP revisions.
- The IEM would also recommend that the previous requirement as committed to by [REDACTED] be clearly reflected in Table 9-1 of the LTC Application package, Environmental Hold Points.

Conclusions and Recommendations

Upon review of the submitted documents for LTC#5B, LTC#2F and LTC#3F, and based on our understanding of the works proposed in addition to communications and information provided by BC Hydro, we have no objections to issuing these LTCs for the works associated with the diversion outlet works, including in-river excavation, as described. Ultimately, all works must be compliant with appropriate permits, approvals, authorizations, and conditions as identified within the EAC and CEAA Decision Statement, regulations, and the CEMP.

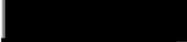
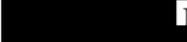
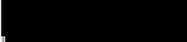
Yours truly,



Original signed and sealed version maintained on file.

 R.P.Bio., P.Biol., P.Ag.

Independent Environmental Monitor, Delegate

cc.  Water Management Branch, Manager of Water Allocation and Utilities Section
 FLNRO Water Management Officer
 FLNRO Water Management Officer
 BC Hydro, Manager, Project Environmental Risk Management
 BC Hydro Regulatory Manager