

# Accidents and Malfunctions Plan

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*Site C Clean Energy Project*  
*Revision 0: June 5, 2015*

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## Revision History

<b>Version</b>	<b>Date</b>	<b>Comments</b>
Draft	10-17-2014	Draft
Rev 0	06-05-2015	Final Plan

## **Glossary**

- Dam Construction
- Construction of works that will be permanent features of the Site C dam, such as coffer dams.
  - Site preparation, including clearing, grubbing, construction of access roads and the like are excluded.

## 1.0 Background

### 1.1 The Site C Clean Energy Project

The Site C Clean Energy Project (the Project) will be the third dam and generating station on the Peace River in northeast B.C. The Project will provide 1,100 megawatts of capacity and about 5,100 gigawatt hours of energy each year to the province's integrated electricity system. The Project will be a source of clean, reliable and cost-effective electricity for BC Hydro's customers for more than 100 years.

The key components of the Project are:

- an earthfill dam, approximately 1,050 metres long and 60 metres high above the riverbed;
- an 83 kilometre long reservoir that will be, on average, two to three times the width of the current river;
- a generating station with six 183 MW generating units;
- two new 500 kilovolt AC transmission lines that will connect the Project facilities to the Peace Canyon Substation, along an existing right-of-way;
- realignment of six segments of Highway 29 over a total distance of approximately 30 kilometres; and
- construction of a berm at Hudson's Hope.

The Project will also include the construction of temporary access roads, a temporary bridge across the Peace River, and worker accommodation at the dam site.

### 1.2 Project Benefits

The Project will provide important benefits to British Columbia and Canada. It will serve the public interest by delivering long term, reliable electricity to meet growing demand; contribute to employment, economic development, ratepayer, taxpayer and community benefits; meet the need for electricity with lower GHG impact than other resource options; contribute to sustainability by optimizing the use of existing hydroelectric facilities, delivering approximately 35 per cent of the energy produced at the W.A.C. Bennett Dam, with only five per cent of the reservoir area; and include an honourable process of engagement with First Nations and the potential for accommodation of their interests.

### 1.3 Environmental Assessment Process

The environmental assessment of the Project has been carried out in accordance with the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), the *BC Environmental Assessment Act* (BCEAA), and the *Federal-Provincial Agreement to Conduct a Cooperative Environmental Assessment, Including the Establishment of a Joint Review Panel of the Site C Clean Energy Project*. The assessment considered the environmental, economic, social, heritage and health effects and benefits of the Project, and included the engagement of Aboriginal groups, the public, all levels of government, and other stakeholders in the assessment process.

Detailed findings of the environmental assessment are documented in the Site C Clean Energy Project Environmental Impact Statement (EIS), which was completed in accordance with the Environmental Impact Statement Guidelines (EIS Guidelines) issued by the Minister of Environment of Canada and the Executive Director of the Environmental Assessment Office of British Columbia. The EIS was submitted to regulatory agencies in January 2013, and amended

in August 2013 following a 60 day public comment period on the assessment, including open house sessions in Fort St. John, Hudson's Hope, Dawson Creek, Chetwynd, town of Peace River (Alberta) and Prince George.

In August 2013, an independent Joint Review Panel (JRP) commenced its evaluation of the EIS, and in December 2013 and January 2014 undertook five weeks of public hearings on the Project in 11 communities in the Peace region, including six Aboriginal communities. In May 2014, the JRP provided the provincial and federal governments with a report summarizing the Panel's rationale, conclusions and recommendations relating to the environmental assessment of the Project. On completion of the JRP stage of the environmental assessment, the CEA Agency and BCEAO consulted with Aboriginal groups on the JRP report, and finalized key documents of the environmental assessment for inclusion in a Referral Package for the Provincial Ministers of Environment and Forests, Lands and Natural Resource Operations.

Construction of the Project is also subject to regulatory permits and authorizations, and other approvals. In addition, the Crown has a duty to consult and, where appropriate, accommodate Aboriginal groups.

## **1.4 Environmental Assessment Findings**

The environmental assessment of the Project focused on 22 valued components (VCs), or aspects of the biophysical and human setting that are considered important by Aboriginal groups, the public, the scientific community, and government agencies. In the EIS, valued components were categorized under five pillars: environmental, economic, social, heritage and health. For each VC, the assessment of the potential effects of the Project components and activities during construction and operations was based on a comparison of the biophysical and human environments between the predicted future conditions with the Project, and the predicted future conditions without the Project.

