



# Management Plan

for the purpose of a

## Licence of Occupation - Roads

for the

### BC Hydro

### Takla Landing Reliability Project

BC Hydro Project: DY0910  
Chartwell Consultants Ltd. Project: 15-716

Prepared by:

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[Name]



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[Signature]

**August 1, 2017**

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[Date]

**IMPORTANT NOTICE**

This report was prepared exclusively for BC Hydro by Chartwell Consultants Ltd. to support a Licence of Occupation application associated with the Takla Landing Reliability Project (TLRP). The quality of information, conclusions and estimates contained herein are based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by BC Hydro only and any other use of or reliance on this report by any third party is at that party's sole risk.

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## 1.0 PROJECT OVERVIEW

### 1.1 PROJECT OVERVIEW

Purpose: Roads  
Specific Purpose: Electric Powerline  
Period of Use: Ten to thirty years  
Tenure: Licence of Occupation

The purpose of this Management Plan is to support a Licence of Occupation application for the access requirements of the Takla Landing Reliability Project (the Project). The intent of the Project is to increase protection of existing electrical distribution infrastructure, improve the safety of workers, reduce wildfire risk, and improve operational stability for the community of Takla Landing. The primary activities involved in the Project will include the harvesting of timber, clearing and maintenance of vegetation, construction and maintenance of permanent and temporary access roads and machine trails, installation, maintenance and removal of temporary stream crossings, excavation of borrow pits and quarry sites, disposal of spoil material, as well as the alteration of archaeological features and other sensitive features. This Management Plan aims to describe the manner in which the development of access requirements will be performed diligently and in accordance with existing legislation.

### 1.2 AUTHORIZATIONS, PERMITS OR APPROVALS

In accordance with the *Forest Act*, an Occupant Licence to Cut will be required from the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) for a five-year period commencing September, 1<sup>st</sup>, 2017 for the purpose of removing timber for the development of permanent and temporary access roads both inside and outside of the Statutory Right of Way. The Statutory Right of Way around the powerline has been applied for under a separate Crown Land Application.

The Project will involve the transportation of heavy equipment and materials on existing forest roads. Road Use Permits from the Ministry of Forests, Lands and Natural Resource Operations will be required to use Forest Service Roads, and Maintenance Agreements will be required to use roads that are under road permit or special use permit.

Operations in or around fresh water may be prescribed as part of the Project. In accordance with the *Water Sustainability Act* and Water Sustainability Regulation 36/2016, change Approvals or Notifications may be required from a decision maker on a site-by-site basis. In addition, the federal Department of Fisheries and Oceans may need to review the Project.

Burning operations may be prescribed as part of the Project. In accordance with the *Wildfire Act* and Wildfire Regulation 38/2005, burn registration numbers for Category 3 Open Fires may be required from the Wildfire Management Branch.

Delays in the tenure approval process may require an initial portion of the project to commence under a temporary Special Use Permit from the Ministry of Forests, Lands and Natural Resource Operations prior to obtaining a Licence of Occupation.

### 1.3 FIRST NATIONS

As per the BC Provincial Consultative Area Database (CAD), the Project is within the asserted territory of four First Nations:

- Carrier Sekani Tribal Council;
- Lake Babine Nation;
- Takla Lake First Nation; and
- Yekooche First Nation

Consultation and engagement with the First Nations has been carried out since the inception of the Project (see Appendix B1 – Consultation and Engagement Summary).

## 2.0 LOCATION

### 2.1 GENERAL DESCRIPTION

BAB25F52 is a single phase distribution feeder that supplies power from the Babine Substation (near Granisle) to Takla Landing, a 250-resident community approximately 195 kilometres northeast of Fort St. James. The line is constructed primarily overhead with approximately 2.7 kilometres of submarine cable crossing Takla Lake. The Licence of Occupation area being applied for herein includes a network of 23.5 km of new road construction, reconstruction, and machine trail between Fort Babine to Takla Landing (see Appendix A1 – General Location Map and Appendix A2 – Site Plan).

Access	Length (km)
New	21.407
Reconstruction	0.597
Machine Trail	1.472
Total	23.476

The Licence of Occupation area being applied for includes 10 metres each side of road centerline for a total width of 20 metres. The total Licence of Occupation area being applied for is approximately 47.1 hectares (ha). Road surface widths will be approximately 5 meters.

### 2.2 LOCATION JUSTIFICATION

The Project Area is situated around existing electrical distribution infrastructure including a previously cleared 10-metre right-of-way. Since part of the purpose of the Project is to increase protection of existing infrastructure, the location of the Project Area is not flexible. Permanent and temporary road locations as well as machine trails and temporary stream crossings are justified based on an Access Plan that considers environmental and cultural impacts, operational requirements and economic efficiencies.

## 2.3 SEASONAL EXPECTATIONS OF USE

A proposed schedule for this Project is summarized in Table 1

Table 1. Seasonal Expectations of Use of the Project Area.

	2017		2018	
	Spring/Summer	Fall/Winter	Spring/Summer	Fall/Winter
Field Layout & Investigation	✓			
Permitting & Tendering	✓	✓		
Access Ops.		✓	✓	✓
Clearing Ops.		✓	✓	✓
Project Completion				✓

If upon field investigation a species is found within part of the Project Area that requires restricted access at certain times of the year, clearing and access activities will be planned accordingly.

## 3.0 INFRASTRUCTURE

### 3.1 NEW FACILITIES OR INFRASTRUCTURE

To date, additional electrical distribution infrastructure is not planned for the Project. The primary activities planned for the Project will include the harvesting of timber, clearing and maintenance of vegetation, construction and maintenance of permanent and temporary access roads and machine trails, installation, maintenance and removal of permanent and temporary stream crossings, excavation of borrow pits and quarry sites, disposal of spoil material, and the alteration of archaeological features and other sensitive features.

Correspondence with forest licensees and other users of the area has commenced to coordinate their access objectives with that of BC Hydro's. Where conditions are suitable and the situation is appropriate, the construction of snow or one-season winter roads may be constructed in place of all-weather roads.

### 3.2 ACCESS

Access to the area will primarily occur via four mainline roads: Jinx, Hagan, Morrison, and Nilkiltkwa FSR. Public access to roads constructed for the Project will be allowed without interference unless road closures are required for safe construction or maintenance purposes. Before commencing any activities that may interfere with public access to the area, a minimum 30-day notification will be posted to users, the appropriate measures will be taken to ensure the safety of all users, and reasonable efforts will be made to allow safe access through operations or to provide alternative routes.

### **3.3 UTILITIES REQUIREMENTS AND SOURCES**

Fuel and other supplies required for the Project will be supplied by BC Hydro and/or their contractors. No significant utilities are expected to be required for the Project.

BC Hydro will make an effort to keep the powerline energized throughout the entire course of the Project to service the community of Takla Landing. Certified Utility Arborists (CUAs) will be hired for the removal of vegetation that is within the limits of approach (3.0 m) to an energized conductor to ensure unnecessary outages are minimized. In some circumstances, it may be appropriate to schedule an outage to safely remove vegetation around the line.

### **3.4 WATER SUPPLY**

A negligible amount of water is expected to be required as part of the Project except, if required, for wildfire prevention and suppression requirements as per the Wildfire Management Branch.

### **3.5 WASTE COLLECTION, TREATMENT, AND DISPOSAL**

BC Hydro and their contractor(s) will ensure all materials labour, supervision, equipment and tools comply with the requirements of BC Hydro Occupational Safety & Health Standards (see Appendix D2). If temporary labour sites are required, BC Hydro will require the disposal of all waste in an appropriate manner and in accordance with relevant legislation.

## **4.0 ENVIRONMENTAL**

To date, investigative work has included a coarse environmental assessment of the Project Area as well as field investigations. BC Hydro is currently completing environmental and archaeological impact assessments in 2017 as part of the Project.

### **4.1 LAND IMPACTS**

#### **4.1.1 Vegetation Removal**

The Project will require the removal of live, dead, and decaying trees, brush and waste using machine and hand clearing methods within the entire Licence of Occupation area being applied for. All harvesting and clearing operations will be planned and/or reviewed by a Registered Professional Forester (RPF). Certified Utility Arborists (CUAs) will be hired for the removal of vegetation that is within the limits of approach (3.0 m) to an energized conductor. BC Hydro will avoid the creation of secondary hazards to roadways and other users by non-wind firm edges by incorporating areas of high-wind throw risk (e.g. narrow strips of standing timber) into the Project Area.

The Project Area is located in three biogeoclimatic zones: SBSmc2, ESSFmv3, and SBSwk3. The elevation range of the Project Area is between 700 and 1500 m.

- a) SBSmc2

The SBSmc2 (Babine) subzone is a moist, cold variant of the Sub-boreal Spruce Zone. Forests on zonal sites are dominated by lodgepole pine (*Pinus contorta*), hybrid white spruce (*Picea glauca x engelmannii*), and trembling aspen (*Populus tremuloides*). The major understory species in the SBSmc2 subzone include black huckleberry (*Vaccinium membranaceum*), thimbleberry (*Rubus parviflora*), five-leaved bramble (*Rubus pedatus*), Sitka alder (*Alnus viridis* spp. *sinuata*), and red-stemmed feathermoss (*Pluerozium schreberi*).

b) ESSFmv3

The ESSFmv3 (Omineca) subzone is a moist, very cold variant of the Engelmann Spruce – Subalpine Fir Zone. Forests on zonal sites are dominated by subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), and lodgepole pine (*Pinus contorta*). The major understory species in the ESSFmv3 subzone include black huckleberry (*Vaccinium membranaceum*), white-flowered rhododendron (*Rhododendron albiflorum*), Sitka alder *Alnus viridis* spp. *sinuata*), bunchberry (*Cornus canadensis*), stiff clubmoss (*Lycopodium annotinum*), twinflower (*Linnaea borealis*), five-leaved bramble (*Rubus pedatus*), and red-stemmed feathermoss (*Pluerozium schreberi*).

c) SBSwk3

The SBSwk3 (Takla) subzone is a wet, cool variant of the Sub-boreal Spruce Zone. Forests on zonal sites are dominated by lodgepole pine (*Pinus contorta*) and hybrid white spruce (*Picea glauca x engelmannii*). The major understorey species in the SBSwk3 subzone include black huckleberry (*Vaccinium membranaceum*), thimbleberry (*Rubus parviflora*), black twinberry (*Lonicera involucrata*), high-bush cranberry (*Viburnum edule*), bunchberry (*Cornus canadensis*), twinflower (*Linnaea borealis*), trailing raspberry (*rubus pubescens*), red-stemmed feathermoss (*Pluerozium schreberi*), and knight's plume (*Ptilium crista-castrensis*).

#### **4.1.2 Soil Disturbance**

Construction and maintenance of permanent and temporary access roads are expected to create soil disturbance. Spoil material as a result of earthworks during road construction will be disposed of locally and appropriately in areas with low to negligible risk of significant adverse environmental effects.

Timber harvesting and clearing activities will occur with machines that can cause soil disturbance if adequate precautions are not taken. To minimize soil disturbance, sensitive soils will be identified in the field and managed as “Machine Free Zone(s)”.

Upon field investigation, if fossils and fossil sites are found, findings will be managed as per the Fossil Management Framework.

#### **4.1.3 Riparian Encroachment**

The Project will require encroachment of riparian areas. An Environmental Assessment (EA) and Environmental Management Plan (EMP) has been completed for 10 km of the line (with the remainder of the line and access roads scheduled to be completed in 2017) that will

assist in making decisions that ensure the effective management of riparian areas and environmental values (see Appendix C1 – Takla ROW 2016 – AOA – EMP Final). In addition, a BCH Request for Quotation has been completed detailing deliverables and expectations for the completed EA and EMP (see Appendix C2 – Babine to Takla – Distribution Line Environmental Services).

All activities requiring riparian encroachment will ensure the protection of fish habitat and will be performed as per the federal *Fisheries Act*, the provincial *Fish Protection Act* and the *Water Act*. To ensure this, the management of riparian areas will adhere to the BC Hydro Approved Work Practices for Water Crossings (see Appendix D1 - AWPWC) which follows best management practices outlined in the MFLNRO Fish Stream Crossing Guidebook.

#### **4.1.4 Pesticides and Herbicides**

The Project is not expected to require the use or application of pesticides or herbicides.

#### **4.1.5 Visual Impacts**

As per the Visual Landscape Inventory (VLI), the Project is within or near four Visual Sensitivity Units (VSUs) with the following established Visual Quality Objectives (VQOs):

- |                                      |                        |
|--------------------------------------|------------------------|
| • VSU:115 (Babine Lake/Babine River) | VQO: Retention         |
| • VSU: 381 (Takla Lake)              | VQO: Modification      |
| • VSU: 485 (Takla Lake)              | VQO: Modification      |
| • VSU: 480 (Takla Lake)              | VQO: Partial Retention |

The proposed clearing area may be visible from Babine Lake and Takla Lake as well as Haul Lake, Friday Lake, and Tahlo Lake. However, given the intent of the Project (Section 1.1) and that the location of the Project Area is not flexible and contains the existing right-of-way clearing, it is expected that visual alterations to the Project Area are considered to be acceptable.

#### **4.1.6 Archaeological Sites**

There is potential for disturbance of archaeological resources. A Request for Quotation (HCA Permit #2016-0314) has been completed detailing deliverables and expectations for the completed AIA (Appendix C4 – AIA Tender).

To date, locations exhibiting known archaeological potential include an historical Grease Trail and several Heritage Sites near Fort Babine. All activities requiring alteration of archaeological resources will be performed as per the *Heritage Conservation Act* and will not occur without adequate consultation and engagement of the appropriate First Nations and, if required, a valid Site Alteration Permit.

#### **4.1.7 Construction Methods/Materials**

To date, additional electrical distribution infrastructure is not planned for the Project.

The Project will include the construction and maintenance of permanent and temporary access roads, permanent and temporary stream crossings, and temporary machine trails. Subgrade, surfacing, and stream crossings, where required, may be constructed with either local or imported material. Access designs will be signed and sealed by a Registered Professional Forester (RPF) and/or a Professional Engineer (P. Eng) and guided by recommendations in the MFLNRO Forest Road Engineering Guidebook, the MFLNRO Engineering Manual, the MFLNRO Fish Stream-Crossing Guidebook and the Approved Work Practices for Water Crossings (see Appendix D1).

Where conditions are suitable and the situation is appropriate, the construction of snow or one-season winter roads may be constructed in place of all-weather roads. It is not expected that snow or one-season winter roads will require extensive earth works; however, if required, they will be rehabilitated following deactivation.

It is not expected that machine trails or temporary stream crossings will require extensive earth works; however, if required, they will be rehabilitated following deactivation.

Spoil material as a result of earthworks during road construction will be disposed of appropriately in areas with low risk of significant adverse environmental effects.

All materials, labour, supervision, equipment and tools required for the Project will comply with the BC Hydro's Occupational Safety & Health Standards (see Appendix D2).

### **4.2 ATMOSPHERIC IMPACTS**

#### **4.2.1 Sound, Odor, Gas, or Fuel Emissions**

Negligible atmospheric impacts are anticipated as part of this Project. Impacts during tree clearing and removal mainly relate to noise and exhaust emissions. Noise and exhaust emissions are expected to be due to road construction operations, ground based harvesting equipment (excavator) and logging truck vehicles; however, activities will be localized and negligible due to the relatively short duration, remoteness and small scope of the Project.

### **4.3 RESTRICTIONS ON TENURING OF AQUATIC LANDS**

There is no conflict with tenuring of aquatic lands associated with the Project.

#### **4.3.1 Drainage Effect**

All activities will occur in accordance with the *Water Sustainability Act*.

#### **4.3.2 Public Access**

Public access to roads constructed for the Project will be allowed without interference unless road closures are required for safe construction or maintenance purposes. Before

commencing any activities that may interfere with the security of or free passage of public access to the area, a minimum 30-day notification will be posted to users, the appropriate measures will be taken to ensure the safety of all users, and reasonable efforts will be made to allow safe access through operations or to provide alternative routes.

#### **4.3.3 Flood Potential**

There will be no significant flood potential created as a direct result of the Project.

### **4.4 FISH AND WILDLIFE HABITAT**

#### **4.4.1 Disturbance to Wildlife or Wildlife Habitat**

The Project may impact wildlife or wildlife habitat. An Environmental Assessment and Environmental Management Plan (see Appendix C2) is scheduled as part of the Project that will assist in making decisions that ensure the effective management of wildlife habitat.

A search of the Conservation Database Centre (CDC) database for species and ecological communities at risk was completed for the general area surrounding the Project Area. No occurrences of Species at Risk were noted within the Project Area. However, an estimated population of 15 caribou (*Rangifer tarandus*) was identified approximately 5.5 kilometres south of the easternmost 3.5 kilometres of the line near Takla Lake. The population (Northern Mountain Population) is currently designated as blue-listed (special concern or vulnerable) and has a COSEWIC Status of E/SC (Endangered/Special Concern). There are no red-listed (extirpated, endangered or threatened) species within or near the Project Area.

There are no approved Wildlife Habitat Areas (WHAs) within the Project Area. However, there is a proposed WHA (Morice Proposed WHA) for grizzly bear within and around the Project Area. Planning activities may require consideration of an application of a variety of access management measures designed to ensure habitat security, prevent population fragmentation, minimize displacement from preferred habitat, and minimize mortality risk. The Fish and Wildlife Branch (MFLNRO) is responsible for the development of more specific General Wildlife Measures (GWMs), strategies, standards, policies, and orders under the *Government Actions Regulation*. BC Hydro will confirm the status of the proposed WHA prior to any activities that will impact the land.

There is no Ungulate Winter Range (UWR) identified within or around the Project Area except for a small portion (U-7-019) of a mountain top north of the east end of the Powerline near Takla Lake. The UWR is not within the Project Area and the Project is not expected to have any significant impact on the UWR.

There are no Fisheries Sensitive Watersheds within the Project Area. However, there is expected to be significant fish habitat within the Project Area which will be formally assessed by Registered Professional Forester (RPF) and/or a Registered Professional Biologist

(RPBio). Stream crossings will be prescribed by a Qualified Registered Professional<sup>1</sup> (QRP) considering recommendations in the Fish-Stream Crossing Guidebook (MFLNRO) and the Approved Work Practices for Stream Crossings.

## 5.0 SOCIO-COMMUNITY

### 5.1 LAND USE

#### 5.1.1 Land Management Plans and Regional Growth Strategies

The Project Area is on provincial Crown lands managed by a variety of policies, plans, acts and regulations.

The west end of the Project Area lies within Indian Reserve 6 Babine and the east end lies adjacent to Indian Reserve 8 North Takla Lake (West Landing). The Licence of Occupation area being applied for does not include Indian reserve land.

The Project Area falls within the bounds of three Natural Resource Districts (Skeena Stikine, Nadina, and Fort St. James) and three Timber Supply Areas (Bulkley, Morice, and Prince George). Two major forest licensees are actively operating within the Project Area (Canadian Forest Products Ltd. and Western Fraser Mills Ltd.). Correspondence with Greg Yeomans, RPF, Canadian Forest Products Ltd., and Alan Baxter, RPF, West Fraser Mills Ltd. has commenced in the anticipation of reaching an agreement to complete the merchantable timber harvesting as well as the disposal of the waste wood associated with the Project. The Project Area is also within the license area of several small and medium licensees. Timber within existing cutting authorities (cutting permits, Forestry Licence to Cut, etc.) has been committed to the forest agreement holder and will be respected to the extent practicable. BC Hydro will bunch (deck) marketable timber in the risk reduction area in a manner that provides for efficient removal of timber.

The Morice Land and Resource Management Plan covers part of the proposed Project area. Within this document, “widening the hydro powerline right-of-way” is identified as a “reasonable concern” under which timber harvesting may be allowed in “No Timber Harvesting Areas” (Objective 7). The Grease Trail 100 m buffer is the only “No Timber Harvesting Area” that the Project will impact.

An Occupant License to Cut application will be submitted to the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). Correspondence with Ron Donnelly, RPF, MFLNRO has commenced in anticipation of the Occupant License to Cut.

The Project Area is not located within private land or within land designated under the Agricultural Land Reserve (ALR).

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<sup>1</sup> A Qualified Registered Professional (QRP) is defined as a person who has appropriate qualifications and experience to carry out the planning of the Work, and is a member of, or licensed by, a regulatory body in British Columbia that has the legislated authority to regulate its members' performance of these activities. In the context of the AWPWC, this may include engineers, biologists, and foresters.

## 5.2 Socio-COMMUNITY CONDITIONS

### 5.2.1 Adjacent Users or Communities

The Project Area falls within portions of Wildlife Management Units (MUs) 6-8 (Skeena) and 7-27 (Omineca) managed by the Fish and Wildlife Branch (MFLNRO). Wildlife Management Unit 6-8 (Skeena) occurs west of the height of land to Takla Lake and falls in the Upper Nechako Game Management Zone (6c). Wildlife Management Unit 7-27 (Omineca) occurs east of the height of land to Fort Babine and falls within the Omineca Game Management Zone (7d). BC Hydro will notify the Fish and Wildlife Branch (MFLNRO) if planned access roads and/or trails will cross between the two Wildlife Management Units and take sufficient measures to ensure that management objectives for the two Wildlife Management Units are met. It is expected that the Fish and Wildlife Branch will consider the use of gates in such situations.

The Project Area also falls within areas of two Guide Outfitter tenures. Jack Hooper (Guiding Certificate No. 601055) actively operates west of Friday Lake all the way to Fort Babine including a portion of the height of land to the north-east of Friday Lake (Territory 608G003). Stewart Berg (Guiding Certificate No. 601003) actively operates east of Friday Lake to Takla Lake (Territory 608G006). Both tenures are in the Skeena Resource Management Region (Region 6). BC Hydro will notify and engage these stakeholders of planned clearing and access activities within their tenures.

Additionally, there are three Trapline Areas in the Project Area. Trapline Area 1580392 lies at the eastern end of line near Takla Lake, Trapline Area 1579544 lies at the western end of line, including Friday Lake, and northern half of Haul Lake, and Trapline Area 1579572 lies over a small western portion of line around the southern half of Haul Lake. BC Hydro will notify and engage these stakeholders of planned clearing and access activities within their tenures.

The boundary of Mount Blanchet Provincial Park, located on the west side of the southern end of Takla Lake, lies 10 km southeast from the easternmost portion of the Project Area. Mount Blanchet Provincial Park is 24,774 hectares and was designated park status in January 2001 to protect valuable wildlife habitat including spring range for ungulates on the south-facing slopes along the northwest arm of Takla Lake. Significant caribou over-wintering and calving areas and alpine habitat suitable to mountain goat and grizzly bear. Sockeye salmon frequent several of the creeks. The Project will not encroach or affect the park in direct way.

There are no registered recreational trails in close proximity to the Project Area.

### 5.2.2 Existing Services

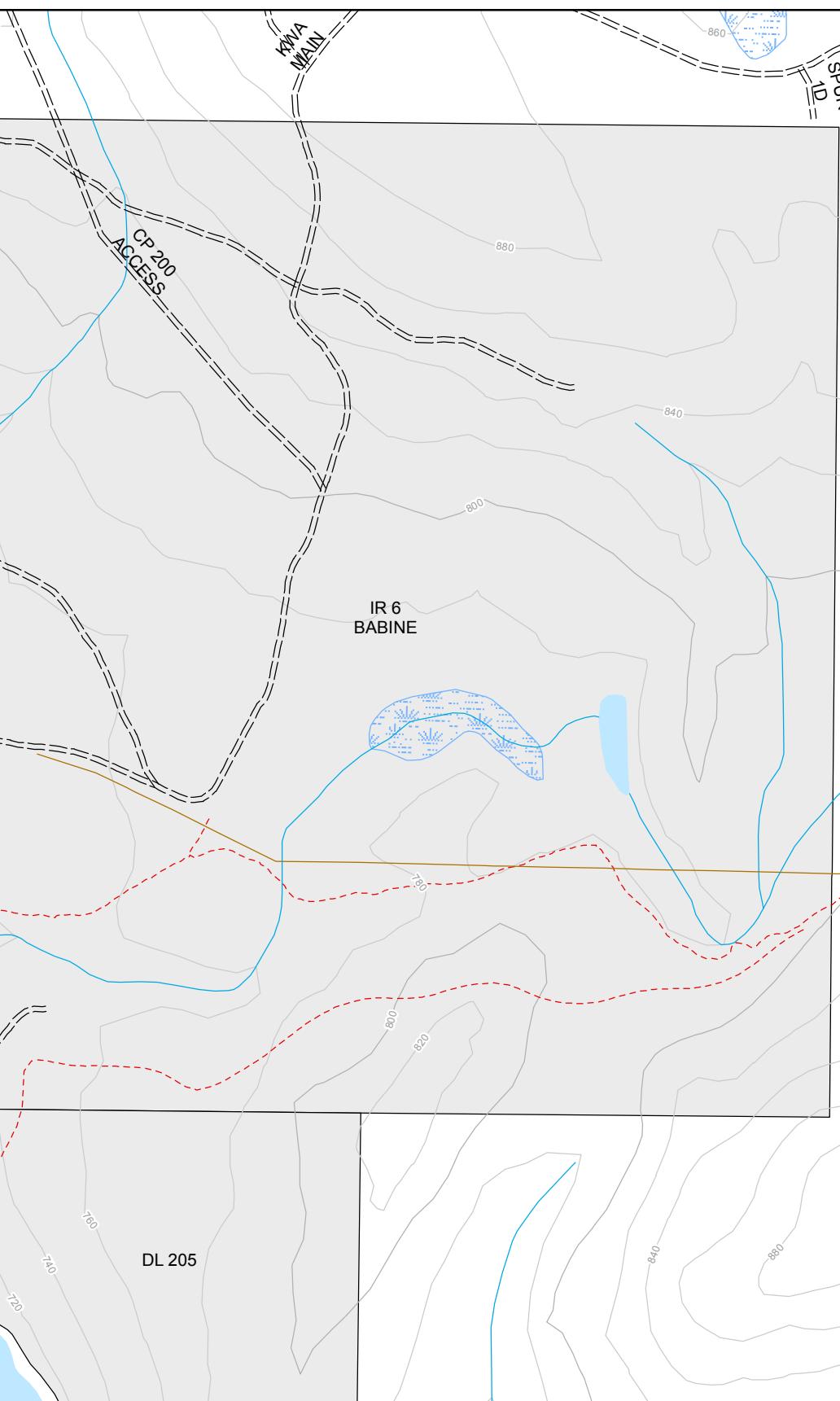
There may be a slight increase in demand for fire and health emergency services on the communities of Smithers and Granisle due to increased industrial activity in the Project Area.



A. Maps

Appendix A1: General Location Map  
Appendix A2: Site Plan

N  
W E  
S



## License of Occupation Site Specific Map

### Legend

- Licence of Occupation Area (Green)
- Tantalis Survey Parcel (Grey)
- BC Hydro Right of Way (Purple)

- Lake/River (Blue)
- Wetland (Blue with dots)
- Stream (Blue line)

- Proposed Road (Magenta dashed)
- Proposed Machine Trail (Orange dashed)
- Proposed Reconstruction Road (Yellow dashed)
- Existing Road (Black dashed)
- Distribution Line (Orange solid)

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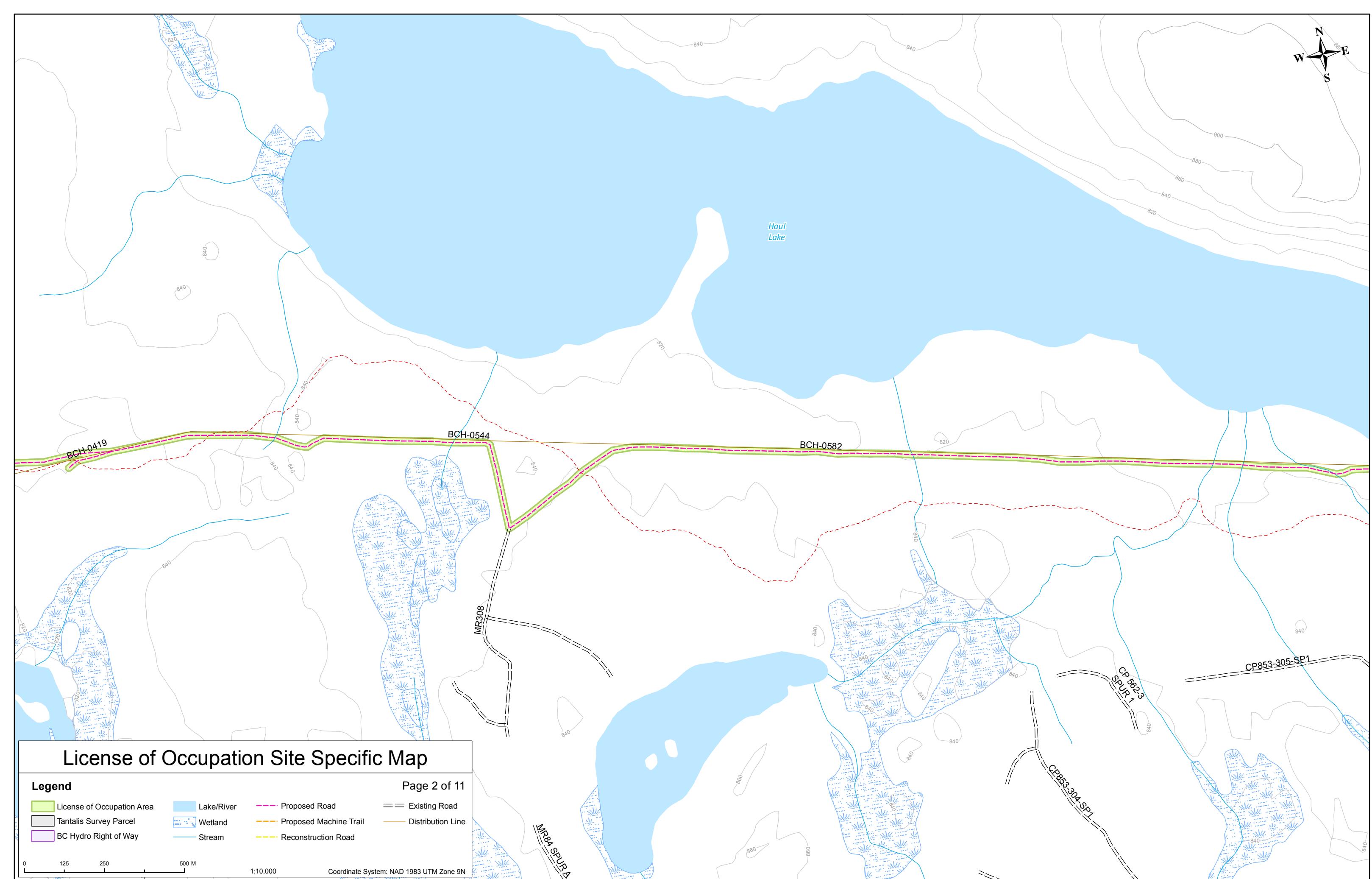
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Coordinate System: NAD 1983 UTM Zone 9N

SECTION 4

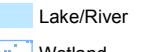
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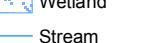
## License of Occupation Site Specific Map

### Legend

- License of Occupation Area
- Tantalis Survey Parcel
- BC Hydro Right of Way



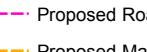
Lake/River



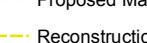
Wetland



Stream



Proposed Road



Proposed Machine Trail



Reconstruction Road

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Coordinate System: NAD 1983 UTM Zone 9N

N  
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## License of Occupation Site Specific Map

### Legend

- Licence of Occupation Area
- Tantalis Survey Parcel
- BC Hydro Right of Way



Lake/River



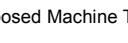
Wetland



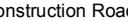
Stream



Proposed Road



Existing Road



Proposed Machine Trail



Distribution Line



Reconstruction Road

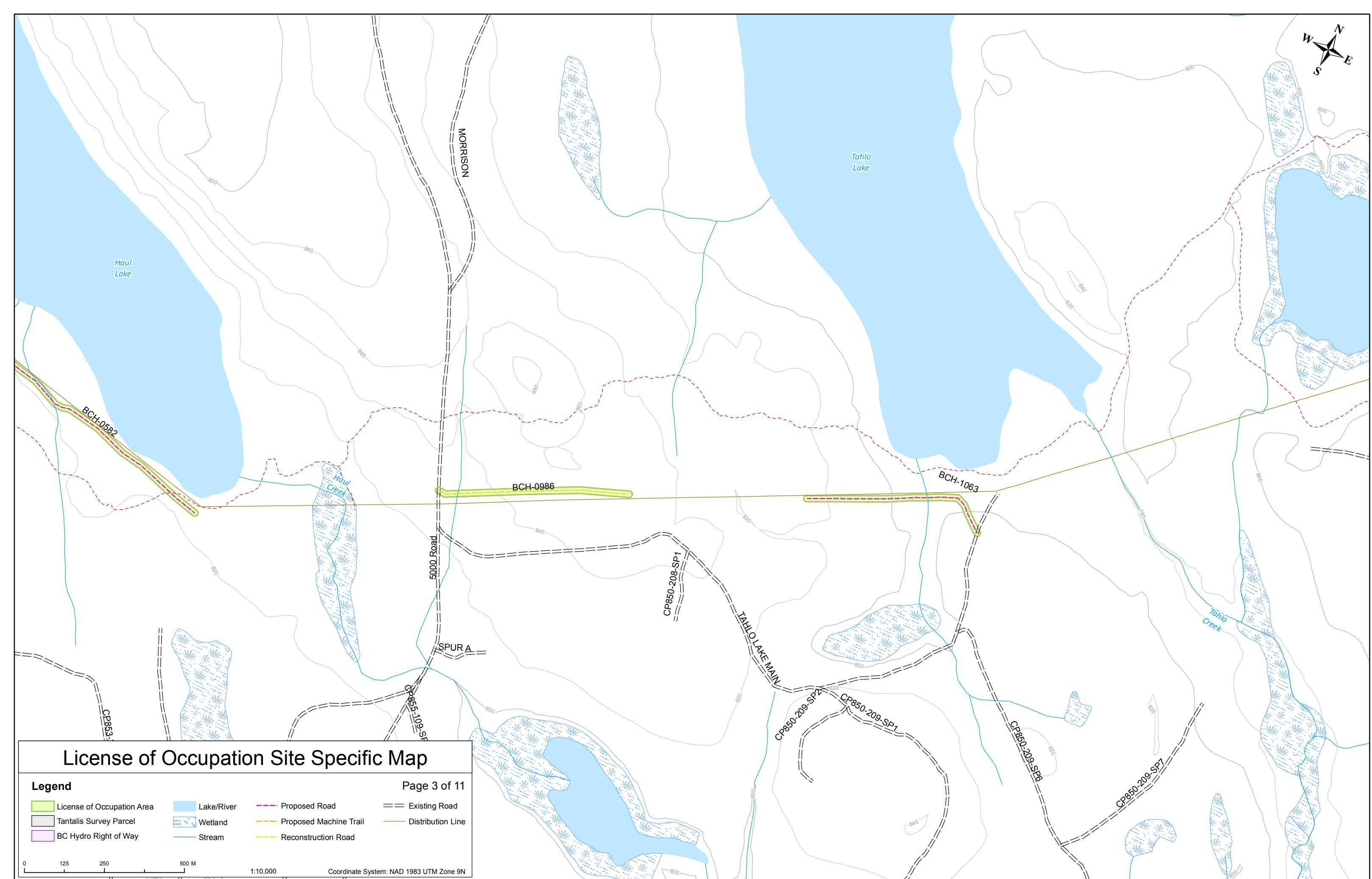
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Coordinate System:

NAD 1983 UTM Zone 9N





## License of Occupation Site Specific Map

### Legend

License of Occupation Area  
Tantalis Survey Parcel  
BC Hydro Right of Way

Lake/River  
Wetland  
Stream

Page 4 of 11

Proposed Road  
Proposed Machine Trail  
Reconstruction Road

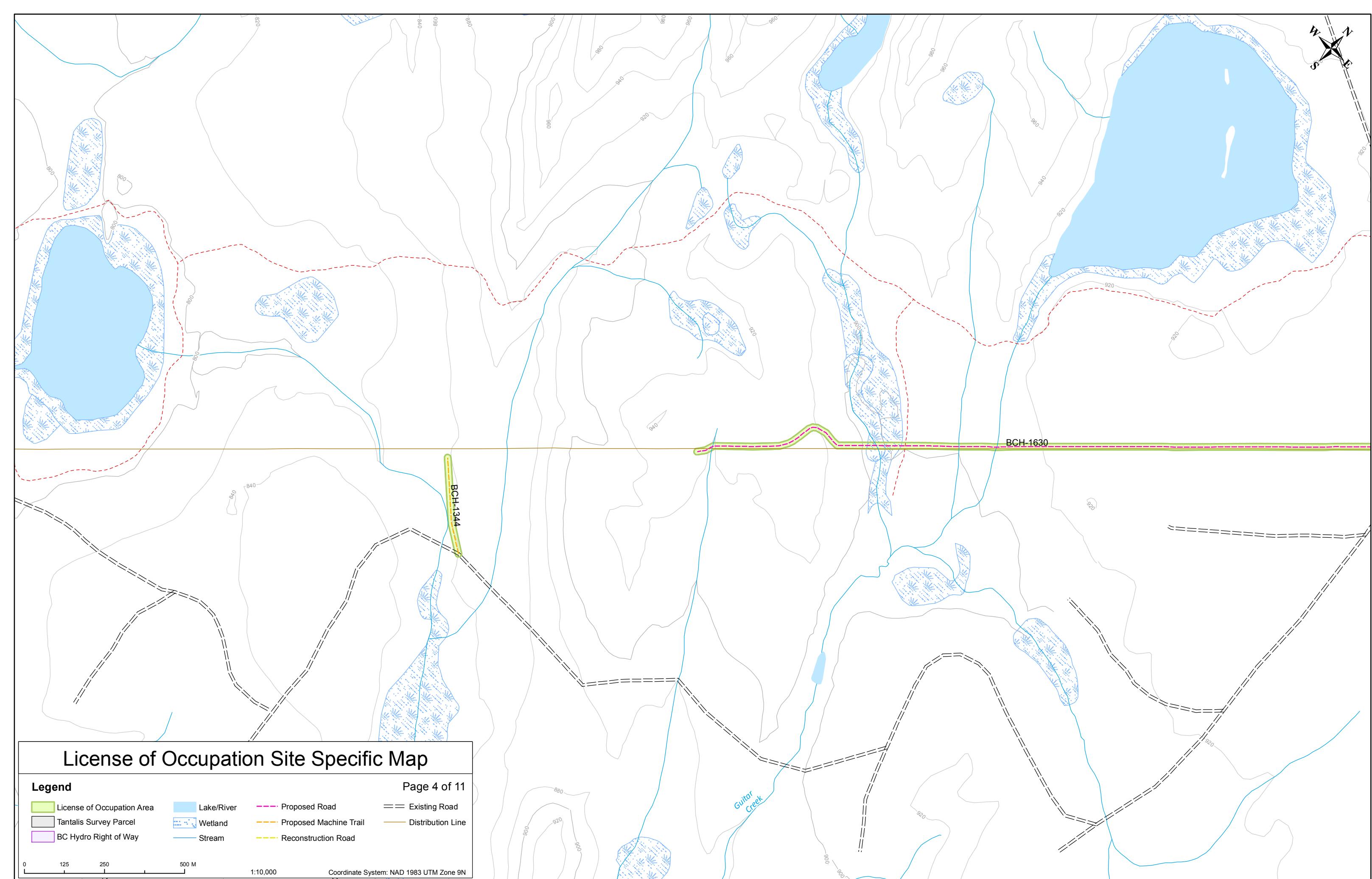
Existing Road

Distribution Line

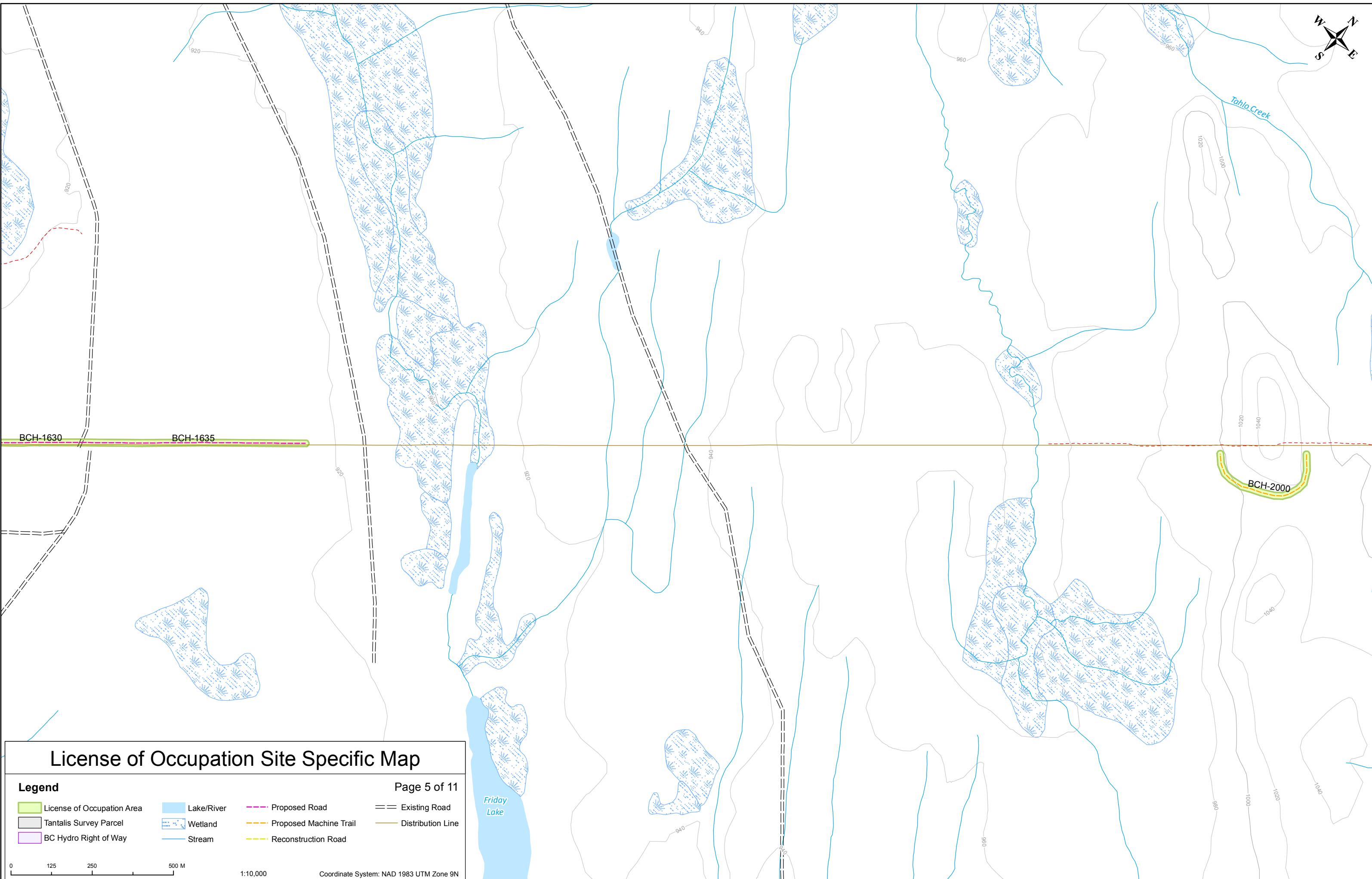
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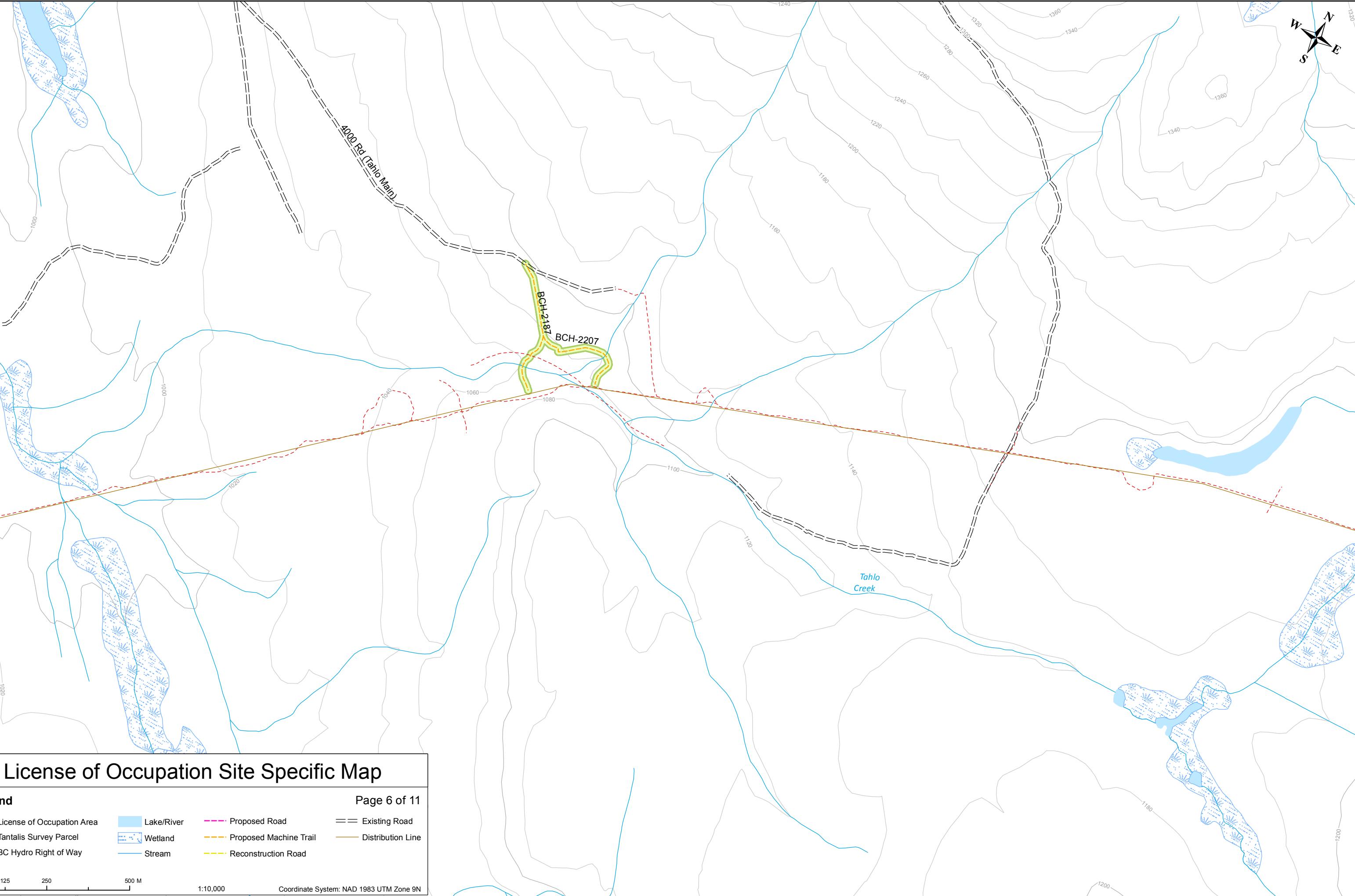
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N  
S  
E  
W