Potential adverse effects on each VC are described in the EIS along with technically and economically feasible mitigation measures, their potential effectiveness, as well as specific follow-up and related commitments for implementation. If a residual effect was found on a VC, the effect was evaluated for significance. Residual effects were categorized using criteria related to direction, magnitude, geographic extent, context, level of confidence and probability, in accordance with the EIS Guidelines.

The assessment found that the effects of the Project will largely be mitigated through careful, comprehensive mitigation programs and ongoing monitoring during construction and operations. The EIS indicates that the Project is unlikely to result in a significant adverse effect for most of the valued components. However, a determination of a significant effect of the Project was found on four VCs: Fish and Fish Habitat, Wildlife Resources, Vegetation and Ecological Communities, and Current Use of Lands and Resources for Traditional Purposes.

## **1.5 Environmental Assessment Conclusion**

On October 14, 2014, the Provincial Ministers of Environment and of Forests, Lands and Natural Resource Operation decided that the Project is in the public interest and that the benefits provided by the Project outweigh the risks of significant adverse environmental, social and heritage effects (<http://www.newsroom.gov.bc.ca/2014/10/site-c-project-granted-environmental-assessment-approval.html>). The Ministers have issued an Environmental Assessment Certificate setting conditions under which the Project can proceed.

Further, on November 25, 2014, The Minister of Environment of Canada issued a Decision Statement confirming that, while the Project has the potential to result in some significant adverse effects, the Federal Cabinet has concluded that those effects are justified in the

circumstances. The Decision Statement sets out the conditions under which the Project can proceed.

## 1.6 Development of Mitigation, Management and Monitoring Plans

Mitigation, management and monitoring plans for the Project have been developed taking into account the measures proposed in the EIS, information received during the Joint Review Panel hearing process, and the Report of the Joint Review Panel on the Project. Those plans are consistent with, and meet requirements set out in, the conditions of the Environmental Assessment Certificate and of the Decision Statement issued on October 14, 2014 and November 25, 2014 respectively.

In addition, in accordance with environmental best practices (Condition 3.1), these plans were informed by the best available information and knowledge, based on validated methods and models, undertaken by qualified individuals and apply the best available economically and technologically feasible mitigation strategies. These plans contain provisions for review and update as new information on the effects of the Project and on the efficacy of the mitigation measures become available.

## 2.0 Accidents and Malfunctions

### 2.1 Objective and Scope

The objective of the Accidents and Malfunctions Plan is to identify potential accidents and malfunctions associated with construction of the Project that may result in adverse environmental effects. The Plan builds on information that was provided in Section 37.2 of the Project's EIS, which described:

- the likelihood and circumstances under which those accidents or malfunctions could occur;
- an overview of the measures that would be implemented to reduce the likelihood and those that could be implemented to mitigate the potential occurrence of an accident or malfunction; and
- the potential effects of accidents and malfunctions.

The Accidents and Malfunctions Plan has been developed in accordance with Condition 2 of the federal Decision Statement, as indicated in the table below.

Condition Number	Federal Decision Statement Condition	Plan Response
2.1	The Proponent shall construct and operate the Designated Project in a manner that prevents accidents and malfunctions that may result in adverse environmental effects.	
2.2	The Proponent shall develop, in consultation with Environment Canada and the Agency, a plan to prevent accidents and malfunctions and outline procedures in the case of occurrence of an accident or malfunction.	The draft plan was provided to Environment Canada and the Agency for review and comment on October 17, 2014.
2.3	The plan shall include:	

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Condition Number	Federal Decision Statement Condition	Plan Response
2.3.1	identification of potential accidents and malfunctions associated with the Designated Project that may result in adverse environmental effects;	Section 3.0 Potential Accidents
2.3.2.	for each potential accident and malfunction identified:	
2.3.2.1.	measures to prevent its occurrence;	Section 3.0 Potential Accidents
2.3.2.2.	a communication plan in case of occurrence, including notifications to be provided;	Section 4.0 Communication
2.3.2.3.	measures to be implemented in case of an occurrence to minimize any adverse environmental effects; and	Section 3.0 Potential Accidents
2.3.2.4.	a reporting process on any environmental effects of the occurrence.	Section 5.0 Reporting
2.4	The Proponent shall submit to Environment Canada and the Agency a draft copy of the plan for review 90 days prior to initiating construction.	Section 2.2 Consultation
2.5	The Proponent shall submit to the Agency the final plan a minimum of 30 days prior to initiating construction.	
2.6	The Proponent shall implement the plan and provide to the Agency a review and summary of the implementation of the plan as well as any updates required to the plan on an annual basis commencing with construction. In the event of an occurrence of an accident or malfunction, the Proponent shall update the plan to incorporate new procedures and measures to avoid a reoccurrence, as necessary.	Section 6.0 Plan Updating

## 2.2 Consultation

Many of the conditions require BC Hydro to consult or collaborate with certain government agencies and Aboriginal groups in respect of measures and plans required by the conditions.