N  
W E  
S

## License of Occupation Site Specific Map

### Legend

- License of Occupation Area
- Tantalis Survey Parcel
- BC Hydro Right of Way

- Lake/River
- Wetland
- Stream

- Proposed Road
- Proposed Machine Trail
- Reconstruction Road

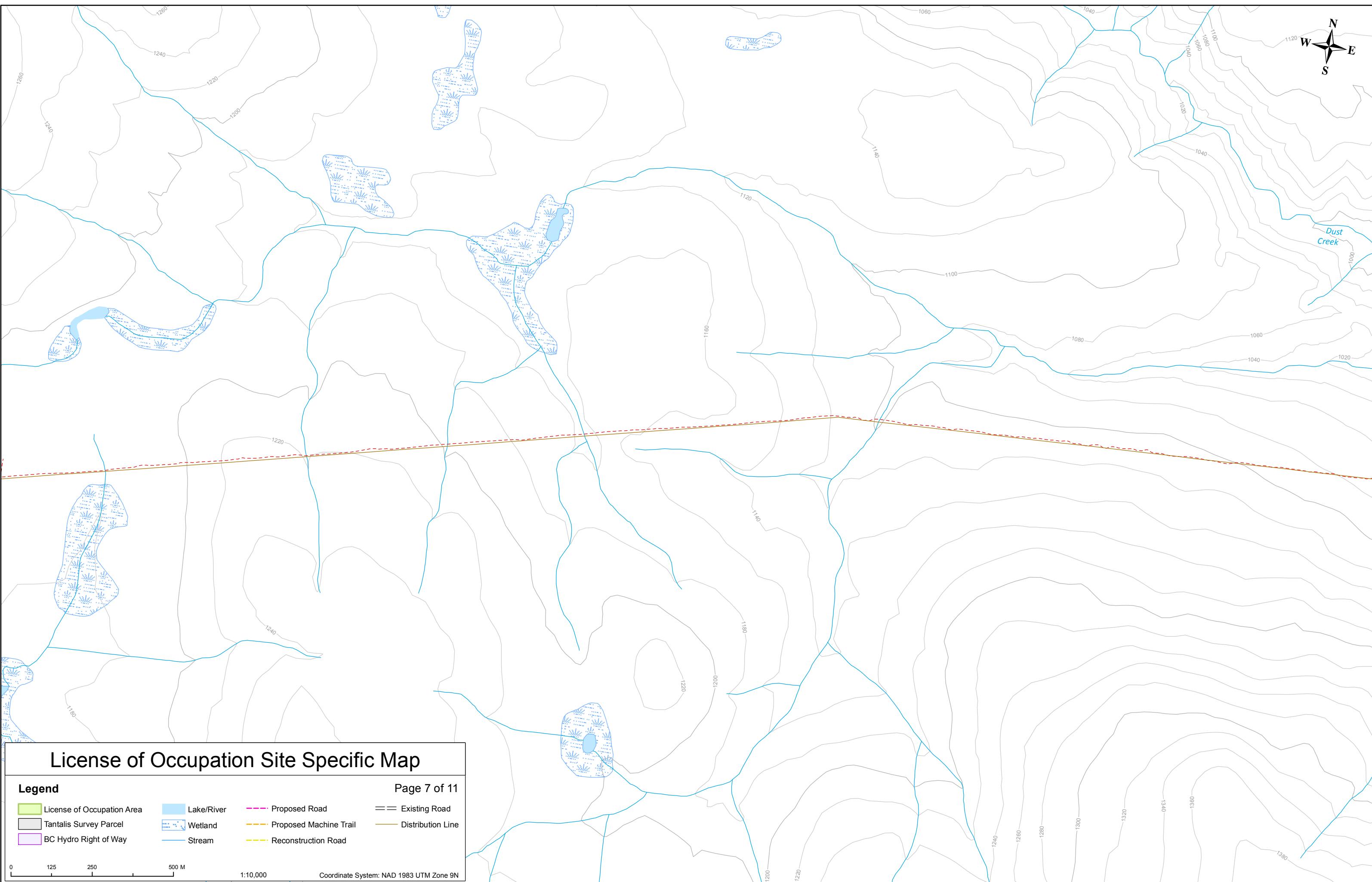
- Existing Road
- Distribution Line

Page 7 of 11

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Coordinate System: NAD 1983 UTM Zone 9N



## License of Occupation Site Specific Map

### Legend

License of Occupation Area

Tantalis Survey Parcel

BC Hydro Right of Way

Lake/River

Wetland

Stream

Proposed Road

Proposed Machine Trail

Reconstruction Road

Page 8 of 11

Coordinate System: NAD 1983 UTM Zone 9N

0 125 250 500 M

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Coordinate System: NAD 1983 UTM Zone 9N

Dust Creek

Beaverdale Creek

N  
S  
E  
W

## License of Occupation Site Specific Map

### Legend

License of Occupation Area

Tantalis Survey Parcel

BC Hydro Right of Way

Lake/River

Wetland

Stream

Proposed Road

Proposed Machine Trail

Reconstruction Road

Page 9 of 11

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Coordinate System: NAD 1983 UTM Zone 9N

BCH-3520

BCH-3470

SAM052.1

SAM069.5

SAM052.8

SAM052.9

SAM052.3

SAM052.2

SAM052.4

SAM052.5

SAM052.6

SAM052.7

SAM052.8

SAM052.9

SAM052.10

LEO SAK FBR (900RD)

SAM069.4

SAM052.11

SAM052.12

SAM052.13

SAM052.14



## License of Occupation Site Specific Map

### Legend

License of Occupation Area  
Tantalis Survey Parcel  
BC Hydro Right of Way

Lake/River  
Wetland  
Stream

Page 10 of 11

Proposed Road  
Proposed Machine Trail  
Reconstruction Road

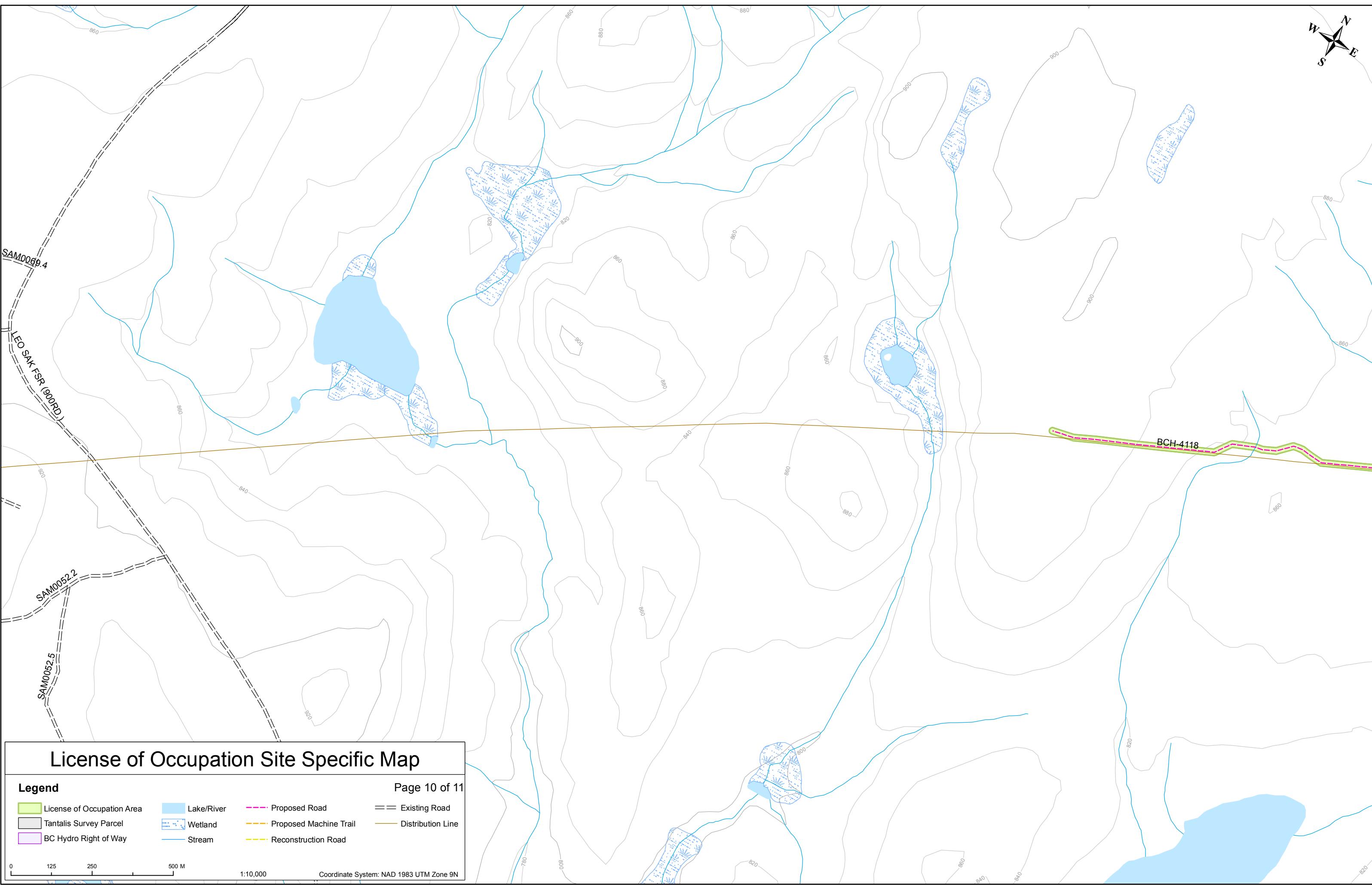
Existing Road

Distribution Line

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Coordinate System: NAD 1983 UTM Zone 9N





Takla  
Lake

DL 4330 IR 8  
NORTH TACLA LAKE  
(WEST LANDING)

## License of Occupation Site Specific Map

### Legend

License of Occupation Area

Tantalis Survey Parcel

BC Hydro Right of Way

Lake/River

Wetland

Stream

Proposed Road

Proposed Machine Trail

Reconstruction Road

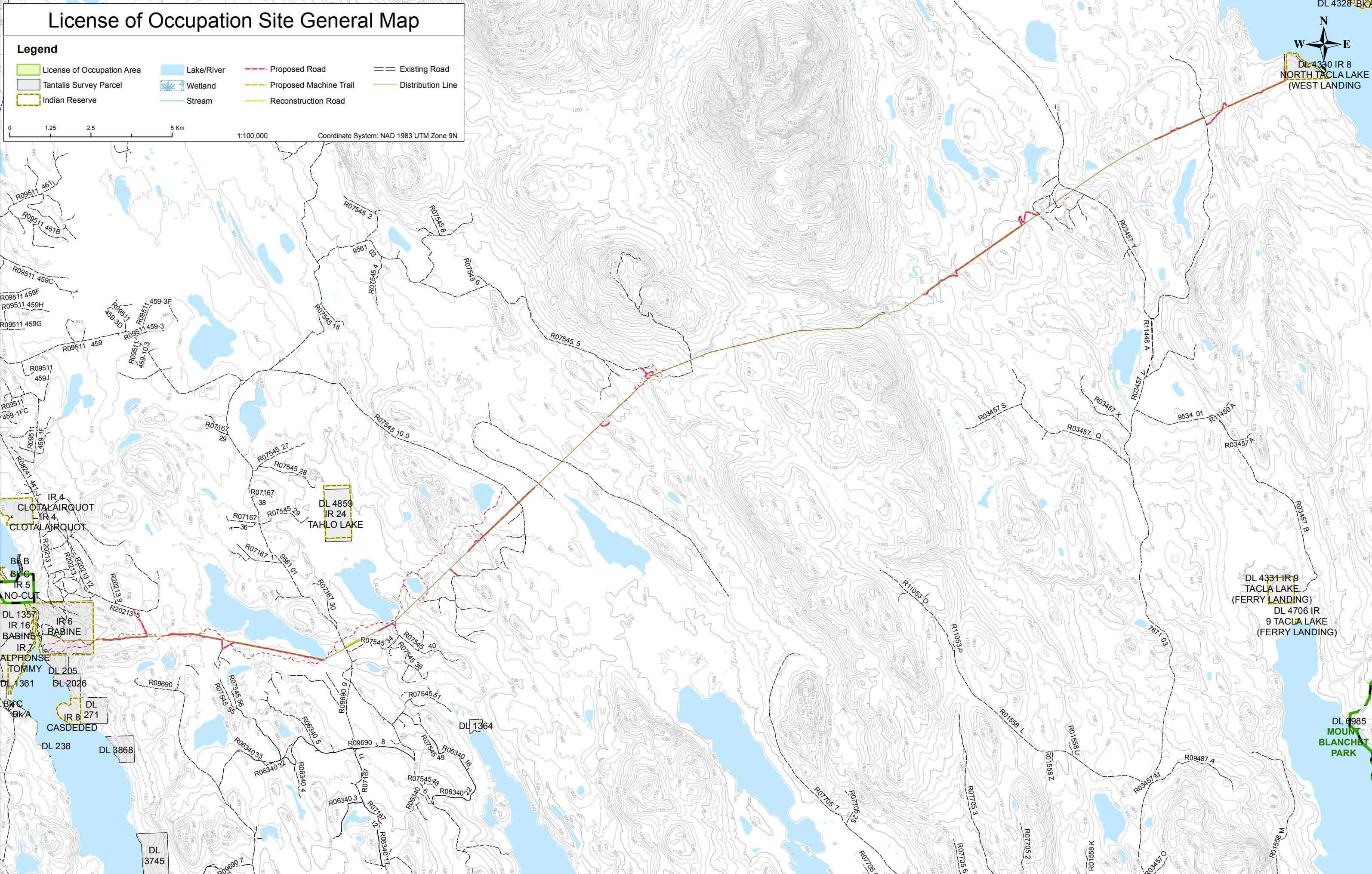
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Coordinate System: NAD 1983 UTM Zone 9N

## License of Occupation Site General Map





B. Correspondence

Appendix B1: Consultation and Engagement Summary

**Consultation and Engagement Summary in Support of a Section 52 Application**

**Prepared for: the Ministry of Forests, Lands, and Natural Resource Operations**

**Prepared by: BC Hydro Aboriginal Relations**

**For the NI-NEW-287 BAB 25F52 -Takla Landing Reliability Upgrade Project**

**1. BC HYDRO'S APPROACH TO CONSULTATION**

BC Hydro undertakes consultation on its projects and supports the consultation conducted by relevant permitting ministries in order to provide potentially impacted First Nations with information about a project and to seek those First Nations' input on the project. The purpose of consultation is to provide First Nations with the opportunity to identify potential adverse impacts of a project on their Aboriginal rights (including title) so that BC Hydro and First Nations can work together to identify measures to avoid, mitigate or otherwise accommodate those impacts. In addition and where appropriate, BC Hydro seeks to identify opportunities and benefits for First Nations related to the project.

This consultation summary is intended to demonstrate that BC Hydro has endeavoured to be proactive, transparent and thorough in our approach to sharing information and responding to questions and concerns from First Nations with respect to NI-NEW-287 BAB 25F52 - Takla Landing Reliability Upgrade Project (Takla Reliability Project or the Project). We engaged in consultation directly at regular intervals with potentially impacted First Nations via e-mail correspondence, telephone calls, and regularly scheduled in-person meetings. BC Hydro intends to continue consulting with First Nations throughout the construction phase of the Takla Reliability Project.

**2. PROJECT BACKGROUND**

The Project is to upgrade reliability at Takla Landing, a community of 250 residents located 195 km northwest from Fort St. James. It is supplied through BC Hydro distribution feeder BAB 25F52, which extends north of the Babine Substation (BAB) for a distance of 116 km where it supplies the Takla Landing community with single-phase power. The line is constructed primarily overhead with approximately 2.7 km of submarine cable crossing Takla Lake.

BC Hydro installed emergency rental generators into the Takla Landing community, on Takla Lake First Nation Indian Reserve (IR) 7 and 7A, in December 2014, in response to numerous outages that month, until a permanent solution to the reliability issues could be put in place. The purpose of the Project is to provide that permanent solution.

The Project will involve widening the existing distribution line corridor/right-of-way (RoW) for approximately 45 km between Fort Babine and Takla Landing (which will require securing appropriate statutory RoWs) to a width where falling trees will not come into contact with the line. The Project will also install a permanent backup diesel generator at Takla Landing by moving the emergency generator to its new location.

Clearing of the RoW is planned to occur over the course of three years:

- Year 1: February 2017;
- Year 2: January-March 2018; and
- Year 3: January-March 2019.

The work to install the permanent diesel generator is scheduled to commence in June 2017. An application to the Crown to purchase property off-reserve has been submitted to the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). Once approvals are received, clearing of some trees surrounding the site can commence.

Construction is scheduled to start in mid-to-late February to early March 2017. The In-Service Date is forecasted to be March 31, 2019.

### **3. SUMMARY OF CONSULTATION TO DATE**

The Project is within the asserted territory as per the BC Provincial Consultative Area Database (CAD) of:

- Carrier Sekani Tribal Council;
- Lake Babine Nation;
- Takla Lake First Nation; and
- Yekooche First Nation.

#### **3.1 Overview of Consultation Activities**

BC Hydro provided Takla Lake First Nation with an overview of the Project in a conference call on June 5, 2015. BC Hydro then notified all First Nations via letter on July 20, 2015. Beginning in May 2016, BC Hydro, Takla Lake First Nation, and Lake Babine Nation met monthly (with the exception of September and December 2016) to discuss the Project, including the environmental and archaeological assessments. BC Hydro has also met separately with Takla Lake First Nation and Lake Babine Nation. Takla Lake First Nation and Lake Babine Nation have not identified any concerns with the Project.

Carrier Sekani Tribal Council and Yekooche First Nation were both engaged again in December, 2015. Neither Nation has identified any concerns with the Project.

On October 7, 2016, BC Hydro was made aware that a family managing a Keyoh (a tract of traditional territory that is historically managed by a family unit) were threatening to blockade the right-of-way if BC Hydro did not agree to meet with them (the family contends that they hold Aboriginal title to the land and should be consulted in lieu of Lake Babine Chief and Council). BC Hydro brought this to the attention of Lake Babine Nation's natural resource contractor, who advised that Lake Babine Nation would contact BC Hydro directly. Lake Babine Nation wrote to BC Hydro on October 11, 2016, affirming that Lake Babine Chief and Council are the Nation's designated representatives with respect to consultation on Lake Babine Nation's Aboriginal rights.

BC Hydro responded via letter to Lake Babine Nation on October 14, 2016, with a copy to Takla Lake First Nation, given that the Keyoh holder family in question are members of Takla Lake First Nation but manage a Keyoh within Lake Babine Nation traditional territory. The letter reiterated that BC Hydro would continue to consult Lake Babine Nation as the recognized rights holders; and advised that if BC Hydro heard anything further from the Keyoh family, BC Hydro will refer them to Lake Babine Nation.

On November 28, 2016, BC Hydro asked Lake Babine Nation and Takla Lake First Nation for an update as to whether they had received further word on whether the Keyoh holder family were contemplating a blockade. Both First Nations said that they did not anticipate a blockade from the family managing the Keyoh. Lake Babine Nation and Takla Lake First Nation are monitoring the situation.

Additional detail about the consultation activities undertaken with each of the First Nations is provided in Section 3.2.

### 3.2 Consultation Summary by Nation

This section provides more detail on the consultation undertaken with each of the First Nations in relation to the Takla Reliability Project, including any specific issues raised and how they have been addressed by BC Hydro.

**Table 3.2-1 Consultation Summary**

<b>First Nation: Carrier Sekani Tribal Council</b>	
<b>Issue Raised</b>	<b>Response/Action</b>
No response provided following the distribution of the Project letter.	BC Hydro followed up several times via e-mail and phone calls asking if Carrier Sekani Tribal Council had specific issues regarding the Project (including offers to meet) on the following dates: September 10, December 16, 2015; January 15, 17, 18, 2016.
No specific issues raised.	On December 16, 2015, BC Hydro spoke with Carrier Sekani Tribal Council's Natural Resource Manager, providing an overview/update on the project and advised that BC Hydro was engaging directly with Lake Babine Nation, Takla Lake First Nation and Yekooche First Nation on the Project. Carrier Sekani Tribal Council indicated that they would advise BC Hydro of their specific issues by January 11, 2016. On January 17, 2016, Carrier Sekani Tribal Council's Natural Resources Manager indicated that they could review the project details that week. No further response from Carrier Sekani Tribal Council was received.

<b>First Nation: Lake Babine Nation</b>	
<b>Issue Raised</b>	<b>Response/Action</b>
No specific issues or concerns were raised with	Lake Babine Nation attend joint meetings with BC

respect to the Project.	Hydro and Takla Lake First Nation to discuss the clearing strategy regarding the project (please see above list of meeting dates).
Interest in contracting opportunities.	A trail clearing contract between BC Hydro and Lake Babine Nation has been signed.
Potential blockade of BC Hydro's right-of-way by Keyoh Holder.	BC Hydro confirmed approach to manage the situation with Lake Babine First Nation and Takla Lake First Nation. Refer to Section 3.1 for more detail.

<b>First Nation: Takla Lake First Nation</b>	
<b>Issue Raised</b>	<b>Response/Action</b>
No specific issues or concerns were raised with respect to the Project.	Takla Lake First Nation attend joint meetings with BC Hydro and Lake Babine Nation to discuss the clearing strategy regarding the project (please see above list of meeting dates).
Interest in contracting opportunities.	BC Hydro and Takla Lake First Nation are in the process of finalizing a general services contract.  A trail clearing contract between BC Hydro and Takla Lake First Nation is currently being negotiated.
Potential blockade of BC Hydro's right-of-way by Keyoh Holder.	BC Hydro confirmed approach to manage the situation with Lake Babine First Nation and Takla Lake First Nation. Refer to Section 3.1 for more detail.

<b>First Nation: Yekooche First Nation</b>	
<b>Issue Raised</b>	<b>Response/Action</b>
<ul style="list-style-type: none"> <li>Distribution of the Project Letter via e-mail on July 20, 2015</li> <li>Follow up emails, phone conversations and voicemails occurred on the following dates: September 10, December 16, 2015, and January 4, 2016.</li> <li>AIA of potential site to install a permanent Diesel Generating Station shared by BC Hydro on</li> </ul>	

<p>January 4, 2016, per Yekooche First Nation's request.</p> <ul style="list-style-type: none"><li>• Distribution of the AIA and EMP for the 10km overlap of the Project Right-of-Way on January 3, 2017</li></ul>	
Issue Raised	Response/Action
No specific issues raised.	A letter from Chief Allan Joseph (Yekooche First Nation) was sent via e-mail to BC Hydro on December 18, 2015, indicating that, although the project had a closer connection to the Takla Lake and Lake Babine Nations, Yekooche would like to be kept informed of any Archaeological Impact Assessments (AIAs) conducted for the project and requested a copy of an AIA conducted in November, 2015. BC Hydro shared a copy of the AIA, conducted in November, 2015, of potential site for the permanent Diesel Generating Station, and committed to continue to provide copies of any AIAs related to the Project.

C. Assessments

Appendix C1: Takla ROW 2016 – AOA – EMP Final

Appendix C2: Babine to Takla – Distribution Line Environmental Services

Appendix C3: 16-0957-035 BC Hydro AIA 10km Babine - Takla Dist Line Dec-21

Appendix C4: AIA Tender

# Takla – Fort Babine Right-of-way Environmental Management Plan

Prepared by:



Mark Pokorski, MSc, RPBio (Ecofor Consulting)

Received by:



Andrew Walter, Senior Environmental Coordinator

**December 16, 2016**  
Revised December 23, 2016

Document ID:	Takla – Fort Babine Right-of-way	Document State:	Final
Document Owner:	Andrew Walter	Version:	1.3
Date on Document:	Dec 23 2016		

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## 1 INTRODUCTION

### 1.1 GENERAL PROJECT BACKGROUND

BC Hydro will be widening the cleared portion of a transmission line right of way (the Project) between Takla Landing, and Fort Babine, BC. The Project is a 10 km section associated with an existing right-of-way (ROW) located approximately 14 km west of Takla Landing and 18 km east of Fort Babine. The majority of the ROW is currently approximately 20 m wide (10 m each side of the transmission line). To reduce the frequency of windthrown trees contacting the transmission line, additional forest along the ROW will be cleared to a width of 60 m (30 m each side of transmission line).

Work is scheduled to commence in February 2017, to take advantage of the snow and frozen ground conditions to facilitate site access, and reduce environmental impacts. Results of the environmental overview findings can be found in Section 4.1.

### 1.2 SCOPE OF WORK

The major components of work will include the following:

1. Clearing of access route to ROW from current forestry road access.
2. Widening of ROW to 30 m each side of transmission line. Snow bridges will be constructed as required for crossing water courses.

### 1.3 PURPOSE OF THE EMP

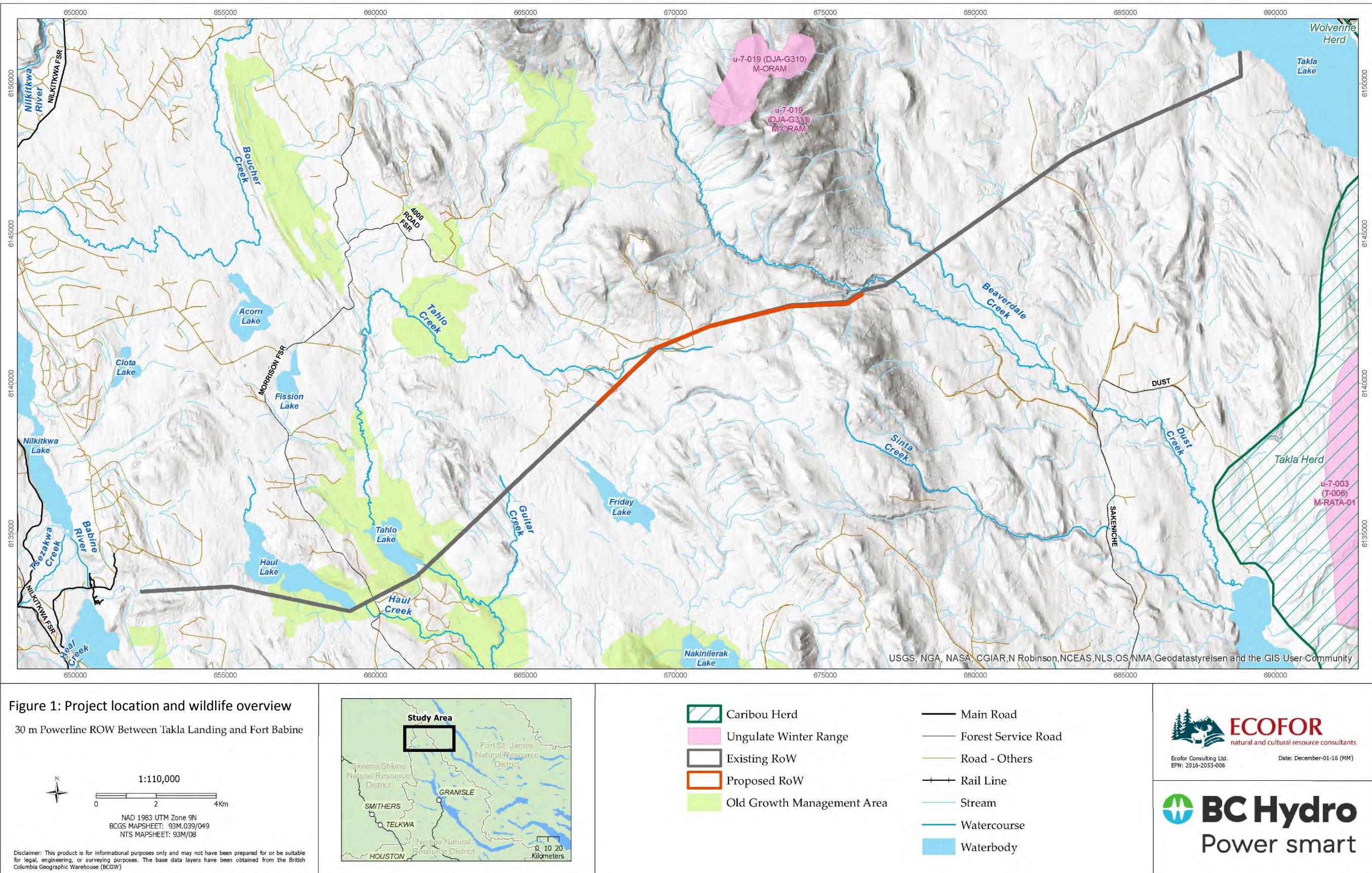
The purpose of this Environmental Management Plan (EMP) is to document the current site conditions and valued ecosystem components (VECs) and to identify elements of the Project that could present a hazard to the environment. The plan describes how these risks will be prevented or mitigated through proper work management and, in the event of an accident, procedures that will contain and limit impacts to the environment. The environmental monitor (EM) for the Project will use this EMP as a guide for evaluating Project impacts and contractor performance. The contractor will use the EMP in identifying his/her required actions and responsibilities to protect the environment during completion of the contract.

Project roles and responsibilities are defined and listed in Table 1 in Section 2.0.

Emergency contact information (for environmental incidents and other emergencies) are listed in Table 2 in Section 3.0.

### 1.4 PERMITS / APPROVALS / NOTIFICATIONS

A Section 52 Forest Act permit is required (Forest District Managers Approval) to remove trees on crown land off of the ROW. This will require submission of this EMP as well as the AIA for review and acceptance. A Forest Act Road Use Permit is required to use the Forest Service Roads for the clearing activity. No other environmental permits, approvals or regulatory notifications are required. If the scope of the project changes and permits are required, BCH will be responsible for permit acquisition. The Contractor shall be responsible for knowledge of and adhering to the conditions of all relevant permits acquired including the maintenance of a copy of all permits at the work site.



## 2 ROLES AND RESPONSIBILITIES

**Table 1. Roles and Responsibilities**

Role	Name	Responsibilities	Confirmation Signature	Date
<b>BC Hydro Project Manager</b>	Shweta Khade	<ul style="list-style-type: none"> <li>• Responsible for overall management, engineering, construction, and environmental performance of the Project</li> <li>• Ensures that EMP is prepared, communicated, accepted and implemented by the Contractor (or delegate this responsibility)</li> <li>• Ensures that the EMP is revised, as necessary (e.g., change in <i>Terms of Reference</i>)</li> <li>• Ensures that environmental incidents are addressed and reported</li> </ul>	_____	
<b>BC Hydro Senior Environmental Task Manager</b>	Andrew Walter	<ul style="list-style-type: none"> <li>• Communicates environmental requirements to the Project Manager, Contractor Site Foreman and Environmental Monitor</li> <li>• Oversees and coordinates the preparation of the EMP</li> <li>• Liaises and provides technical advice to the Project Manager, Site Foreman and Environmental Monitor</li> <li>• Reports to, and advises, BC Hydro's Project Manager on effectiveness of mitigation measures being implemented, difficulties encountered, and how they were managed</li> <li>• Liaises with regulatory agencies as necessary</li> </ul>	_____	
<b>Environmental Monitor</b>	TBD	<ul style="list-style-type: none"> <li>• Monitors and evaluates compliance of work practices, procedures and effectiveness of mitigation measures in this EMP</li> <li>• Confirms EMP requirements to the contractor</li> <li>• Completes and records minutes of the pre-work environmental orientation meeting</li> <li>• Advises on methods to resolve non-conformances</li> <li>• Reports all non-conformances with this EMP to the Ecofor Project Environmental Manager in order for he/she to complete an Environmental Incident Report</li> <li>• Completes summary report at end of Project</li> </ul>	_____	
<b>BC Hydro Construction Officer</b>	Ian Stacey	<ul style="list-style-type: none"> <li>• Provides oversight on day-to-day implementation of EMP requirements</li> <li>• Reports and assists in addressing all non-conformances with EMP</li> </ul>	_____	
<b>Contractor / BCH Crews</b>	TBD	<ul style="list-style-type: none"> <li>• Provides oversight on day-to-day implementation of EMP requirements</li> <li>• Reports and assists in addressing all non-conformances with EMP</li> </ul>	_____	

The Environmental Monitor (EM) and Contractor Site Foreman and BCH Construction Officer will be responsible to ensure that this Environmental Management Plan (EMP) has been reviewed and understood by all personnel involved with the Takla – Fort Babine Right-of-Way (“the Project”). Environmental issues are to be reviewed in a pre-job Environmental Orientation meeting with the EM and contractors to ensure that environmental risks have been identified and adequately addressed. The

contractors will be issued a copy of the EMP, required to read and understand the content, and confirm that they understand their roles and responsibilities in environmental protection to the EM by signing the Environmental Orientation Record (EOR) (Appendix 1). No contractors are permitted to work at the site until the EOR has been reviewed and signed. The crews are also to be familiar with the Oil and Chemical Spill Emergency Plan (Appendix 2). Any changes to the work plan are to be brought to the attention of the EM so that the EMP can be updated as needed. A copy of the EMP will be kept on site at all times in a designated area.

### **3 ENVIRONMENTAL INCIDENTS AND EMERGENCY CONTACTS**

Any environmental incidents, including spills, will be brought to the attention of BC Hydro immediately. The Contractor is responsible to ensure that staff are adequately trained and equipped to deal with potential environmental incidents related to the work. Any concerns with regard to preparedness for environmental incidents should be brought to the attention of the EM prior to starting work.

A list of emergency contacts is provided below. Anyone can and must report an environmental incident to the Environmental Monitor or Construction Officer. However, it should be noted that only BC Hydro staff will initiate subsequent reporting procedures to outside agencies. The Environmental Monitor should be contacted immediately in order to initiate Environmental Incident Report (EIR) reporting and agency notifications.

**Table 2. Project Contacts**

Contact	Name	Office Number	Cell Phone Number
<b>BC Hydro Senior Environmental Task Manager</b>	Andrew Walter	604-528-1770 ext. 71770	604-910-1770
<b>Environmental Monitor</b>	TBD		
<b>BC Hydro Construction Officer</b>	Ian Stacey		250-961-8329
<b>Contractor Site Foreman</b>	TBD		
<b>Emergency Management BC</b>		1-800-663-3456	
<b>DFO Spill Reporting</b>		604-666-3500	
<b>Environment Canada</b>		604-666-6100	

### **4 VALUED ECOSYSTEM COMPONENTS**

Ecofor completed an environmental overview assessment for this project in October 2016. The assessment involved a desktop and field assessment of general environmental risks, potential erosion and sediment control issues, stream identification, and wildlife and vegetation values. A desktop review of the project area focused on data searches of available Provincial Data (e.g. BC Conservation Data Centre, HabitatWizard) to identify Valued Ecosystem Components (VECs) that could potentially be impacted by the Project and the mitigation measures to be applied to each potential impact. These are discussed in the following sections.

#### **4.1 ENVIRONMENTAL OVERVIEW ASSESSMENT**

The site was visited by Ecofor personnel (Mark Pokorski, Ruth Lloyd) with a Babine Lake Nation technician (Ivan West) from October 4<sup>th</sup> to October 8<sup>th</sup>, 2016 to conduct the field portion of the environmental overview. Takla Lake First Nation was contacted to provide a technician for the field crew, however travel arrangements could not be arranged in time for the field work. A walkthrough of the full 10 km of ROW was conducted to document general environmental risks, stream crossings, sediment and erosion control concerns and wildlife features.

Site photos from the visit are provided in Sections 4.1.1, 5.3.1 and Appendix 7.

**Table 3: Potential impacts, mitigation and environmental sensitivity ratings for identified valued ecosystem components (VECs).**

VEC	ESR	Impact Management Strategy
Water Quality	Low	Limit crossings to the extent possible. Maintain 15 m RMZ around streams, and MFZs in riparian wetland areas. Keep clearing debris out of streams. Cross streams using snow bridges to avoid disturbance to stream banks and stream bed (See Section 5.3).
Fish and Fish Habitat	Low	See Water Quality. In addition, maintain as much riparian vegetation as possible to stabilize stream banks, maintain stream temperatures and provide cover to fish (See Section 5.3).
Introduction of invasive species / noxious weeds	Low	Ensure Project vehicles and all machinery is clean when entering site to avoid introduction of noxious weeds (See Section 5.5).
Terrestrial Wildlife – Birds	Low	Complete clearing outside breeding bird season. Minimize removal of shrubs. Presence of crossbills is possible but unlikely; EM will investigate potential sightings (See Section 5.6.1).
Terrestrial Wildlife – Mammals	Low	No specific impact mitigation required due to low probability of impact (See Section 5.6).
Terrestrial Wildlife – Reptiles & amphibians	Low	Complete clearing in winter to avoid impacts to wetlands and other potential breeding habitats (See Section 4.1.4.3).
Species at Risk – Caribou	Nil	No caribou are expected within the Project area (See Section 4.1.4.1).
Species at Risk – Fisher	Low/nil	Potential fisher habitat present in aspen/cottonwood stands in western portion of Project. Low probability of denning trees present in Project area. If fisher sightings occur, cease operations in the area and contact EM. A 100 m buffer is recommended on active fisher den trees (See Section 5.6.3).
Species at Risk – Vegetation	Low	Complete clearing in winter with sufficient snow coverage to avoid ground disturbance and direct impacts to plants. Maintain shrub coverage to minimize indirect impacts to plants (See Section 5.4).

#### 4.1.1 PROJECT LOCATION

The Project follows the existing ROW from UTM coordinate 9.667402.6139323 east to 9.676216.6142981. Access via roads from Fort Babine requires passage through The Acorn access control gate which is locked at certain times of year (key available from Smithers Forestry, Lands, Natural Resource Operations (FLNRO) office).

The Project area that is scheduled for clearing is largely forested; excepting a 600 m stretch which was previously cleared to about 30 m each side of the transmission line, and another 800 section which was cleared to 30 m south of the transmission line (10 m north of transmission line).

#### 4.1.2 VEGETATION

The Project area falls within three biogeoclimatic subzones: Babine Moist Cold Sub-boreal Spruce (SBSmc2), Takla Wet Cool Sub-boreal Spruce (SBSwk3) and Omineca Moist Very Cold Engelmann Spruce-Subalpine Fir (ESSFmv3) (Appendix 6). The biogeoclimatic subzones have different compositions of forest cover, understory, along with different climatic condition and moisture regimes, which influence the plant and animal populations that live there.

##### SBSwk3

There is approximately 1 km of SBSwk3 at the eastern end of the Project. This subzone typically has climax forests of hybrid white spruce and subalpine fir, with lodgepole pine on drier sites (DeLong 2004). During the field visit, this section was found to have forests dominated by hybrid white spruce, with some canopy representation of subalpine fir, lodgepole pine, trembling aspen and black cottonwood. Several steep slopes are present, and dominated by aspen and cottonwood on the western exposures; the eastern exposures are conifer dominated, with abundant moss carpeting. This section of the ROW has extensive areas with high moisture levels. Some of these areas are forested wetlands, while others are moist forest. Riparian wetlands are discussed in greater detail with watercourses in Section 4.1.5.

##### ESSFmv3

The highest-elevation central portion of the Project is comprised of ESSFmv3 (approximately 5 km). Forests throughout this section are dominated by mature hybrid white spruce and subalpine fir. Some areas have dense shrub coverage (white rhododendron, black twinberry), while others have sparse shrub coverage. There are few (almost zero) deciduous trees throughout this zone. Due to the subalpine climate, this area likely receives a lot of snow, influencing which animals can access it throughout the winter.

##### SBSmc2

SBSmc2 makes up the westernmost 3.7 km of the Project. This section appears quite similar to the ESSFmv3 section, being dominated by hybrid white spruce and subalpine fir. There is little to no deciduous tree cover, but there is abundant thick shrub growth (white rhododendron, black twinberry). Many areas have a thick carpet of moss.

##### 4.1.2.1 Wetlands

There are number of wetlands that intersect the Project area. Some of these are riparian wetlands and are described in the watercourse section (4.1.5). The other wetlands, not considered connected to a watercourse, are described below. Impacts are expected to be low to wetlands, provided sufficient snow cover exists to prevent ground disturbance by the equipment used to clear the trees.

There is a forested fen area immediately adjacent PWC15 (Tahlo Creek (west)) at the west end of the project (Figure 2). This area has abundant small pools of standing water, along with sedges, brown mosses and black spruce as the dominant vegetation. This wetland extends 110 m along the ROW and approximately 100 m to the north of the ROW. It does not appear to be connected to Tahlo Creek.



**Figure 2: Forested fen area within Project ROW and to extending north adjacent PWC15 at west edge of Project.**



**Figure 3: Open sedge-dominated fen on southern edge of existing ROW near the midpoint of the Project.**

There is an open sedge-dominated fen present south of the ROW (Figure 3) near the midpoint of the Project, just east of the small lake. PWC08 was mapped at this location, but it was determined to be NCD. The fen extends 600 m to the south where it connects to a stream, but there is no channel within the fen nearby the Project. The area within the ROW adjacent this fen is saturated, but does not have any continuous channelization.

#### 4.1.2.2 Plant Species at Risk

The BC Conservation Data Centre (BC CDC) indicates the potential presence of 19 vascular plant and 6 non-vascular plant (i.e. lichens, mosses, liverworts) species at risk (Table 4) in the general area of the Project (search criteria: Bulkley-Nechako Regional District, ESSF & SBS biogeoclimatic zones). There are no plant species listed under COSEWIC and SARA. There are no known occurrences of rare plant species in the vicinity of the Project.

The site visit was conducted in October, so the presence of rare species could not be assessed. It is expected that direct impacts to any potential rare plant populations will be minimized by conducting the project activities during the winter. Indirect effects (change in microclimatic conditions resulting from removal of tree canopy) may have potential impacts to rare plants populations, but the limited size (60 m wide) of the ROW will minimize these impacts.

**Table 4: List of vascular and non vascular plant species at risk with potential to occur within the project area (Bulkley-Nechako Regional District, ESSF & SBS biogeoclimatic zones) (BC Species and Ecosystem Explorer 2016).**

Scientific Name	English Name	Prov Status	BC List
<b>VASCULAR PLANTS</b>			
<i>Acorus americanus</i>	American sweet-flag	S2	Red
<i>Carex backii</i>	Back's sedge	S2S3	Blue
<i>Carex bicolor</i>	two-coloured sedge	S3	Blue
<i>Delphinium bicolor</i> ssp. <i>bicolor</i>	Montana larkspur	S3	Blue

<i>Draba ruaxes</i>	coast mountain draba	S3	Blue
<i>Glyceria pulchella</i>	slender managrass	S2S3	Blue
<i>Isoetes x truncata</i>	truncated quillwort	S1S2	Red
<i>Lloydia serotina var. flava</i>	alp lily	S3	Blue
<i>Melica bulbosa</i>	oniongrass	S3	Blue
<i>Plagiobothrys cognatus</i>	sleeping popcornflower	S3	Blue
<i>Polemonium boreale</i>	northern Jacob's-ladder	S3	Blue
<i>Polemonium elegans</i>	elegant Jacob's-ladder	S3?	Blue
<i>Polystichum kruckebergii</i>	Kruckeberg's holly fern	S3	Blue
<i>Ranunculus pedatifidus ssp. affinis</i>	birdfoot buttercup	S3	Blue
<i>Silene drummondii var. drummondii</i>	Drummond's campion	S3?	Blue
<i>Sparganium fluctuans</i>	water bur-reed	S2S3	Blue
<i>Stuckenia vaginata</i>	sheathing pondweed	S3	Blue
<i>Torreyochloa pallida</i>	Fernald's false manna	S1	Red
<i>Woodsia alpina</i>	alpine cliff fern	S3	Blue
<b>NON VASCULAR PLANTS</b>			
<i>Andreaea rupestris var. papillosa</i>		S1	Red
<i>Brachythecium holzingeri</i>		S2S3	Blue
<i>Grimmia mollis</i>		S2S3	Blue
<i>Meesia longiseta</i>		S3	Blue
<i>Pohlia crudooides</i>		S2S3	Blue
<i>Sphagnum balticum</i>		S2S3	Blue
<i>Splachnum vasculosum</i>		S2S3	Blue

#### 4.1.3 NOXIOUS WEEDS

Due to the timing of the field visit the presence of noxious weeds in the existing ROW was not assessed. Standard precautions from minimizing the chances of introducing noxious weeds and invasive species are included in Section 5.5.

#### 4.1.4 WILDLIFE

##### 4.1.4.1 Mammals

Ungulates (deer and moose) may browse in shrubby areas of the Project throughout the year. Several deer antler rubs were located in areas with abundant willows, and areas with abundant aspen showed bark stripping done by moose (Appendix 7).

Abundant berry-bearing shrubs were present (oval-leaved blueberry and black huckleberry), providing excellent forage for black and grizzly bears. The limited area of the proposed footprint will result in minimal impacts to wildlife resulting from the Project activities. Most of the berry shrubs will likely be untouched by equipment, since the clearing will be conducted in winter.

Squirrel middens were observed throughout the Project, as would be expected due to the presence of mature cone-bearing trees. In one instance, an ermine was seen emerging from a squirrel midden; an

indication that it had evicted (and/or eaten) the squirrel that had constructed the midden (Appendix 7). The clearing resulting from the Project, may displace small mammals that rely on tree cover. There is abundant habitat of the same type on both sides of the Project. The overall impact of the Project on small mammal populations is expected to be low.

### **Ungulates**

Northern caribou management is the responsibility of the Ministry of Environment (MoE) and the Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO). The BC government, under the Forest Range Protection Act (FRPA), has legally designated Ungulate Winter Ranges (UWR) and Wildlife Habitat Areas (WHAs), each with accompanying General Wildlife Measures (GWMs) for management direction.

- **Ungulate Winter Range** is an area that contains habitat necessary to meet the winter habitat requirements of an ungulate species.
- **Wildlife Habitat Areas** are intended to conserve those habitats considered most limiting on the landscape to a given species.
- **General Wildlife Measures** are management guidelines which are to be implemented within UWRs and WHAs. GWMs can include measures that restrict industrial or work activities, especially for management of wildlife during highly sensitive periods such as late winter, breeding and calving.

The Project does not enter any Wildlife Habitat Management Zones, UWR, or mountain goat areas. The Project area may have ungulates such as moose, deer, and/or elk present however, significant impact to wildlife is not expected as animals tend to move away from work areas. A wildlife overview map can be found in Appendix 6.

The desktop review revealed a known range and UWR (U-7-003 [T-006]) for the Takla Herd of the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus*) approximately 12 km to the east of the Project (COSEWIC 2014). The Northern Mountain Population of Woodland Caribou, specifically the Takla caribou herd, is considered a provincially *Endangered/Special Concern* species (COSEWIC 2014) and are blue-listed in BC. The greatest known threats for these caribou are disturbances related to noise, infrastructure development, habitat alteration, hunting, weather and impacts of climate change, and predation (Environment Canada 2012). Caribou herds primarily use high-elevation habitats such as alpine and sub-alpine mountainous ranges, but the location of the Project, away from the mapped range, means that work associated with this project is not expected to have any impact on caribou populations. Any sightings related to caribou should be reported to BC Hydro.

There is a pair of mountain goat UWRs (U-7-019 [DJA-310] & [DJA-311]) approximately 6 km to the north of the Project, near the summit of Frypan Peak. There is no suitable mountain goat habitat within the Project, and the distance of the Project to the UWRs will prevent any potential impact to mountain goat populations.

### **Fisher**

Fisher is an Identified Wildlife Species blue-listed (at-risk) member of the weasel family with a wide distribution across BC. Their preferred habitat is mature forests; they're not found in young forests, recently burned or logged areas (Eder and Pattie 2001). Within the Project, they are unlikely to inhabit the ESSF area (due to snow levels and lack of aspen/cottonwood trees for denning), but may occur in the SBS zones. Within these zones they utilize large size (>65 cm diameter) cottonwoods as den trees, making use of cavities in the tree. No trees of suitable size were found during the field visit, so the potential impact on fisher population is considered low to nil.

#### 4.1.4.2 Birds

Several species of birds were noted at the site during the site visit (black-capped chickadee, gray jay). None of the species observed are considered at risk. Very few potential nest cavities were noted during the field visit.

Stick nests built by some raptors are protected from disturbance under the BC Wildlife Act even when unoccupied by birds (e.g. bald eagle and osprey nests). No stick nests matching the characteristics for these species (or any other bird species) were found during the field visit.

There is excellent songbird nesting habitat present in the shrubby areas found throughout the Project. However, the current schedule for the Project does not include vegetation clearing during the breeding bird window, so there is not expected to be impacts to nesting birds. One exception to this is the potential presence of white-winged or red crossbills. These two species are known to breed in coniferous forest during the winter months, if sufficient food is available. Since the Project is dominated by coniferous forest, there is potential for this species to be present during clearing operations. However, the probability of nests being located within the area scheduled for clearing is very low, given the large expanse of undisturbed forest surrounding the Project.

Crossbills are small-medium sized birds (slightly larger than half the size of an American robin) that feed primarily on seeds on conifer trees (Figures 4 & 5). Males of both species are reddish in colour with black wings, while females are olive to yellow-green instead of red. White-winged crossbills of both sexes have white wingbars; red crossbills lack wingbars. These birds tend to feed and travel in flocks, often being seen and heard while they travel between conifer treetops as they search for food. Nesting may occur during any month of the year and is dependant on abundant conifer seed crops. Nests are built on a horizontal branch in conifer trees, typically between 2 and 5 meters off the ground (though they have been found from ground level to the tops of trees). The female crossbill builds the nest over several days, constructing an open cup from twigs, weeds, grass, bark, lichens and moss (Audubon Society 2016). Nesting may occurs in loose colonies (multiple nests in the same tree or nearby trees).



**Figure 4: Male white-winged crossbill.** (By John Harrison, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=6037838>)



**Figure 5: Female red crossbill.** (By <http://www.naturepicsonline.com/>, Copyrighted free use, <https://commons.wikimedia.org/w/index.php?curid=969826>)

#### **4.1.4.3 Amphibians & Reptiles**

Western toads (blue-listed in BC) will likely be found within the Project site as adults. There's potential breeding habitat present adjacent the Project at the small lake near the middle of the route.

There is no potential for impacts from the Project to toad or other amphibian breeding habitat since wetlands and the lake will not be impacted, and the clearing work will take place during the winter.

Reptiles (snakes and turtles, will be dormant during the Project-related work. Since they will be hibernating below snow level there will be no impact to these species.

#### **4.1.4.4 Species at Risk**

The BC CDC lists 41 vertebrate and invertebrate animal species at risk that occur in the general region that the Project is found (Table5). There are no recorded observations of any of these species nearby the Project area in the provincial database; though some undoubtedly are present (e.g. grizzly bear, little brown myotis (bat)) at some time during the year.

Some of the invertebrate species, all the fish, and some of the bird species (e.g. gulls, terns) are associated with aquatic environments. These species will be protected by following the mitigation procedures outlined for streams and water quality.

The bird species at risk are all migratory birds, and will have migrated south to their wintering ranges while the work is taking place. Similarly, bats (e.g. little brown myotis) typically migrate south for the winter and will not be present within the project site.

The remaining species will be dormant and below snow level if they are found within the Project area at all. They are unlikely to be adversely impacted due to the very limited disturbance that will result from the Project.

**Table 5: Vertebrate and invertebrate animal species at risk with potential to be found in the general area of the Project (BC Species and Ecosystem Explorer 2016).**

Scientific Name	English Name	Prov Status	BC List	Identified Wildlife	COSEWIC	SARA
<b>VERTEBRATES</b>						
<b>Amphibians</b>						
<i>Anaxyrus boreas</i>	Western Toad	S3S4	Blue		SC (Nov 2012)	1-SC (Jan 2005)
<b>Birds</b>						
<i>Antigone canadensis</i>	Sandhill Crane	S4B	Yellow	Y (Jun 2006)	NAR (May 1979)	
<i>Ardea herodias herodias</i>	Great Blue Heron, herodias subspecies	S3B,S4N	Blue	Y (Jun 2006)		
<i>Asio flammeus</i>	Short-eared Owl	S3B,S2N	Blue	Y (May 2004)	SC (Mar 2008)	1-SC (Jul 2012)
<i>Botaurus lentiginosus</i>	American Bittern	S3B	Blue			
<i>Buteo swainsoni</i>	Swainson's Hawk	S2B	Red			
<i>Chordeiles minor</i>	Common Nighthawk	S4B	Yellow		T (Apr 2007)	1-T (Feb 2010)
<i>Contopus cooperi</i>	Olive-sided Flycatcher	S3S4B	Blue		T (Nov 2007)	1-T (Feb 2010)

<i>Cypseloides niger</i>	Black Swift	S2S3B	Blue		E (May 2015)	
<i>Euphagus carolinus</i>	Rusty Blackbird	S3S4B	Blue		SC (Apr 2006)	1-SC (Mar 2009)
<i>Falco peregrinus anatum</i>	Peregrine Falcon, anatum subspecies	S2?B	Red		SC (Apr 2007)	1-SC (Jun 2012)
<i>Hirundo rustica</i>	Barn Swallow	S3S4B	Blue		T (May 2011)	
<i>Hydroprogne caspia</i>	Caspian Tern	S3B	Blue		NAR (May 1999)	
<i>Larus californicus</i>	California Gull	S2S3B	Blue			
<i>Melanitta perspicillata</i>	Surf Scoter	S3B,S4N	Blue			
<i>Pelecanus erythrorhynchos</i>	American White Pelican	S1B	Red	Y (Jun 2006)	NAR (May 1987)	
<i>Podiceps nigricollis</i>	Eared Grebe	S3B	Blue			
<b>Mammals</b>						
<i>Gulo gulo luscus</i>	Wolverine, luscus subspecies	S3	Blue	Y (May 2004)	SC (May 2014)	
<i>Myotis lucifugus</i>	Little Brown Myotis	S4	Yellow		E (Nov 2013)	1-E (Dec 2014)
<i>Ochotona collaris</i>	Collared Pika	S3S4	Blue		SC (Nov 2011)	
<i>Oreamnos americanus</i>	Mountain Goat	S3	Blue			
<i>Pekania pennanti</i>	Fisher	S3	Blue	Y (Jun 2006)		
<i>Rangifer tarandus pop. 15</i>	Caribou (northern mountain population)	S3	Blue	Y (May 2004)	E/SC (May 2014)	1-T/SC (Jan 2005)
<i>Ursus arctos</i>	Grizzly Bear	S3?	Blue	Y (May 2004)	SC (May 2002)	
<b>Fish</b>						
<i>Acipenser transmontanus pop. 3</i>	White Sturgeon (Nechako River population)	S1	Red		E (Nov 2003)	1-E (Aug 2006)
<i>Oncorhynchus clarkii clarkii</i>	Cutthroat Trout, clarkii subspecies	S3S4	Blue			
<i>Oncorhynchus kisutch</i>	Coho Salmon	S4	Yellow		E (May 2002)	
<i>Salvelinus confluentus</i>	Bull Trout	S3S4	Blue	Y (Jun 2006)	SC (Nov 2012)	
<b>Reptiles</b>						
<i>Chrysemys picta pop. 2</i>	Painted Turtle - Intermountain - Rocky Mountain Population	S2S3	Blue		SC (Apr 2006)	1-SC (Dec 2007)
<b>INVERTEBRATES</b>						
<b>Molluscs</b>						
<i>Sphaerium striatinum</i>	Striated Fingernailclam	S3S4	Blue			
<i>Acroloxus coloradensis</i>	Rocky Mountain Capshell	S3S4	Blue		NAR (Nov 2001)	
<i>Galba obrussa</i>	Golden Fossaria	S2S3	Blue			
<i>Physella propinqua</i>	Rocky Mountain Physa	S3S4	Blue			
<i>Physella virginea</i>	Sunset Physa	S3S5	Blue			
<i>Pristiloma arcticum</i>	Northern Tightcoil	S3S4	Blue			

Insects						
<i>Cicindela hirticollis</i>	Hairy-necked Tiger Beetle	S2S4	Blue			
<i>Erynnis afranius</i>	Afranius Duskywing	S1S3	Red			
<i>Somatochlora brevicincta</i>	Quebec Emerald	S3	Blue			
<i>Somatochlora forcipata</i>	Forcipate Emerald	S3?	Blue			
<i>Somatochlora kennedyi</i>	Kennedy's Emerald	S3S4	Blue			

\* E-Endangered; T-Threatened; SC-Special Concern; NAR – Not at Risk

#### 4.1.5 WATERCOURSES

The Project crosses 17 watercourses that meet the definition of a stream (Table 6), and several riparian wetland areas. Streams in the west half of the Project flow into the Skeena River watershed, while those in the eastern half flow into the Fraser River watershed. Prior to the field assessment, all mapped watercourses were assigned a Potential Watercourse (PWC) identification number. There were 15 watercourses shown on the provincial spatial data. During the field assessment, four of the original 15 PWCs (PWC01, PWC05, PWC06, & PWC08) were determined to be Non-classified drainages (NCD). An additional six watercourses meeting the definition of a stream were located during the field assessment. Additional streams were identified by adding a letter to the PWC identification number (e.g. PWC12a). Some NCDs were identified which have the appearance of streams (see additional details in Table 6) to document why they were not considered streams.

There are two named streams within the Project area, both with the name Tahlo Creek (denoted Tahlo Creek (east) [480-598800-99100-71100] and Tahlo Creek (west) [watershed code: 480-598800-99100] in the Table). Dust Creek (watershed code: 182-819600-63300-42100) is located just to the east of the Project; most streams in the eastern half of the Project are tributaries to Dust Creek. The named streams, along with several other streams have assigned watershed codes in the provincial database (e.g. PWC02, PWC04, PWC08, PWC10, PWC11a, PWC12).

The field assessment did not attempt to determine whether streams were fish bearing. BC Hydro assumes all streams are fish bearing for the purposes of this EMP. Fish presence has been confirmed within several of the streams in the Project area by previous work conducted in the area (Table 6) (Habitat Wizard 2016); tributaries to these streams have the potential provide fish habitat. Tahlo Creek (east) has records for Dolly Varden, rainbow trout and cutthroat trout. Tahlo Creek (west) had records of coho salmon, cutthroat trout, Dolly Varden, longnose dace, longnose sucker, mountain whitefish, northern pikeminnow, peamouth chub, prickly sculpin, rainbow trout, redside shiner, and sockeye salmon, but only rainbow trout and Dolly Varden have records in proximity to the Project. Dust Creek has records for Dolly Varden, kokanee, sockeye salmon and whitefish.

These streams must be protected from the potential entry of sediments or other debris. As the work will take place in winter, it is expected that chances for erosion will be minimal due to thick snow coverage. Specific mitigation measures are discussed in section 5.3.1 of this report. Summaries of each stream are provided below.

#### 4.1.6 STREAM SUMMARIES

Summaries of streams and riparian wetland crossing are provided below, moving from east to west. Streams that are located close together are combined into single sections. Refer to Table 7 for additional details.

##### PWC02 & PWC02A

PWC02 and PWC02A are located about 30 m apart; their RMZs may be best combined to form one larger buffer.



Figure 6: PWC02 on south edge of ROW



Figure 7: PWC02A on southern edge of existing ROW

##### PWC02B

This stream has a steep approach on the west side, some of which is > 60%. The eastern approach is shallower.



Figure 8: PWC02B on south edge of ROW looking south



Figure 9: PWC02B on southern edge of existing ROW looking towards transmission line

**PWC03**

This stream has shallow approaches on both sides and the dominant substrate is cobble.



Figure 10: PWC03 on within ROW looking south



Figure 11: PWC03 in existing ROW looking north

**PWC03A**

PWC03A may be an ephemeral stream, but was flowing at the time of the assessment the channel is dominated by gravel and fine substrates. The approach to this stream is shallow on both sides.



Figure 12: PWC03A within ROW looking north



Figure 13: PWC03A within ROW looking south

**PWC03D & PWC03E**

These two streams are about 40 m apart. Both have shallow approaches, have gravel substrate and are very small streams.



**Figure 14: PWC03D within ROW looking north**



**Figure 15: PWC03E on northern edge of existing ROW**

**PWC04 and PWC04A**

PWC04 is a larger stream (S3) with high quality fish habitat. PWC04A runs approximately parallel to the southern edge of the existing ROW at a steep gradient, then joins PWC04. The RMZ for these streams needs to be combined.

The west approach to PWC04 is step, but less than 60%. The east approach has areas >60%, but there is room for the RMZ at the base of the slope.



**Figure 16: PWC04A on south edge of ROW looking west**



**Figure 17: PWC04 within the existing ROW, looking south (upstream)**

**PWC08A**

The riparian wetland associated with the small lake near the midpoint of the project extends into the existing ROW. This wetland should receive a MFZ ribbon line along the border of the wetland and a RMZ ribbon line 15 m back from the MFZ.



**Figure 18: PWC08A wetland within existing ROW looking west**



**Figure 19: PWC08A wetland within existing ROW looking east**

**PWC08B**

This wetland should receive a MFZ ribbon line along the border of the wetland and a RMZ ribbon line 15 m back from the MFZ.



**Figure 20: PWC08B wetland associated with the small lake. Viewed in north side of proposed ROW.**



**Figure 21: PWC08B wetland associated with the small lake. Shrubby section that extends to existing ROW.**

**PWC09**

This very small stream is in a draw that is almost flat is dominated by fine substrates.



**Figure 22: PWC09 on south edge of ROW looking south**



**Figure 23: PWC09 on southern edge of existing ROW looking towards transmission line**

**PWC10**

Within the southern half of the proposed ROW, the banks are very steep on either side of this stream. The northern side of the ROW has banks that are much shallower.



**Figure 24: PWC10 on south edge of existing ROW looking south**



**Figure 25: PWC10 on south side of proposed ROW**

**PWC11 & PWC11A**

PWC11 (Tahlo Creek (east)) is a sizable creek with excellent quality fish habitat and known fish presence. There is a step bank along the south edge of the ROW and on the northeast side as well. A small stream, PWC11A, joins Tahlo Creek near the north edge of the proposed ROW. The RMZ for these streams will be combined where they overlap.



**Figure 26: PWC11 on south edge of proposed ROW looking southeast**



**Figure 27: PWC11A where it joins PWC11**

**PWC12A, PWC12 & PWC13**

These three streams are located within close proximity, and each have channels that have been altered by beaver activity. No stream channel measurements were recorded for these streams, because they all have multiple channels which form a maze-like pattern through a larger wetland area. It is recommended that this whole area be considered a riparian wetland and buffered as one entity. Yellow MFZ ribbon should be used to delineate the boundary of the wetland on either side, with blue/orange RMZ ribbon 15 m beyond that. The approaches to this area are generally shallow.



**Figure 28: PWC13 near the edge of the existing ROW, showing one of the main channels dammed by beaver activity.**



**Figure 29: PWC12 within the existing ROW, looking north, showing more beaver-dammed area.**

**PWC15**

Tahlo Creek (west) is a slow flowing stream with abundant beaver activity and confirmed fish presence. The approaches are shallow, however there is a riparian wetland on each side of the stream channel which should receive a RMZ 15 m buffer.



**Figure 30: PWC15 within existing ROW looking north**



**Figure 31: PWC15 within existing ROW looking west**

**Table 6: Watercourses documented during Ecofor field visit to the Fort Babine-Takla ROW Project site in October 2016.**

Potential WC#	Zone	UTM Easting	UTM Northing	Stream Name	WSC	Ecofor Class	Avg Channel Width (m)	General water depth (m)	Dominant substrates	Fish species known	Fish comments
<b>PWC01</b>	9U	676023	6142846	N/A		NCD	N/A			N/A	N/A
<b>PWC02</b>	9U	675828	6142716	-	182-819600-63300-42100-5750-0460	S4	1.2	0.15	Fine organics, gravel, moss cobbles	-	tributary of Dust Creek
<b>PWC02A</b>	9U	675797	6142710	-	-	S4	1.0	0.2	Fine organics, some cobble	-	tributary of Dust Creek
<b>PWC02B</b>	9U	675745	6142650	-	-	S4	0.7	0.2	Gravel/cobble	-	tributary of Dust Creek
<b>PWC03</b>	9U	675660	6142652	-	-	S4	0.8	0.15	Gravel/Cobble	-	tributary of Dust Creek
<b>PWC03A</b>	9U	675325	6142643	-	-	S4	0.8	0.2	Gravel/fines	-	tributary of Dust Creek
<b>PWC03B</b>	9U	675233	6142636	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC03C</b>	9U	675174	6142639	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC03D</b>	9U	674962	6142625	-	-	S4	0.9	0.15	Gravel/cobble	-	tributary of Dust Creek
<b>PWC03E</b>	9U	674917	6142627	-	-	S4	1.1	0.2	Gravel	-	tributary of Dust Creek
<b>PWC04</b>	9U	673951	6142576	-	182-819600-63300-42100-5750-2970	S3	2.7	0.4	Cobble/gravel	-	tributary of Dust Creek
<b>PWC04A</b>	9U	673862	6142540	-	-	S4	1.3	0.3	Gravel	-	tributary of Dust Creek
<b>PWC04B</b>	9U	673357	6142426	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC05</b>	9U	673057	6142395	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC06</b>	9U	672688	6142302	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC06A</b>	9U	672506	6142223	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC07</b>	9U	672262	6142207	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC08</b>	9U	671638	6141960	-	480-598800-99100-71100-8850	NCD Wetland	N/A	N/A	N/A	-	tributary of Tahlo Creek, but no connectivity
<b>PWC08A</b>	9U	670981	6141840	-	182-819600-63300-42100-5750	Riparian Wetland	N/A	N/A	fines	-	riparian area to small lake which drains into Dust Creek
<b>PWC08B</b>	9U	670698	6141724	-	182-819600-63300-42100-5750	Riparian Wetland	N/A	N/A	fines	-	riparian area to small lake which drains into Dust Creek
<b>PWC08C</b>	9U	670320	6141543	N/A	N/A	NCD	N/A	N/A	Gravel/cobble	N/A	N/A
<b>PWC08D</b>	9U	670281	6141591	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC09</b>	9U	670138	6141526	-	-	S4 (S6)	0.4	0.15	Fines, organics	-	Tributary to Tahlo Creek
<b>PWC10</b>	9U	669715	6141309	-	480-598800-99100-71100-6280	S3	1.9	0.4	Gravel/cobble	-	Tributary to Tahlo Creek
<b>PWC11</b>	9U	669407	6141178	Tahlo Creek (east)	480-598800-99100-71100	S3	3.1	0.45	Cobble/gravel	Dolly Varden, Rainbow Trout, Cutthroat Trout	Fish presence confirmed
<b>PWC11a</b>	9U	669330	6141206	-	480-598800-99100-71100-6010	S4	0.7		cobble/gravel	-	Tributary to Tahlo Creek
<b>PWC12</b>	9U	668264	6140159	-	480-598800-99100-71100-3570	S4	N/A	-	Fines, organics	-	Tributary to Tahlo Creek
<b>PWC12a</b>	9U	668336	6140222	-	-	S4	N/A	-	Fines, organics	-	Tributary to Tahlo Creek
<b>PWC13</b>	9U	668181	6140116	-	-	S4	N/A	~0.1	Fines, organics	-	Tributary to Tahlo Creek
<b>PWC013A</b>	9U	668087	6139987	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC14</b>	9U	668051	6139951	N/A	N/A	NCD	N/A	N/A	N/A	N/A	N/A
<b>PWC15</b>	9U	667379	6139313	Tahlo Creek (west)	480-598800-99100	S3	2.5	1-2 m	fines	Coho Salmon, Cutthroat Trout, Dolly Varden, Longnose Dace, Longnose Sucker, Mountain Whitefish, Northern Pikeminnow, Peamouth Chub, Prickly Sculpin, Rainbow Trout, Redside Shiner, Sockeye Salmon	Only fish records in proximity to Project are Dolly Varden and Rainbow Trout.

#### 4.2 CULTURAL RESOURCES

Cultural resources are important and protected in British Columbia under the Heritage Conservation Act. An Archaeological Impact Assessment (AIA) will be conducted for the project by Terra Archaeology. Refer to the AIA for additional information and mitigation.

#### 4.3 FOSSILS

Fossil deposits are occasionally found in the Omineca Region. No fossils have been identified at the project area, and due to the lack of excavation occurring during the Project there is a little to no chance of fossil discovery.

### 5 ENVIRONMENTAL PROTECTION AND MITIGATION MEASURES

Appendix 5 contains BC Hydro Environmental Field Construction Guides that include Best Management Practices (BMPs) applicable to this Project. In addition to the field guides, the following sections apply to the project. If there is any question about any of the recommendations, please ask the EM or BC Hydro Environmental Task Manager for clarification.

#### 5.1 VEHICLES AND EQUIPMENT

The implementation of the following measures will ensure that deleterious substances are not transported to and from the Project area:

- Vehicles and machinery will arrive at the project area in clean and washed condition and be maintained such that they are free of fluid leaks. Equipment will be inspected prior to start up and at the beginning of each day.
- Machinery will arrive onsite free of mud, soil, seeds, or plant parts to ensure that invasive plant species are not carried onto the site.
- All construction equipment and machinery used will be clean and free of leaks and or excessive oil and grease. This includes all vehicles brought onsite by the contractor and by any subcontractors or delivery vehicles, etc. The construction contractor is responsible for all vehicles entering the project. If machinery arrives that is leaking or has excessive oil and grease as deemed by the EM, it will not be allowed to enter the work site until the machine is in satisfactory condition.

#### 5.2 OIL AND FUEL HANDLING AND SPILL PREPAREDNESS

Spills and leaks of oils and fuels can adversely affect terrestrial and aquatic environments if not managed properly. In addition to sorbent materials required to cleanup drips, leaks and minor spills, fully stocked spill kit(s) are to be located on site to deal with any emergency spill situations. Spill kits are to be available in all areas where oil filled equipment will be working, and staff and contractors on site are to be trained in the proper use of spill kits. In addition to the stationary spill kits, vehicle spill kits are also required. **The Contractor is responsible to provide, stock and maintain all spill kit provisions required for completion of this project.** A list of BC Hydro Vehicle Spill Kit contents is included in **Appendix 4** as a guide. Due to the risk of spill and fire, fuels and/or other petroleum or combustible products are to be stored on site only in pre-approved areas. Fuel storage is to be kept as small as possible and use of jerry cans or Tidy Tanks mounted in trucks are preferred. To reduce the risk and the impact of spills:

1. Implement the oil spill response plan (**Appendix 2**);

2. Inspect all machinery for leaks or worn hoses, fittings, etc., and make all repairs prior to arriving at the site;
3. Place oil-sorbent sheets and/or containers under vehicles and equipment parked in high risk areas i.e., adjacent to watercourses) for longer than two hours, or immediately under any vehicle or equipment that is leaking;
4. Containment for 110% of the fuel and lubricants for all small machinery (compressors, generators, etc.)
5. Provide adequate containment for fuel and oil products and ensure that all containers are properly labelled according to WHMIS and TDG requirements;
6. Ensure that any employees and/or contractors fuelling equipment understand the environmental risks of the area, are equipped with adequate spill prevention and response measures, have appropriate training, and are following fuelling practices deemed acceptable by BC Hydro;
7. Ensure that all fuel vehicles are parked only in designated areas on site with brakes applied and wheels chocked;
8. All fuel transfers are to be done as far away as practical from drainage and water bodies (use 30 m distance from water as a guideline);
9. Fuel stored on site during construction is to be stored in a location more than 30 m from any waterbody, protected from vandalism, and include secondary containment or double-walled fuel tanks. Proper refueling equipment will be kept on hand (funnels or nozzles for jerry cans and absorbent pads for drips). Small fuel tanks (jerry cans) will be stored within contain capable of containing 110% the volume of the container; and
10. Locate emergency spill response kits in areas where oil-filled equipment will be used and provide additional spill response materials in sufficient quantities on-site to catch drips, minor leaks and spills (suggested suppliers for this type of equipment are found in Appendix 3). The spill response kits are to only be used in the event of a spill incident and not for day-to-day equipment and tool management.

### **5.3 PROTECTION OF WATER QUALITY AND FISH HABITAT**

BC Hydro has identified two types of waterbody for protection during the Project: Streams crossed, and riparian wetlands (connected to streams) crossed by the Project.

#### **5.3.1 FLAGGING**

A flagging crew was contracted to flag 15 m Riparian Management Zone (RMZ) buffers on each side of streams located within the Project, regardless of the stream size or fish-bearing status. Flagging consisted of a combination of orange and blue ribbon. Within the RMZ buffer there is to be no machine entry with tracks, except to pass through the buffer to continue clearing on the other side. Unconnected wetlands, are delineated with yellow MFZ tape to ensure machines do no enter these areas except where necessary to cross the wetland.

#### **5.3.2 WATER CROSSINGS**

All water crossings as identified in Section 5.3.1 will be crossed in the winter months using either Ice Bridge fords or Snow Fills as described in Approved Work Practices for Water Crossing Installation, Maintenance, and Deactivation (AWPWC). The AWPWC represents a component (Appendix B) of the Protocol Agreement for Maintenance Work In and Around Water between BC Hydro, the Province of B.C. and Fisheries and Oceans Canada (2009). Specifically, the crossings will confirm to the following sections and practices below:

### 5.3.2.1 Ice Bridges and Snow Fills

- Crossing design will conform to the criteria in the Forest-Stream Crossing Guidebook (as described below);
- Crossings will be constructed only of clean (ambient) water, ice and snow; materials such as gravel, rock and woody material shall not be used;
- Snow fills will be constructed in such a way that they will not restrict water flow at any time;
- The Work shall not include realigning the watercourse, dredging, placing fill, or grading or excavating the bed or bank of the watercourse;
- The crossing shall not run along the length of a water body.

#### **Ice Bridges**

Ice bridges are effective stream crossing structures for larger northern streams and rivers, where the water depth and streamflow under the ice are sufficient to prevent the structure from coming in contact with the stream bottom (“grounding”), and where spring ice jams are not a concern. Grounding can block streamflow and fish passage and cause scouring of the stream channel.

#### **Design of Ice Bridges**

- Planning considerations in the design of ice bridges include depth of water, minimum winter daily streamflow, substrate, crossing location, maximum load strength, time of use, depth of ice required, approach construction, maintenance and monitoring, and decommissioning.

#### **Installation of Ice Bridges**

The three steps below outline the general installation procedures for ice bridges in fish streams.

1. Thickness – Measure and record ice thickness and stream depth routinely. Evidence of grounding, or an increased risk of the ice base grounding with the streambed, may require that the bridge be temporarily or permanently decommissioned.
2. Approaches – Locate ice bridges where cutting into the streambank can be avoided during construction of the approaches. Remove all debris and dirt and place it at a stable location above the high-water mark of the stream. Take steps to prevent it from eroding.

Construct approaches of clean compacted snow and ice to a thickness that should adequately protect streambanks and riparian vegetation. Construction should begin from the ice surface. Where limited snow is available, locally available gravel from approved pits can be used to build up approaches and should be removed when the ice bridge is removed.

When it is time for deactivation, remove all ice bridge approaches and any imported material (e.g., clean gravel on approaches). Where stream-banks have been inadvertently exposed to mineral soil, re-contour and re-vegetate them using all appropriate measures to stabilize the site and facilitate their return to a vegetated state.

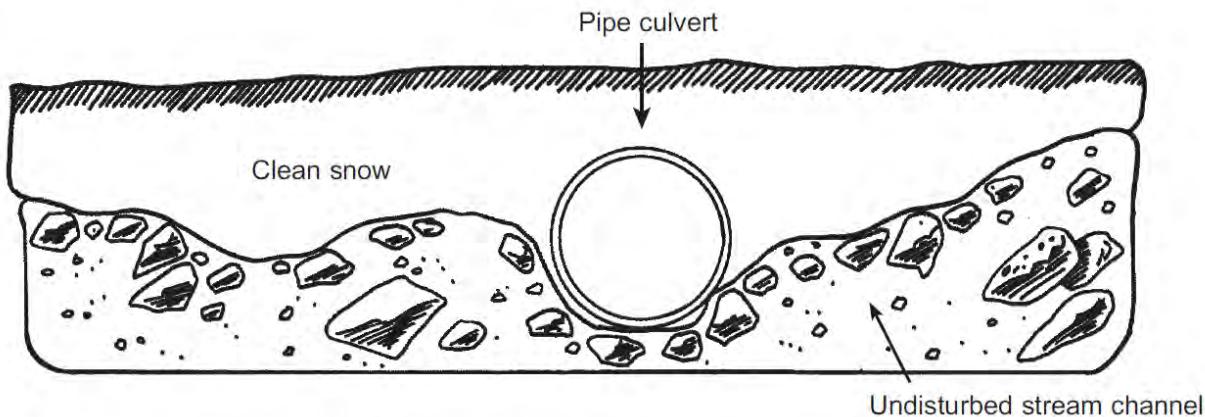
3. Water withdrawal – To maintain existing fish habitat, ensure that the withdrawal of water does not exceed 10% of the instantaneous flow.

#### **Snowfills**

### Design of Snowfills

Snowfills (see Figure 32) are options that may be considered for seasonal use depending on the site, time of year, and other environmental constraints that may apply.

- Snowfills are constructed by filling the channel with compacted clean snow (i.e., free of dirt and debris). Their use should be considered if the stream is dry or the water is frozen to the stream bottom. Culverts can accommodate unanticipated streamflow due to unseasonal thaws. To avoid adverse impact on the stream, remove culverts and snow before spring thaw.
- Snowfills should not be constructed and deactivated in a manner that adversely affects fish or fish habitat at breakup.
- Snowfills should not realign, dredge, or infill the watercourse (with material other than clean snow), or result in grading or excavating the bed or bank of the watercourse.



**Figure 32: Temporary winter stream crossings using compacted snowfills. Culverts or heavy steel pipe allow meltwater to pass during warm weather trends. (BC Ministry of Forests, Lands and Natural Resource Operations, BC Ministry of Environment, and Fisheries and Oceans Canada. 2012)**

### Installation of Snowfills

The five steps below outline the general installation procedures for snowfills in fish streams.

1. Construction period – Construct snowfill of dirt-free snow only when sufficient quantities are available for construction. Construction should begin after the stream has frozen solidly to the bottom or the stream has ceased to flow, or when sufficient ice occurs over the stream to prevent snow loading from damming any free water beneath the ice. Where possible, place snow into the stream channel with an excavator. Crawler tractors may be used to push snow into the stream channel, but only if they can push snow unaccompanied by dirt and debris.
2. Streamflow – Where streamflow is anticipated during periodic winter thaws, place a pipe culvert, or heavy steel pipe within the stream channel to allow for water movement beneath. Heavy steel pipe is easier to salvage and has less chance of crushing under load and during removal. The use of log bundles in snowfills and ice bridges is no longer recommended in

accordance with Fisheries and Oceans Canada Operational Statement <http://www.pac.dfo-mpo.gc.ca/habitat/os-eo/icebridge-pontsduglace-eng.htm>.

3. Soil – Do not cap snowfill with soil. Soil placed within the stream channels could make its way into the stream during winter thaws.
4. Temporary removal – Remove any snowfill that may cause damage to the stream because of warmer weather, and reconstruct a new snowfill when colder weather returns.
5. Removal – Remove all snowfills and materials before the spring melt and place materials above the normal high-water mark of the stream to prevent them from causing sediment and erosion. Deactivation should include the use of all appropriate measures to stabilize the site and facilitate its return to a vegetated state.

Machine crossings should be done within the existing cleared area of the ROW, unless otherwise flagged. Clearing within the RMZ is to be done by hand only; care should be taken to avoid falling trees into stream channels to avoid buildup of excessive debris in streams (depositing debris within streams is a violation of the *Water Act*). Vegetation clearing should be kept to a minimum immediately adjacent to streams to reduce the chances of bank erosion and retain the ecological benefits provided by riparian vegetation (e.g. maintaining cool water temperatures for sensitive fish species, providing protective cover to fish, etc).

These addition measures should be observed:

- Minimize removal of vegetation, and avoid ground disturbance to minimize erosion potential.
- No re-fuelling or servicing of any vehicle is to take place within 30 m of any ditch or watercourse.
- BC Hydro Erosion and Sediment Control Techniques can be found in Appendix 5.2

### **5.3.3 RIPARIAN VEGETATION MANAGEMENT.**

A 15 m top of bank Riparian Management Zone (RMZ) will be flagged for all waterbodies as described in Section 5.3.1 and in accordance with BC Hydro's Approved Work Practices of Managing Riparian Vegetation. The AWPRV also represents a component of the Protocol Agreement for Maintenance Work In and Around Water between BCH, the Ministry of Environment (MOE) and Fisheries and Oceans Canada (DFO) (2009). Site Specific Riparian Prescriptions for each creek have been developed (Appendix 8; Table 7) in order to protect the integrity of the waterbodies.

A few of the basic BMP's within the AWPRV include:

- 15 m top of bank riparian zone
- Only remove to stump height up to 30% of woody cover
- Additional techniques such as pruning or topping trees in order to provide cover while ensuring vegetation does not grow into lines is allowed
- All vegetation that is not expected to grow into the line (e.g. shrubs, small trees) shall not be disturbed
- All work shall be done by hand, with the exception of selective removal of trees at top of bank by machinery as long as the tracks of the machinery are behind the flagged RMZ.

**Table 7: Stream crossing locations and descriptions based on Ecofor field visit to the Fort Babine - Takla ROW Project site in October 2016.**

Potential WC#	Zone	UTM Easting	UTM Northing	Ecofor Class	Avg Channel Width (m)	General water depth (m)	Dominant substrates	Approach description	Other Comments
PWC02	9U	675828	6142716	S4	1.2	0.15	Fine organics, gravel, instream moss, and cobbles	20-40% slope but only 2-4 m deep	
PWC02A	9U	675797	6142710	S4	1.0	0.2	Fine organics, some cobble, turns to gravel/cobble towards centre of ROW	15-20% slopes	about 30 m from PWC02
PWC02B	9U	675745	6142650	S4	0.7	0.2	Gravel/cobble	part of west approach >60%,	about 60 m from PWC02a
PWC03	9U	675660	6142652	S4	0.8	0.15	Gravel/Cobble	shallow approaches	Possibly ephemeral, some sections subsurface
PWC03A	9U	675325	6142643	S4	0.8	0.2	Gravel/fines	shallow approaches	Possibly ephemeral
PWC03D	9U	674962	6142625	S4	0.9	0.15	Gravel/cobble	shallow approaches (1.5 m deep, 10-20%)	possibly ephemeral; but flowing at assessment.
PWC03E	9U	674917	6142627	S4	1.1	0.2	Gravel	approaches about 2 m deep, 25% slope	Appears to flow throughout year.
PWC04	9U	673951	6142576	S3	2.7	0.4	Cobble/gravel	East approach steep on South side of ROW and PROW--but room for RMZ at base of slope. West approach steep but less than 60%.	High rate of flow, high-quality habitat. PWC04a tributary joins on S edge of existing ROW.
PWC04A	9U	673862	6142540	S4	1.3	0.3	Gravel	Runs parallel ROW, steep slope on south side	High rate of flow, tributary of PWC04. Flows parallel to ROW from west for 85 m, joins PWC04 within ROW.
PWC08A	9U	670981	6141840	Riparian Wetland	N/A	N/A	fines	steep slope on east approach, less steep on west side. Wetland area in ROW, north PROW and part of south PROW.	Riparian wetland with connection to nearby lake.
PWC08B	9U	670698	6141724	Riparian Wetland	N/A	N/A	fines	shallow slopes	Riparian wetland with connection to nearby lake.
PWC09	9U	670138	6141526	S4 (S6)	0.4	0.15	Fines, organics	shallow (almost flat)	Some subsurface flow, high rate of flow, small scoured channel. Just south of existing ROW, the channel is poorly defined due to a relatively recent channel redirection, but it rejoins channel just outside of south PROW.
PWC10	9U	669715	6141309	S3	1.9	0.4	Gravel/cobble	steep for most (>40%). Less steep in existing ROW and in northern half of east bank. >60% towards south end of PROW	
PWC11	9U	669407	6141178	S3	3.1	0.45	Cobble/gravel	Steep along southern half of PROW (>60%), better approach within existing ROW.	Stream within deep draw. Small tributary (PWC11a) joins stream in North PROW. Current flagging correctly follows stream.
PWC11a	9U	669330	6141206	S4	0.7		cobble/gravel	In steep draw (>30%)	This stream joins PWC11 near northern PROW boundary. Steep gradient stream with many small falls
PWC12	9U	668264	6140159	S4	N/A	-	Fines, organics	shallow draw (<15%)	Multiple channels spread across 30 m due to beaver activity (no channel measurements).
PWC12a	9U	668336	6140222	S4	N/A	-	Fines, organics	shallow draw (<15%)	Multiple channels spread across 30 m due to beaver activity (no channel measurements).
PWC13	9U	668181	6140116	S4	N/A	~0.1	Fines, organics	near flat	Shallow stream, marginal stream but connected to fish-bearing creek. Spreads into various channels as it crosses cleared ROW, so no channel measurements possible.
PWC15	9U	667379	6139313	S3	2.5	1-2 m	fines	shallow draw (<10%)	flags were rehung higher, and 15 m from riparian wetland

## 5.4 VEGETATION CLEARING OUTSIDE OF RMZ

The main objective of the Project is to clear the forest 30 m from each side of the transmission line. The work will be completed during the winter, which will minimize ground disturbance. Work will be primarily removal and chipping of vegetation on site using a roly chipper machine. The following mitigation measures should be followed during clearing operations to avoid unnecessary disturbance.

- Clearing boundaries (ROW edges, RMZ and MFZ) will be clearly marked;
- Vegetation outside the work area will not be disturbed, with the possible exception of danger tree removal in accordance with Worksafe BC regulations;
- Retain understory shrubs where possible to minimize disturbance to ground layer vegetation and maintain ungulate browsing habitat. This mitigation will mainly be accomplished by conducting the work in the winter under a snowpack

### 5.4.1 BREEDING BIRD TIMING WINDOWS FOR VEGETATION CLEARING

Destruction or disturbance of birds, active bird nests and bird eggs is illegal under the BC Wildlife Act, and the federal Migratory Bird Convention Act. The Ministry of Environment Omineca Region has outlined a specific time period when sensitive stages of birds and other wildlife are most likely to be present (Table 8). Project activity scheduling to avoid the timing periods is ideal and ensures protection of birds and wildlife.

**Table 8. Critical Timing Windows for Song Birds and Raptors.**

Species	Least Risk Period	Significance
Songbirds	May 1 – July 31	Critical window
Raptors	March 1 – July 31	Critical window
Raptors	August 1 – Sept 30	Cautionary window

Vegetation clearing for the Project is scheduled to take place outside the critical timing windows for breeding birds. If work cannot be completed outside of the sensitive timing windows, a qualified Biologist must first conduct a survey for nesting birds to determine if any nesting birds are present within or immediately adjacent to the areas being proposed to be disturbed.

## 5.5 NOXIOUS WEEDS

Surveys for noxious weeds were not conducted during the field visit. Because the work will be completed in winter, it is expected that the risk of introduction of noxious weeds is very small. The following mitigations will be observed to ensure this.

- Contractor will ensure that before mobilizing to the site, all equipment is pressure washed or steam cleaned to remove all plant remnants.
- All equipment that arrives on site should be checked and certified free of soil and vegetation by the Contractor. **If vehicles do not arrive satisfactorily clean they will be sent to the nearest commercial car wash for cleaning (Smithers).**
- No erosion control materials are expected to be required on site; if it is needed, avoid using straw or hay on site as erosion protection; if it must be used, use only straw that is certified weed free.
- Do not import fill from sites outside the Project area, unless approved by the EM or BCH Environmental Representative.
- Any disturbed ground should be revegetated as soon as possible following the completion of works on that part of the site. A native seed mixture should be used in this area.

- Prior to leaving the site, all equipment should be cleaned and inspected to ensure all plant debris and soil has been removed.

## 5.6 WILDLIFE

Few, if any, wildlife sightings are expected during the time period for which the work is scheduled. If wildlife sightings occur, they will be reported to the environmental monitor who will use the information to adapt the work activities as appropriate to minimize potential disturbance to wildlife. The environmental monitor will monitor wildlife activity near work areas.