BC Hydro began consultation on the Project in late 2007, before any decision to advance the Project to an environmental assessment. BC Hydro's consultation with the public, stakeholders,



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regional and local governments, regulatory agencies, and Aboriginal groups is described in EIS Section 9, Information Distribution and Consultation.

Additional information on the consultation process and a summary of issues and concerns raised during consultation are provided in:

- Volume 1 Appendix G, Public Information Distribution and Consulting Supporting Documentation
- Volume 1 Appendix H, Aboriginal Information Distribution and Consultation Supporting Documentation
- Volume 1 Appendix I, Government Agency Information Distribution and Consultation Supporting Documentation
- Volume 5, Appendix A01 to A29, Parts 2 and 2A, Aboriginal Consultation Summaries
- Technical Memo: Aboriginal Consultation

Draft versions of a number of the mitigation, management and monitoring plans required by the conditions were submitted to applicable government agencies and Aboriginal groups for comment on October 17, 2014.

Comments on these draft plans were received from various government agencies and Aboriginal groups during November and December 2014, and were considered in the revisions to these plans. BC Hydro's consideration of these comments is provided in the consideration tracking tables that accompany each plan.

On December 15, 2014, Treaty 8 Tribal Association (T8TA), on behalf of West Moberly, Saulteau and Prophet River First Nations, submitted to BC Hydro a letter in response to BC Hydro's request for comment on the Plans sent on October 17, 2014. The letter included several appendices, including the Joint Review Panel (JRP) Report and transcripts from the JRP hearings in December 2013 and January 2014. BC Hydro responded to the three First Nations on January 21, 2015 noting that the October 17 2014 request for comments on the plans was to provide an opportunity to the First Nations to submit to BC Hydro any information they wanted to provide in relation to the Plans. BC Hydro advised that it was aware of the information referred to in T8TA's letter when the plans were prepared, and advised that it was preparing a table setting out where any mitigation measures identified by representatives of the three First Nations during the hearings are considered in the draft plans and would provide that to the First Nations once complete. Accordingly BC Hydro's responses to those mitigation measures identified by the representatives of the three First Nations during the JRP hearings were provided to the EAO in a separate table by letter dated May 19, 2015. Aside from the December 15, 2014 letter, BC Hydro has not received further comments from these First Nations. A letter of understanding dated April 30, 2015 respecting provision of capacity funding to support review of the plans was entered into by BC Hydro and Saulteau First Nations (on behalf of Saulteau, West Moberly and Prophet River First Nations).

New draft plans (i.e., Housing Plan and Housing Monitoring and Follow-Up Program, and the quarry/pit development plans) were provided to the entities identified in the EAC conditions on April 7, 2015. The Vegetation and Wildlife Mitigation and Monitoring Plan was revised based on comments received on the October 17, 2014 version and based on discussions with Environment Canada and the BC Ministry of Environment, and was re-submitted to applicable entities on April 7, 2015.

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Comments on the revised plans were requested by May 11, 2015 to allow for review, consideration of comments and finalization of the plans 30 days prior to the commencement of construction.

Comments were received by this requested date from:

- Fort Nelson First Nation
- Ministry of Forests, Lands and Natural Resource Operations (FLNRO), and
- Métis Nation British Columbia.

The Peace River Regional District submitted their comments on the plan on May 14, 2015. FLNRO submitted additional comments on May 15, 2015, including comments from the BC Ministry of Environment.

BC Hydro considered the comments provided and prepared final plans. On May 19, 2015, BC Hydro submitted the following mitigation, management and monitoring plans to the BC Environmental Assessment Office (BC EAO) for review:

- Construction Environmental Management Plan
- Construction Safety Management Plan
- Fisheries and Aquatic Habitat Management Plan
- Vegetation and Wildlife Mitigation and Monitoring Plan
- Vegetation Clearing and Debris Management Plan
- Aboriginal Plant Use Mitigation Plan
- Aboriginal Training and Inclusion Plan
- Business Participation Plan
- Emergency Services Plan
- Healthcare Services Plan
- Labour and Training Plan
- Cultural Resources Mitigation Plan
- Heritage Resources Management Plan
- Housing Plan and Housing Monitoring and Follow-Up Program
- Wuthrich Quarry Development Plan
- West Pine Quarry Development Plan; and
- Del Rio Pit Development Plan.