### 5.6.1 BIRDS

Migratory birds will not be present during the Project-related work, so no mitigation measures are generally required. There is a small chance of active crossbill species nests in the area to be cleared. If these birds are sighted, the EM should be contacted to verify identification and determine whether a nest is present. If confirmed, the nest should be provided with a 30 m buffer until the nest is no longer active.

### 5.6.2 BEARS

Black bears and grizzly bears are unlikely to be encountered at the Project site during the winter months for which the work is scheduled. Bears occasionally awake from their winter dormancy and may emerge from their dens during the winter months and could be attracted by unsecured food on the Project site. To minimize the potential for human bear-conflict should this situation arise:

- Ensure workers are aware of the potential for bear encounters at the site, and that they have bear awareness training.
- Ensure the Project site is kept clean, with all food and food waste stored in secured vehicles or animal proof dumpsters.
- If a bear is seen on site, workers should retreat to safe locations (e.g. vehicles) until the bear is gone.
- Bear sightings should be reported to the on-site supervisor and any sightings should be discussed at morning tailgate meetings to ensure all workers are kept aware of the current bear situation.
- Bears will not be approached or fed.

In the unlikely situation that bears are seen on the site on a regular basis (i.e. problem bears), an armed bear monitor is recommended to ensure worker safety. Local Conservation Officers should be contacted to report the situation.

### 5.6.3 FISHERS

If a fisher is sighted within the Project, it will be reported to the EM or BC Hydro Representative for follow-up investigation. If a fisher den tree is confirmed on site, a 100 m no disturbance buffer (Larry Davis, personal communication) will be provided to protect the den tree.

## 5.7 WASTE MANAGEMENT

Production of waste is expected to be minimal for this project. All waste materials are to be removed and disposed of in accordance with the BC Hydro Waste Management Standards, *BC Environmental Management Act*, *BC Hazardous Waste Regulations* and *Transportation of Dangerous Goods Act and Regulations*. Activities will be conducted in an environmentally responsible manner.

The following steps are recommended for waste management:

1. Minimize waste production.
2. Ensure that an adequate number of appropriate waste containers are provided.
3. Designate a safe area for temporary waste storage with adequate containment, secure and protected from weather and wildlife until removal and disposal can be arranged.
4. Categorize and label all waste materials appropriately. Sampling and analysis of waste materials may be required to determine the appropriate disposal option.
5. Check to ensure that Hazardous Waste registration, storage, permit and transportation requirements are met, if applicable.
6. Remove all waste materials from the site as soon as possible in accordance with all applicable standards and regulations.

#### **5.7.1      NON-HAZARDOUS WASTE**

Non-hazardous waste will be disposed of at authorized landfills. Landfills may be operated by municipalities, regional districts, or private operators. Landfills typically have acceptance criteria defining which types of waste they can accept. For example, some municipal landfills will not accept metals, appliances, tires, or demolition waste such as drywall or woodwaste. To encourage recycling, some jurisdictions may impose bans on materials such as cardboard or pallets. For non-routine solid waste disposal, contact the landfill operator to find out if the waste can be accepted.

Disposal without authorization of wastes is prohibited on lands under provincial jurisdiction. This includes inert demolition wastes such as concrete, wood waste, asphalt, equipment, and vehicle parts. No on-site burial of waste will be permitted.

#### **5.7.2      HAZARDOUS WASTE**

The project could involve the disposal of hazardous waste (most likely in the event of a spill). Sorbent materials or soils saturated with more than 3% oil or gasoline are also classified as hazardous wastes. Soils and/or other materials contaminated by petroleum products or other undesirable materials will be cleaned up according to the manufacturer's instructions and to regulatory standards. Contaminated soils will be excavated, treated on-site, or hauled off-site to an accepted treatment and/or disposal area. Provincial special waste regulations, with respect to storage, land fill, and disposal of materials must be adhered to.

#### **5.7.3      SEWAGE DISPOSAL**

If necessary, the contractor and/or BCH crews will provide portable sanitary facilities throughout the duration of the construction period. The facilities will be located well away from any surface drainage or water bodies and securely fastened to the ground. The facilities will be removed from the site upon completion of the project.

### **5.8    HERITAGE OR ARCHAEOLOGICAL SITES**

An AIA has been completed for this project and all recommendations within the AIA must be followed. In general, given the importance and protection required for archaeological sites, this section is provided to outline the general approach and procedure to manage chance Heritage or archaeological finds.

In the event that project works uncover heritage or archaeological resources such as human bones, stone tools, shell deposit (middens), pithouses, rock paintings, or culturally modified trees, the following procedures are to be followed:

- Stop working immediately.
- Notify your supervisor and the EM or Construction Officer as soon as possible.
- Avoid disturbing the site.

You may have discovered unrecorded archaeological resources, which are protected under the *Heritage Conservation Act*. Under this Act, all contractors are responsible for protecting archaeological resources uncovered during the course of work.

## 5.9 FOSSIL DEPOSITS

No excavation will be conducted as part of the project, so the discovery of fossils will not occur.

## 6 ENVIRONMENTAL MONITORING AND INCIDENT REPORTING

It is the responsibility of the contractor to ensure that the requirements of the EMP are met. The EM will only visit the site as required, to monitor and observe the environmentally sensitive aspects of the project at BC Hydro's discretion. The EM will conduct a site visit prior to the commencement of the Project, during the shut-down stages of the Project, and as required during any of the key stages of the Project. It is the responsibility of the contractor to notify the BC Hydro Construction Officer of these key events (see Table 2 for contact list). It is the responsibility of the BC Hydro Construction Officer to notify the EM. **The Environmental Monitor has the authority to order the shutdown of the Project if environmental protection is compromised.**

It is the responsibility of the Contractor to report all observed environmental incidents to the BC Hydro Construction Officer and the EM as soon as possible so that they can proceed with the appropriate notifications of BC Hydro personal and, if necessary, external agencies. Prompt reporting will be made so that site management can ensure that incidents are handled appropriately. For response to oil and chemical emergencies, refer to **Appendix 2**, the Oil and Chemical Emergency Response Plan and follow the six steps of spill response.

An EM will be independently contracted by BC Hydro to ensure that the requirements of the EMP are adhered to. The EM will submit written inspection reports from every site visit. The daily inspection will be documented and discussed with the Construction Officer before the monitor leaves the site and electronic copies of the report will be forwarded to the Environmental Task Manager, and the Construction Officer. The daily inspection report will clearly state any items requiring attention (subsequent reports will identify if the items were dealt with) and to whom directions were communicated to at the site.

The monitor will complete a written report within 10 working days of the completion of the majority of the works that includes the following:

- Detailed accounts of the completion of works with milestone events.
- Confirmation of the use of standards and recommended best practices, or supported alternatives through an appropriate professional's signed, and sealed technical rationale.
- Confirmation of the consistency of the completed works with the notification submitted.
- Fish and wildlife protection mitigation difficulties encountered, and how those difficulties were managed.
- Outstanding issues and how and when they will be reported.

Copies of this report will be provided to BC Hydro and a copy retained by the EM.

## 7 REFERENCES

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**APPENDIX 1 ENVIRONMENTAL ORIENTATION RECORD**

The Environmental Orientation Record (EOR) is to be completed for all work (BCH and contractor) involving an environmental component. The BC Hydro work coordinator (e.g., Project Manager, Designer, Planner, etc.), is responsible for ensuring that the environmental requirements of the work are reviewed with the workers before work is started, and that a record of the discussion is documented on the EOR. For work undertaken by BC Hydro employees, this form is to be signed by the BCH work coordinator and the BC Hydro crew leader. For work undertaken by contractors, this form is to be signed by the BCH work coordinator and the contractor. By signing the EOR, the BCH crew supervisor or the contractor indicate they have been advised of and understand the environmental requirements of the contract. The EOR is to be filed with the contract documents.

	Date:	File No.	
<b>1</b>	<b>Project Information</b>		
	Project Title Fort Babine-Takla ROW widening.		
	Project Description Widening of transmission line ROW to 60 m for 10 km section between Fort Babine and Takla Landing.		
	Project Location Between Fort Babine and Takla Landing. See EMP for map.		
<b>2</b>	Contractor Information (if applicable)		
	Company Name		
	Company Address		
	Site Contact/Representative Name		
	Phone #	Cell #	E-mail
<b>3</b>	<b>Key Environmental Issues and Requirements</b> Review and record the environmental issues and requirements of the work as specified in the Environmental Management Plan (EMP), Environmental Field Guides or other environmental requirements (e.g., Contract clauses, SOR). Use the checklist below to guide discussion.		
	Is there an EMP, Field Guide, or other environmental requirement for the work?		<input type="checkbox"/> Yes <input type="checkbox"/> NA
	<b>Site-Specific Environmental Sensitivities</b>	<b>Site-Specific Environmental Protection Requirements</b>	<input type="checkbox"/> Discussed <b>NA</b>
	Soil Erosion / Compaction	See Water Quality section below	<input type="checkbox"/> Yes <input type="checkbox"/> NA

Vegetation Disturbance or Removal	<ul style="list-style-type: none"> <li>Confirm Clearing boundaries (ROW edges, RMZ and MFZ) are clearly marked; do not work if unsure;</li> <li>Vegetation outside the work area will not be disturbed, with the possible exception of danger tree removal in accordance with Worksafe BC regulations;</li> <li>Retain understory shrubs where possible to minimize disturbance to ground layer vegetation and maintain ungulate browsing habitat.</li> </ul> <p><b>Noxious Weed Management</b></p> <ul style="list-style-type: none"> <li>Contractor will ensure that before mobilizing to the site, all equipment is pressure washed or steam cleaned to remove all plant remnants.</li> <li>All equipment that arrives on site should be checked and certified free of soil and vegetation by the Contractor. If vehicles do not arrive satisfactorily clean they will be sent to the nearest commercial car wash for cleaning (Smithers).</li> <li>No erosion control materials are expected to be required on site; if it is needed, avoid using straw or hay on site as erosion protection; if it must be used, use only straw that is certified weed free.</li> <li>Do not import fill from sites outside the Project area, unless approved by the EM or BCH Environmental Representative.</li> <li>Any disturbed ground should be revegetated as soon as possible following the completion of works on that part of the site. A native seed mixture should be used in this area.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Generation and Disposal of Hazardous Substances	<ul style="list-style-type: none"> <li>Sorbent materials or soils saturated with more than 3% oil or gasoline are also classified as hazardous wastes.</li> <li>Soils and/or other materials contaminated by petroleum products or other undesirable materials will be cleaned up according to the manufacturer's instructions and to regulatory standards.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Generation and Disposal of Waste	<ul style="list-style-type: none"> <li>Non-hazardous waste will be disposed of at authorized landfills.</li> <li>Disposal without authorization of wastes is prohibited on lands under provincial jurisdiction. This includes inert demolition wastes such as concrete, wood waste, asphalt, equipment, and vehicle parts. No on-site burial of waste will be permitted.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Contaminated Soil Management	<ul style="list-style-type: none"> <li>Contaminated soils are unlikely to be encountered, excepting the possibility of a spill. Soils will be excavated, off-site to an accepted treatment and/or disposal area. (See Hazardous Substances above.)</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA

Spill of Hazardous Substances	<ul style="list-style-type: none"> <li>• A spill containment kit must be readily accessible on-site and crews adequately trained in spill response.</li> <li>• Locate emergency spill response kits in areas where oil-filled equipment will be used and provide additional spill response materials in sufficient quantities on-site to catch drips, minor leaks and spills. The spill response kits are to only be used in the event of a spill incident and not for day-to-day equipment and tool management.</li> <li>• No re-fuelling or servicing of any vehicle is to take place within 30 m of any ditch or watercourse.</li> <li>• Inspect all machinery for leaks or worn hoses, fittings, etc., and make all repairs prior to arriving at the site;</li> <li>• Place oil-sorbent sheets and/or containers under vehicles and equipment parked for longer than two hours, or immediately under any vehicle or equipment that is leaking.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Fuel and Flammable Storage	<ul style="list-style-type: none"> <li>• Containment for 110% of the fuel and lubricants on the equipment permanently parked is to be installed;</li> <li>• Provide adequate containment for fuel and oil products and ensure that all containers are properly labelled according to WHMIS and TDG requirements;</li> <li>• Ensure that any employees and/or contractors fuelling equipment understand the environmental risks of the area, are equipped with adequate spill prevention and response measures, have appropriate training, and are following fuelling practices deemed acceptable by BC Hydro;</li> <li>• Ensure that all fuel vehicles are parked only in designated areas on site with brakes applied and wheels chocked;</li> <li>• All fuel transfers are to be done as far away as practical from drainage and water bodies (use 30 m distance from water as a guideline);</li> <li>• No storing of large volumes of fuel on site is to be permitted. If storing smaller quantities of fuel on-site it is to be stored in a location outside environmental sensitive areas (more than 30 m away from water), be protected from vandalism, and include secondary containment or double-walled fuel tanks.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Dust Generation / Other Air Emissions	<ul style="list-style-type: none"> <li>• Excessive dust or other air emissions are not expected to occur during this project.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA

Water Quality – Erosion and Siltation	<ul style="list-style-type: none"> <li>Minimize removal of vegetation, and avoid ground disturbance to minimize erosion potential.</li> <li>No re-fuelling or servicing of any vehicle is to take place within 30 m of any ditch or watercourse.</li> <li>BC Hydro Erosion and Sediment Control Techniques can be found in Appendix 5.2.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Fish and Aquatic - Habitat Alteration, Disturbance or Loss	<ul style="list-style-type: none"> <li>No work will be conducted in aquatic habitats. Adhere to sediment and erosion control plan and exercise proper fuel handling and spill avoidance practices to avoid impacts to local streams and water bodies.</li> <li>Follow all AWPRV prescriptions as per this EMP. If unclear on prescription language, stop and acquire direction from BC Hydro Representative.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Wildlife and Bird – Habitat Alteration, Disturbance or Loss	<ul style="list-style-type: none"> <li>No impacts to birds or wildlife are expected due to the timing.</li> <li>Wildlife and bird sightings should be reported to the EM</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Disturbance to Heritage Resources / Archaeological Sites	<ul style="list-style-type: none"> <li>If any artifacts or remains are discovered during excavation or other activities, work must cease and steps will be taken to protect the artifact. The BC Hydro Environmental Representative will be contacted immediately and will provide guidance.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Visual Impacts / Noise Concerns	<ul style="list-style-type: none"> <li>During the work all equipment will have standard materials for reducing noise in good working order. E.g. mufflers.</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Property Considerations	<ul style="list-style-type: none"> <li>No entry to private property is required during the Project</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Disruption of Recreation Use	<ul style="list-style-type: none"> <li>No disruptions are anticipated</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Public Safety Concerns	<ul style="list-style-type: none"> <li>No public safety concerns are anticipated beyond additional traffic on local roads</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
Do the tools and equipment meet the requirements?		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
4	<b>Permits and Approvals Information:</b> Ensure the necessary environmental permits and approvals relating to the work have been obtained prior to starting work.		
	Are environmental notifications, permits, licenses or approvals required? If so, list applicable regulatory requirements.	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Have the permits, licenses and approvals obtained and / or checked? If so, identify permit reference numbers.	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
5	Emergency Response Plan / Oil and Chemical Spill Response Plan		
	Has the Emergency Response Plan been discussed?	<input type="checkbox"/> Yes	<input type="checkbox"/> NA

	Has the Oil and Chemical Spill Response Plan been discussed?	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Are there spill kits available on location? If so where are they located?	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
6	<b>Environmental Incident Reporting:</b> Ensure BC Hydro Crew Leader or Contractor is aware of BCH/BCTC EIR system.		
	Environmental Incident Reporting Procedures discussed?	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
7	Environmental Competency		
	Demonstrated applicable environment training for appropriate crew members/supervisors?	<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Site Environmental Monitor to be on-site in lieu of training?	<input type="checkbox"/> Yes	<input type="checkbox"/> NA

All project personnel (BC Hydro, Contractor, and other) must receive an Environmental Orientation and Sign the EOR Record.

The individuals signing below have been briefed on and understand the environmental requirements of the work as detailed within this EOR.

The individuals understand that there is a **BC Hydro EOR** and **BC Hydro EMP with additional environmental reference information and site specific details**. These documents shall be posted by the contractor supervisor in a location readily accessible to all project personnel.

Safety tailboards held for the project shall include a discussion of Environmental Risks associated with the work, and relevant parts of the EOR and EMP.

Company	Worker Name	Worker Role	Worker Signature	Date

Additional Comments:

**Return completed, signed form to Project EM**

## APPENDIX 2 OIL AND CHEMICAL SPILL EMERGENCY RESPONSE PLAN

If a spill of fuel, oils, unmixed cement, lubricants or other harmful substances occurs, the following procedures shall be implemented.

B.C. Hydro Spill Response Steps	
1.	Ensure Safety
2.	<b>Stop the Flow</b> (When Possible)
3.	Secure the Area
4.	Contain the Spill
5.	<b>Notify/Report</b> (Emergency Management BC 1-800-663-3456)
6.	Clean-Up
(circumstances may dictate another sequence of events)	

### 1. ENSURE SAFETY

- Ensure personal/public, electrical and environmental safety
- Wear appropriate Personal Protective Equipment (PPE)
- Never rush in, always determine the product spilled before taking action
- Warn people in immediate vicinity
- Ensure **no ignition sources** if spill is of a flammable material

### 2. STOP THE FLOW (WHEN POSSIBLE)

- Act quickly to reduce the risk of environmental impacts
- Close valves, shut off pumps or plug holes/leaks, set containers upright
- Stop the flow of the spill at its source

### 3. SECURE THE AREA

- Limit access to spill area
- Prevent unauthorized entry onto site

### 4. CONTAIN THE SPILL

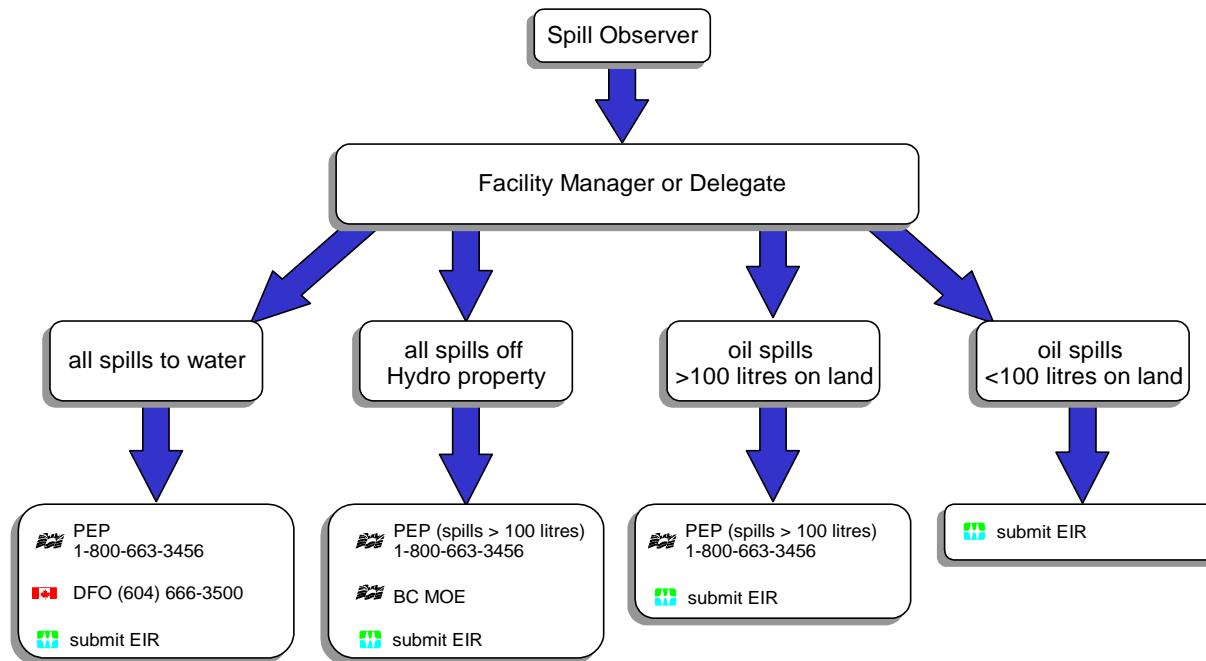
- Block off and protect drains and culverts
- Prevent spilled material from entering drainage structures (ditches, culverts, drains)
- Use spill-sorbent material to contain spill
- If necessary, use a dike or any other method to prevent any discharge off site
- Make every effort to minimize contamination

Contain as close to the source as possible

## 5. NOTIFY / REPORT

- Notify appropriate Site Supervisor or alternate of incident (provide spill details)
- When necessary the first external call should be made to (see spill reporting requirements):  
Emergency Management BC 1-800-663-3456 (24 hour) (SPILL REPORTING IS TO BE INITIATED BY THE FACILITY MANAGER OR A DELEGATE)
- Provide necessary spill details to other external agencies (see spill reporting requirements)
- Complete a BC Hydro Environmental Incident Report (EIR) available on the BC Hydro intranet site ([http://w3.bchydro.bc.ca/env\\_incident\\_rpt/index.htm](http://w3.bchydro.bc.ca/env_incident_rpt/index.htm)).

BC Hydro Spill Reporting  
Notification Chart



**Table 1: List of externally reportable quantities for commonly used substances**

Product	Quantity
<b>Class 2.1 – flammable gas (e.g., propane)</b>	10 kg or 10 min.
<b>Class 2.2 – non-flammable gas (e.g., SF6, CO2)</b>	10 kg or 10 min.
<b>Class 3 - flammable liquids</b>	100 litres
<b>Class 8 - corrosive liquid acids and caustics (e.g., battery acid)</b>	5 kg or litres
<b>Class 9 – environmentally hazardous (e.g., PCB's, used ethylene glycol)</b>	1 kg or litre
Oil & Waste Oil	100 litres
Other Substances (e.g., new antifreeze, power-wash water)	200 kg or litres
Pesticides & Herbicides	1 kg or litre

**Note: All spills to water are reportable.** If in doubt as to whether or not to report a spill, err on the side of caution and report the spill. Agency notification will be initiated by BC Hydro or the Environmental Monitor.

## 6. CLEAN-UP

- Technical assistance is available from Environmental Risk Management on clean-up procedures and residue sampling.
- Be advised that it is a legislative requirement that all equipment and/or material used in clean-up (e.g., used sorbents, oil containment materials etc.) are to be disposed of in accordance with BC Ministry of Environment (MOE) requirements. Generation Environment will assist in compliance with federal and provincial legislation.
  - Accidental spills may produce special wastes (e.g., material with > 3% oil) and contaminated soil. Be advised that it is a legislative requirement that all waste disposal complies with the *BC Hazardous Waste Regulations* and the *BC Environmental Management Act*.
  - Waste-contaminated sorbent material may not be disposed of in a landfill without prior approval from MOE and the landfill operator.
- Be advised that it is a legislative requirement that contaminated soil is treated and dealt with as required on a site-specific basis and complies with the requirements of the *BC Contaminated Sites Regulations*.

### APPENDIX 3 SPILL RESPONSE EQUIPMENT SUPPLIERS

**Please note:** sorbent materials are designed for **specific** uses and purposes (e.g., oil only sorbents vs. general sorbents). Ensure that the appropriate materials are ordered for the Project.

- All standard spill response equipment including standard kits can be ordered as a regular BC Hydro stores requisition.
- Contact Store 1: (604) 590-7572 or (47572). Use form 60320.

Spill containment booms, sorbent sweeps and pads are also available from the companies listed below. Custom made kits and supplies are also available upon request.

Company	Address	Phone Number
Acklands-Grainger Inc. <sup>1,2,3,5</sup>	#200 & #205, 31136 Peardonville Rd Abbotsford, BC V2S 5W6	604- 854-6664
	2475 Douglas Rd Burnaby, BC V5C 5A9	604-879-5764
	1620 Island Hwy Campbell River, BC V9W 2E5	250-287-9215
	#1, 725 Industrial Rd Cranbrook, BC V1C 4C7	250-426-3335
	10208 - 94th Ave Fort St John, BC V1J 4X3	250-785-8135
	3407-3rd Ave, PO Box 578 Port Alberni, BC V9Y 4E4	250-724-0181
	155 George Hills Way Prince Rupert, BC V8J 3R2	250-624-9195
	#222, Hwy 23 North PO Box 1530 Revelstoke, BC V0E 2S0	250-837-5161
	3010 Highway Drive Trail, BC V1R 2T3	250-364-1277
	2015 Government Street Victoria, BC V8T 4N9	250-384-1111
Aquaguard <sup>1,2,4,5</sup>	Unit #203, 1305 Welch Street North Vancouver, B.C. V7P 1B3	604-980-4899
Canadian West Wiper <sup>2,4</sup>	212- 590 Ebury Pl. Annacis Island, B.C.	604-522-5650
CG Industrial Specialties Ltd. <sup>2,3</sup>	8980 Oak Street Vancouver, B.C.	604-263-1671 (after hours) 604-942-5739
	5052 Hartway Drive Prince George, BC V2K 5B7	250-962-8261

Columbia Environmental Services <sup>7</sup>	2950 Highway Drive Trail, BC V1R 2T3	250-364-2510 1-800-648-5166
Enviro-Guard Products Ltd. <sup>1,2,5</sup>	5508 Dorset Burnaby, B.C.	604-435-6671
Hazco Canada Inc. <sup>2,7</sup>	#160 - 13511 Vulcan Way Richmond, BC V6V 1K4	604-214-7000 1-800-361-3201
	2478 Fawn Terrace Mill Bay, BC V0R 2P0	250-743-3946 1-800-667-0444
Hazmasters Environmental Controls Inc. <sup>2</sup>	3131 Underhill Avenue Burnaby, B.C. V5A 3C8	604-420-0025 (after hours) 604-443-9908
Industrial Equipment Company Ltd. <sup>5</sup>	2243 - 6th Avenue Castlegar, BC V1N 2W1	250-365-7767
Infra-Tech Polymers Inc. <sup>1,2,3</sup>	Unit #4, 1947 Telegraph Trail Langley, B.C. V3A 4P8	604-888-8808 1-800-567-4888
Nilex Inc. <sup>6</sup>	3963 Phillips Avenue Burnaby, BC V5A 3K4	604-420-6433 1-800-663-0478
	1015 Great St. Prince George, BC V2N 2K8	250-563-9898
Pigmalion Environmental Products <sup>1,2,3</sup>	109 - 3840 Jacombs Richmond, B.C.	604-273-2236
Rocky Mountain Environmental Ltd. <sup>1,2,3,4,5</sup>	11940 Kingfisher Drive Richmond, BC V7E 3X6	604-275-1346 1-800-677-4556
Spill-Check Environmental Products <sup>1,2,3</sup>	Falkland, VOE 1W0 B.C.	250-379-2212
SpilKleen (Division of Agra max Inc) <sup>1,2,3,4,5</sup>	Nelson, BC	250-505-3806 1-877-455-5336
StanChem Inc. <sup>3</sup>	20333 - 102B Ave Langley, B.C.	604-513-9009 (after hours) 604-685-5036
Sumas Environmental Services <sup>7</sup>	4623 Byrne Road Burnaby, BC V5J 3H6	604-682-6678 1-866-887-8627
Tech-Power Industrial Supplies Ltd. <sup>1,2,3</sup>	745 Clark Vancouver, B.C.	604-254-3952
Versatech Products Inc. <sup>2,4,5</sup>	11951 Forge Place Richmond, B.C.	604-271-7500 1-877-925-7500

Note: The suppliers noted above provide:

- <sup>1</sup> Cellulose treated sorbent booms, pads and socks
- <sup>2</sup> Polypropylene sorbent booms and pads
- <sup>3</sup> Particulate sorbents (floor drying materials)
- <sup>4</sup> Containment boom
- <sup>5</sup> Spill containment products; storage
- <sup>6</sup> Geotextiles, silt fences/curtains, drainage
- <sup>7</sup> Spill cleanup equipment and services

**APPENDIX 4 VEHICLE SPILL KIT CONTENTS**

**BC hydro**

**VEHICLE EMERGENCY SPILL RESPONSE KIT**  
**CONTENTS**

Quantity	Description	Stock Numbers
2 each	Spill Response Kit (Complete kit)	154-0017
2 each	10' Oil Only Socks	154-0018
15 each	7.1.1.1.1 Polypropylene sorbent pads (Oil only) 18"X18"X3/8"	154-0019
1 each	Neoprene Mat (Drain Cover) 48"X48"X1/8"	154-0804
1 each	PCB Test Kit – (Not Required)	154-0016
1 each	250ml Glass Sampling Jar with Lid and Eye Dropper	154-0816
1 each	25ml Amber Bottle with Lid – (Not Required)	154-0829
2 each	Sample Jar Labels and Chain of Custody Doc.	Stores 1
2 each	10 Quart Cellulose Sorbent Material, Oil Only	154-0020
1 each	Barrier Ribbon, Yellow "Caution Do Not Enter"	154-0805
1 each	Poly Disposal Bags (45 Gal. Drum size, minimum 6 mil)	113-0015
1 each	Blank Labels for plastic bags	Stores 1
1 each	Plastic Bag Tie	388-4072
1 each	Epoxy Plug Compound (Hydrocarbon Compatible)	154-0021
1 each	Spill Kit Container Marked "Spill Response Kit"	154-0835
1 each	Spill Response Card	Print Shop D98-19
1 each	List of Kit Contents	Print Shop D98-7

# ATTENTION

**\*\* IMMEDIATE REPLACEMENT OF ANY CONTENTS USED IS ESSENTIAL \*\***

**REFER TO BC HYDRO WASTE MANAGEMENT STANDARD WM-110 (SPILL RESPONSE)**

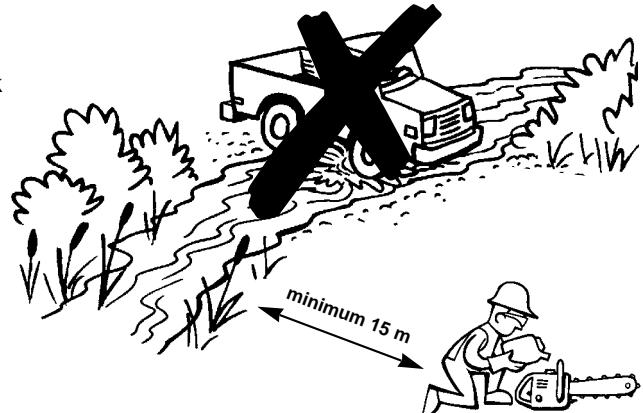
## APPENDIX 5 BC HYDRO ENVIRONMENTAL CONSTRUCTION GUIDES AND BMP'S

### APPENDIX 5.1 SITE ACCESS AND GENERAL CONDITIONS

# Road Maintenance Field Guide #1

## SITE ACCESS & GENERAL CONDITIONS - Page 1 of 2

- Conduct a pre-work meeting with local Road Coordinator, contractors and operators to review planned work, road maintenance field guides and site plans. Keep field guides and site plans with operators at all times.
- Check with the Road Coordinator or Contract Administrator that approval to travel to the site has been obtained from private landowners, public agencies, and First Nations (if applicable).
- Work involving maintenance and repair of water crossing structures over streams, rivers or watercourses (whether they are dry or wet) requires regulatory agency notification and possibly approval. Do not start work without written assurance that notification or approval is in place. Comply with all requirements outlined in the workplan and field guides unless otherwise instructed by the Contract Administrator.
- Verify the road access to the work site is safe. All bridges and major culverts (over 2 metre diameter) are required to have load ratings posted by the land owner, licensee or governing agency. Check to make sure that the route to the work site is intact (unaffected by landslides, snow avalanches, or large muddy areas). Contact the Contract Administrator if you have any doubts about safety.
- Make sure all required tools and supplies are on-site prior to commencement of work (including safety supplies and fire tools).
- Maintain a record of notifications and approvals and keep a copy at the worksite. Write specific comments on the plan if necessary to record site conditions and work done if it was different than shown on the plan.
- Do not develop access across, or drive through, any natural watercourse or wetland (even if dry) without consulting with Contract Administrator (or environmental support staff).
- Do not disturb natural wildlife habitat such as beaver dams, eagle nests, heron rookeries, marbled murrelet nests, hawk nests, owl nests, bear dens, marmot dens, wildlife trees etc. If encountered, stop work immediately and contact environmental support staff.
- Protect streams, ponds, ditches, and other waterbodies from sediment, oil, fuel, chemicals etc. Refuel equipment (including power saws) more than 15m from waterbodies. Use erosion and sediment control techniques, to prevent sediment from entering waterbodies (See FG#14).
- Keep spill response kits on site with each machine. Follow requirements of Waste Management Act for transport and disposal of waste materials.
- Minimize disruption to private property owners, others living nearby and users of the area. Limit noise, control dust and allow other vehicles to pass when practical. Maintain a clean worksite.
- Clean vehicle when leaving an area infested with noxious weeds, such as knapweed or scotch broom.

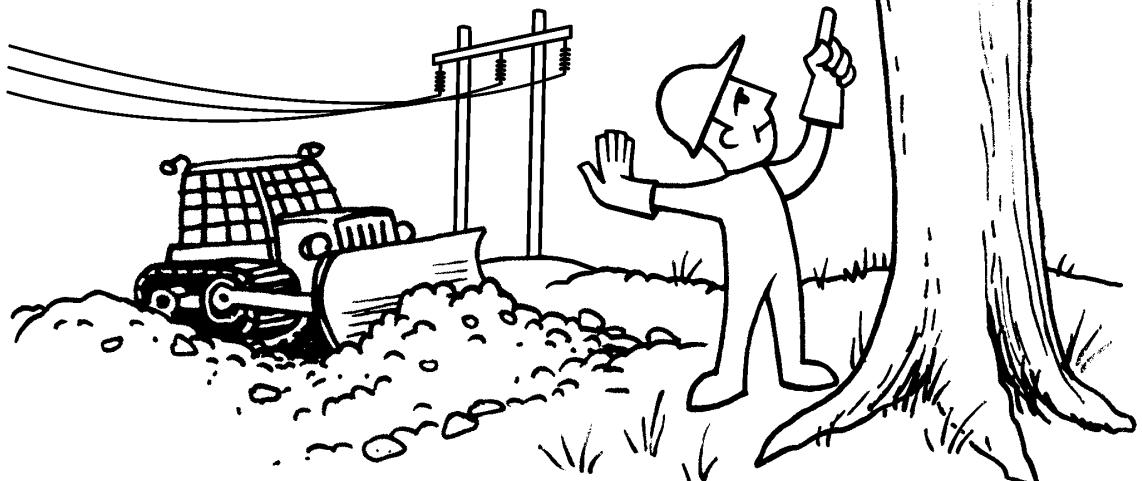


FG# 1 Site Access/Conditions	FG# 2 Valley Roads	FG# 3 Hillslope Roads	FG# 4 Access Tracks	FG# 5 Culverts	FG# 6 Cross Ditches, Etc.	FG# 7 Ditching	FG# 8 Insloping & Outsloping
FG# 9 Subdrains & Seepage	FG# 10 Grading	FG# 11 Road Surfacing	FG# 12 Road Stability & Spoil	FG# 13 New Road Development	FG# 14 Erosion & Sediment	FG# 15 Revegetation	FG# 16 When To Ask For Help

# Road Maintenance Field Guide #1

## SITE ACCESS & GENERAL CONDITIONS - Page 2 of 2

- Roads and forest sites undergoing seasonal break-up should not have road construction or maintenance activities performed on them. Reschedule activities or use other types of equipment or methods of access.
- Shut down road construction and maintenance activities if the following conditions are observed:
  - (i) Soils are soft and visibly muddy.
  - (ii) Soils flow and move when excavated.
  - (iii) Rilling occurs on exposed soils.
  - (iv) Sedimentation into ditches occurs or cannot be stopped.
  - (v) Silty water or sediment is flowing from the work site towards streams, lakes, wetlands or marine sensitive areas.
  - (vi) Watercourses are flowing at or above their banks.
  - (vii) 75 mm of precipitation in a 24hr period or 40mm of precipitation in a 12hr period west of the Cascade mountain range (or times of extreme snowmelt).
  - (viii) 50mm of precipitation in a 24hr period or 30mm of precipitation in a 12hr period east of the Cascade mountain range (or times of extreme snowmelt).
- The following site activities are required before shutting the work site down, and following completion of work at the site.
  - (i) Minimize erosion and sedimentation from stockpiled, erodible soils  
(See FG# 5, 6, 7 & 14).
  - (ii) Minimize the risk of sedimentation from all work sites to watercourses  
(See FG# 5, 6, 7 & 14).
  - (iii) Leave all drainage patterns unobstructed.
  - (iv) Add temporary water control measures as needed (e.g. waterbars, check dams etc. See FG# 6 & 7).
  - (v) Leave roads passable unless they are not safe.
  - (vi) Inform the road coordinator of any roads that cannot be used.



FG# 1 Site Access/Conditions	FG# 2 Valley Roads	FG# 3 Hillslope Roads	FG# 4 Access Tracks	FG# 5 Culverts	FG# 6 Cross Ditches, Etc.	FG# 7 Ditching	FG# 8 Insloping & Outsloping
FG# 9 Subdrains & Seepage	FG# 10 Grading	FG# 11 Road Surfacing	FG# 12 Road Stability & Spoil	FG# 13 New Road Development	FG# 14 Erosion & Sediment	FG# 15 Revegetation	FG# 16 When To Ask For Help

**APPENDIX 5.2 EROSION AND SEDIMENT CONTROL**

# Road Maintenance Field Guide #15

## SITE REVEGETATION

### Purpose and Definition

The purpose of site revegetation is to reduce long term erosion and mitigate disturbance from road construction and maintenance operations. Site revegetation includes grass seeding, bioengineering and tree planting.

### Grass Seeding

Hand seeding is the most common and cost effective method of grass seeding as it can be done by anyone concurrent with construction and maintenance operations. Hand grass seeding can be done with planting bags or shoulder mounted, hand crank spreaders, which ensure even coverage and distribution. Hand grass seeding can also be assisted by using ATV's, pick-ups or skidders. See additional comments for other types of grass seeding.

### Other Methods

Additional methods of site revegetation include tree planting and Bioengineering. Although bioengineering is a specialized treatment which requires experienced persons, recognizing the need for this treatment is important. Bioengineering or tree planting may be needed (1) on large exposed slopes, (2) at cat track sites or spoil areas, (3) on rock buttressed slopes, (4) at steep road fillslopes and cutslopes, (5) at disturbed riparian zones, (6) where large construction projects have caused extensive disturbance, or (7) where slopes are too steep to hold grass seed. Approval from the Contract Administrator is required for use of these methods ([FG# 16](#)).



### Erosion and Sediment Control

- Cat tracking ([FG# 14](#)).
- Loose straw ([FG# 14](#)).
- Erosion mats ([FG# 14](#)).

### Important Points

#### Do:

- Grass seed immediately after maintenance and construction and while soils are cool and wet.
- Use sod forming grasses under transmission lines to inhibit other plant growth.
- Use a minimum of 80 kg per hectare of grass seed (range 80 to 100) on access roads.
- Use a grass seed mixture that includes 30% bunch grasses on reclamation sites not under transmission lines to promote native plant germination.
- Use a minimum of 300kg/ha slow release fertilizer (18-18-18) along with grass seeding.
- Use a grass seed mixture suited for the time of year seeding occurs.

#### Don't:

- Don't grass seed before or during frost or freezing temperatures (unless using frost resistant seed like Fall Rye).
- Don't use fertilizers near streams or wetlands.
- Don't use grass seed and plants not approved by a vegetation specialist.
- Don't grass seed the road grade surface if it may cause the development of false ditches ([FG# 10](#)).

### Additional Comments

- Remove and clean up all garbage and debris on site during site reclamation and while operations are on-going ([FG# 1](#)).
- If grass seed ravelles on steeper or loose sandy slopes, consider hydro-seeding or bioengineering.
- Other methods of grass seeding include: truck mounted dry seeding, truck mounted hydro seeding, aerial dry seeding and aerial hydro seeding. These methods require assistance and approval from the Contract Administrator.
- Items frequently used to enhance revegetation include decompaction of soil and replacing woody debris and organics. Ask for help from the Contract Administrator before undertaking these techniques.

FG# 1 Site Access/Conditions	FG# 2 Valley Roads	FG# 3 Hillslope Roads	FG# 4 Access Tracks	FG# 5 Culverts	FG# 6 Cross Ditches, Etc.	FG# 7 Ditching	FG# 8 Insloping & Outsloping
FG# 9 Subdrains & Seepage	FG# 10 Grading	FG# 11 Road Surfacing	FG# 12 Road Stability & Spoil	FG# 13 New Road Development	FG# 14 Erosion & Sediment	FG# 15 Revegetation	FG# 16 When To Ask For Help

# Road Maintenance Field Guide #14

## EROSION AND SEDIMENT - Page 1 of 2

### Purpose and Definition

The control of erosion and sedimentation is important to protect water quality and fish habitat. Sedimentation can kill fish, destroy fish habitat, and interfere with the chlorination process for purifying drinking water. Erosion and sediment control are standard activities for all road maintenance and construction work.

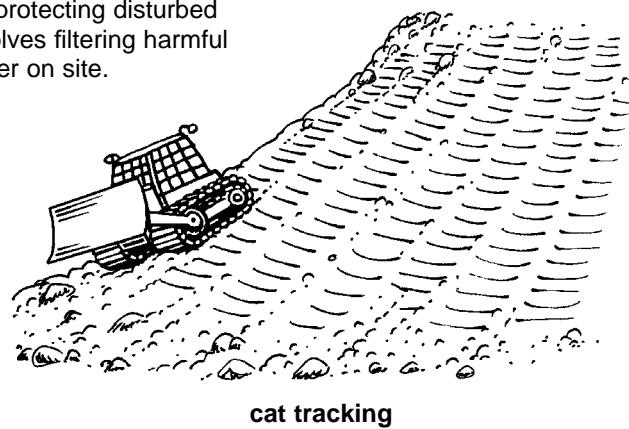
Methods and tools used to control erosion and sedimentation are listed below. Controlling erosion involves minimizing ground disturbance and protecting disturbed soil areas from rain and running water. Controlling sediment involves filtering harmful sediment out of the flow of dirty water or containing the dirty water on site.

### Erosion Control

- Cat tracking
- Erosion mats
- Loose straw
- Tarps and coverings
- Grass seed
- Bioengineering
- Rock armour
- Temporary diversion of water from work site

### Sediment Control

- Work site isolation
- Pumping & diverting
- Silt fence
- Catchment basin
- Straw bales
- Non-woven geotextiles



### Erosion Control Techniques

**Cat tracking:** Groove the slope using tracked equipment to create a series of ridges and depressions that run across the slope and along the contour (drive up and down the fall line).

**Erosion mats:** Protective mulch blankets or turf reinforcement mats used to temporarily stabilize and protect disturbed soils. Install to manufacturers instructions and recommendations.

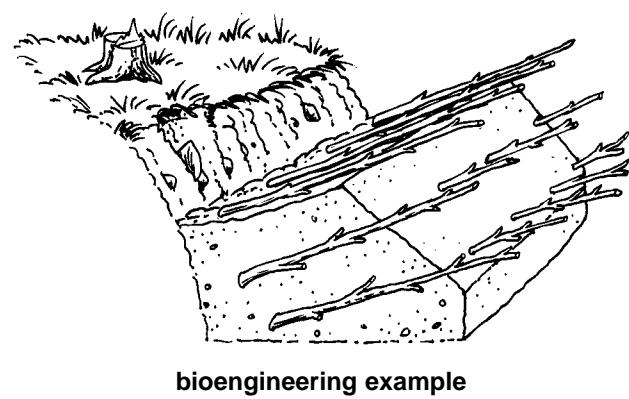
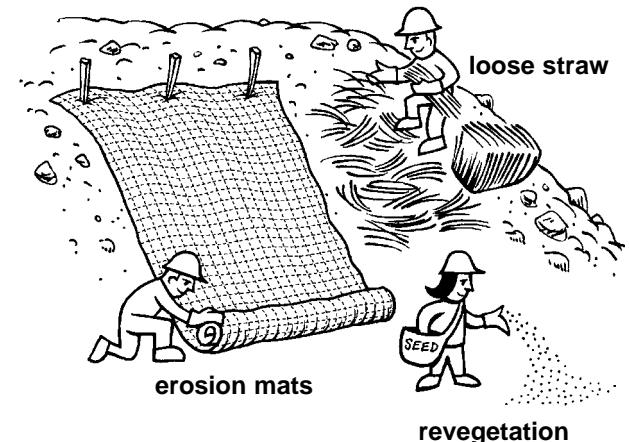
**Loose straw:** Used to temporarily protect exposed soils until vegetation is established. Break straw bales into flakes, pull apart flakes and scatter over exposed soils. Applying loose straw is a more cost effective alternative to erosion mats but does not stabilize the slope surface.

**Tarps and coverings:** Temporary cover to protect exposed soils. All coverings should be removed, re-used or re-cycled after use.

**Grass seed:** Grass seeding of exposed soils is required during all maintenance and construction activities to provide short and long term erosion and sediment control. For further information see [Field Guide #15](#), Revegetation.

**Bioengineering:** Provides additional stability and soil retention to maintained roads, deactivated roads, landslide scars, stream banks or riparian zones with live hardwood cuttings. Consider using where grass seed will not adhere to steeper slopes or raveling occurs.

**Rock armour:** Angular rock placed to form a barrier between flowing water and erodible soils. Rock should be large enough to resist movement under anticipated flows. Ask the Contract Administrator for help in determining the appropriate size of rock armour to use.



FG# 1 Site Access/Conditions	FG# 2 Valley Roads	FG# 3 Hillslope Roads	FG# 4 Access Tracks	FG# 5 Culverts	FG# 6 Cross Ditches, Etc.	FG# 7 Ditching	FG# 8 Insloping & Outsloping	
FG# 9 Subdrains & Seepage	FG# 10 Grading	FG# 11 Road Surfacing	FG# 12 Road Stability & Spoil	FG# 13 Road Stability & Spoil	New Road Development	FG# 14 Erosion & Sediment	FG# 15 Revegetation	FG# 16 When To Ask For Help

# Road Maintenance Field Guide #14

## EROSION AND SEDIMENT - Page 2 of 2

### Sediment Control Techniques

**Work site Isolation:** Isolate the work site from exposure to flowing water by installing cross ditches, waterbars (**FG# 6**) or catchment basins.

**Pumping and Diverting Water:** A work site isolation technique used to temporarily divert or remove water from the work site.

**Silt Fence:** A temporary sediment barrier consisting of filter fabric, attached to supporting posts and entrenched into the soil. Refer to manufacturer for installation instructions.

**Catchment Basin:** Catchment basins are built to temporarily contain sediment laden water to allow excess sediment to settle. They are frequently used to stop sediment in ditch water from entering a culvert or stream, or hold sediment laden water pumped from another site.

**Straw Bales:** Straw bales, when wrapped with filter fabric and secured are a versatile erosion and sediment control technique.

### Components of a catchment basin include:

- (1) a pit or depression excavated with stable slopes,
- (2) a raised dam to stop the water from escaping, along with silt fence or filter fabric to stop sediment from escaping,
- (3) a pump to remove the sediment laden water before escaping,
- (4) cleaning of fine sands and some silts once deposited,
- (5) armour to prevent scouring at the outflow area and
- (6) a safe, well vegetated, discharge area away from streams, lakes or wetlands.

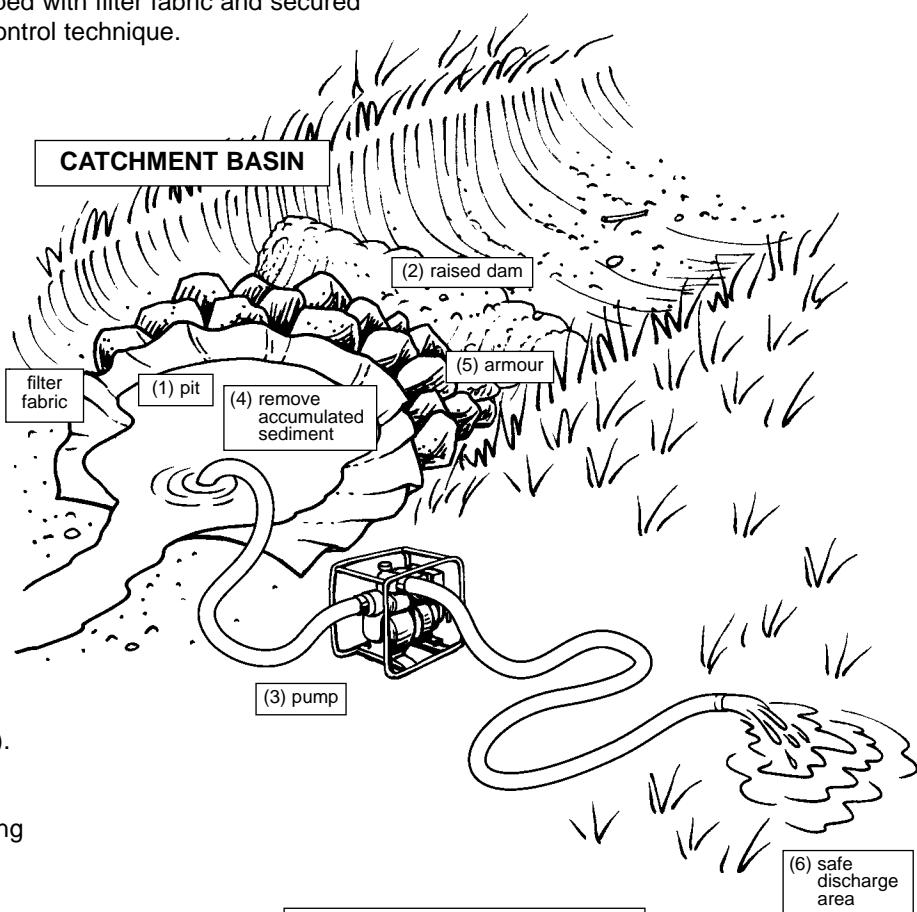
### Important Points

#### Do:

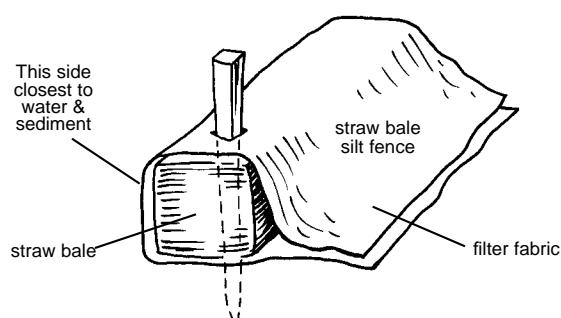
- Protect disturbed soils from eroding.
- Grass seed disturbed soils (**FG# 15**).
- Isolate work sites and route water away from wet work areas.
- Time work near sensitive areas during dry periods (**FG# 1**).

#### Don't:

- Don't only use one technique for erosion and sediment control.
- Don't leave erosion and sediment structures unattended, especially at times of high flows.
- Don't assume that areas are safe for discharging dirty water; walk downslope to check drainage patterns.
- Don't assume that erosion and sediment control will prevent landslides. Use other techniques and ask for help (**FG# 16**).
- Don't pump from natural watercourses or ditches that are suspected to contain fish.



### STRAW BAILE CHECK DAM



FG# 1 Site Access/Conditions	FG# 2 Valley Roads	FG# 3 Hillslope Roads	FG# 4 Access Tracks	FG# 5 Culverts	FG# 6 Cross Ditches, Etc.	FG# 7 Ditching	FG# 8 Insloping & Outsloping
FG# 9 Subdrains & Seepage	FG# 10 Grading	FG# 11 Road Surfacing	FG# 12 Road Stability & Spoil	FG# 13 New Road Development	FG# 14 Erosion & Sediment	FG# 15 Revegetation	FG# 16 When To Ask For Help

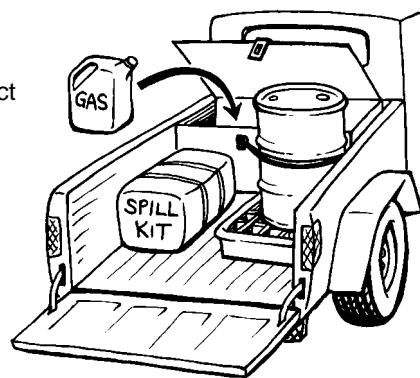
**APPENDIX 5.3 OILS AND FUELS – TRANSPORT, STORAGE AND USE**

# Environmental Field Guide #12

## OILS & FUELS – Transportation, Storage, Use

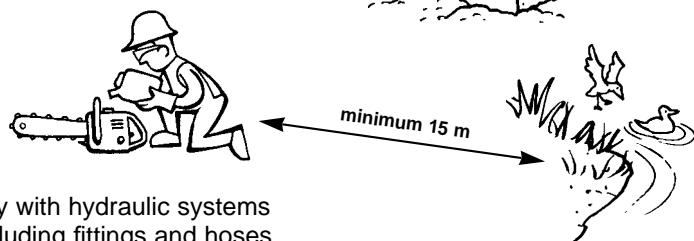
### Transportation

- Transport and manage fuels, lubricants and other petroleum-based products in accordance with regulations of the Federal Transportation of Dangerous Goods Act (TDG) and BC Waste Management Act.
- Ensure that persons preparing materials for shipping (preparing waste manifest/shipping documents), transporting and receiving goods are properly trained and have valid TDG certification.
- Store large quantities of fuel (more than 2000L) and lubricants in dedicated, waterproof facilities designed to contain 110% of the volume of the largest tank. Locate such facilities as far away as practical from waterbodies and wetlands.
- Fuels and lubricants must be transported in containers that are labeled according to TDG requirements and designed for that purpose.
- Containers must be in good condition, must not leak and must be sealed with a proper fitting cap or lid.
- Transport containers 23 L (5 gallon) or less and equipment that contains fuels and lubricants (e.g. chainsaws) in the equipment box of vehicle. The box should be able to contain fuels and oils in the event of a spill.
- Transport containers greater than 23 L (5 gallon), including 205 L (45 gallon) drums, upright and secured to prevent shifting and toppling.



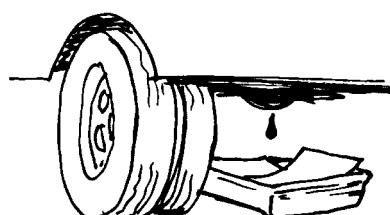
### Refueling in the Field

- Refuel equipment and fill small portable containers a minimum of 15 m from waterbodies or wetlands.



### Large Equipment

- Check daily that trucks, backhoes and other machinery with hydraulic systems are free of leaks and in good mechanical condition including fittings and hoses.
- Install drip trays with sorbent pads under drill rigs and any other equipment that work from a stationary position. Inspect, clean out and replace sorbent pads regularly.
- Spill Kits, approved by BC Hydro, are required on all line trucks and are recommended for other heavy vehicles and trucks.



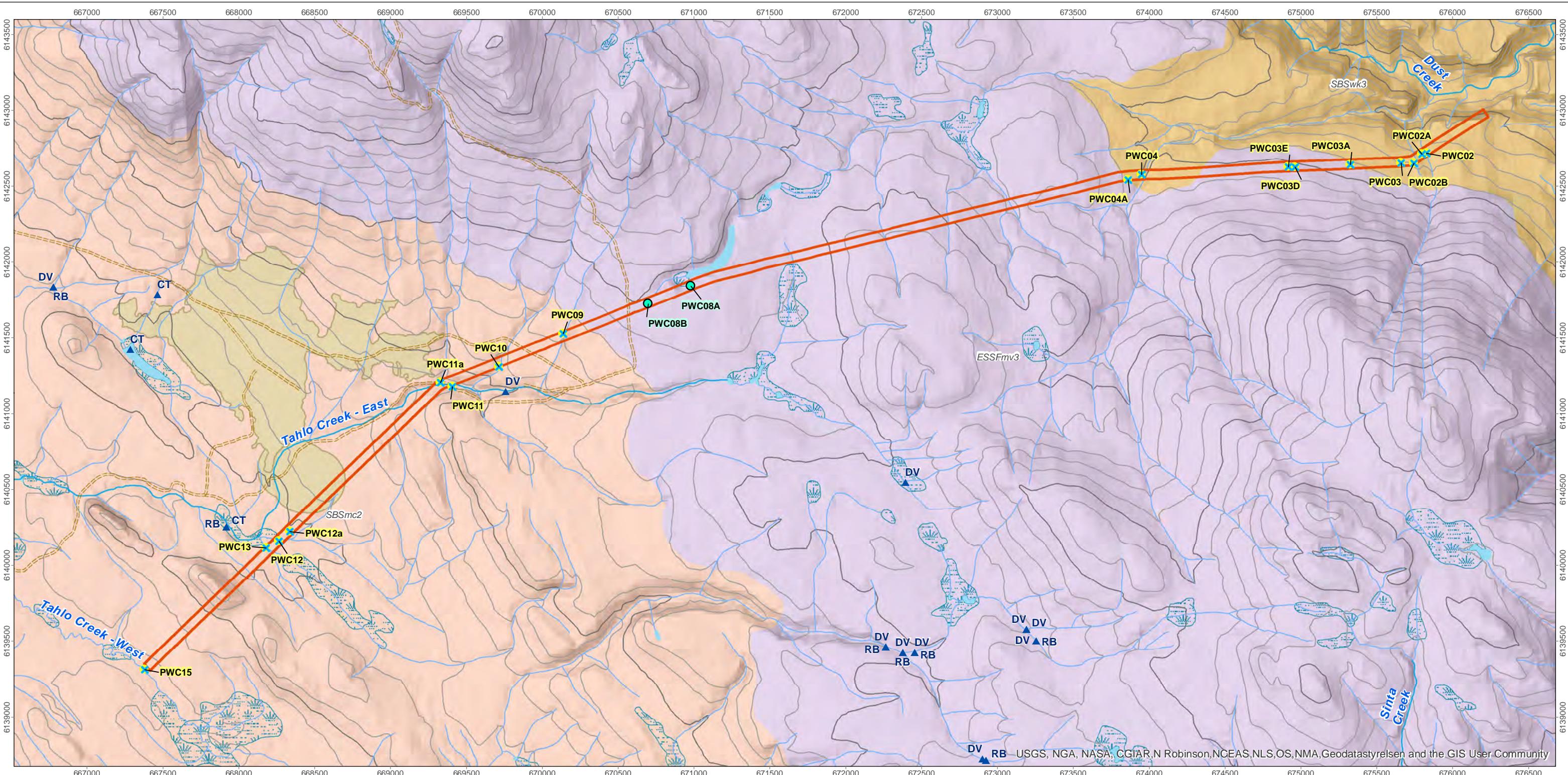
### Spill Response

In the event of a spill, follow established spill response procedures:

- Ensure Safety** - to employees, public; use protective equipment; consult MSDS sheets.
- Stop the Flow** - act quickly; close valves; plug leaks.
- Secure the Area** - limit access; move non-essential people; eliminate ignition sources; test PCB content.
- Contain the Spill** - block drains; prevent oil entering waterways; use Spill Kit sorbents, earth, sod.
- Notify/Report** - notify PEP if quantities exceed threshold (check BC Hydro information sheet or contact the Contract Administrator). Notify contract administrator/supervisor as soon as possible. Complete spill report and submit to Contract Administrator.
- Clean Up** - place clean up material in leak proof, sealed, labeled containers; protect from weather; store in secure location.



**APPENDIX 6 ADDITIONAL MAPPING**



## BIOPHYSICAL OVERVIEW

30 m Powerline ROW Between Takla Landing and Fort Babine



1:25,000

0 0.5 1Km  
NAD 1983 UTM Zone 9N  
BCGS MAPSHEET: 93M.039/049  
NTS MAPSHEET: 93M/08

Disclaimer: This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. The base data layers have been obtained from the British Columbia Geographic Warehouse (BCGW)



● Riparian Wetland

✖ Stream Crossing

■ Proposed RoW

■ Omineca Moist Very Cold Engelmann Spruce-Subalpine Fir

■ Babine Moist Cold Sub-boreal

■ Takla Wet Cool Sub-boreal Spruce

■ Cutblock

## Fish Records

▲ Fish Observation

— Road Permit

■ Waterbody

— Stream - Definite

— Contour - Index

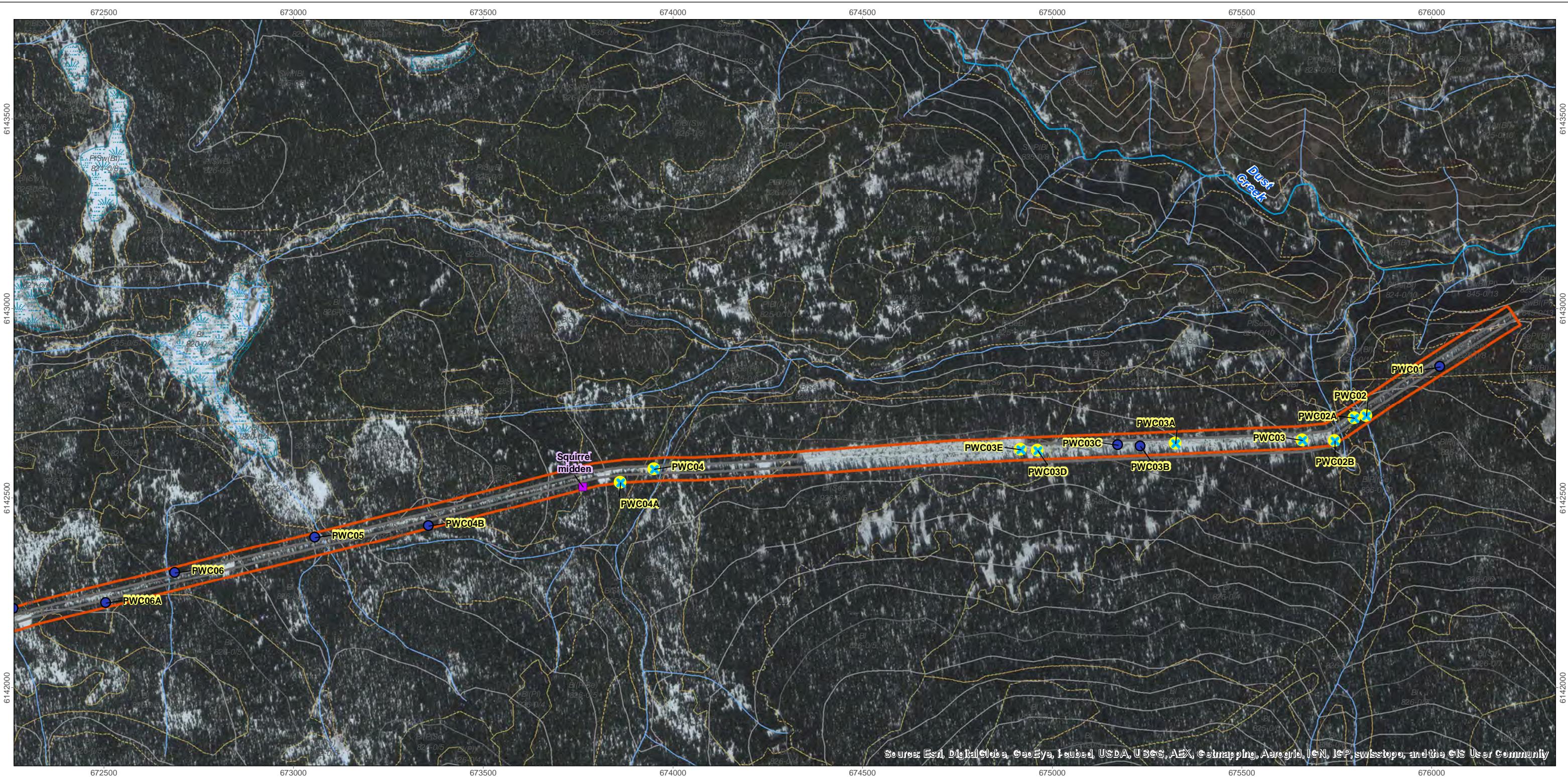
— Contour - Intermediate

■ Wetland

RB - Rainbow Trout  
DV - Dolly Varden  
CT - Cutthroat Trout

 **ECOFOR**  
natural and cultural resource consultants  
Ecofor Consulting Ltd.  
EPN: 2016-2053-006  
Date: December-01-16 (MM)

 **BC Hydro**  
Power smart



### Stream and Wildlife Survey Overview

30 m Powerline ROW Between Takla Landing and Fort Babine

Map 1 of 3

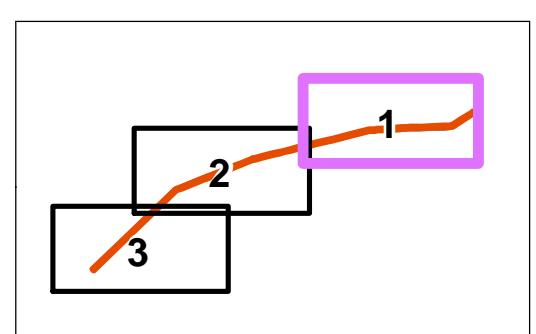
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Meters  
0 250 500  
NAD 1983 UTM Zone 9N  
BCGS MAPSHEET: 93M.039/049  
NTS MAPSHEET: 93M/08

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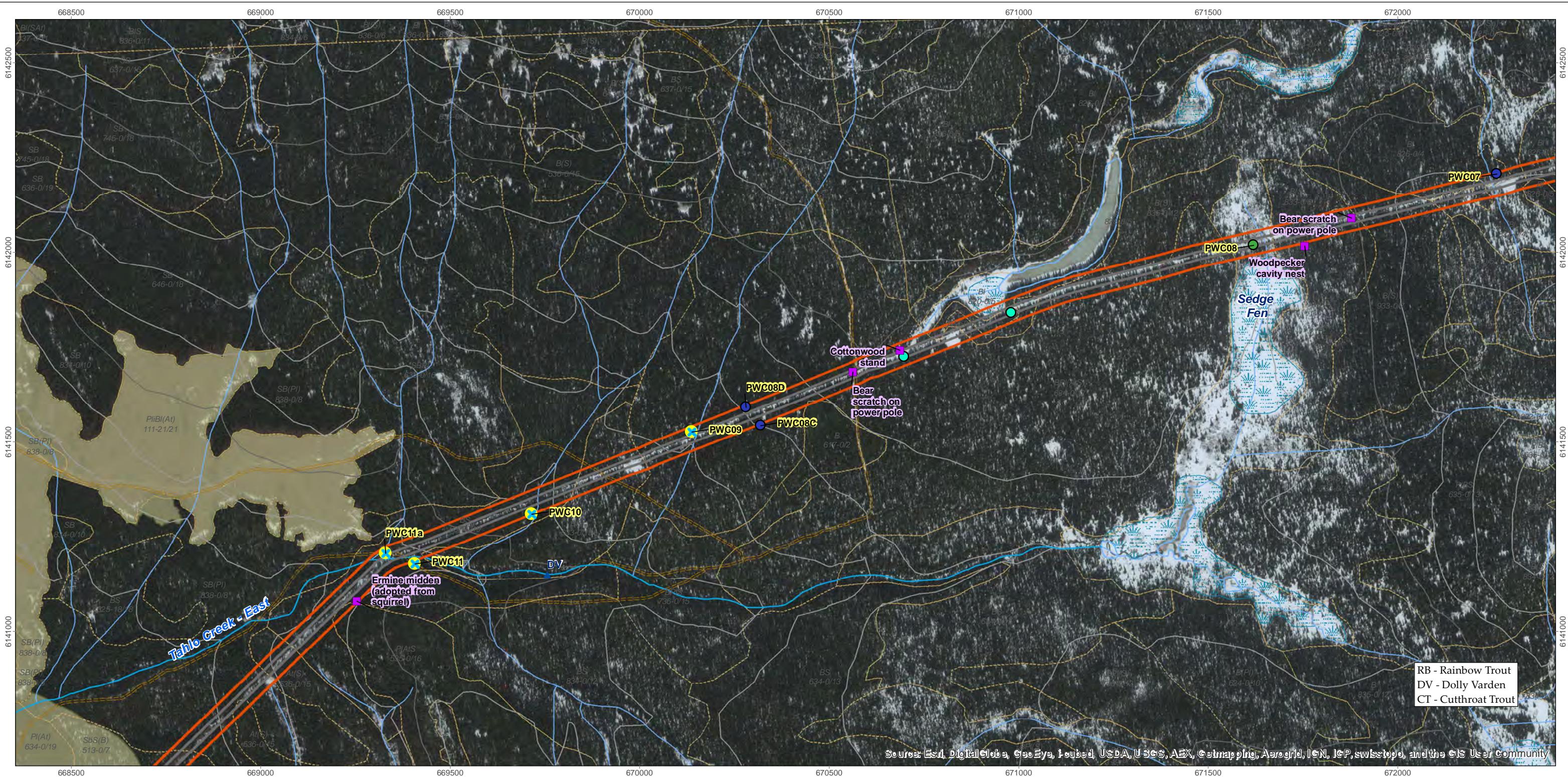


- Wildlife Observation
- Non-classified Drainage (NCD)
- ✖ Stream Crossing
- ◻ Existing RoW
- ◻ Proposed RoW
- ◻ Forest Cover (VRI)
- ◻ Waterbody
- ◻ Stream - Definite
- Contour (100m)
- Contour (20m)
- ◻ Wetland



**ECOFOR**  
natural and cultural resource consultants  
Ecofor Consulting Ltd.  
EPN: 2016-2053-012  
Date: December-01-16 (MM)

**BC Hydro**  
Power smart

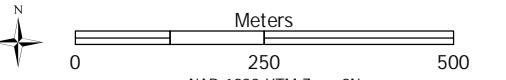


### Stream and Wildlife Survey Overview

30 m Powerline ROW Between Takla Landing and Fort Babine

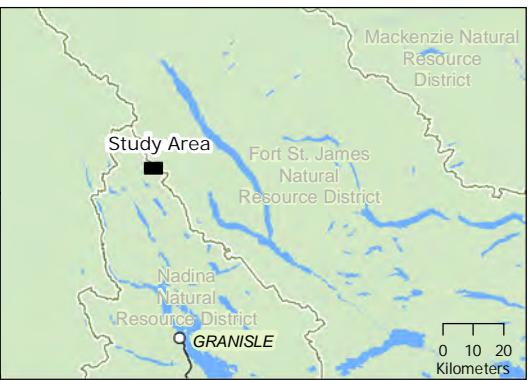
Map 2 of 3

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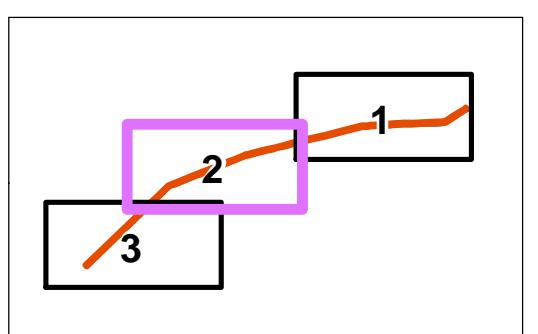


NAD 1983 UTM Zone 9N  
BCGS MAPSHEET: 93M.039/049  
NTS MAPSHEET: 93M/08

Disclaimer: This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. The base data layers have been obtained from the British Columbia Geographic Warehouse (BCGW)

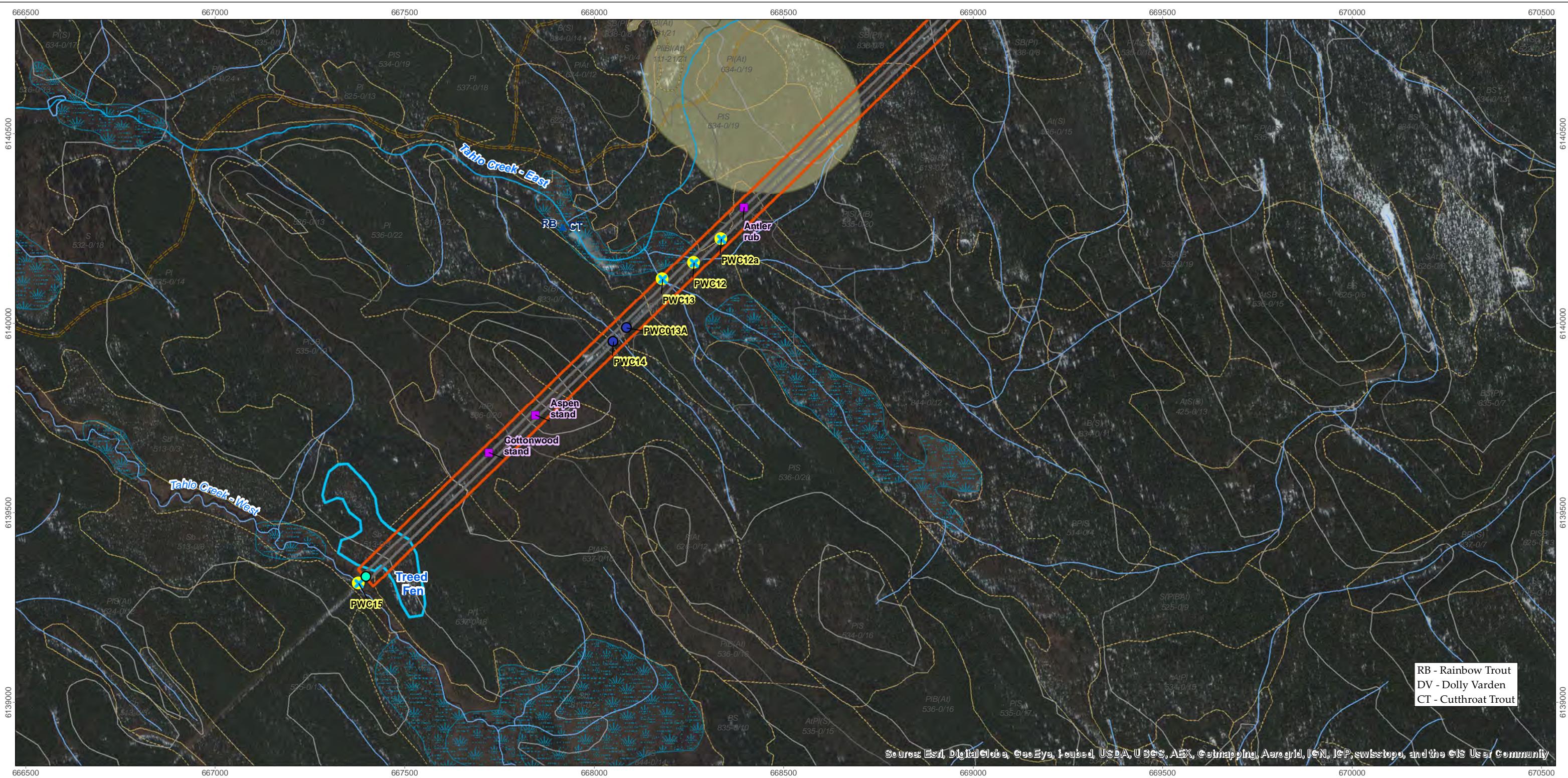


- Fish Records**
- Wildlife Observation
  - Non-classified Drainage (NCD)
  - NCD Wetland
  - Riparian Wetland
  - Stream Crossing
  - Existing Row
  - Proposed RoW
  - Fish Observation
  - Road Permit
  - Waterbody
  - Stream - Definite
  - Contour (100m)
  - Contour (20m)
  - Wetland
  - Forest Cover (VRI)



**ECOFOR**  
natural and cultural resource consultants  
Ecofor Consulting Ltd.  
EPN: 2016-2053-012  
Date: December-01-16 (MM)

**BC Hydro**  
Power smart



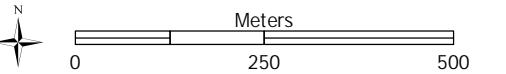
### Stream and Wildlife Survey Overview

30 m Powerline ROW Between Takla Landing and Fort Babine

Map 3 of 3

1:10,000

Meters



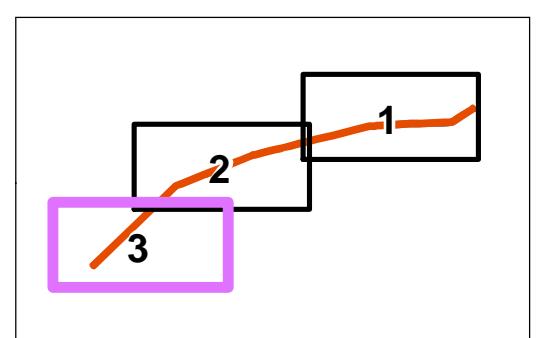
NAD 1983 UTM Zone 9N  
BCGS MAPSHEET: 93M.039/049  
NTS MAPSHEET: 93M/08

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- Wildlife Observation
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- ▲ Fish Observation
- Waterbody
- Stream - Definite
- Contour (100m)
- Contour (20m)
- Wetland
- Cutblock



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**APPENDIX 7 SITE PHOTOS**

# Fort Babine – Takla Landing ROW Site Photos



**Date:** Oct 5, 2016

**Comments:**

Trembling aspen stand typical of those on the western slopes of hills in the western half of the Project.



**Date:** Oct 4, 2016

**Comments:**

Black cottonwood stand mixed in with some aspen.



**Date:** Oct 4, 2016

**Comments:**

Bark stripped by moose in an aspen stand.

# Fort Babine – Takla Landing ROW Site Photos



**Date:** Oct 5, 2016

**Comments:**

Deer antler rub found on willow shrubs in a wet area.



**Date:** Oct 6, 2016

**Comments:**

Old woodpecker nest cavity in snag.  
Very few nest cavities were observed in the Project.



**Date:** Oct 5, 2016

**Comments:**

Squirrel midden that appears to have been adopted by an ermine (at red arrow).

**APPENDIX 8 SITE SPECIFIC PRESCRIPTIONS (PATHFINDER)**

AMU: DY0910-1028

Circuit: BAB 25F52

Structure: 172 168 to 308  
369

Road: 4000 Road (see Sec. 10)

Pre-work No.: \_\_\_\_\_

Contractor: L.H.I.

Estimated Date of Completion:

BCH Veg Coordinator: Ian Stacey

Office No.: \_\_\_\_\_

Cell No.: 250-961-8329

E-mail: idstacey@telus.net

**SIGNIFICANT OPERATIONAL ASPECTS**

## 1. PETROLEUM / CHEMICAL (REFER TO SOP 3)

- Do not leave fuels/oils on site when not attended.
- Ensure no fuel or refuelling is within RVMA's.

## 2. FIRE PREPAREDNESS

- To report a fire or fire activity call 1-800-663-5555 or \*5555 on most cellular networks.
- Fire Danger Web Site - URL: <http://bcwildfire.ca/hprScripts/DgrCIs/index.asp?Region=0>
- Slashing and Rolly works are considered high risk activities under the Wildfire Act.
- Water sources located at RVMA's 172 168 (S3), 194 453 (S3), 190 154 (S3 and S4), 059 203 (S3), and 2524894 (Lake/Wetland); see map for locations.

## 3. PROPERTIES

- Entire work area is on crown land.

## 4. WATER QUALITY

- Specific water quality strategies have not been identified or provided by BC Hydro for this project.
- The Vegetation Coordinator may provide further direction.

## 5. RIPARIAN MANAGEMENT (REFER TO SOP 4, 8, AND THE BC HYDRO AWPRV AGREEMENT)

- For further riparian information, refer to target and non-target species under Section 9 (Vegetation Management) & the AWPRV Riparian Prescription Card.

RIPARIAN NAME/ID	STREAM CLASS	AWPRV	PRESCRIPTION
172 168 (2d2)	S3	Yes	<p><b>On RoW:</b></p> <ul style="list-style-type: none"> <li>▪ No work required on RoW</li> </ul> <p><b>Timber Edge:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Pine spruce, and balsam 15cm dsh and greater and/or 8m in height and greater.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Pine, spruce, and balsam less than 15cm dsh and/or less than 8m in height.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
266 391 (2d2)	S3	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Pine, spruce, and balsam 2m in height and greater</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs</li> </ul> <p><b>Timber Edge:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Remove pine and spruce 15cm dsh and greater.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Pine and spruce less than 15cm dsh.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
190 154 (2d2)	S3 and S4	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Spruce, balsam, and pine 2m in height and greater.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid all damage to all low growing shrubs.</li> </ul> <p><b>Timber Edge:</b></p> <p><u>Topping:</u></p> <ul style="list-style-type: none"> <li>▪ Within 5m of both channels, top only spruce 30 dsh and greater to a height of 10m.</li> </ul> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Pine, spruce, balsam, and cottonwood 15 dsh and greater (except for spruce 30 dsh and greater within 5m of both channels – see topping section above).</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Pine, spruce, and balsam less than 15cm dsh.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Climbing equipment.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove</p>

AMU: DY0910-1028

Circuit: BAB 25F52

Structure: 172 168 to 308  
369

Road: 4000 Road (see Sec. 10)

Pre-work No.: \_\_\_\_\_

Contractor: L.H.I.

Estimated Date of Completion: \_\_\_\_\_

BCH Veg Coordinator: Ian Stacey

Office No.: \_\_\_\_\_

Cell No.: 250-961-8329

E-mail: idstacey@telus.net

			felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.
059 203 (2d2)	S3	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Within the first 5m of the RVMA on the east side, remove pine, spruce, and balsam 6m in height and greater</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ For the remainder on RoW, retain all vegetation.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>Timber Edge:</b></p> <p><u>Topping:</u></p> <ul style="list-style-type: none"> <li>▪ Within 5m of the stream, top only live balsam 30 dsh and greater to a height of 10m.</li> </ul> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ From the East RVMA boundary to the top of gully on the west side, and within the first 5m of the existing RoW edge, remove pine, balsam and spruce 10m in height and greater (except for balsam 30 dsh and greater within 5m of the stream – see topping section above).</li> <li>▪ From the top of gully on the west side, to the west RVMA boundary, within the first 5m of the existing RoW edge, remove pine, spruce, and balsam 8m in height and greater.</li> <li>▪ Starting from 5m past the existing RoW edge to the boundary ribbon, remove pine, balsam, and spruce 15 dsh and greater (except for balsam 30 dsh and greater within 5m of the stream – see topping section above).</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Snags heavily damaged by woodpeckers (tops are broken off and will not impact the line – wildlife trees)</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Climbing equipment.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
287 248 (2d2)	S4x2	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Spruce and balsam 4m in height and greater.</li> </ul> <p><u>Tall Slash:</u></p> <ul style="list-style-type: none"> <li>▪ Willow and alder 2m in height and greater to a treated height of 1.5m.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>Timber Edge:</b></p> <p><u>Topping:</u></p> <ul style="list-style-type: none"> <li>▪ Within 2m of both channels, top only spruce 30 dsh and greater to a height of 10m.</li> </ul> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Within the first 5m of the existing RoW edge, remove spruce and balsam 8m in height and greater (except for spruce 30 dsh and greater within 2m of both channels – see topping section above).</li> <li>▪ Starting from 5m past the existing RoW edge to the boundary ribbon, remove spruce and balsam 15 dsh and greater (except for spruce 30 dsh and greater within 2m of both channels – see topping section above).</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Climbing equipment.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
076 326 (2d2)	Wetland	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Pine, spruce, and balsam 8m in height and greater.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs</li> </ul> <p><b>Timber Edge: South of Road</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Within the first 5m of the existing RoW edge, remove pine, spruce, balsam, cottonwood, and aspen 8m in height and greater.</li> <li>▪ Starting from 5m past the existing RoW edge to the boundary ribbon, remove spruce, balsam, cottonwood, and aspen 8m in height and greater.</li> </ul> <p><b>North of the Road</b></p> <ul style="list-style-type: none"> <li>▪ Same as above, but within 5m of the wetland, top spruce, balsam, and pine 30 dsh and greater to a height of 15m.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p>

AMU: DY0910-1028

Circuit: BAB 25F52

Structure: 172 168 to 308  
369

Road: 4000 Road (see Sec. 10)

Pre-work No.: \_\_\_\_\_

Contractor: L.H.I.

Estimated Date of Completion:

BCH Veg Coordinator: Ian Stacey

Office No.: \_\_\_\_\_

Cell No.: 250-961-8329

E-mail: idstacey@telus.net

			<ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Climbing equipment.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
2524894 (2d2)	Lake/Wetland	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Balsam, spruce and pine 8 m height and greater.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>Timber edge:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Within the first 5 m of the existing RoW edge, remove pine, spruce, balsam and aspen 8 m height and greater.</li> <li>▪ Starting from 5m past the existing RoW edge to the boundary ribbon, remove spruce, balsam, pine and aspen 15 cm dsh and greater (except for below top of bank along the north boundary (see retain section below)).</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Between 308 369 and 245 389 along the north boundary, below the top of the bank, retain all spruce, balsam, aspen, and pine.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>Debris:</b></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><b>Equipment Required:</b></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p> <p>***This RVMA prescription is also in the 2016 Form 1</p>

## 6. FISH HABITAT MANAGEMENT (REFER TO SOP 4)

- Specific fish habitat management strategies have not been identified or provided by BC Hydro for this project.
- The Vegetation Coordinator may provide further direction.

## 7. WILDLIFE (REFER TO SOP 4)

- BC Conservation Data Centre screening for Species at Risk (SAR) and other legislated habitat parameters was completed on October 20, 2015. Included screening for SAR Masked Sensitive Occurrences, SAR Non-sensitive Occurrences, Fisheries Sensitive Watersheds, Wildlife Habitat Areas, and Ungulate Winter Range.
- **NO Overlaps** have been documented to occur within the work areas.
- During layout, no occurrences of SAR were found. Treatment crews should be aware of locally occurring SAR, and if during the course of treatment work, SAR are encountered, then work in the area should stop, and the finding should be reported to the Vegetation Coordinator.
- The active nests of most birds are protected by Federal and/or Provincial legislation. If active nests are encountered, do not disturb the nest, then use the BC Hydro Bird Nest flowchart, and seek advice from the Vegetation Coordinator for further action.
- Care should be taken to not disturb the soil and non-target vegetation.
- Specific wildlife management strategies have not been identified or provided by BC Hydro for this project.
- The Vegetation Coordinator may provide further direction.

## 8. HERITAGE (REFER TO SOP 4)

- **YES** known sites were found. There are 5 known Arch sites located within the work area.
  - Between 172 168 and 150 189: CMTs located on the west side of the RVMA
  - Between 344 016 and 320 039: CMTs located on the south boundary
  - Between 280 075 and 254 098: Grease trail (Old bladed trail) – 5m buffer hung in red flagging
  - Between 190 194 and 159 164: Grease trail (Old bladed trail) – 5m buffer hung in red flagging
  - Between 105 315 and 076 326: Grease trail (Old bladed trail) – 5m buffer hung in red flagging
- If during the course of treatment work, cultural heritage features are found, then work in the area should stop, and the finding should be reported to the Vegetation Coordinator.
- Further specific cultural heritage management strategies have not been identified or provided by BC Hydro for this project.
- The Vegetation Coordinator may provide further direction.

## 9. VEGETATION MANAGEMENT (HERBICIDE □ MANUAL ■ MECHANICAL ■) (REFER TO SOP 4 AND 8)

- Target vegetation includes spruce, balsam, pine, aspen, willow, alder and cottonwood
- Non target vegetation includes rose, twinberry, dogwood, high bush cranberry, and raspberry.

Break down for Treatment Unit (Rolly) is according to Timber type changes

TREATMENT UNIT	STRUCTURE/ LOCATION	COMMENTS
Rolly	172 168 to 121 212 (Sb <sub>10</sub> )  266 391 to 147 496 (Sb <sub>10</sub> )  100 538 to 022 604 (Sb <sub>9</sub> Sx <sub>1</sub> )	These areas are low, wet sections with black spruce as the leading species with some scattered balsam and pine. Saturated soils are present throughout and it is recommended to treat these areas in frozen conditions. The average slope is 1% and the average height is 15m with a maximum of 22m. The average stem diameter is 20cm with a maximum of 50cm. The average density is 1200 stems per hectare (1150@3a1, 50@3a2) which varies in each area depending on the level of saturated soils. Brush density varies as well ranging from 800 to 4200 stems per hectare. Dead standing timber is present throughout the work area at approximately 50 stems per hectare. Machine Free Zone is hung between 266 391 to 194 453 and 171 474 to 147 496 where there are high levels of saturated soils. Assess prior to machine entry.
Rolly	121 212 to 078 250 (Pl <sub>7</sub> Bl <sub>15</sub> Sx <sub>15</sub> )	

AMU: DY0910-1028

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	291 368 to 240 412 (Pl <sub>9</sub> Sx <sub>1</sub> )  171 474 to 075 560( Pl <sub>10</sub> )	These sections are on higher dry ground with pine as the dominant target species with scattered balsam and spruce. The average slope is 10% with a maximum of 20%. The average density of brush varies ranging from 200 to 2000 stems per hectare. The average density for tree size stems is 800 stems per hectare (750@3a1, 50@3a2). The average height is 20m with a maximum of 25m and the average stem diameter is 21cm with a maximum of 45cm. Dead standing timber is present throughout the work area ranging from 50 to 300 stems per hectare.
Rolly	011 309 to 291 368 (Sx <sub>5</sub> Bl <sub>3</sub> Pl <sub>2</sub> )	Located on a steep hill with an average slope of 55% and a maximum of 65%, this is the only area where spruce is the dominant target with scattered balsam and pine. The average density is 1800 stems per hectare (400@brush, 1200@3a1 and 200@3a2). The average height is 17m with a maximum of 25m. The average dsh is 23 cm with a maximum of 37cm. Dead standing timber is present throughout the work area at approximately 50 stems per hectare.
Rolly	078 250 to 332 332 (At <sub>8</sub> Sx <sub>2</sub> )	This is a small area with aspen as the dominant target species with scattered balsam and spruce. The average slope is 25% with a maximum of 30%. The average density is 2000 stems per hectare (600@brush, 1200@3a1 and 200@3a2). The average height is 24m with a maximum of 29m and the average dsh is 24 cm. Dead standing timber is present throughout the work area at approximately 50 stems per hectare.
Rolly	022 604 to 308 369 (variable)	This is the dominant type in the work area with balsam as the leading species with scattered pine and spruce. The average slope is 7% with a few sections of up to 60% - refer to map for locations. The average density for tree size stems is 900 stems per hectare (700@3a1, 200@3a2). Brush density is variable and ranges from 250 to 800 stems per hectare. The average height is 18m with a maximum of 27m. The average stem diameter is 25cm with a maximum of 50cm. Dead standing timber is present throughout the work area at approximately 50 stems per hectare.  There is a small section directly east of the NCW by 046 338 which has slopes over 60% and may require hand falling. Several other small sections between 344 016 to 190 154 have slopes between 50-60% and may require hand falling as well – refer to map for locations. One spruce located just outside of the southern work area is flagged with pink ribbon as it has the potential to just contact the line (190 154 +33m). The height is 30m and the stem diameter is 45cm.