The CEA Agency and Environment Canada submitted comments on the revised plan on May 22, 2015. These comments were considered and the final plans were revised accordingly and submitted on June 5, 2015 to the entities identified in the EAC conditions.

## **2.3 Construction Environment Management Plan**

The Accidents and Malfunction is interrelated with the Construction Environment Management Plan (CEMP). The CEMP sets out the environmental requirements with respect to the construction of the Project. The CEMP provides the specifications that Environmental Protection Plans (EPPs) must satisfy. EPPs are written, detailed procedures that are produced by Contractors' qualified environmental professional in advance of construction at any location.

## **3.0 Potential Accidents and Malfunctions**

The following parts of Project construction have the potential, through accident or malfunction, to adversely affect the environment:

- Failure of the Stage 2 Upstream Cofferdam;

- Release or spills of chemicals and hazardous materials;
- Containment pond leakage or failure;
- Sediment control failure; and
- Fire and explosion.

The following sections describe the measures to reduce the likelihood or mitigate the potential occurrence of the above accidents or malfunctions.

### **3.1 Failure of the Stage 2 Upstream Cofferdam**

#### **Measures to Reduce the Likelihood of Occurrence**

BC Hydro operates a hydrometric data collection system in the Williston and Site C local catchments. A total of six additional data collection platforms were installed in the Site C local catchment in 2012 and 2013 to provide more data for streamflow forecasting from the Site C local catchment. The data from the hydrometric data collection system would be used to improve the calibration of the watershed models and improve flood forecasting in the Site C local catchments.

Calibrated models are capable of predicting flood flows from hydrometric data and will be used to predict inflows to the Project. After each flood these models will be updated with meteorological and streamflow data as a continuous process of improving the reliability of the models to predict floods.

During construction flood forecasts will be used so that operating personnel at Peace Canyon Dam are on alert and ready to reduce discharges prior to flood arrival at the dam site. Reducing the Peace Canyon discharges will result in lower headpond levels when the flood arrives, which will reduce the peak water levels and reduce the risk of overtopping.

In 2014, BC Hydro completed a seismic hazard assessment to better identify the hazards to its facilities in the event of a major earthquake. The study provides a better understanding of the intensity of ground movements that could be expected at BC Hydro's facilities in the event of a major earthquake. The study found that the seismic hazard has decreased or remained stable for the Peace River system.

#### **Measures to be Implemented In Case of an Occurrence**

It will take approximately four days for the headpond levels to peak after the start of the flood from the Site C local catchment. In the event that a larger flood than the capacity of the diversion works is forecast, there will be sufficient time to implement the emergency preparedness plans and evacuate potentially flooded areas downstream.

### **3.2 Release or Spills of Chemicals and Hazardous Materials**

#### **Measures to Reduce the Likelihood of Occurrence**

Large quantities of chemicals and hazardous materials will not be stored on the construction sites; rather, they will be brought to site in quantities similar to the rate at which they are consumed. Chemicals will be transported to site either by rail or by truck and stored in appropriate containers according to applicable standards and regulations. Temporary construction infrastructure that will store chemicals and hazardous materials include:

- Vehicle maintenance facilities – chemicals stored will include lubricants, antifreeze, petroleum products, and other materials required to maintain construction equipment

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- Tank farm where diesel, gasoline, and other liquid fuels required for construction will be stored. Proper secondary containment such as double-wall tanks or lined containment areas will be installed to minimize fuel seepage into the environment.
- Explosive magazines for secure storage of ammonium nitrate and stick explosives
- Storage facilities for cement, fly-ash, and other concrete additives
- Waste treatment facilities – for camp, truck washing, and cement wastewater, as well as antifreeze, lubricants, and other liquid and solid wastes generated on-site

Secondary containment of hazardous substances will be provided as recommended in the Canadian Council of Ministers of the Environment (CCME) Environmental Codes of Practice (CCME 1993; CCME 1994)

Spills are most likely to occur from activities such as refuelling. Trucks will transport fuel from the tank farm to heavy equipment on-site. Pickup trucks and other more mobile equipment will refuel at the tank farm directly.

Other likely spill events will result from breaks in hydraulic lines of excavators or other large construction equipment. To minimize the effect of hazardous material spills, with the exception of the initial construction of the construction berms, all construction areas will be contained behind a dike or other confinement structure, and therefore the spill will not be exposed to the environment outside of the construction site.

All vehicles will be equipped with an appropriately sized spill kit, and personnel operating will have applicable training.