**10. ROADS / ACCESS**

- From the bridge in Smithers, travel 3.5 km E on Hwy 16, then turn left onto Babine Lake Road. Continue for 50km then keep left onto the 4000 Road. At km 59 turn right onto the 5000 Road. **The Acorn gate is located at km 12 – key required at the MoF (\$100.00 deposit required per Key).** At km 14 keep left onto the 514 Road. Continue to the end of the road at which point turn right onto the 4000 Road. Stay on the main road until approximately km 8 where the cut block road is located.
- There are two machine access routes marked with pink flagging leading to the work site:
  - Preferred Access Route: This approach is the most direct but crosses the grease trail (marked with red gates at either end) and has a 40% grade for approximately 15m just before entering the work area. It also requires a ford across Tahlo Creek which is marked with pink flagging.
  - Alternate Access Route: This direction avoids crossing the grease trail and has more favourable grades. It also avoids going through mature timber as much as possible – the majority is brush size and small trees. This route avoids crossing Tahlo Creek but will require a ford through an S4 creek.
- From the end of the 4000 Road, a quad trail was established leading to structure 093 189.

**11. OTHER ISSUES / ASPECTS**

- Field layout completed October 26, 2015.
- Ribbon Colours are as follows:
  - Treatment boundary – Orange ‘R/W Boundary” winter weight ribbon
  - RVMA boundary – Orange “Riparian Management” and blue winter weight ribbons
  - Vegetation inventory plots – Blue and yellow poly ribbon
  - Guy wires – Pink winter weight ribbon.
  - MFZ boundary – Yellow “Machine Free Zone” winter weight ribbon
- Be aware of possible LOA issues. Depending on line sag, circuit load, and ambient temperature vegetation could enter within LOA. A daily assessment of line clearance should be completed prior to the commencement of mowing and slashing. If areas are found where vegetation has entered LOA, then contact the Vegetation Coordinator.
- Keep running surface and ditches of all roads, culverts and trails free of debris.

List of Attachments: Form 1a, 7 and 8, Treatment Maps, Check form 2 and 3.

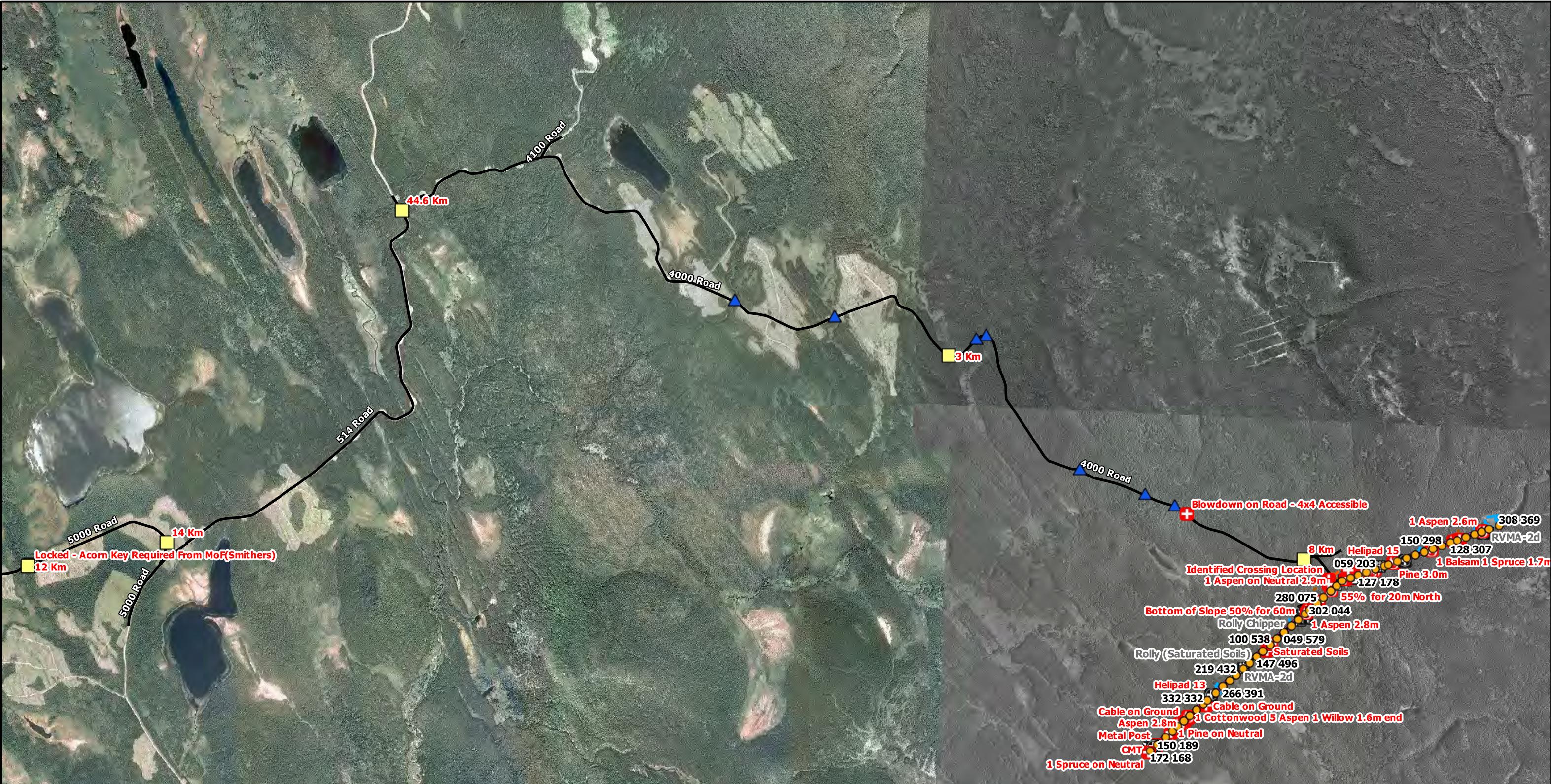
Name of Plan or Map: Vegetation Maintenance Program Plan/Map Date: \_\_\_\_\_

Pre-work Prepared By: Pathfinder Endeavours Ltd. Pre-work Date: \_\_\_\_\_

Pre-work Approved By: Ian Stacey

BCH Vegetation Coordinator

BCH Operations Manager



### Legend

BAB 25F52 Structures



Rolly Chipper

Rolly (Saturated Soils)

Rolly Chipper

RVMA

RVMA-2d

RVMA-6c

RVMA-NTZ

### Circuit Features - Points

■ Arch Site

▲ Bridge

■ Creek Ford

■ Gate

+ Helipad

■ Hotspot

■ Km Marker

■ Steep Slope

■ Tree Felling

■ Work Hazard

### Circuit Features - Lines

— Arch Buffer

— Distribution Line

— Grease Trail

--- NCD

— Road-2x4

— Road-4x4

--- Road-ATV

— Road-No Access

— Stream



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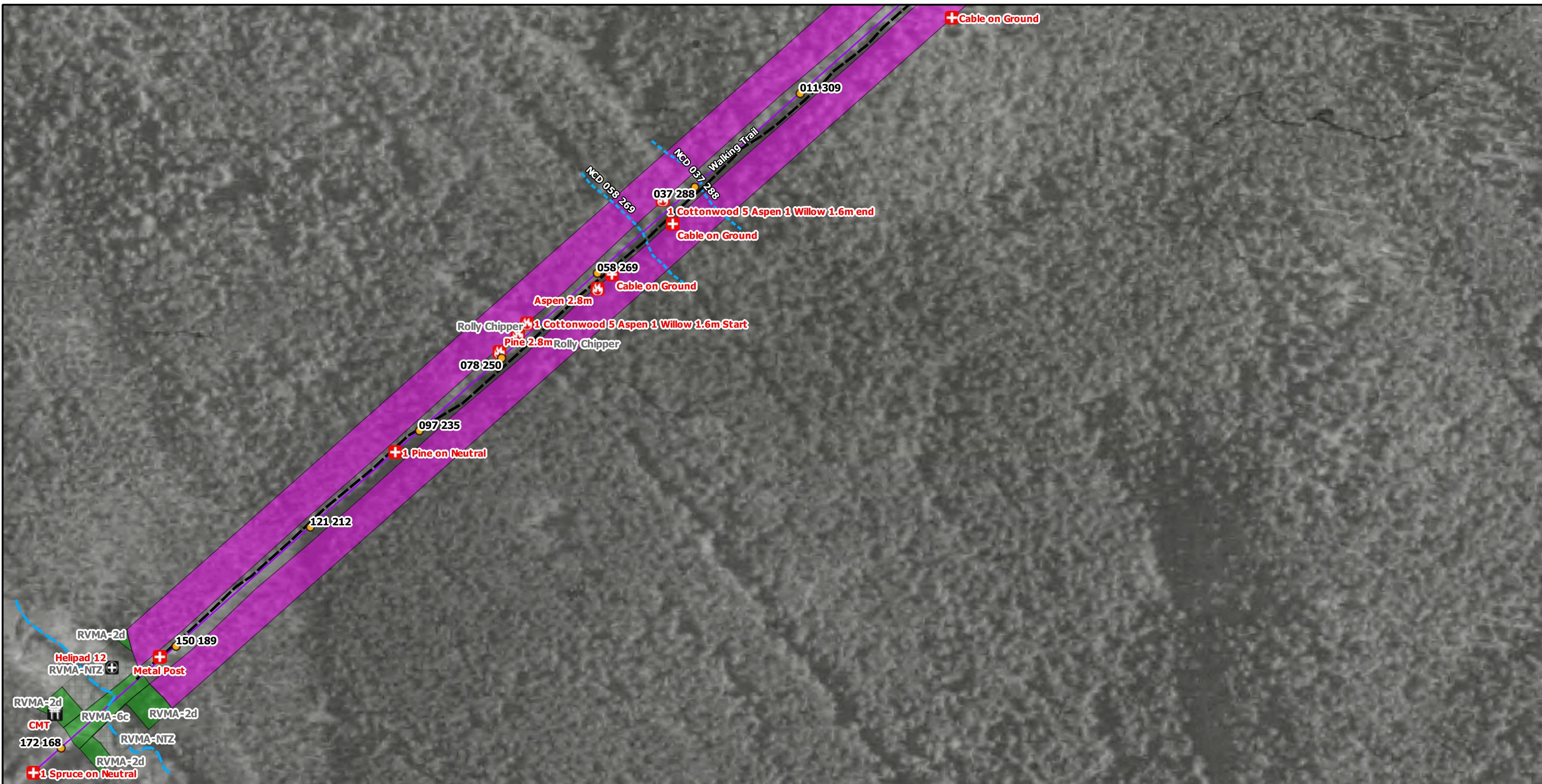
**BChydro**

Vegetation Maintenance  
Program (RoW Widening)  
**BAB 25F52**

172 168 to 308 369  
Access Map

	<b>BChydro</b>
<b>Vegetation Maintenance Program (RoW Widening) BAB 25F52 172 168 to 308 369 Access Map</b>	
Date	Nov 10, 2015
DWG NO	

Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.



### Legend

BAB 25F52 Structures



Rolly Chipper

Rolly (Saturated Soils)

Rolly Chipper

RVMA

RVMA-2d

RVMA-6c

RVMA-NTZ

### Circuit Features - Points

Arch Site

Bridge

Creek Ford

Gate

Helipad

Hotspot

Km Marker

Steep Slope

Tree Felling

Work Hazard

### Circuit Features - Lines

Arch Buffer

Distribution Line

Grease Trail

NCD

Road-2x4

Road-4x4

Road-ATV

Road-No Access

Stream



1:2500 0 25 50 75 100 m

**BChydro**

Vegetation Maintenance  
Program (RoW Widening)  
**BAB 25F52**  
172 168 to 308 369  
Treatment Map 1

	Date	Nov 10, 2015	DWG NO	
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Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.



### Legend

#### BAB 25F52 Structures



#### Rolly Chipper

- Rolly (Saturated Soils)
- Rolly Chipper

#### RVMA

- RVMA-2d
- RVMA-6c
- RVMA-NTZ

### Circuit Features - Points



### Circuit Features - Lines

— Arch Buffer

— Bridge

— Creek Ford

— Gate

— Helipad

— Hotspot

— Km Marker

— Steep Slope

— Tree Felling

— Work Hazard

— NCD

— Road-2x4

— Road-4x4

— Road-ATV

— Road-No Access

— Stream



1:2500 0 25 50 75 100 m

**BChydro**

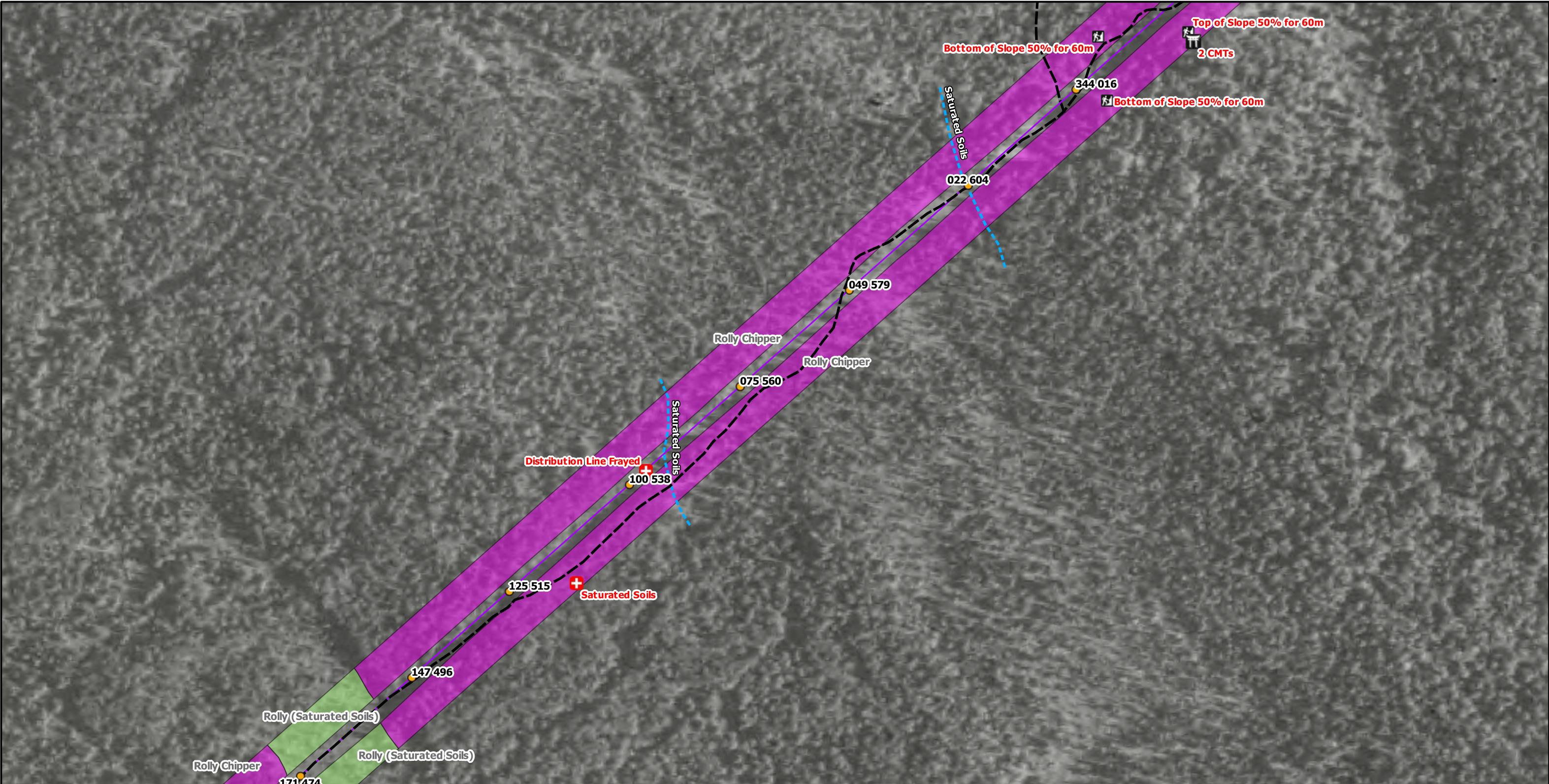
Vegetation Maintenance  
Program (RoW Widening)  
**BAB 25F52**

172 168 to 308 369  
Treatment Map 2

Date Nov 17, 2016

DWG NO

Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.



### Legend

#### BAB 25F52 Structures



#### Rolly Chipper

Rolly (Saturated Soils)

Rolly Chipper

#### RVMA

RVMA-2d

RVMA-6c

RVMA-NTZ

### Circuit Features - Points

- Arch Site
- Bridge
- Creek Ford
- Gate
- Helipad
- Hotspot
- Km Marker
- Steep Slope
- Tree Felling
- Work Hazard

### Circuit Features - Lines

- Arch Buffer
- Distribution Line
- Grease Trail
- NCD
- Road-2x4
- Road-4x4
- Road-ATV
- Road-No Access
- Stream



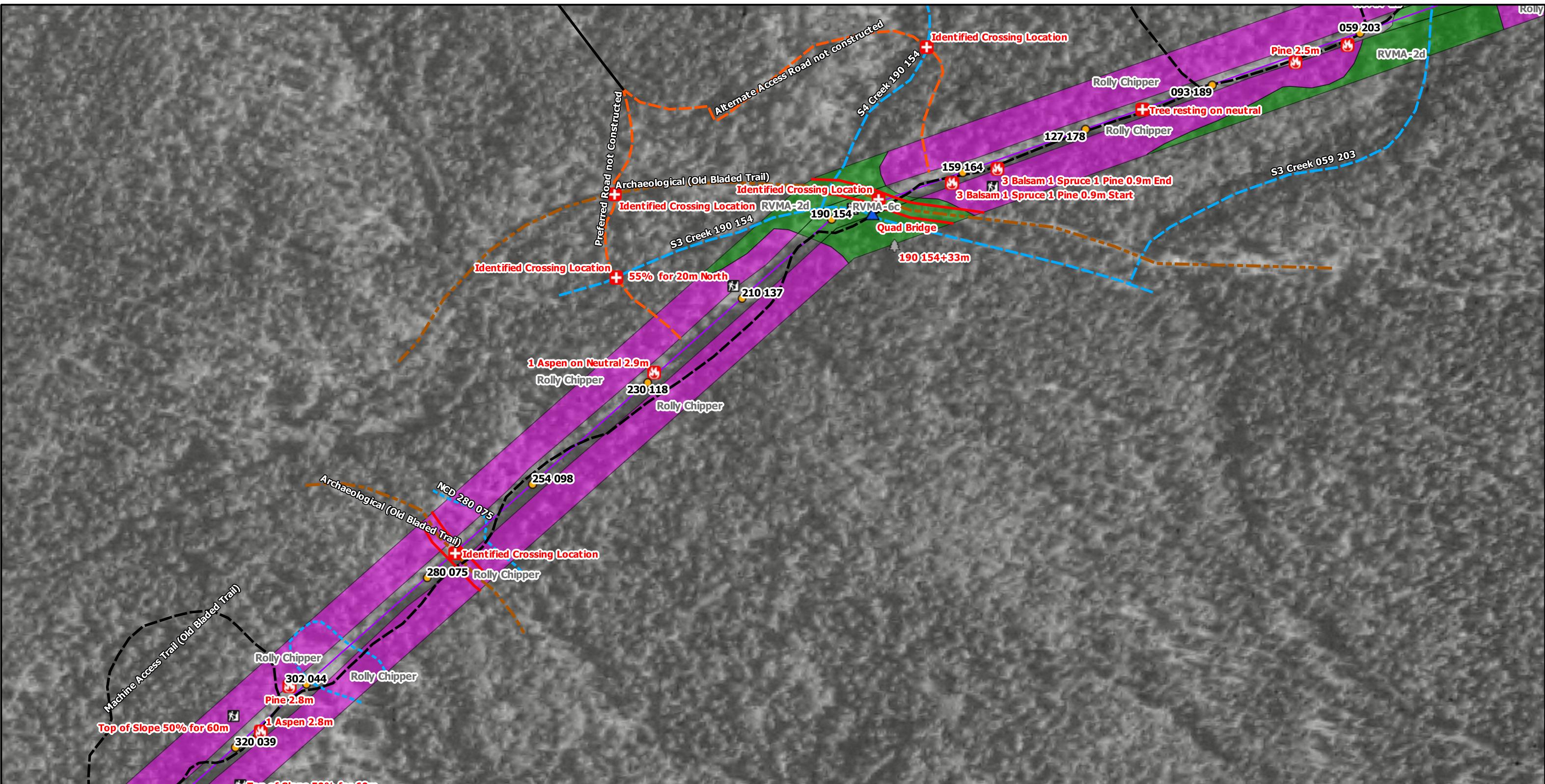
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**BChydro**

Vegetation Maintenance  
Program (RoW Widening)  
**BAB 25F52**  
172 168 to 308 369  
Treatment Map 3

	Date	Nov 17, 2016	DWG NO	
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Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.



### Legend

BAB 25F52 Structures

Rolly Chipper

RVMA

RVMA-2d

RVMA-6c

RVMA-NTZ

### Circuit Features - Points

Arch Site

Bridge

Creek Ford

Gate

Helipad

Hotspot

Km Marker

Steep Slope

Tree Felling

Work Hazard

### Circuit Features - Lines

Arch Buffer

Distribution Line

Grease Trail

NCD

Road-2x4

Road-4x4

Road-ATV

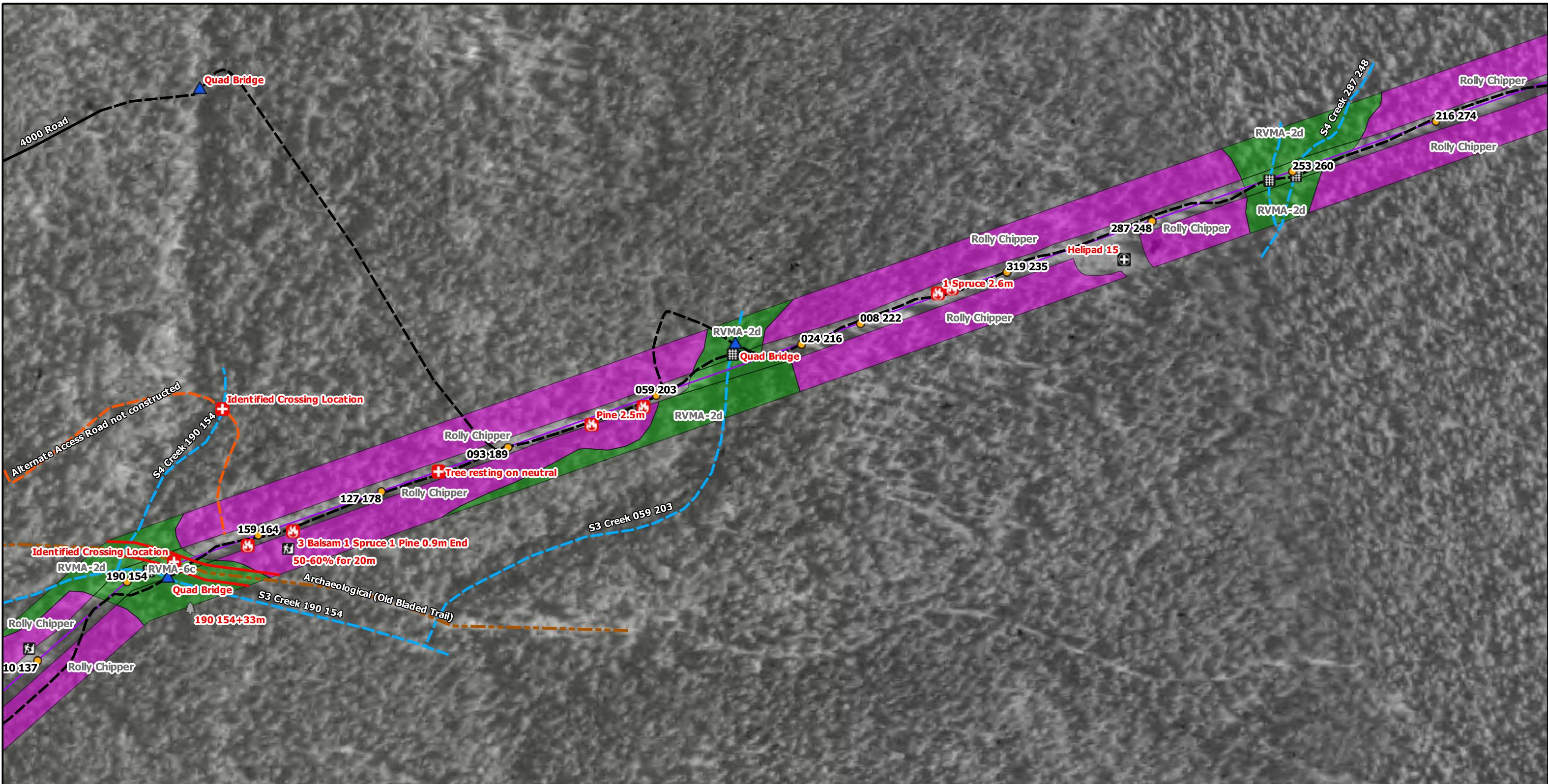
Road-No Access

Stream



Vegetation Maintenance Program (RoW Widening) BAB 25F52 172 168 to 308 369 Treatment Map 4	
Date	Nov 17, 2016
DWG NO	

Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.



### Legend

BAB 25F52 Structures



Rolly Chipper

Rolly (Saturated Soils)

Rolly Chipper

RVMA

RVMA-2d

RVMA-6c

RVMA-NTZ

### Circuit Features - Points

Arch Site

Bridge

Creek Ford

Gate

Helipad

Hotspot

Km Marker

Steep Slope

Tree Felling

Work Hazard

### Circuit Features - Lines

Arch Buffer

Distribution Line

Grease Trail

NCD

Road-2x4

Road-4x4

Road-ATV

Road-No Access

Stream



1:2500 0 25 50 75 100 m

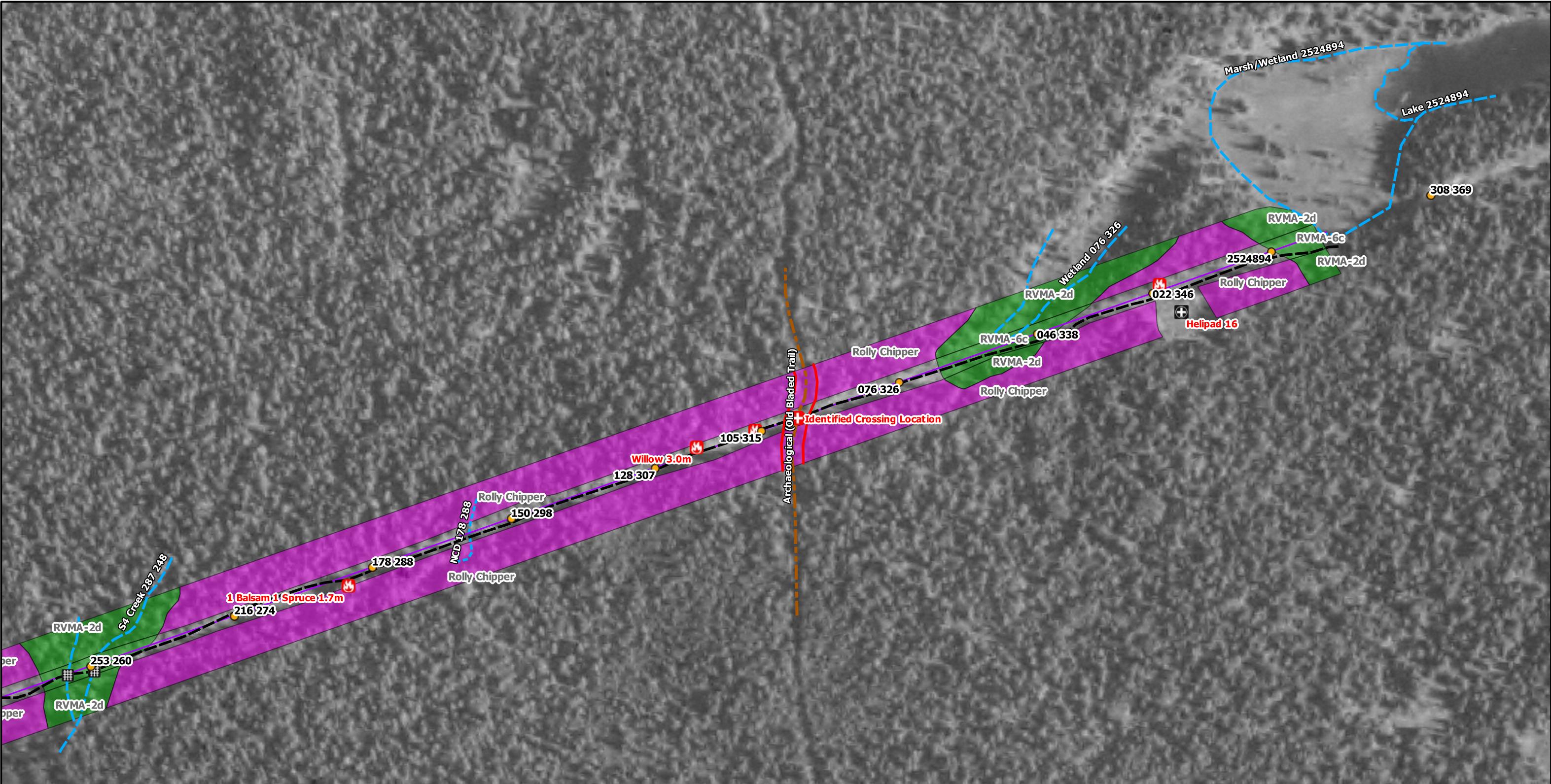
**BChydro**

Vegetation Maintenance  
Program (RoW Widening)  
**BAB 25F52**

172 168 to 308 369  
Treatment Map 5

	BChydro	
	Vegetation Maintenance Program (RoW Widening) <b>BAB 25F52</b>	172 168 to 308 369 Treatment Map 5
Date	Nov 17, 2016	DWG NO

Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.



### Legend

#### BAB 25F52 Structures



#### Rolly Chipper

- Rolly (Saturated Soils)
- Rolly Chipper

#### RVMA

- RVMA-2d
- RVMA-6c
- RVMA-NTZ

### Circuit Features - Points

- Arch Site
- △ Bridge
- Creek Ford
- Gate
- +/- Helipad
- Hotspot
- Km Marker
- #/# Steep Slope
- Tree Felling
- +/- Work Hazard

### Circuit Features - Lines

- Arch Buffer
- Distribution Line
- Grease Trail
- NCD
- Road-2x4
- Road-4x4
- Road-ATV
- Road-No Access
- Stream



1:2500 0 25 50 75 100 m

**BChydro**

Vegetation Maintenance  
Program (RoW Widening)  
**BAB 25F52**  
172 168 to 308 369  
Treatment Map 6

	<b>BChydro</b>
Vegetation Maintenance Program (RoW Widening) <b>BAB 25F52</b>	
172 168 to 308 369	Treatment Map 6
Date	Nov 17, 2016
DWG NO	

Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.

AMU: \_\_\_\_\_ Circuit: BAB 25F52 Structure: 2524894 to 2468049 Road: 4000 Road (see Sec. 10)  
 Pre-work No.: \_\_\_\_\_ Contractor: L.H.I. Estimated Date of Completion: \_\_\_\_\_  
 BCH Veg Coordinator: Ian Stacey Office No.: \_\_\_\_\_ Cell No.: 250-961-8329 E-mail: idstacey@telus.net

**SIGNIFICANT OPERATIONAL ASPECTS**

- 1. PETROLEUM / CHEMICAL (REFER TO SOP 3)
  - Do not leave fuels/oils on site when not attended.
  - Ensure no fuel or refuelling is within RVMA.
- 2. FIRE PREPAREDNESS
  - To report a fire or fire activity call 1-800-663-5555 or \*5555 on most cellular networks.
  - Fire Danger Web Site - URL: <http://bcwildfire.ca/hprScripts/DgrCls/index.asp?Region=0>
  - Slashing and mechanical treatment are considered a high risk activity under the Wildfire Act.
  - Water sources located at RVMA 252 4894 Lake, 064 573 (S3), 104 578 (S4), 285 585 (S4), 182 585 (S4), 150 585 (S3, S4)
- 3. PROPERTIES
  - Entire work area is on crown land.
- 4. WATER QUALITY
  - Specific water quality strategies have not been identified or provided by BC Hydro for this project.
  - The Vegetation Coordinator may provide further direction.
- 5. RIPARIAN MANAGEMENT (REFER TO SOP 4, 8, AND THE BC HYDRO AWPRV AGREEMENT)
  - For further riparian information, refer to target and non-target species under Section 9 (Vegetation Management) & the AWPRV Riparian Prescription Card.

RIPARIAN NAME/ID	STREAM CLASS	AWPRV	PREScription
252 4894 (2d2)	Lake	Yes	<p><b>On RoW:</b></p> <p><b>Remove:</b></p> <ul style="list-style-type: none"> <li>▪ Balsam, spruce and pine 8 m height and greater.</li> </ul> <p><b>Retain:</b></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>Timber edge:</b></p> <p><b>Remove:</b></p> <ul style="list-style-type: none"> <li>▪ Within the first 5 m of the existing RoW edge, remove pine, spruce, balsam and aspen 8 m in height and greater.</li> <li>▪ Starting from 5m past the existing RoW edge to the boundary ribbon, remove spruce, balsam, pine and aspen 15 cm dsh and greater (except for below top of bank along the north boundary (see retain section below)).</li> </ul> <p><b>Retain:</b></p> <ul style="list-style-type: none"> <li>▪ Between 308 369 and 245 389 along the north boundary, below the top of the bank, retain all spruce, balsam, aspen, and pine.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>Debris:</b></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><b>Equipment Required:</b></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
064 573 (2d2)	S3	Yes	<p><b>On RoW:</b></p> <ul style="list-style-type: none"> <li>▪ No work required on RoW.</li> </ul> <p><b>Timber edge:</b></p> <p><b>Topping:</b></p> <ul style="list-style-type: none"> <li>▪ Within 5m of the stream and within the first 5m of the existing RoW edge, top spruce 30 dsh and greater to a height of 8m.</li> <li>▪ Within 5 m of the stream and starting from 5m past the existing RoW edge to the boundary ribbon, top spruce 30 dsh and greater to a height of 10 m.</li> </ul> <p><b>Remove:</b></p> <ul style="list-style-type: none"> <li>• Remove spruce, pine and balsam 15 cm dsh and greater (except for spruce 30 dsh and greater within 5m of the channel – see topping section above).</li> </ul> <p><b>Retain:</b></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>Debris:</b></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><b>Equipment Required:</b></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Climbing equipment</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
104 578 (2d2)	S4 x2	Yes	<p><b>On RoW:</b></p> <p><b>Remove:</b></p> <ul style="list-style-type: none"> <li>▪ Within 5m from center, remove balsam and spruce 5 m in height and greater.</li> </ul> <p><b>Previously Manually Treated Area (South RoW Edge)</b></p> <p><b>Remove:</b></p> <ul style="list-style-type: none"> <li>▪ Remove 2 balsam trees marked with pink flagging, and 2 balsam trees just inside the work area.</li> </ul> <p><b>Retain:</b></p> <ul style="list-style-type: none"> <li>▪ For the remainder on RoW, retain all vegetation.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>North Timber edge:</b></p>

AMU: \_\_\_\_\_ Circuit: BAB 25F52 Structure: 2524894 to 2468049 Road: 4000 Road (see Sec. 10)  
 Pre-work No.: \_\_\_\_\_ Contractor: L.H.I. Estimated Date of Completion: \_\_\_\_\_  
 BCH Veg Coordinator: Ian Stacey Office No.: \_\_\_\_\_ Cell No.: 250-961-8329 E-mail: idstacey@telus.net

			<p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Remove balsam and spruce 15 cm dsh and greater.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
285 585 (2d2)	S4	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Within 5m from center, remove balsam and spruce 5 m in height and greater.</li> </ul> <p><b>Previously Manually Treated Area (South RoW Edge)</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Remove 3 spruce and 1 balsam trees just in the work area.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ For the remainder on RoW, retain all vegetation.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>North Timber edge:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Remove balsam and spruce 15 cm dsh and greater.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p>
182 585 (2d2)	S4	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Within 5m either side from center, remove balsam, pine, alder and spruce 3 m in height and greater.</li> </ul> <p><b>Previously Manually Treated Area (South RoW Edge)</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Remove 1 spruce marked with pink flagging.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ For the remainder on RoW, retain all vegetation.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>North Timber edge:</b></p> <p><u>Topping:</u></p> <ul style="list-style-type: none"> <li>▪ Within 5 m of the channel, top only spruce 30 dsh and greater to a height of 10 m.</li> </ul> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Remove balsam, pine and spruce 15 cm dsh and greater (except for spruce 30 dsh and greater within 5m of the channel – see topping prescription above).</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Climbing equipment</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.</p> <p>***Hotspot in RVMA - CUA Required. ***</p>
150 585 (2d2)	S4 x2 S3 x1	Yes	<p><b>On RoW:</b></p> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Further than 5 m from the stream, remove alder 4 m in height and greater.</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Within 5 m from the stream, retain alder.</li> <li>▪ For the remainder on RoW, retain all vegetation.</li> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><b>Timber edge:</b></p> <p><u>Topping:</u></p> <ul style="list-style-type: none"> <li>• Within the first 2m of all channels, top only spruce 30 dsh and greater to a height of 10m.</li> </ul> <p><u>Remove:</u></p> <ul style="list-style-type: none"> <li>▪ Within the first 5 m of the existing RoW edge, remove pine, spruce and balsam 8 m in height and greater (except for spruce 30 dsh and greater within 2m of channel – see topping prescription above).</li> <li>▪ Starting from 5m past the existing RoW edge to the boundary ribbon, remove spruce, balsam, and pine 15 cm dsh and greater (except for spruce 30 dsh and greater within 2m of channel – see topping prescription above).</li> </ul> <p><u>Retain:</u></p> <ul style="list-style-type: none"> <li>▪ Avoid damage to all low growing shrubs.</li> </ul> <p><u>Debris:</u></p> <ul style="list-style-type: none"> <li>▪ Cut scatter and lay flat all debris to lengths of 2m or less.</li> </ul>

AMU: \_\_\_\_\_ Circuit: BAB 25F52 Structure: 2524894 to 2468049 Road: 4000 Road (see Sec. 10)  
 Pre-work No.: \_\_\_\_\_ Contractor: L.H.I. Estimated Date of Completion: \_\_\_\_\_  
 BCH Veg Coordinator: Ian Stacey Office No.: \_\_\_\_\_ Cell No.: 250-961-8329 E-mail: idstacey@telus.net

			<ul style="list-style-type: none"> <li>▪ Ensure all debris is clear of channel and above high water mark.</li> </ul> <p><u>Equipment Required:</u></p> <ul style="list-style-type: none"> <li>▪ Brush saw.</li> <li>▪ Chainsaw.</li> <li>▪ Climbing equipment.</li> <li>▪ Rolly is permitted to reach in 5m ensuring tracks do not enter RVMA.</li> </ul> <p>Trees greater than 5m from the RVMA boundary to be hand felled away from stream channel. Rolly can remove felled trees and chip to reduce fuel loading, while ensuring tracks do not enter RVMA.    ***Hotspot in RVMA - CUA Required. ***</p>
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#### 6. FISH HABITAT MANAGEMENT (REFER TO SOP 4)

- Specific fish habitat management strategies have not been identified or provided by BC Hydro for this project.
- The Vegetation Coordinator may provide further direction.

#### 7. WILDLIFE (REFER TO SOP 4)

- BC Conservation Data Centre screening for Species at Risk (SAR) and other legislated habitat parameters was completed on September 15th, 2016. Included screening for SAR Masked Sensitive Occurrences, SAR Non-sensitive Occurrences, Fisheries Sensitive Watersheds, Wildlife Habitat Areas, and Ungulate Winter Range.
- **NO Overlaps** have been documented to occur within the work areas.
- During layout, no occurrences of SAR were found. Treatment crews should be aware of locally occurring SAR, and if during the course of treatment work, SAR are encountered, then work in the area should stop, and the finding should be reported to the Vegetation Coordinator.
- The active nests of most birds are protected by Federal and/or Provincial legislation. If active nests are encountered, do not disturb the nest, then use the BC Hydro Bird Nest flowchart, and seek advice from the Vegetation Coordinator for further action.
- Care should be taken to not disturb the soil and non-target vegetation.
- Specific wildlife management strategies have not been identified or provided by BC Hydro for this project.
- The Vegetation Coordinator may provide further direction.

#### 8. HERITAGE (REFER TO SOP 4)

- **YES** known sites were found. There are 2 known Arch sites located within the work area.
  - Between 245 389 and 215 396: CMT's located along the north boundary.
  - Between 033 435 and 002 442: CMT's located along the north boundary.
- If during the course of treatment work, cultural heritage features are found, then work in the area should stop, and the finding should be reported to the Vegetation Coordinator.
- Further specific cultural heritage management strategies have not been identified or provided by BC Hydro for this project.
- The Vegetation Coordinator may provide further direction.

#### 9. VEGETATION MANAGEMENT (HERBICIDE MANUAL MECHANICAL ) (REFER TO SOP 4 AND 8)

- Target vegetation includes spruce, balsam, pine, aspen, willow, alder and cottonwood
- Non target vegetation includes rose, twinberry, dogwood, high bush cranberry, and raspberry.

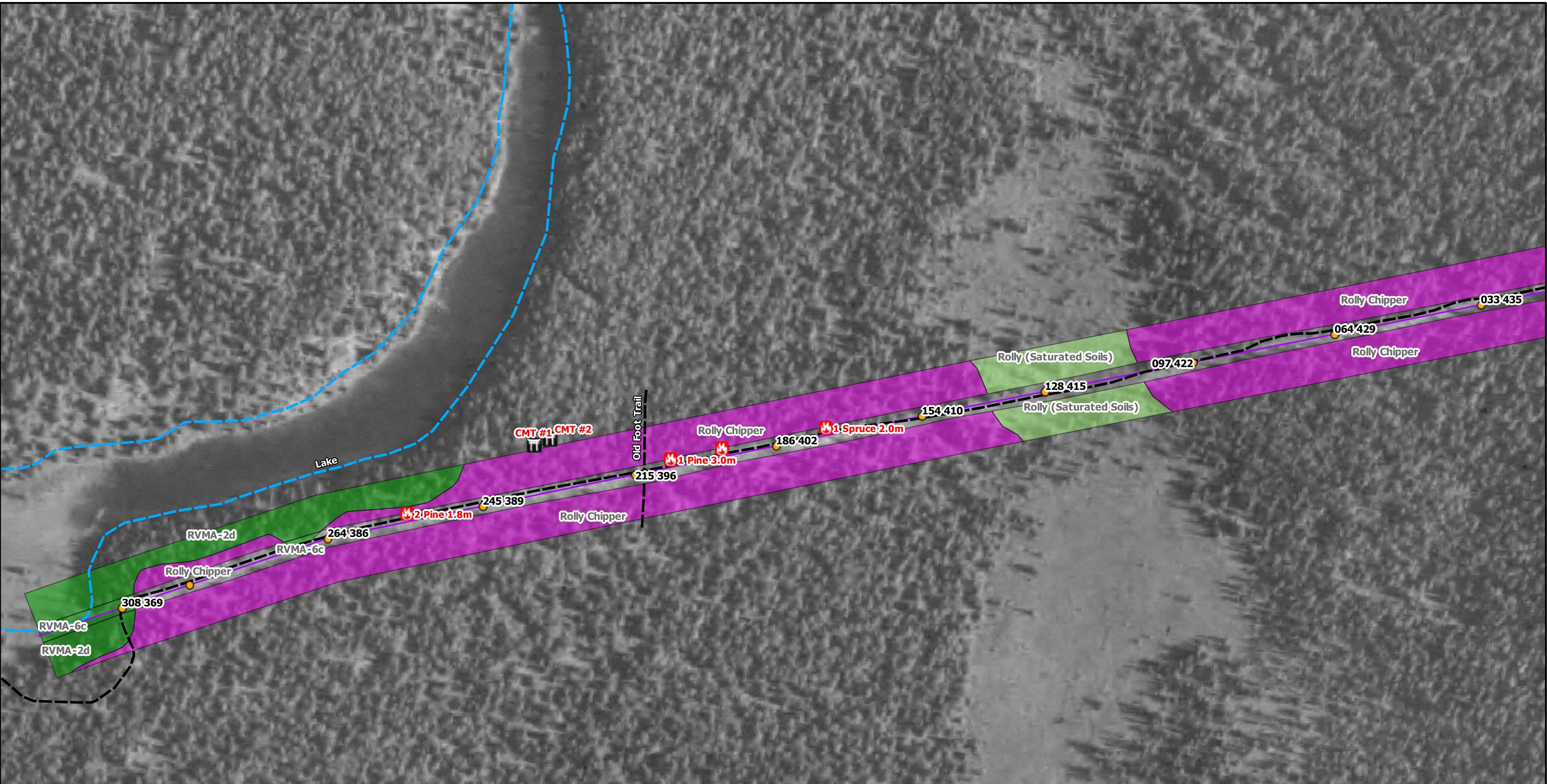
Break down for Treatment Unit (Rolly) is according to Timber type changes

TREATMENT UNIT	STRUCTURE/ LOCATION	COMMENTS
Rolly	2524894 to 128 415 (Bl <sub>7</sub> Pl <sub>3</sub> )	This is the dominant type in the work area with balsam as the leading species with scattered pine and spruce. The average slope is 5% to a maximum of 15%. The average density for tree size stems is 1000 stems per hectare (800@3a1, 200@3a2, several scattered @ 3a3). Brush density is variable and ranges from 2600 to 4800 stems per hectare. The average height is 18 m with a maximum of 25 m. The average stem diameter is 22 cm with a maximum of 60 cm. Dead standing timber is present throughout the work area at approximately 50 stems per hectare.
Rolly/saturated soils	154 410 to 097 422 (Sb <sub>10</sub> )	Machine Free Zone is hung between 154 410 and 097 422 where there are high levels of saturated soils. Assess prior to machine entry. Rolly work in frozen conditions. Black spruce is the leading specie within this unit with scattered balsam and pine on higher ground. The average density is 800 stems per hectare. (800@3a1) The average height is 15 m to a maximum of 25 m. The average stem diameter is 15 cm with a maximum of 30 cm. Dead standing timber is present throughout the work area at approximately 50 stems per hectare.
Rolly	128 415 to 064 573 (Bl <sub>9</sub> Sx <sub>1</sub> )	This is the dominant type in the work area with balsam as the leading species with scattered spruce and pine. The average slope is 5% to a maximum of 12%. The average density for tree size stems is 1200 stems per hectare (700@3a1, 500@3a2). Brush density is variable and ranges from 2500 to 5000 stems per hectare. The average height is 15m with a maximum of 25m. The average stem diameter is 24cm with a maximum of 42cm. Dead standing timber is present throughout the work area at approximately 50 stems per hectare.
Rolly	114 567 to 267 576 (Bl <sub>4</sub> Sx <sub>3</sub> Sb <sub>3</sub> )	The terrain for this section is rolling with an average slope of 6% to a maximum of 15%. This section consists mainly of balsam and spruce with scattered pine and cottonwood. The average height is 12 m to a maximum of 22 m. The average stem diameter is 18 cm to a maximum of 42 cm. The average density is 1000 stems per hectare. (400@3a1, 600@3a2). Brush density is variable and ranges from 1000 to 5000 stems per hectare. Dead standing timber is present throughout the work area at approximately 50 stems per hectare.
Rolly/debris management	267 576 to 150 585	This section was manually widened and the Rolly chipper will be required for debris management. Some trees are to be removed along the boundary as well as scattered trees up to 5 m outside the boundary which have been identified with pink ribbon (see map for details). The main vegetation on RoW consists of balsam and spruce. The average density is 1500 stems per hectare. The average height is 4 m. The average stem diameter is 6 cm with approximately 10 stems over 15 cm stem diameter. The average slope is 15% to a maximum of 40%.
Rolly	065 579 to 068 028 (Bl <sub>8</sub> Sx <sub>2</sub> )	The terrain for this section is rolling and the slope varies from 8% to 20%. A small island of treatment is present within 150 585 RVMA. The vegetation consists mainly of balsam and spruce. The average height is 14 m to a maximum of 25 m. The average stem diameter is 20 cm to a maximum of 57 cm. The average density is 1200 stems per hectare. (1000@3a1, 200@3a2, 1800@ brush). Dead standing timber is present throughout the work area at approximately 50 stems per hectare.
Rolly	068 028 to 246 8049 (Pl <sub>8</sub> Sx <sub>2</sub> )	The terrain for this section is level and the slope varies from 10% to 20%. A section is present between 014 059 and 246 8049 with a slope of 60%. The vegetation consists mainly of pine and spruce with scattered balsam and aspen. The average height is 20 m to a maximum of 40 m. The average stem diameter is 25 cm to a maximum of 65 cm. The average density is 1250 stems per hectare. (600@3a1, 600@3a2, 50@3a3, 4000@ brush). Dead standing timber is present throughout the work area at approximately 500 stems per hectare.

AMU: \_\_\_\_\_ Circuit: BAB 25F52 Structure: 2524894 to 2468049 Road: 4000 Road (see Sec. 10)  
 Pre-work No.: \_\_\_\_\_ Contractor: L.H.I. Estimated Date of Completion: \_\_\_\_\_  
 BCH Veg Coordinator: Ian Stacey Office No.: \_\_\_\_\_ Cell No.: 250-961-8329 E-mail: idstacey@telus.net

<p>10. ROADS / ACCESS</p> <ul style="list-style-type: none"> <li>▪ From the bridge in Smithers, travel 3.5 km E on Hwy 16, then turn left onto Babine Lake Road. Continue for 50km then keep left onto the 4000 Road. At km 59 turn right onto the 5000 Road. <b>The Acorn gate is located at km 12 – key required at the MoF (\$100.00 deposit required per Key).</b> At km 14 keep left onto the 514 Road. Continue to the end of the road at which point turn right onto the 4000 Road. Stay on the main road until approximately km 8 where the cut block road is located.</li>   <li>▪ From the end of the 4000 Road, a quad trail was established leading to structure 093 189.</li> </ul> <p>11. OTHER ISSUES / ASPECTS</p> <ul style="list-style-type: none"> <li>▪ Field layout completed October 26th 2016</li> <li>▪ Ribbon Colours are as follows:           <ul style="list-style-type: none"> <li>• Treatment boundary – Orange ‘R/W Boundary” winter weight ribbon</li> <li>• RVMA boundary – Orange “Riparian Management” and blue winter weight ribbons</li> <li>• Vegetation inventory plots – Blue and yellow poly ribbon</li> <li>• Guy wires, hazards and Trees greater than 30m from circuit– Pink winter weight ribbon</li> <li>• MFZ boundary – Yellow “Machine Free Zone” winter weight ribbon</li> <li>• CMT’s identified by Pathfinder – Pink and red winter weight ribbon</li> <li>• CMT’s identified by the archeologist – Pink “CMT” winter weight ribbon</li> </ul> </li>   <li>▪ Be aware of possible LOA issues. Depending on line sag, circuit load, and ambient temperature vegetation could enter within LOA. A daily assessment of line clearance should be completed prior to the commencement of mowing and slashing. If areas are found where vegetation has entered LOA, then contact the Vegetation Coordinator.</li> <li>▪ Keep running surface and ditches of all roads, culverts and trails free of debris.</li> </ul>		

List of Attachments: Form 1a, 7 and 8, Treatment Maps, Check form 2 and 3 Species at Risk Listing applicable to the project area.  
 Name of Plan or Map: Vegetation Maintenance Program Plan/Map Date: \_\_\_\_\_  
 Pre-work Prepared By: Pathfinder Endeavours Ltd. Pre-work Date: \_\_\_\_\_  
 Pre-work Approved By: Ian Stacey Wayne Clarke  
 BCH Vegetation Coordinator BCH Operations Manager



### Legend

BAB 25F52 Structures



Rolly Chipper

■ Rolly (Saturated Soils)

■ Rolly Chipper

■ Rolly Chipper (Debris Management)

RVMA

■ RVMA-2d

■ RVMA-6c

■ RVMA-NTZ

### Circuit Features - Points

■ Arch Site

■ Creek Ford

+/- Helipad

🔥 Hotspot

↗ Steep Slope

🌲 Tree Felling

+/- Work Hazard

### Circuit Features - Lines

— Distribution Line

--- NCD

— Road-ATV

— Stream

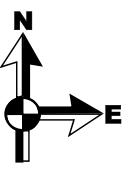


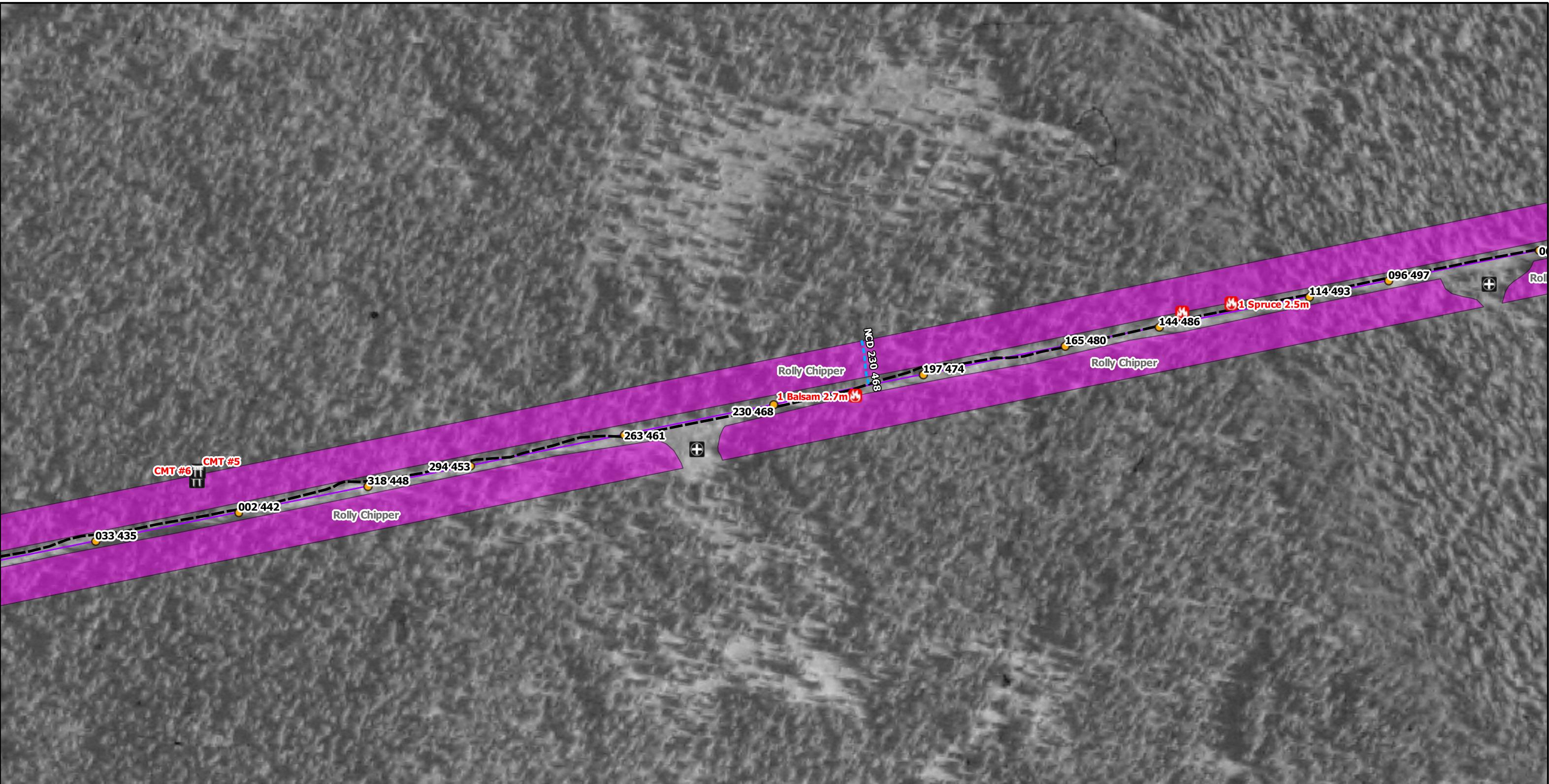
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Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.

**BChydro**

Vegetation Maintenance  
Program (RoW Widening)  
**BAB 25F52**  
2524894 to 2468049  
Treatment Map 1

	<b>Date</b> Nov 18, 2016	<b>DWG NO</b>
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### Legend

BAB 25F52 Structures



Rolly Chipper

  Rolly (Saturated Soils)

  Rolly Chipper

  Rolly Chipper (Debris Management)

RVMA

  RVMA-2d

  RVMA-6c

  RVMA-NTZ

### Circuit Features - Points

T Arch Site

# Creek Ford

+ Helipad

🔥 Hotspot

S Steep Slope

🌲 Tree Felling

+ Work Hazard

### Circuit Features - Lines

— Distribution Line

— NCD

— Road-ATV

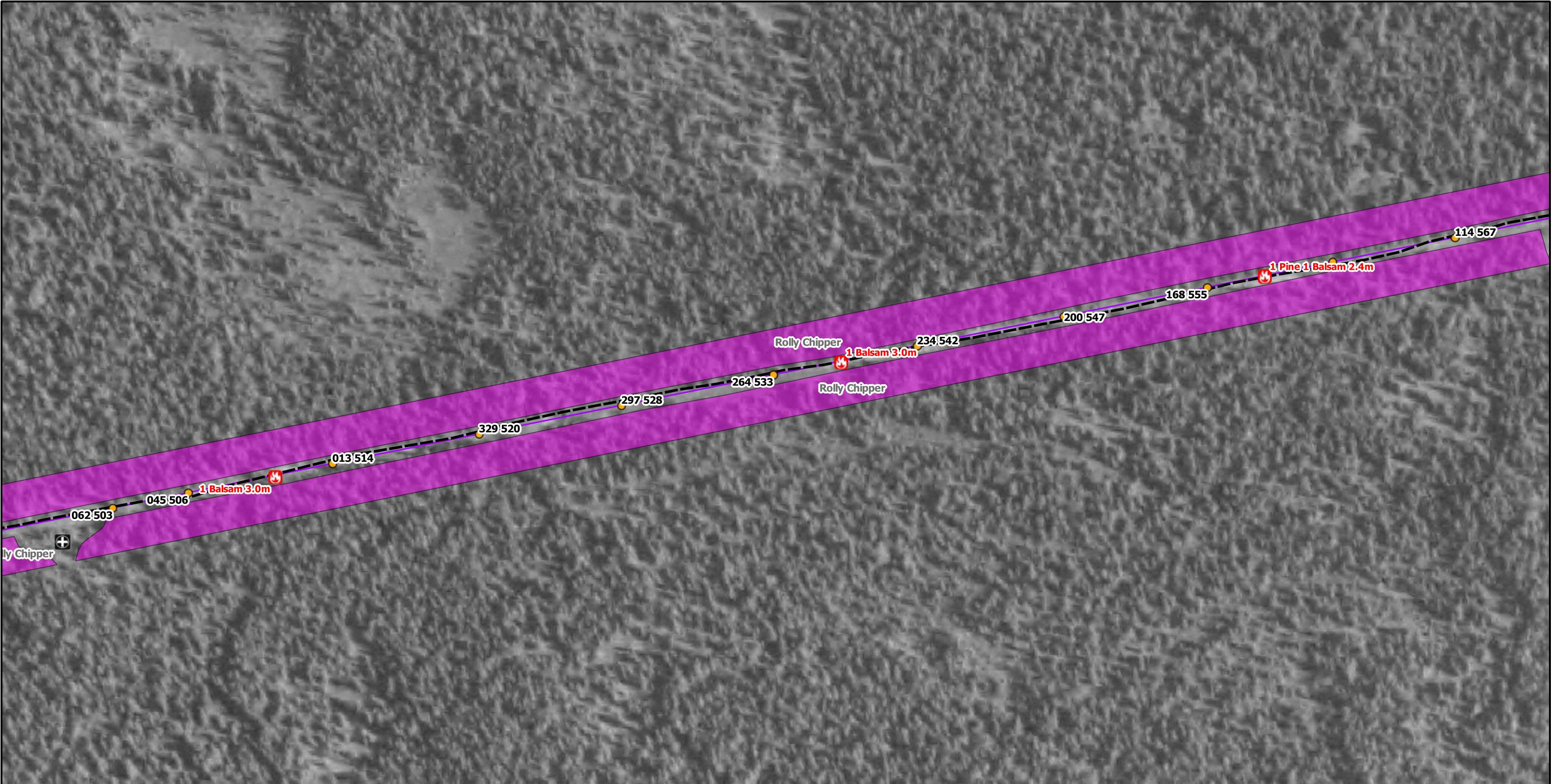
— Stream



1:2500 0 25 50 75 100 m

	<b>BChydro</b>
<b>Vegetation Maintenance Program (RoW Widening) BAB 25F52 2524894 to 2468049 Treatment Map 2</b>	
Date	Nov 18, 2016
DWG NO	

Map Notes:  
 1. Datum: NAD83  
 2. Projection: BC Albers  
 3. Base Data: Province of B.C.



### Legend

BAB 25F52 Structures



Rolly Chipper

■ Rolly (Saturated Soils)

■ Rolly Chipper

■ Rolly Chipper (Debris Management)

RVMA

■ RVMA-2d

■ RVMA-6c

■ RVMA-NTZ

### Circuit Features - Points

■ Arch Site

■ Creek Ford

+ Helipad

■ Hotspot

△ Steep Slope

■ Tree Felling

+ Work Hazard

### Circuit Features - Lines

— Distribution Line

— NCD

— Road-ATV

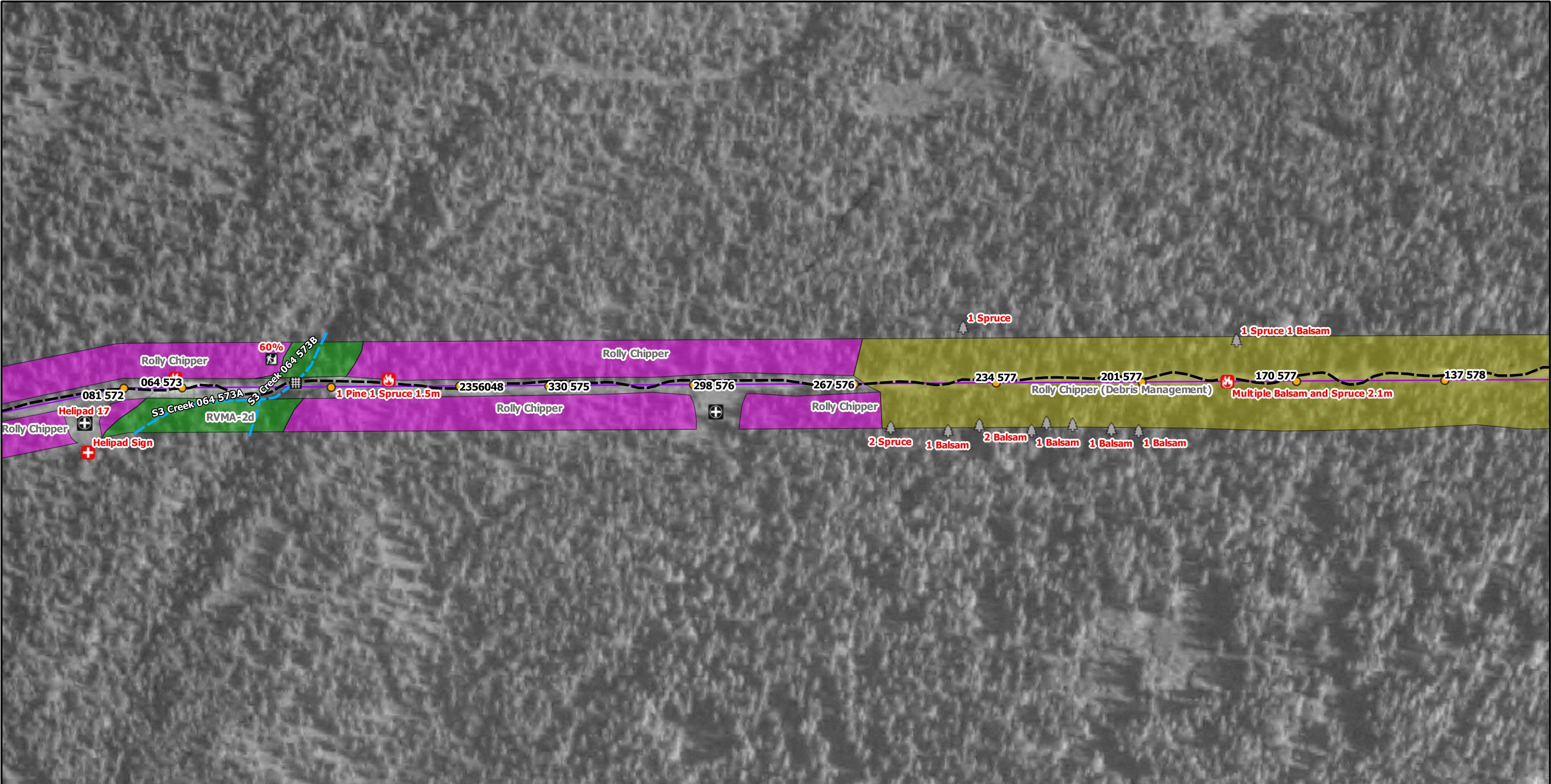
— Stream



1:2500 0 25 50 75 100 m

Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.

	<b>BChydro</b>
<b>Vegetation Maintenance Program (RoW Widening) BAB 25F52 2524894 to 2468049 Treatment Map 3</b>	
Date	Nov 18, 2016
DWG NO	



### Legend

BAB 25F52 Structures



Rolly Chipper

Rolly (Saturated Soils)

Rolly Chipper

Rolly Chipper (Debris Management)

RVMA

RVMA-2d

RVMA-6c

RVMA-NTZ

### Circuit Features - Points

Arch Site

Creek Ford

Helipad

Hotspot

Steep Slope

Tree Felling

Work Hazard

### Circuit Features - Lines

Distribution Line

NCD

Road-ATV

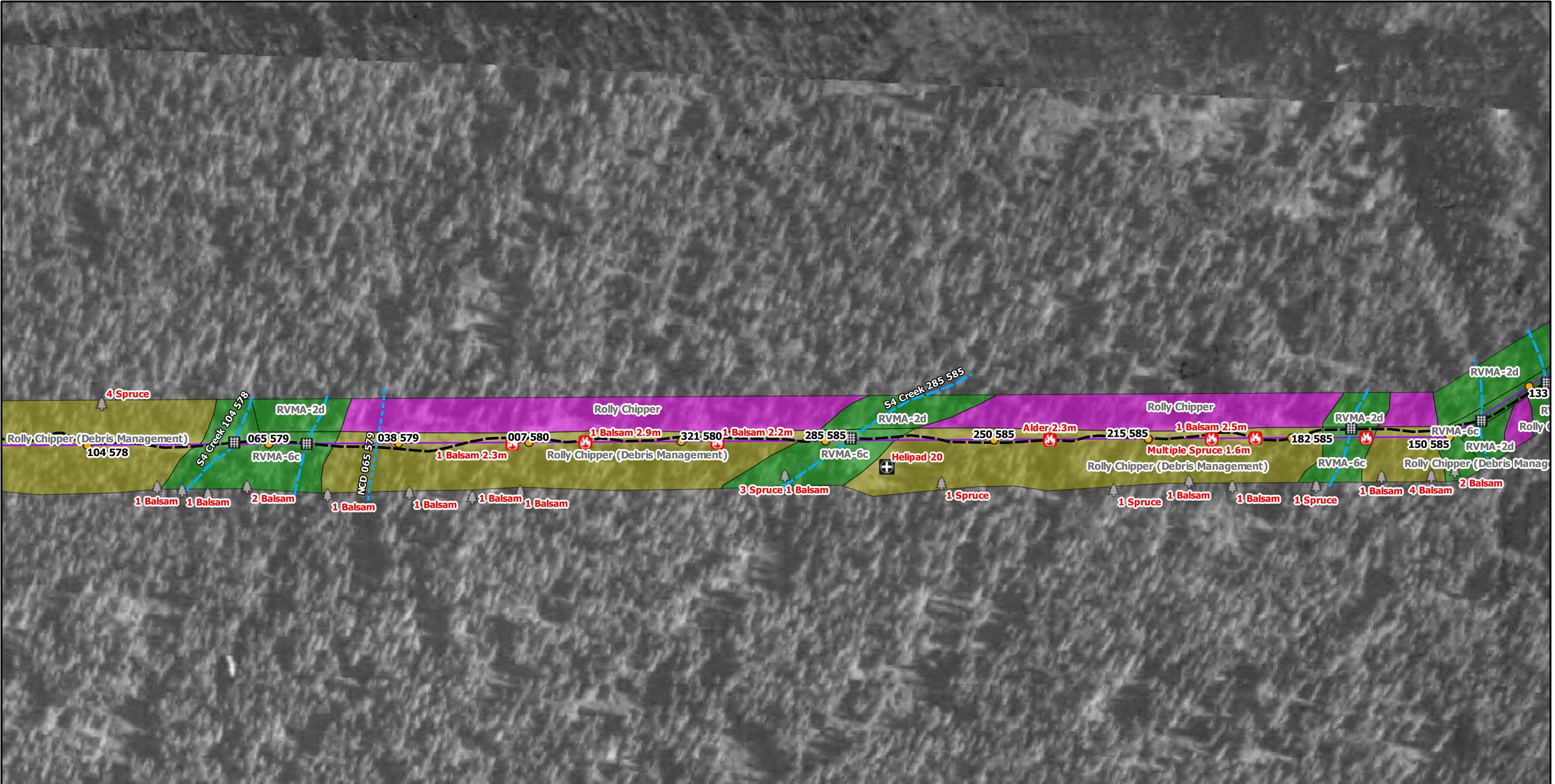
Stream



1:2500 0 25 50 75 100 m

	<b>BChydro</b>
<b>Vegetation Maintenance Program (RoW Widening) BAB 25F52 2524894 to 2468049 Treatment Map 4</b>	
Date	Nov 25, 2016
DWG NO	

Map Notes:  
 1. Datum: NAD83  
 2. Projection: BC Albers  
 3. Base Data: Province of B.C.



#### Legend

BAB 25F52 Structures

Rolly Chipper

Rolly (Saturated Soils)

Rolly Chipper

Rolly Chipper (Debris Management)

RVMA

RVMA-2d

RVMA-6c

RVMA-NTZ

#### Circuit Features - Points

Arch Site

Creek Ford

Helipad

Hotspot

Steep Slope

Tree Felling

Work Hazard

#### Circuit Features - Lines

Distribution Line

NCD

Road-ATV

Stream



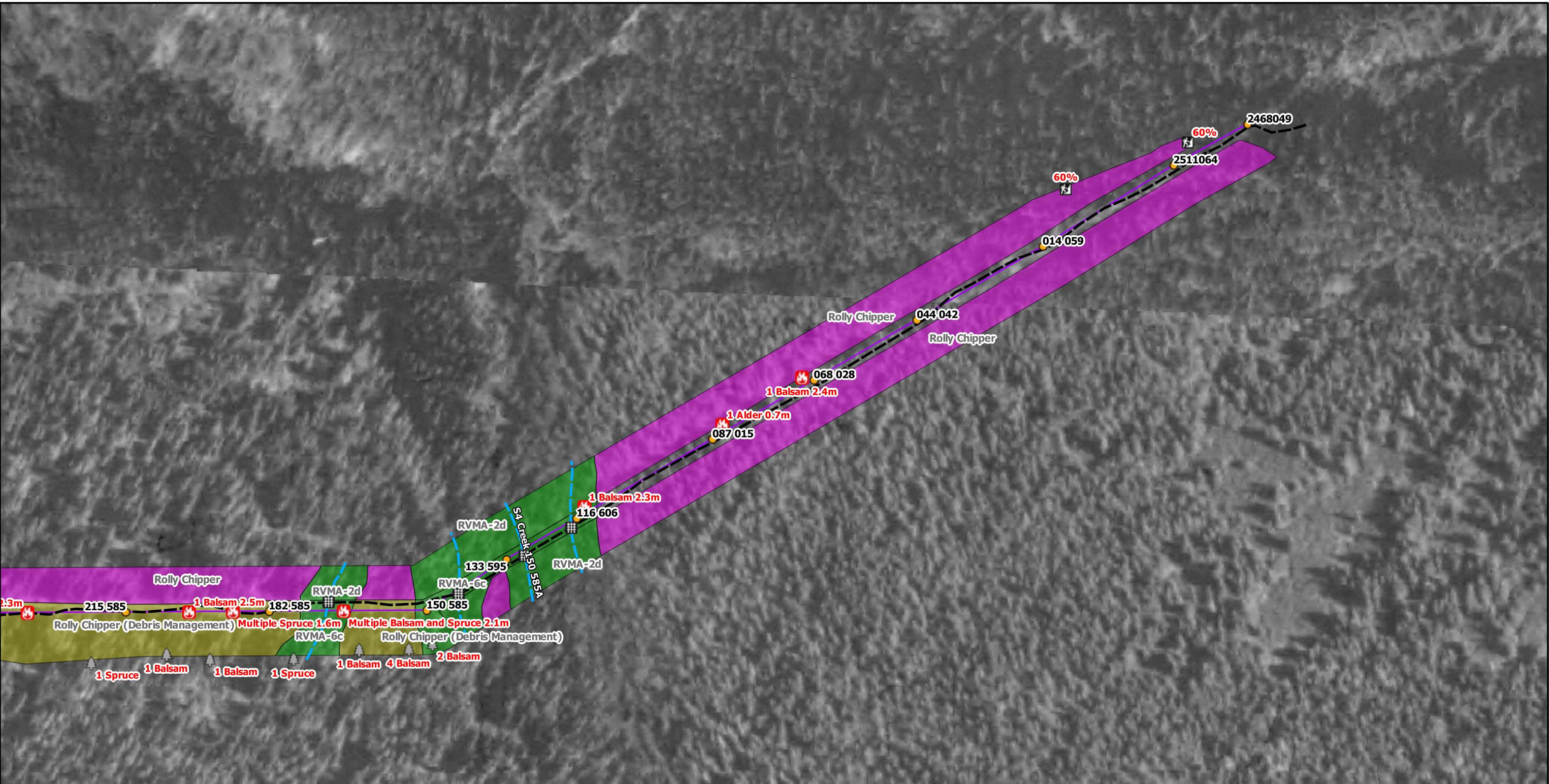
1:2500 0 25 50 75 100 m

BChydro

Vegetation Maintenance  
Program (RoW Widening)  
BAB 25F52  
2524894 to 2468049  
Treatment Map 5

	Date	Nov 25, 2016	DWG NO	
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Map Notes:  
1. Datum: NAD83  
2. Projection: BC Albers  
3. Base Data: Province of B.C.



### Legend

BAB 25F52 Structures

Rolly Chipper

Rolly (Saturated Soils)

Rolly Chipper

Rolly Chipper (Debris Management)

RVMA

RVMA-2d

RVMA-6c

RVMA-NTZ

### Circuit Features - Points

Arch Site

Creek Ford

Helipad

Hotspot

Steep Slope

Tree Felling

Work Hazard

### Circuit Features - Lines

Distribution Line

NCD

Road-ATV

Stream



1:2500 0 25 50 75 100 m

	<b>BChydro</b>
Vegetation Maintenance Program (RoW Widening) BAB 25F52	
2524894 to 2468049	Treatment Map 6
Date	Nov 25, 2016
DWG NO	

**Request for Quotation (“RFQ”)**  
**THIS IS NOT AN ORDER**

RFQ #: 8303

Title: Babine to Takla - Distribution Line  
Environmental Services

Contact Person: Lucas Leite

Email: [lucas.leite@bchydro.com](mailto:lucas.leite@bchydro.com)

**This RFQ Package consists of:**

1. Instructions
2. Form of Quotation
3. Contract Documents composed of  
Work Order, and:
  - Appendix1\_AWPRV\_field\_card
  - Appendix2\_Reconnaissance\_Map\_Topographic

## PART 1 INSTRUCTIONS

### 1.0 PURPOSE

This RFQ is issued to Select Consultants who qualified under:

- RFSQ 1422 - Environmental Consulting Services

British Columbia Hydro and Power Authority (“**BC Hydro**”) invites you, hereafter referred to as the “**Proponent**”, to submit a Quotation for:

RFQ Title: Babine to Takla - Distribution Line Environmental Services

RFQ Number: 8303

### **Background**

The community of Takla has experienced an increasing number of power outages of which some have lasted several days. These outages are mainly due to the narrow right-of-way (ROW) currently cleared around distribution line BAB 25F52 and an increasing number of trees falling onto the line. Heavy fog often delays helicopter access required to repair the line and prolongs the duration of the outages. The interruptions also create a significant wildfire hazard.

To increase reliability and safety for the operation and maintenance of BAB 25F52, BCH has proposed to clear target vegetation (vegetation that could come within the safe limits of approach to the power line) within 30m of either side of the line (effectively increasing the ROW to 60m in width). Strategies used to clear vegetation will include:

- Logging in areas identified with Merchantable Timber (skidders will be used)
- Chipping (likely using a Rolly Chipper) in areas of non merchantable timber
- Hand felling within the 15m Riparian Vegetation Management Area (RVMA) surrounding all watercourses and the Grease Trail.

### **Scope of Work**

The Scope of Work for this RFQ includes the following

- Environmental Assessment of Valued Ecosystem Components for approximately 35km by 60m associated with Distribution Line BAB 25F52 from Fort Babine to Takla Landing (West side of Takla Lake)
- Environmental Management Plan incorporating both environmental assessment results and proposed mitigation based on scope of project work.

Please refer to Part 3 Contract Documents, Work Order for more details.

This Part 1 of the RFQ applies to and governs the preparation of the Quotation in response to this RFQ.

The anticipated timeline for this RFQ process is as follows; however the actual timing and sequence of events may vary and shall ultimately be determined by BC Hydro.

<b>Activity</b>	<b>Target Date</b>
Release RFQ to Qualified Suppliers under RFSQ 1422	May 26, 2017
BC Hydro receives responses (Close RFQ)	June 14, 2017
Notify Successful Proponent	June 19, 2017

## 2.0 **SUBMISSION INSTRUCTIONS**

Potential Proponent should provide the Quotation electronically via email to Lucas Leite, the “**Procurement Contact**”, at [lucas.leite@bchydro.com](mailto:lucas.leite@bchydro.com) at or before:

11:00 a.m. local time, **June 14, 2017**

The submission should be in the English language in MS Word, MS Excel or PDF format. Due to BC Hydro email system restrictions, any single email, including all attachments, should be limited to 10 MB in size to minimize the risk of non-transmission.

The Quotation should be submitted on the Form of Quotation included in Part 2 of this RFQ, which should be completed to provide all of the information requested. BC Hydro invites a Quotation that is responsive to the requests for information in the Form of Quotation, and is not inviting lengthy generalized submissions with respect to any issue referred to in the Form of Quotation.

***Proposals received after the Closing Time and Date will not be considered.***

## 3.0 **SITE**

### 3.1. Site Conditions

Proponent, either personally or through a representative, has the responsibility to be knowledgeable of the Site before submitting a Quotation and to be familiar with, and make allowance for, all factors relating to the Site that might affect the performance of the Work, including the location of the Site, local conditions related to the Work, geotechnical and subsurface conditions, Site drainage, Site access, local weather, availability of labour, equipment and materials and any other relevant matters. By submitting a Quotation, the Proponent will be deemed to have undertaken any required inspection and to have taken account of all such factors in the preparation of its Quotation. No additional payments or time extensions shall be claimable or due because of difficulties relating to conditions at the Site or factors as described in this Section 3.1 which were reasonably foreseeable by a Consultant qualified to undertake the Work that was knowledgeable of, and had inspected, the Site and considered the factors listed in this Section.

3.2. Information Session

Not Used.

**4.0 EVALUATION**

4.1 Evaluation Committee

The evaluation of Quotations to identify a Preferred Proponent will be carried out by a committee of one or more persons appointed by BC Hydro (the “**Evaluation Committee**”). The Evaluation Committee may be assisted by other persons as the Evaluation Committee may determine it requires, including technical, financial, legal and other advisors or employees of BC Hydro.

4.2 Evaluation Criteria

The Evaluation Committee will compare and evaluate the Quotations to identify the Quotation which the Evaluation Committee judges to be the most advantageous to BC Hydro by applying the evaluation criteria set out below.

<b>Criterion</b>	<b>Evaluation Weight</b>
1 Compensation	40%
2 Key personnel experience	30%
3 Capacity to meet schedule	15%
4 First Nations Inclusion and Capacity Building	10%
5 Safety Management Plan	5%
<b>Total Evaluation Weight</b>	<b>100%</b>

4.3 Evaluation Process

To assist in evaluation of Quotations, the Evaluation Committee may, in its sole and absolute discretion, but is not required to:

- (a) conduct reference checks and background investigations of the Proponent, and any subcontractors proposed in the Quotation, with internal and/or external sources, and rely on and consider any relevant information received from the references and from any background investigations in the evaluation of Quotations;
- (b) seek clarification or additional information from any, some, or all Proponents with respect to their Quotation, and consider such supplementary information in the evaluation of Quotations;
- (c) request interviews/presentations with any, some, or all Proponents to clarify any questions or considerations based on the information included in Quotations, and consider any supplementary information received from interviews/presentations in the evaluation of Quotations; and
- (d) seek confirmation that the inclusion of any Personal Information about an individual in a Quotation has been consented to by that individual.

#### 4.4 Detailed Evaluations

In conducting an evaluation:

- (a) the Evaluation Committee will not be required to complete a detailed evaluation of all Quotations and may, after completing a preliminary review of all Quotations, identify and drop from any detailed evaluation any Quotation which the Evaluation Committee judges to not be in contention to be selected as the Quotation of the Preferred Proponent when compared to the other Quotations;
- (b) the Evaluation Committee may at any time drop from detailed evaluation a Quotation from a Proponent that the Evaluation Committee judges to not be sufficiently safety oriented;

#### 4.5 Reservation of Rights

BC Hydro reserves the right, in its sole and absolute discretion, to:

- (a) at any time, for any reason, reject any or all Quotations and terminate the process under this RFQ, and proceed with the Work as described in this RFQ in some other manner, including reissue a request for Quotations or undertake another procurement process for the same or similar scope of Work;
- (b) evaluate a Quotation that includes one or more alteration, modification or amendment to the specifications or drawings or both by applying the evaluation criteria as set out in Section 0 to identify the alteration, modification or amendment that BC Hydro determines is most advantageous to itself, and select that Quotation based on the identified alteration(s), modification(s) or amendment(s) together with the corresponding adjustment, if any, to the Quotation Price;
- (c) accept the Quotation which, applying the evaluation criteria as set out in Section 4.2, BC Hydro determines is most advantageous to itself, and, without limitation, select a Quotation which does not have the lowest Quotation Price;
- (d) award separate Contracts for portions of the Work, including with respect to one or more payment items; and
- (e) if only one Quotation is received, reject that Quotation and terminate the process under this RFQ, and proceed with the Work as described in this RFQ in some other manner, including entering into negotiations with that Proponent with respect to any matter, including price.

#### 5.0 NO CONTRACTUAL OR LEGAL OBLIGATIONS

The RFQ documents are not intended to constitute, or be interpreted as, a call for tenders, and the submission of a quotation is not intended to create any contractual or other legal obligations or duties whatsoever owed to the Proponent by BC Hydro, including any obligation or duty to accept or reject a Quotation, to enter into negotiations, to continue negotiations, or to award a Contract. Without restricting the generality of the foregoing, no contractual relations shall exist between BC Hydro and the Proponent until the execution of a Contract with the Proponent, except for any waivers, releases, exclusions or limitations of liability, confidentiality and/or indemnity obligations or other covenants or agreements made, given or accepted by Proponent in the Form of Quotation or otherwise in connection with this RFQ process.

## **6.0 QUOTATION PREPARATION COSTS AND NO CLAIMS**

Proponent is solely responsible for its own costs and expenses incurred in preparing and submitting its Quotation and for attending any Site visits, meetings, due diligence, negotiations or discussions with BC Hydro or BC Hydro's representatives and consultants, relating to or arising from this RFQ.

By submitting a Quotation, Proponent irrevocably waives any claim against BC Hydro and its employees, directors, officers, advisors or representatives for any compensation of whatsoever nature or kind, including for loss of anticipated profits, loss of opportunity, indirect, incidental or consequential damages or losses if no Contract is entered into for the Work between the Proponent and BC Hydro for any reason whatsoever, including in the event that BC Hydro rejects or disqualifies or for any other reason fails to accept a Quotation.

## **7.0 ENQUIRIES**

All enquiries regarding this RFQ should be directed to the Procurement Contact. Information obtained from any source other than the Procurement Contact will not form part of this RFQ and may not be used or relied on by a Proponent for the purpose of preparing its Quotation.

## **8.0 ADDENDA**

BC Hydro may, in its sole and absolute discretion, through the Procurement Contact, amend this RFQ at any time by issuing a written addendum (an "**Addendum**"). Written Addenda are the only means of amending or clarifying this RFQ, and no other form of communication whether written or oral, including responses to enquiries provided pursuant to Section 6.0, will be included in or in any way amend this RFQ. Only the Procurement Contact is authorized to amend or clarify this RFQ by issuing an Addendum. No other employee or agent of BC Hydro is authorized to amend or clarify this RFQ.

## **9.0 OWNERSHIP OF QUOTATION**

Upon delivery to BC Hydro, the Quotation and all its contents become the property of BC Hydro and will not be returned to the Proponent.

## **10.0 USE OF RFQ DOCUMENTS**

No person may, without the express prior written consent of BC Hydro, use, copy or disclose any information contained in the RFQ documents for any purpose other than for the purpose of preparing a Quotation.

## **11.0 FOIPPA**

Proponent should be aware that BC Hydro is a "public body" defined by and subject to the *Freedom of Information and Protection of Privacy Act* (British Columbia) ("**FOIPPA**"). Subject to FOIPPA and this RFQ, BC Hydro will endeavor to keep the Quotation and its contents confidential.

Proponent is responsible for compliance with laws applicable to the collection, use and disclosure of Personal Information, including FOIPPA. If Proponent includes Personal

Information (including resumes) in the Quotation, then by submitting a Quotation the Proponent will be deemed to represent to BC Hydro that the Proponent has obtained written consent from the applicable individual(s), including the consent to the indirect collection of Personal Information by BC Hydro, and that the Personal Information may be forwarded to BC Hydro for the purposes of responding to this RFQ and may be used by BC Hydro for the purposes set out in this RFQ. BC Hydro reserves the right to require proof of such consent and to reject the Quotation if such consent is not provided as required by applicable law.

**PART 2 FORM OF QUOTATION**

## FORM OF QUOTATION

### **Babine to Takla - Distribution Line Environmental Services – RFQ 8303**

To: British Columbia Hydro and Power Authority (“**BC Hydro**”)

Attention: Lucas Leite

Email: [lucas.leite@bchydro.com](mailto:lucas.leite@bchydro.com)

#### **PROPOSER INFORMATION**

This Quotation is submitted by:

Legal Name of Proposer (the “ <b>Proposer</b> ”):	
Address:	
Name of Representative:	
Representative’s Telephone Number:	
Representative’s Email Address:	

#### **PROPOSER’S DECLARATIONS**

The Proposer declares and confirms it:

- (a) received, has examined and understands the RFQ documents, including any issued Addenda;
- (b) agrees to all terms and conditions of the RFQ;
- (c) has full knowledge of the Work that may be required to be performed by it in accordance with the Contract Documents included in Part 3 of the RFQ;
- (d) complied with the RFQ;
- (e) based its Quotation price on the estimated quantities set out in the Schedule of Quantities and Prices contained in Schedule 2, and understands that actual quantities may vary; and
- (f) has completed and includes with this Quotation all Schedules attached to the Form of Quotation included with the RFQ.

This Quotation is executed by the undersigned as of the date noted below.

---

Authorized Signatory

---

Name and Title of Authorized Signatory

---

Date

## SCHEDULE 1 – RFQ SUBMISSION REQUIREMENTS

### Babine to Takla - Distribution Line Environmental Services – RFQ 8303

Please respond to the questions under each heading clearly and concisely. This Schedule is provided separately in Word Format. The rows are expandable. Please complete and return the Word Format

Please respond to the Criteria under each heading clearly and concisely.

#### Key Personnel Experience

Q1

- a) Please provide names and résumés of all personnel the Proponent proposes to appoint on the project. Also please
- i. Indicate expected roles, to be played by each team member along with a detailed description of responsibilities. Include a list of deliverables each role is responsible for
  - ii. Describe any specific experience and knowledge related to conducting Environmental Assessments in Lake Babine and Takla FN Territories for each team member associated with this submission.