Additional measures to reduce the likelihood of a release or spill of chemicals and hazardous material are described in the following sections of the CEMP:

- Section 4.6 Fuel Handling and Storage Management;
- Section 4.8 Hazardous Waste Management; and
- Section 4.13 Spill Prevention and Response.

### **Measures to be Implemented In Case of an Occurrence**

In the event of an occurrence, spills will be cleaned up as soon as practical. When applicable, a qualified professional will be onsite to monitor the clean up and report to appropriate regulatory authorities.

### **3.3 Containment Pond Leakage or Failure**

Containment ponds will be constructed to manage storm water runoff and wastewater collected on-site. A potential source of wastewater collected on-site will be from the cement plants. Both the storm water and cement plant wastewater containment ponds will be settlement ponds.

#### **Measures to Reduce the Likelihood of Occurrence**

To reduce the likelihood of an occurrence, water level will be monitored on an ongoing basis. The stability of the containment structures will also be regularly monitored.

Additional measures to reduce the likelihood of containment pond leakage or failure are described in the following sections of the CEMP:

- Section 4.4 Erosion Prevention and Sediment Control Management;
- Section 4.13 Spill Prevention and Response; and
- Section 4.14 Surface Water Quality Management.

### **Measures to be Implemented In Case of an Occurrence**

In the event of a containment pond leak or failure, the Project emergency response plan will be followed.

## **3.4 Sediment Control Failure**

Structures to control sediment from entering the Peace River and other watercourses will be installed, monitored, and maintained at various locations throughout the Project.

The magnitude and impact as a result of a failure of a sediment control structure will depend on the location and purpose of the structure. The impact to the environment in the event of a sediment control device failure may be the release of sediment into the water.

### **Measures to Reduce the Likelihood of Occurrence**

To reduce the likelihood of an occurrence, sediment control structures will be installed, monitored, and maintained in accordance with the Contractor's Environmental Protection Plan.

Additional measures to reduce the likelihood of sediment control failure are described in the following sections of the CEMP:

- Section 4.4 Erosion Prevention and Sediment Control Management; and
- Section 4.14 Surface Water Quality Management.

### **Measures to be Implemented In Case of an Occurrence**

In the event of an occurrence, the sediment control structure will be repaired as soon as practical. Furthermore, an evaluation will be conducted to determine the cause of the occurrence and if required appropriate measures will be taken to prevent re-occurrence.

## **3.5 Fire and Explosion**

### **Measures to Reduce the Likelihood of Occurrence**

Fire controls at the dam site will include strategically positioned heat and smoke detectors and alarms, as well as automatic sprinklers and suitable extinguishers. Planning for work areas will ensure that personnel could easily evacuate in the event of an emergency.

Debris from clearing activities will be managed to minimize risk of fire and magnitude of fires should one occur. Construction sites will be cleared with adequate buffers to minimize wildfire spreading at the construction sites.

Explosives will be used at the dam site, and West Pine, Wuthridge, and Portage Mountain quarries. To minimize the risk of explosion, dynamite and detonators will be stored on-site in explosives magazines and, when required, will be loaded and transported to the blasting sites. Explosive magazines will be stored a safe distance from other facilities. Ammonium nitrate and fuel oil will be delivered by truck and only mixed during delivery down the blast hole.

Additional measures to reduce the likelihood of fire and explosion are described in:

- Section 5.2 Fire Hazard and Abatement Plan in the Construction Safety Management Plan; and
- the following sections of the CEMP:
  - Section 4.2 Blasting Management;

- Section 4.6 Fuel Handling and Storage Management; and
- Appendix A Smoke Management Plan.

### **Measures to be Implemented In Case of an Occurrence**

In the event of a fire or explosion, the Project emergency response plan will be followed.

## **4.0 Communication**

BC Hydro has established emergency response protocols for its existing facilities on the Peace River. These protocols include procedures for notification and emergency contact information. Site C will follow these protocols should an accident or malfunction that requires notification occur.

## **5.0 Reporting**

BC Hydro will develop a procedure for notifying BC Ministry of Environment; BC Ministry of Forests, Lands and Natural Resource Operations; Environment Canada and Fisheries and Oceans Canada in the event that an accident or malfunction as described in Section 3 occurs. The procedure will be developed in consultation with the named agencies prior to commencement of dam construction.

## **6.0 Plan Updating**

The Plan will be updated annually beginning with the commencement of dam construction. In the event of an occurrence of an accident or malfunction, BC Hydro will update the plan to incorporate new procedures and measures to avoid a reoccurrence, as necessary.