*For submitting resume(s), please also refer to Schedule 4 – Personal Information Consent Form(s).*

#### Capacity to Meet Schedule

Q2

Please provide a detailed schedule of activities as well as level of effort that will be employed in order to efficiently complete the work. Explain your approach to getting the work done (where will you stay, how will you access the site etc.). Please note that this is a remote site with limited access. There are a few logging roads that intersect with the ROW and a trail has been cleared that is accessible in parts by an ATV or Side by Side. Cleared Heli pads are located at regular intervals along the ROW.

*(Note: Your response will be evaluated on your understanding of the nature of the work and how you intend to complete it with minimal risk to schedule delay)*

#### First Nations Inclusion and Capacity Building

Q3

Please describe First Nations (FN) inclusion for the project including responsibilities, number of FN participants, anticipated level of effort, responsibilities and any capacity building opportunities. Describe how FN from both LBN and Takla will interact during the project.

#### Safety Management Plan

Q5

Please include a typical Safety Management Plan (SMP) for work similar in scope to the Work contemplated in this RFQ

## SCHEDULE 2 - COMPENSATION

### Babine to Takla - Distribution Line Environmental Services – RFQ 8303

BC Hydro is seeking to procure a cost effective solution. Potential Proponents responding to this opportunity and future opportunities are encouraged to propose resources at the most competitive market rate available.

BC Hydro is seeking an all-inclusive maximum fees and expenses contract. Proposed rate should include all costs of performing the Services (including all expenses, travel (if applicable) office costs and overhead), should be in Canadian dollars and should include all taxes except the Canadian Goods and Services Tax.

Please complete the attached Excel Sheet to provide the information requested in the table format below. **The completed Excel Sheet MUST be returned.**

#### **Tab - Project Rates**

Cost Estimate Template	Name	Role/Level	Name	Role/Level	Name	Role/Level		Item (Rate/Period)	Item (Rate/Period)	Item (Rate/Period)	Item (Rate/Period)	
	Fees				Disbursements							Task Total
Task Description (Please describe)	Rate per hour	Rate per hour	Rate per hour	Rate per hour	Fees Subtotal	Rate (please specify UOM)	Disbursement Subtotal					
	Hours	Hours	Hours	Hours		Amount	Amount	Amount	Amount	Grand Total before GST		
Hours	Hours	Hours	Hours			Amount	Amount	Amount	Amount			
Hours	Hours	Hours	Hours			Amount	Amount	Amount	Amount			
Hours	Hours	Hours	Hours			Amount	Amount	Amount	Amount			

**Note:**

Rate per hour should be inline with RFSQ 1422 rates and same as those indicated in tab "Rate Sheet"

**Tab – Rate Sheet**

<b>Employee Rate Sheet</b>		
Personnel name	Classification	Rate
<b>Note:</b>		
Rate per hour should be inline with RFSQ 1422 rates.		

**SCHEDULE 3 - RELATIONSHIP DISCLOSURE STATEMENT: CONFLICT OF INTEREST  
AND UNFAIR ADVANTAGE****Babine to Takla - Distribution Line Environmental Services – RFQ 8303**

The Proponent declares on its own behalf and on behalf of each member of the Proponent's team that:

- (a) this declaration is made to the best of the knowledge of the Proponent and, with respect to relationships of each member of the Proponent's team, to the best of the knowledge of that member;
- (b) the Proponent and the members of the Proponent's team have reviewed the definition of Restricted Parties (if included in the RFP) and the non-exhaustive list of Restricted Parties (if any are specifically referenced in the RFP); and
- (c) the following is:
  - (1) a full disclosure of all members of the Proponent's team who were employees of BC Hydro at any time during the previous two year period from the date of this disclosure;
  - (2) a full disclosure of all known relationships the Proponent and each member of the Proponent's team has, or has had, with:
    - i. BC Hydro;
    - ii. any listed Restricted Party;
    - iii. any current employees, shareholders, directors or officers, as applicable, of BC Hydro or any listed Restricted Party;
    - iv. any former shareholders, directors or officers, as applicable, of BC Hydro or any listed Restricted Party, who ceased to hold such position within two years from the date of this disclosure; and
    - v. any other person who, on behalf of BC Hydro or a listed Restricted Party, has participated or been involved in this competitive procurement process or the design, planning or implementation of the Agreement or has confidential information about the Agreement or this competitive procurement process; and
  - (3) a full description of the actions that the Proponent has undertaken or offers to undertake to address any actual, perceived or potential conflict of interest or unfair advantage arising from the relationships disclosed pursuant to subsections (c)(1) and (c)(2) above; and
- (d) if no such relationships are disclosed by the Proponent, the Proponent is not aware of any former employees as described in subsection (c)(1) above nor any relationships between the Proponent or any member of the Proponent's team, and any of the persons described in subsection (c)(2) above, and the Proposal has not been prepared

with any involvement from any of those persons.

Name of Member of Proponent's Team	Name of Party with Relationship (e.g., list BC Hydro or a Restricted Party name)	Details of the Nature of the Relationship with BC Hydro or the listed Restricted Party
e.g. Firm Name Ltd.	Name of Restricted Party	<i>Firm Name Ltd. is working with [name of Restricted Party] on Project X.</i>
e.g. John Smith	BC Hydro	<i>John Smith was a BC Hydro employee from [date] to [date]</i>
e.g. Jane Smith	Name of Restricted Party	<i>Jane Smith worked with [name of Restricted Party] on Project X from [date] to [date]</i>

For the purposes of this Schedule 3-5 – Relationship Disclosure Statement: Conflict of Interest and Unfair Advantage:

**“Proponent’s team”** means:

- (a) all persons who have been involved in the preparation of the Proponent’s Proposal; and
- (b) all persons who the Proponent proposes to perform work or services under any resulting Agreement.

The Proponent has undertaken or offers to undertake the following actions to address any actual, perceived or potential conflict of interest or unfair advantage arising from the relationships disclosed pursuant to subsections (c)(1) and (c)(2) above:

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#### SCHEDULE 4 - PERSONAL INFORMATION CONSENT FORM(S)

*Vendors that will be submitting to BC Hydro, as part of their Quote, a resume, work history, summary of qualifications or other “personal information”, with respect to any individual, should submit, in relation to each such individual, a consent form, in the following form, completed and signed by that individual.*

***Vendors should note that receipt of these consents is important for BC Hydro to meet its obligations under the (BC) Freedom of Information and Protection of Privacy Act. Quotes that do not include the necessary consent forms may be rejected at BC Hydro’s discretion.***

#### PERSONAL INFORMATION CONSENT FORM

With the provision of my signature at the foot of this statement I, \_\_\_\_\_,  
(Print Name)  
consent to the indirect collection from \_\_\_\_\_  
(Print Name of Vendor)

by BC Hydro, of my personal information in the form of a work history, resume or summary of qualifications.

In consenting to this indirect collection, I understand that my personal information, so collected, will be used by BC Hydro for the sole purpose of evaluating the submitted Proposal for the Work. I understand further that my personal information, once collected by BC Hydro, will be handled by BC Hydro in accordance with the provisions of the (BC) *Freedom of Information and Protection of Privacy Act*.

\_\_\_\_\_  
\_\_\_\_\_  
Signature ) Date  
              )

**PART 3 CONTRACT**

## WORK ORDER

**(To be completed and signed by BC Hydro Project Manager and the Consultant prior to the start of any assignment. No work shall commence without issuance by BC Hydro of a Contract Order or Release number as the case may be).**

This Work Order is made as of the \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_ between British Columbia Hydro and Power Authority ("BC Hydro"), and \_\_\_\_\_ ("Consultant") and incorporates by reference the terms and conditions of the Consulting Services Agreement between the parties dated \_\_\_\_\_ 20\_\_\_\_ (the "Master Agreement"). In case of conflict between the terms and conditions of this Work Order and the terms and conditions of the Master Agreement, this Work Order shall prevail. However, any changes, including additional terms and conditions, that Consultant may purport to impose in response to this Work Order will not be valid unless and until expressly accepted in writing by BC Hydro's Representative as identified in the Master Agreement or this Work Order.

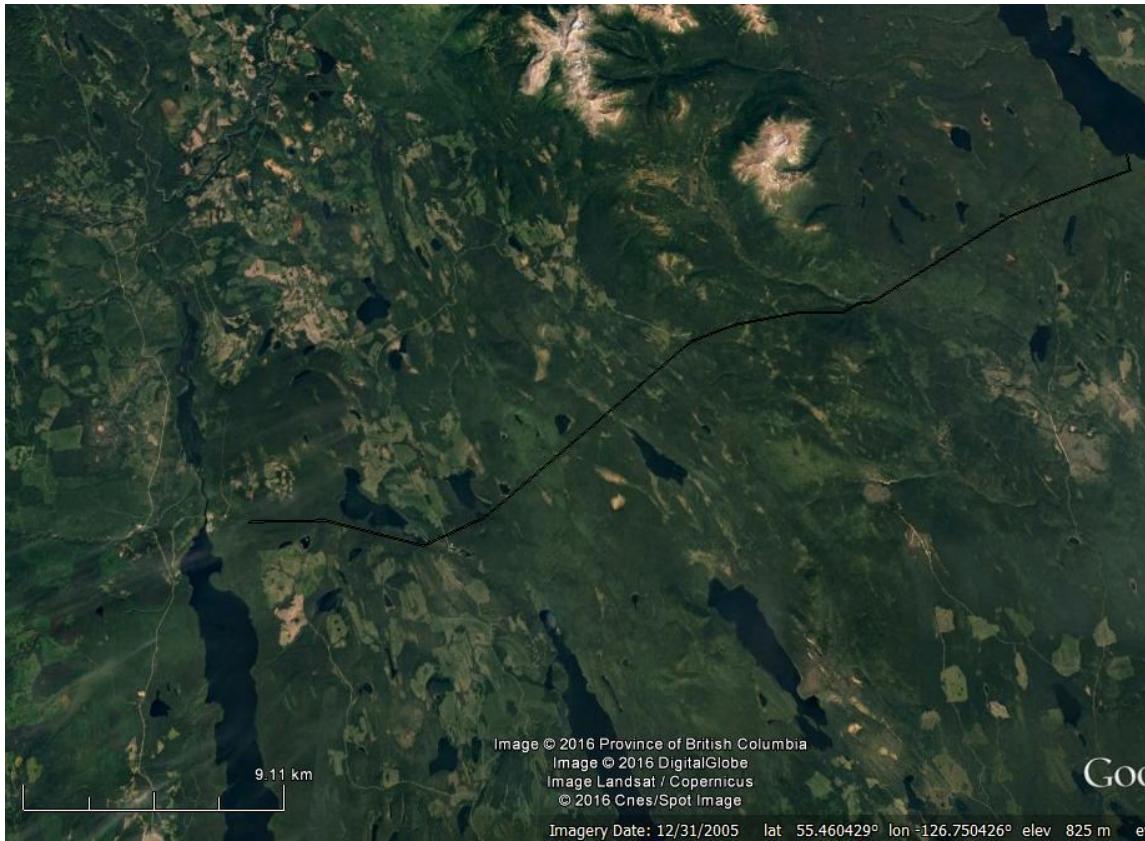
BC Hydro and Consultant agree that Consultant will perform the Services described in this Work Order on the following terms:

### A. Project Description and Location:

The community of Takla has experienced an increasing number of power outages of which some have lasted several days. These outages are mainly due to the narrow right-of-way (ROW) currently cleared around distribution line BAB 25F52 and an increasing number of trees falling onto the line. Heavy fog often delays helicopter access required to repair the line and prolongs the duration of the outages. The interruptions also create a significant wildfire hazard.

To increase reliability and safety for the operation and maintenance of BAB 25F52, BCH has proposed to clear target vegetation (vegetation that could come within the safe limits of approach to the power line) within 30m of either side of the line (effectively increasing the ROW to 60m in width).

As per Figure 1, the works will take place along the Distribution line between Fort Babine and Takla Landing (Start 650800 6133093 to End 688813 6151064)



**Figure 1. Black line represents Distribution ROW where works to take place. Approximate length is 45km.**

## B. Scope of Services and Deliverables:

### ASSUMPTIONS

- It is assumed that cutting and chipping of non-merchantable timber using a roly chipper will be done in the winter months with sufficient snow cover to mitigate for ground disturbance
- Logging operations will include hand falling and skidding with associated ground disturbance. Access road creation and upgrades are unknown at this time and will not form part of this RFQ.
- All Identified RVMA's will be machine free zones to mitigate for riparian impact and ground disturbance
- No environmental permits or notifications will be required. The EMP will be used to from part of the Crown Land License of Occupation Application.
- All riparian zones will be flagged independently by a forestry consultant and are not part of the scope of work.

- Site specific Riparian Prescriptions as per BC Hydro's Approved Work Practices for Riparian Vegetation Maintenance (AWPRV) will be developed by a forestry consultant and reviewed internally by BC Hydro for applicability (See Appendix 1 for general AWPRV guidelines). These shall be included as an appendix to the EMP but are not the responsibility of the environmental consultant to evaluate.
- The environmental consultant will work with the forestry consultant to ensure all waterbodies are accurately identified and appropriate buffers placed. This will involve, ensuring forestry flagging accurately captures appropriate setbacks of all waterbodies covered in the AWPRV.
- It is assumed for the purposes of the assessment that all waterbodies that are connected are fish bearing, therefore no sampling protocols are required. Stream sampling data to be collected will include:
  - Classified or non classified drainage
  - Stream width
  - Avg stream depth
  - Substrate type
  - Bank stability description
  - Approach description (in order to determine requirements if creek requires a crossing)
  - Known fish presence and fish species
  - Stream name
  - Location in UTM's
  - Watershed Code
  - Other comments
- Polygons indicated in Appendix 2 as non-vegetated as well as the Winter 2017 Rolly Chipping polygon will not need an Environmental Assessment. See Appendix 2 for approximate location of areas of Merchantable and Non Merchantable Timber, as well as areas where no Environmental Assessment will be required.

## CULTURAL HERITAGE INFORMATION

Two Traditional Use Surveys are being completed that will cover the 45km section of distribution line. Upon award, the survey information will be made available to guide the Env Assessment and EMP.

## ENVIRONMENTAL ASSESSMENT DESCRIPTION

The purpose of the environmental assessment is to identify all Valued Ecosystem Components (VEC's) associated with the project. These include but not necessarily limited to:

- Fish and fish habitat
- Wildlife and wildlife habitat
- Species at Risk
- Nests covered by the Wildlife Act
- Amphibians/reptiles and associated habitat
- Ecosystems at Risk

As part of the assessment, the consultant shall field check all riparian zones to ensure they have been appropriately identified and flagged by the forestry consultant as per 15m Top of

Bank buffers described in the AWPRV and non classified drainages and isolated wetlands flagged as Machine Free Zones.

## **ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

The purpose of the EMP is to provide site specific recommendations for managing any identified VEC'S at risk of impacts related to the project. Mitigation should include standard accepted best practices associated for the protection of identified VECs.

It is expected that the environmental assessment will be integrated into the EMP.

## **SCHEDULE OF MILESTONE TASKS AND DELIVERABLES**

Task	Delivery Date
Safety Management Plan Submission	Latest by June 26, 2017
Start of Field Work	Anticipated July/August 2017
DRAFT EMP	September 7, 2017
FINAL EMP	September 15, 2017

Field work must commence as soon as possible once snow clears and report completion by September 15, 2017. The Work Schedule assumes there will be no extenuating circumstances that will impact the Respondent's ability to complete the Work. If unforeseen circumstances arise that impact the Respondent's ability to complete the Work by September 15, 2017, BC Hydro and the Respondent will work together to resolve the issue to enable the Contractor to complete the Work without further delay.

**C. Key Personnel** (to be defined based on the successful Proponent's proposed key personnel):

**D. Timeline and Schedule** (including project meeting schedule):

The term of this work shall be from, **June 19, 2017** through, **January 1, 2018** unless earlier terminated in accordance with its terms. Consultant shall comply with the schedule for performance of the Work as directed by Hydro's Representative.

BC Hydro shall have the right, in its absolute discretion, to renew the Term for one (1) additional successive period of one (1) year, by providing Contractor with written notice of such renewal at least 30 days prior to the expiration of the then current Term. Unless otherwise agreed to by the parties in writing or expressly provided in the Contract, the terms and conditions of the Contract, including pricing, applicable immediately prior to the expiration of the previous Term shall apply during the renewal period.

**E. Compensation and Expenses** (including Maximum Fee):

The Consultant shall perform the Work as directed by Hydro's Representative in accordance with the Compensation Schedule and the terms and conditions of the Master Agreement.

Payment for the Work will be based on the actual hours authorized by Hydro's Representative.

**Maximum Fees** – The maximum aggregate liability of BC Hydro to Consultant for fees and expenses is limited to an amount equal to \$\_\_\_\_\_ and BC Hydro will not pay or otherwise be liable to Consultant for fees and expenses in excess of such amount unless otherwise expressly agreed to in writing by BC Hydro.

**F. BC Hydro's Representative (if different than "Hydro's Representative" under Master Agreement):**

**G. Other Terms and Conditions:**

The Consultant shall not, directly or indirectly, solicit or offer employment to any BC Hydro employee or in any way interfere with the relationship between BC Hydro and any BC Hydro employee, both during the term of the Work Order and for a period of 3 months following termination of the Work Order, except with the prior written consent of BC Hydro. The foregoing shall not prevent the Consultant from making general solicitations of employment not directed specifically at any such employees. For purposes of this paragraph 5 a "BC Hydro employee" shall be deemed to include a corporation or other entity in which such employee is an officer, director, or holder of a 33% or greater equity interest.

In addition to the non-solicitation obligation above, the Consultant shall not use any former BC Hydro employee to perform Work under or in connection with the Work Order for a period of 3 months following the hiring of such former BC Hydro employee, unless prior written approval has been obtained from BC Hydro".

The Consultant shall require all Subcontractors and all other affiliates or other entities which perform Work under the Work Order to be bound by and comply with the provisions of this paragraph to the same extent as the Consultant is hereby bound.

**APPROVED AND ACCEPTED BY BOTH PARTIES** as of the date first above written.

**BRITISH COLUMBIA HYDRO AND POWER AUTHORITY**

Authorized Signatory: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

**CONSULTANT'S FULL LEGAL NAME:**

Authorized Signatory: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

**Client and Project**

		FORESTRY ONLY	
PROPOSER		FOREST LICENCE	
BC Hydro		CUTTING PERMIT	
CONTACT		CUTBLOCKS	
Andrew Walter, Natural Resource Specialist Environmental Risk Management		OTHER I.D.	
ADDRESS		CENTRAL INTERIOR	
6911 Southpoint Drive Burnaby BC V3N 4X8		ELEVATION (a.s.l.)	
PHONE	FAX OR EMAIL	59.3 ha	BIOGEOCLIMATIC ZONE
604-528-1770	andrew.walter@bchydro.com	990-1220 m	ESSmv3, SBS mc&wk3

**Assessment Summary**

SURVEY DATE(S)	SURVEY CREW (AND AFFILIATION)		
October 4–13, 2016	Heleana Moore (Terra), Kirby West (Takla), Quentin Williams (Babine)		
FIELD DIRECTOR(S)	FIELD DIRECTOR LOCATION		CREW SUPERVISOR(S)
Shana Morin	On site		Heleana Moore
REASON FOR ASSESSMENT	PREVIOUSLY RECORDED SITES IN VICINITY (AND TYPES)		
Client request	1 Trail (historic), 5 CMT sites (post-1846) see Table 1 for details		
TRAVERSE TYPE	AVERAGE CREW TRAVERSE WIDTH	NUMBER OF AREAS OF ARCH POTENTIAL	NUMBER OF SUBSURFACE TESTS
Judgmental	60 m	6	76
PROTECTED SITES (AND TYPES) IN CONFLICT WITH DEVELOPMENT	NON PROTECTED SITES (AND TYPES)		
None	GhSp-47, GiSn-1, -3 (post-1846 CMTs and/or trail); CMT Site 1-4		
REPORT AUTHOR(S)	HCA PERMIT	PROJECT OFFICER	PERMIT HOLDER
Shana Morin	2016-0314	Vashti Thiesson	Kim Statham

**Additional Archaeological Work Recommended? No****Project Area Description**

BC Hydro proposes to widen an existing right-of-way (ROW) along an approximately 10 km long section of the BC Hydro distribution line located between the community of Fort Babine (Babine IR 6) and West Landing (North Takla Lake IR 8). This widening will expand the existing ROW from 10 m to 60 m in width in order to eliminate tree-related power outages affecting service to Takla Landing.

The vegetation clearing is planned for early 2017 and will be facilitated by the use of a roly chipper (mulcher). Although ground alterations are anticipated to be minimal, there is the potential for disturbing undocumented archaeological sites, and a high probability that undocumented pre- and post-AD 1846 culturally modified trees (CMTs) may be impacted by tree clearing activities.

A desk-top review of topographic data and satellite imagery (Google Earth) indicates that the project route crosses steeply rolling hills interspersed with several creeks and low-lying wetlands.

A search of the Province's Remote Access to Archaeological Data (RAAD) application indicated that six documented sites are located within 2 km of the project route (Table 1). All six sites comprise post-AD 1846 CMTs. The most significant site, the Takla Grease Trail, also referred to as the *Wud'at* Trail, overlaps the project area. Due to the length of the trail, it has been assigned multiple Borden numbers. Sites GiSn-1 and GiSo-7 represent documented portions of the trail in proximity to the study area. Although some pre-AD 1846 CMTs have been recorded in association with portions of the Takla Grease Trail, those protected features have been identified within Borden blocks which do not overlap the 10 km long current study area (e.g., GhSo-22 and GhSp-45). Collectively this trail has been designated as GhSp-47, but the individually registered segments have typically been managed as separate entities for the purpose of development-related impact assessment and mitigation.

Two archaeological overview assessments (AOAs) have been completed for forest districts which overlap the project area (Clark 2002, Horrell 2009). These AOAs identified multiple areas predicted to have moderate and high archaeological potential along the proposed ROW.

A search of the Provincial Archaeological Report Library (PARL) revealed that two permitted archaeological studies have been completed in the vicinity of the project route. In 1999, Arcas Consulting Archeologists Ltd. conducted timber-related archaeological impact assessments (AIAs) in what was then designated the Morice Forest District (HCA Permit 1999-0150; Pegg 2000). All 35 archaeological sites recorded under this permit are CMT sites, nine of which are associated with trails. Sixteen of these sites and trails pre-date AD 1846.

In 2000, I. R. Wilson Consultants Ltd. conducted an AIA of the existing distribution line (Wilson 2001), wherein nine new CMT sites were recorded, comprising over 800 CMTs. Two of these CMT sites represent large segments of the Takla Grease Trail (GhSo-22 and GhSp-45). A few examples of pre-AD 1846 modification were observed within these two sites which do not overlap the current study area. During the initial clearing of the transmission line ROW, an HCA Site Alteration Permit was recommended only for those trail segments containing features protected under the HCA. The potential for buried archaeological remains does not appear to have been addressed within the IR Wilson report (subsurface testing methods are described, but test locations and results are lacking from the permit report).

The current study aims to relocate previously identified CMTs, and to identify and test locations with the potential for subsurface archaeological materials and features.

## Methodology

Per Permit 2016-0314, crew members were spaced at approximately 15 m intervals along survey transects, all ground exposures encountered were inspected for cultural materials, and all trees (all species standing or fallen, including stumps) along survey transects were examined for indications of cultural modification. Survey was intensified in areas considered to have higher archaeological potential based on topographic and hydrological terrain features observed in the field.

Archaeological potential was assessed based on: proximity to water, food resources, slope, drainage, forest cover, previously documented archaeological and heritage resources, presence of topographic landforms commonly associated with known archaeological sites in the region (e.g., terraces, knolls, breaks-in-slope) and local knowledge.

All CMTs encountered in the field were flagged using pink CMT flagging. Banner-style CMT flagging, approximately 5 m in length, was used to denote historic trails. All flagging was labelled within the CMT site number and date.

Subsurface tests were at least 35 cm by 35 cm and were shovel excavated until sterile matrix was encountered. Excavated materials were screened through 6 mm mesh. These tests were excavated in areas of moderate to high archaeological potential; the interval of testing in such areas averaged 3 m.

A qualified field director was a member of the survey crew during this assessment.

## Survey Results

Terrain surveyed throughout the project area consisted of moderate to steep, rolling hills interspersed with creeks and/or low-lying wetlands. The area was forested primarily with lodgepole pine, balsam fir and spruce. Aspen, willow and devil's club were noted along and within low-lying and saturated areas.

Ten mapped creeks, including Tahlo Creek, cross the project area. An additional three unnamed creeks and a small unnamed lake parallel the project area. The majority of these creeks were observed to be either slow-flowing or consisting of standing water, with the exception of Tahlo Creek (western-flowing) and a beaver-dammed creek situated to the immediate west of the western project area boundary. Terrain surrounding all of the hydrological features observed within the project area is either sloping or low-lying, with the exception of six discrete areas subject to subsurface examination. These shovel test areas (STAs) are described below, in Table 2.

Three previously recorded, post-AD 1846 CMT sites overlap the project area and were revisited during this survey. Two additional known post-AD 1846 CMT sites fall within 50 m of the project area, and were therefore also revisited. Table 3 outlines crew observations at these five post-AD 1846 CMT sites. All of the sites have been heavily impacted by past development activities. Notably, no CMTs were observed in association with any of the revisited portions of the Takla Grease Trail. Overgrown dirt access roads now generally follow the trail corridor.

Four previously unidentified, post-AD 1846 CMT sites were identified within the project area boundary (CMT Sites 1-4). In total, four bark-stripped lodgepole pine CMTs and two bark-stripped balsam CMTs were identified within these four sites. Tree cores obtained during the survey indicate modification of these trees occurred between 1939 and 1970. One blazed trail (BT), consisting of nine modified trees, was also identified during this study. Cores obtained from blazed trees indicate that these modifications occurred circa 1965. Details regarding these sites can be found in Table 4; a CMT Level II form for CMT sites 1 -4 and BT 1 is appended.

Excluding the STAs, the potential for the presence of buried archaeological remains is assessed as low within the surveyed project area due to the sloping to low-lying nature of the terrain and the lack of any additional well-defined and/or well-drained landforms typically associated with archaeological sites or features.

### Evaluation of Testing Program(s)

Shovel test intervals for the purposes of site discovery averaged approximately 3 m. The effectiveness of this testing scheme is indicated by the probability of detecting a site of given size with a given artifact density. We have used the Hypergeometric Distribution Test to calculate the probability of site detection:

$$p = 1 - h(x, N, n, k)$$

where  $x = 0$ ,  $N$  and  $n$  are values describing the density of tests and  $k$  represents site size and artifact density.

The probability of detecting a site larger than 100 square metres with greater than four artifacts per square metre was high (99.8%) at any test location (Table 5). The likelihood that very small, sparse sites (i.e., less than 50 square metres with fewer than two artifacts per square metre) would have been detected was moderately high (78.2%).

### Impact Assessment and Recommendations

No sites pre-dating AD 1846 were identified during the surface or subsurface examination of the project area, therefore no further archaeological work is recommended, provided the proposed project area remains the same and is not altered to include any unassessed areas. Although no archaeological sites were identified within the assessed proposed project route, no assessment can guarantee to identify all undocumented sites located in a particular area. Therefore, if archaeological materials are observed during any phase of development operations, all ground-altering activities in the vicinity of the materials must be halted immediately and a qualified archaeologist and the relevant First Nations contacted. If a qualified archaeologist considers the materials to be protected under the *Heritage Conservation Act*, ground-altering activities may only resume with approval of the Archaeology Branch. Supervisors and operators should be aware that sites and objects located on public or private land and associated with human habitation or use that might pre-date AD 1846 are automatically protected under Section 13 (2) of the Act and cannot be altered without a permit issued pursuant to Sections 12 or 14 of the Act.

This assessment addresses the potential for the existence of physical evidence of past human activity and does not encompass traditional use or other heritage concerns of the First Nation communities. This information, as well as recommendations regarding the post-AD 1846 CMT sites identified during this study, should be solicited directly from the First Nations.

### References

- Clark, T. (2002). Archaeological Overview Assessment Morice Forest District: Archaeological Potential Model Revisions. On file at the Archaeology Branch, Victoria, B.C.
- Horrell, B. (2009). Review of the Fort St. James Forest District Archaeological Predictive Model. On file at the Archaeology Branch, Victoria, B.C.
- Pegg, B. (2000). Morice Forest District: Archaeological Assessments Permit Report. HCA Permit 1999-150). On file at the Archaeology Branch, Victoria, B.C.
- Wilson, I. R. (2001). Archaeological Inventory & Impact Assessment: Proposed Right-of-Way Additional Clearing, BC Hydro Electrical Transmission Line, Fort Babine to Takla Landing, B.C. HCA Permit 2000-299. On file at the Archaeology Branch, Victoria, B.C.

**Table 1: Previously Recorded Sites within 2 km of Project Area**

Borden Number	Distance and Direction from Project Area	Site Type(s) or Name	Year/HCA Permit
GhSp-47	Overlaps	Takla Grease Trail, CMT	1999-0150
GiSn-1	Overlaps	Takla Grease Trail, CMT	1999-0150
GiSn-2	325 m South	CMT (legacy status)	1999-0150
GiSn-3	Overlaps	CMT (legacy status)	2000-0299
GiSn-4	15 m Southeast	CMT (legacy status)	2000-0299
GiSo-7	45 m Northwest	Takla Grease Trail, CMT	1999-0150
GiSo-9	1.1 km Southwest	CMT (legacy status)	2000-0299
GiSo-10	1.6 km Southwest	CMT (legacy status)	2000-0299

**Table 2: Archaeological Potential Description**

STA ID	Landform Description	Matrix Description (cm dbs*)		Number of Tests	Result	Figure Number	Image Number
STA 1	Consists of a gently sloping bench measuring approximately 15 x 5–7 m. This bench overlooks low-lying and saturated terrain to the northeast.	0–9 cm 9–29 cm 29–35 cm	Littermat Medium-brown course-grained, sandy silt with ~15% sub-angular pebbles Compact, light brown clay-rich silt with ~20% sub-angular pebbles and cobbles	8	Negative	Fig. 4	1
STA 2	This southwest-northeast oriented, high terrace edge measures approximately 50 m in length and ranges from 5–7 m in width. A small, unnamed crescent-shaped lake is situated to north and approximately 50 m below. Terrain becomes sloping to the west and low-lying and saturated to the east.	0–9 cm 13–33 cm 33–39 cm 39–51 cm	Littermat Reddish-brown course sandy silt with ~30% angular to sub-angular pebbles and cobbles Grey-brown silty sand with ~30% angular pebbles and cobbles Compact, reddish-brown silty sand with trace clays and ~60% angular pea gravels and cobbles	20	Negative	Fig. 3	2
STA 3	Consists of level to gently sloping terrain (southwestern aspect) measuring approximately 8 x 6 m. This area overlooks a tributary of Tahlo Creek approximately 20 m below and to the south.	0–8 cm 8–18 cm 18–39 cm	Littermat Light brown and orange mottled silty, fine-grained sand with ~5% sub-rounded to sub-angular pebbles; Grey and orange mottled silty clay with ~5% inclusions	8	Negative	Fig. 4	3
STA 4	This area consists of a bench measuring approximately 40 x 2–7 m that overlooks a tributary of Tahlo Creek and associated wetlands to the northeast.	0–6 cm 6–18 cm 18–30 cm	Littermat Reddish-brown sandy silt with 15% angular gravels Brown-grey clay-rich silt with ~30% pebbles and cobbles	15	Negative	Fig. 4	4
STA 5	Consists of a low, rocky knoll overlooking a prominent creek and tributary of Tahlo Creek to the southwest. The terrace edge measure approximately 55 x 5 m.	0–2 cm 2–12 cm 12 cm+	Littermat Medium brown silt sand with ~25% angular gravels Bedrock	15	Negative	Fig. 4	5
STA 6	Consists of level terrain measuring approximately 12 x 10 m that overlooks an unnamed creek and associated gully to the south. This creek empties into Tahlo Creek, located approximately 130 m to the southwest. Surrounding terrain is moderately sloping with a south-southwestern aspect.	0–11 cm 11–19 cm 19–25 cm 25–35 cm	Littermat Moderately compact, medium brown, coarse sandy silt with trace clays and ~10% sub-rounded to sub-angular pebbles Very compact, medium brown clay-rich silt with ~5% pea gravels Medium grey-brown clays with <3% inclusions	10	Negative	Fig. 3	6

\*Depth below surface

**Table 3: Previously Recorded Post-AD 1846 CMT Sites**

Borden Number	Distance and Direction from Project Area	Site Type and Number of CMTs recorded	2016 Observations	Figure Number(s)
GhSp-47	Overlaps	Takla Grease Trail; 643 post-1846 CMTs	No CMTs were noted within the portion of the site which overlaps study area; Trail has been previously harvested and now consists of an overgrown access road with immature alder	Fig. 3, 4
GiSn-1	Overlaps	Takla Grease Trail; 29 post-1846 CMTs	No CMTs were noted within the portion of the site which overlaps study area; Trail has been previously harvested and now consists of an overgrown access road with immature alder	Fig. 3, 4
GiSn-3	Overlaps	Nine post-1846 CMTs were initially recorded in 2000; Site currently holds legacy status	No CMTs were noted within the portion of the site which overlaps study area	Fig. 3
GiSn-4	15 m SE	Nine post-1846 CMTs were initially recorded in 2000; Site currently holds legacy status	Only three post-1846 CMTs were observed in this area	Fig. 4
GiSo-7	45 m NW	Takla Grease Trail; 377 post-1846 CMTs, four historic campsites/traditional use sites	No CMTs were noted within the portion of GiSo-7 that is in close proximity to study area; Trail has been previously harvested and now consists of an overgrown access road with immature alder	Fig. 4

**Table 4: Newly Recorded Post-AD 1846 CMT Sites**

CMT Site Number	Number of Trees	Description	Date of Modification	Figure Number	Image Number
CMT Site 1	1	Bark-stripped, lodgepole pine	1940 ± 5 years	Fig. 4	7
CMT Site 2	1	Bark-stripped, balsam	1945 ± 10 years	Fig. 4	8
CMT Site 3	2	Bark-stripped, lodgepole pine (1), balsam (1)	1963–1970 ± 10 years	Fig. 4	9
CMT Site 4	2	Bark-stripped, lodgepole pine. An additional 12 CMTs were noted to the north of the project boundary in this area, leading down to the unnamed lake (approx. 60 m to the north)	1939–1970 ± 10 years	Fig. 3	10
Blazed Trail 1	9	Blazed, lodgepole pine	1965 ± 5 years	Fig. 4	11

**Table 5: Effectiveness of Subsurface Testing Program**

Test Location	Number of Tests	Estimated Testable Area (m <sup>2</sup> )	Average Test Spacing (m)	Probability of Detecting a Site (%)	
				≥ 50 m <sup>2</sup> ; 2 artifacts per m <sup>2</sup>	≥ 100 m <sup>2</sup> ; 4 artifacts per m <sup>2</sup>
STA 1	8	50	2.6	88	100†
STA 2	20	208	3.3	70	99
STA 3	8	35	2.0	90*	100†
STA 4	15	143	3.1	75	100
STA 5	15	171	3.4	67	99
STA 6	10	92	3.0	76	100†
Average:				78.2	99.8

\*Area tested is <50 m<sup>2</sup>; † Area tested is <100 m<sup>2</sup>



**Photo 1:** Northeast-facing view of STA 1.



**Photo 2:** North-facing view to the small lake from STA 2.



**Photo 3:** Southwest-facing view of K. West (Left) and Q. Williams (Right) shovel testing in STA 3.



**Photo 4:** Photo taken from central portion of STA 4, facing northwest.



**Photo 5:** Northeast-facing view of STA 5; creek is to the southwest.



**Photo 6:** Northwest-facing view to STA 6 (with K. West).



Photo 7: CMT Site 1; CMT 1.



Photo 8: CMT Site 2; CMT 1.



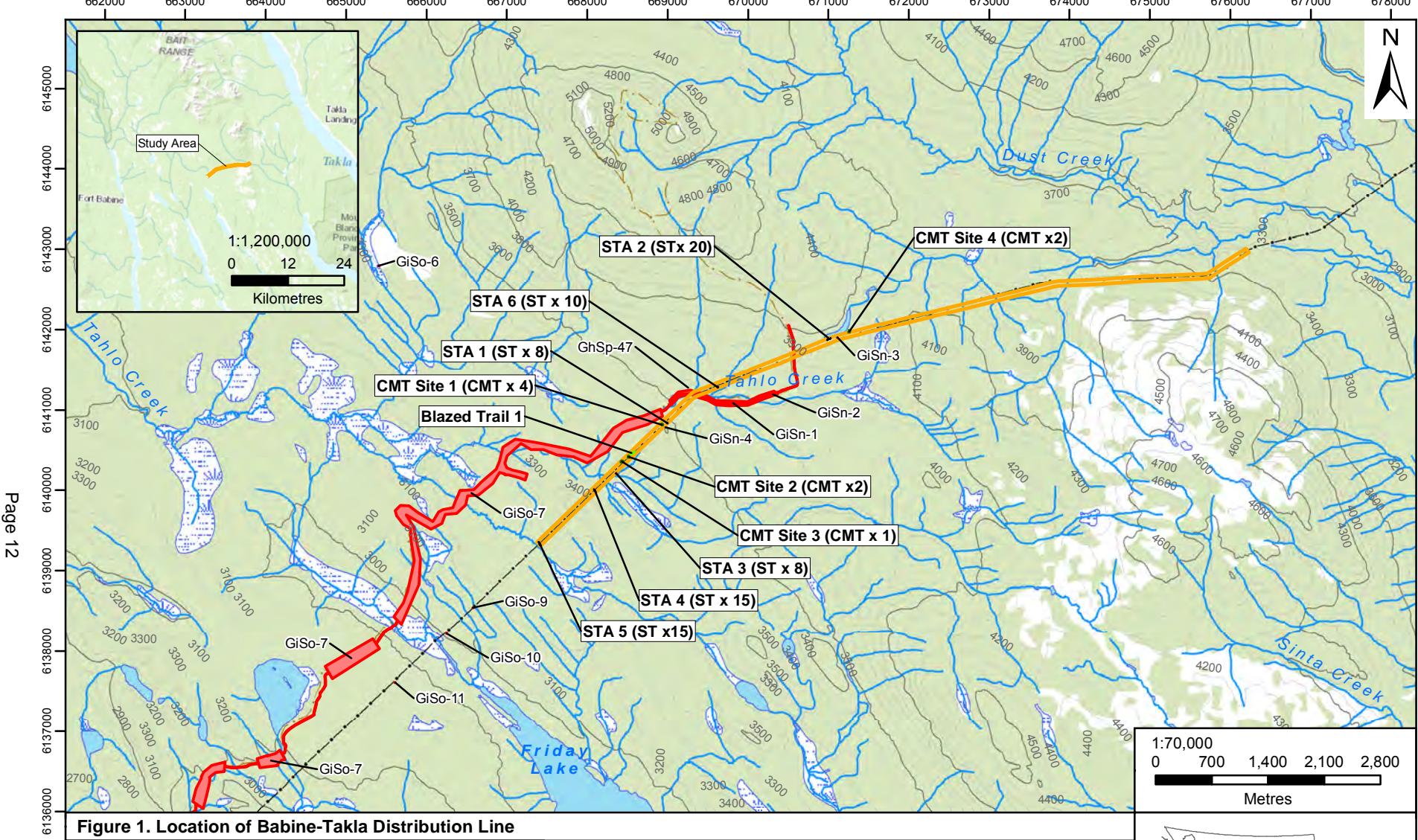
**Photo 9:** CMT Site 3; CMT 1.



**Photo 10:** CMT Site 4; CMT 1.



**Photo 11:** Blazed Trail 1; BT 1.

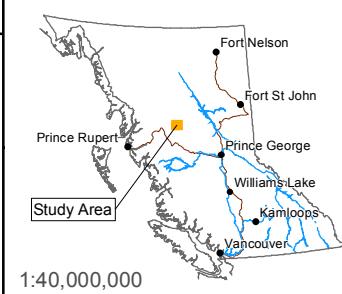


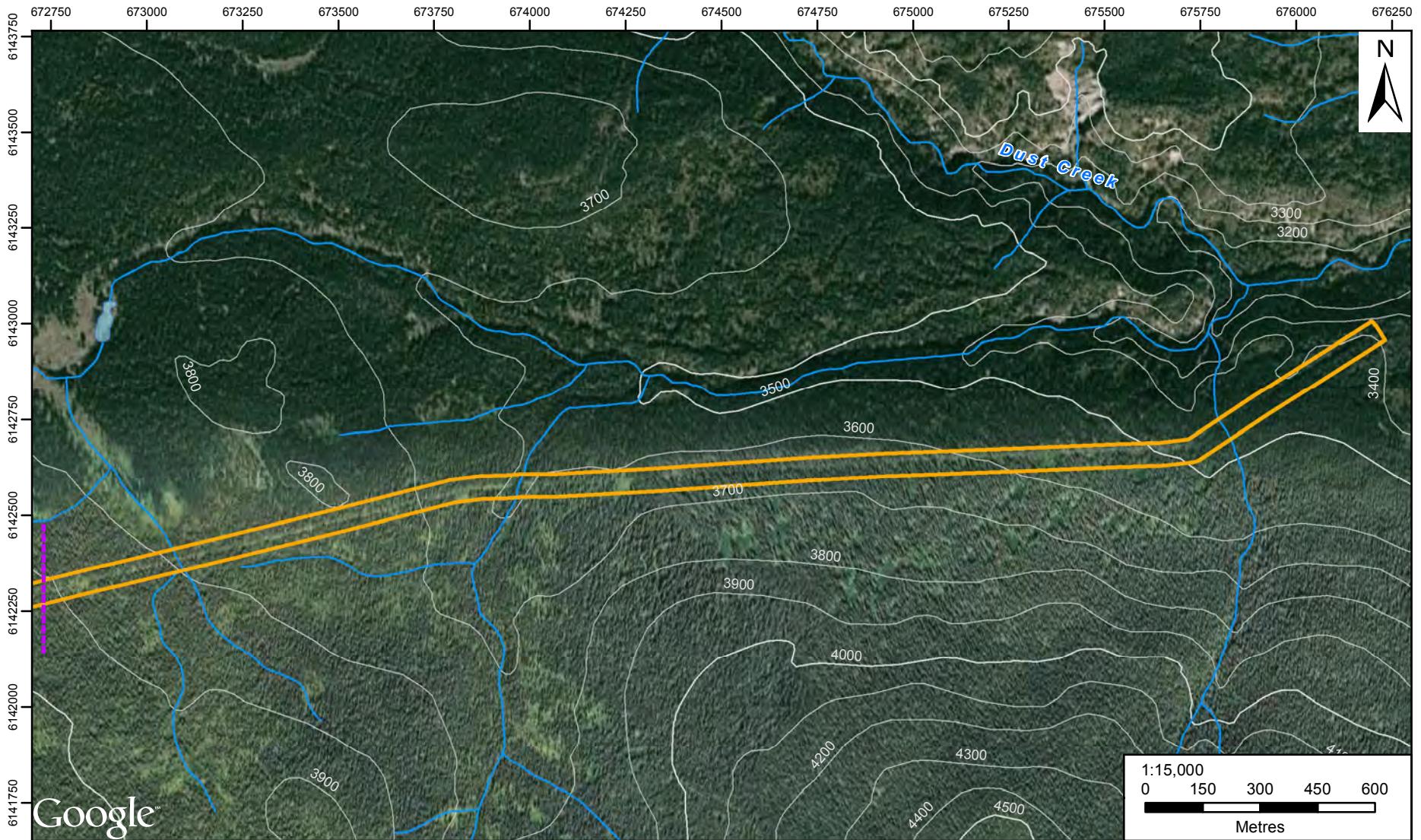
**Figure 1. Location of Babine-Takla Distribution Line**

Terra ID: 16-0957-035  
 Client: BC Hydro  
 HCA Permit: 2016-0314  
 Date Produced: 2016-12-20  
 Coordinate System: NAD 1983 UTM Zone 9N  
 Client Data Currency: 2016-09-21  
 Topographic Data Source: CanVec courtesy NRCAN – 2016-03-07

Study Area  
 Previously Recorded Site (Post-1846 AD)  
 CMT Site  
 Blazed Trail  
 Shovel Test Area

Power Line  
 Contour  
 River/Creek  
 Waterbody  
 Wetland  
 Wooded Area

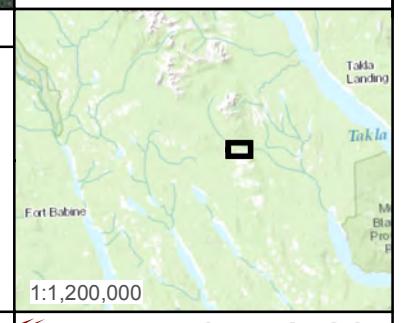




**Figure 2. Babine-Takla Distribution Line**

Terra ID:	16-0957-035
Client:	BC Hydro
HCA Permit:	2016-0314
Date Produced:	2016-12-12
Coordinate System:	NAD 1983 UTM Zone 9N
Client Data Currency:	2016-09-21
Topographic Data Source:	CanVec courtesy NRCAN – 2016-03-07
Imagery Currency:	2003

- Study Area
- Contour
- River/Creek
- Waterbody
- - Match Line



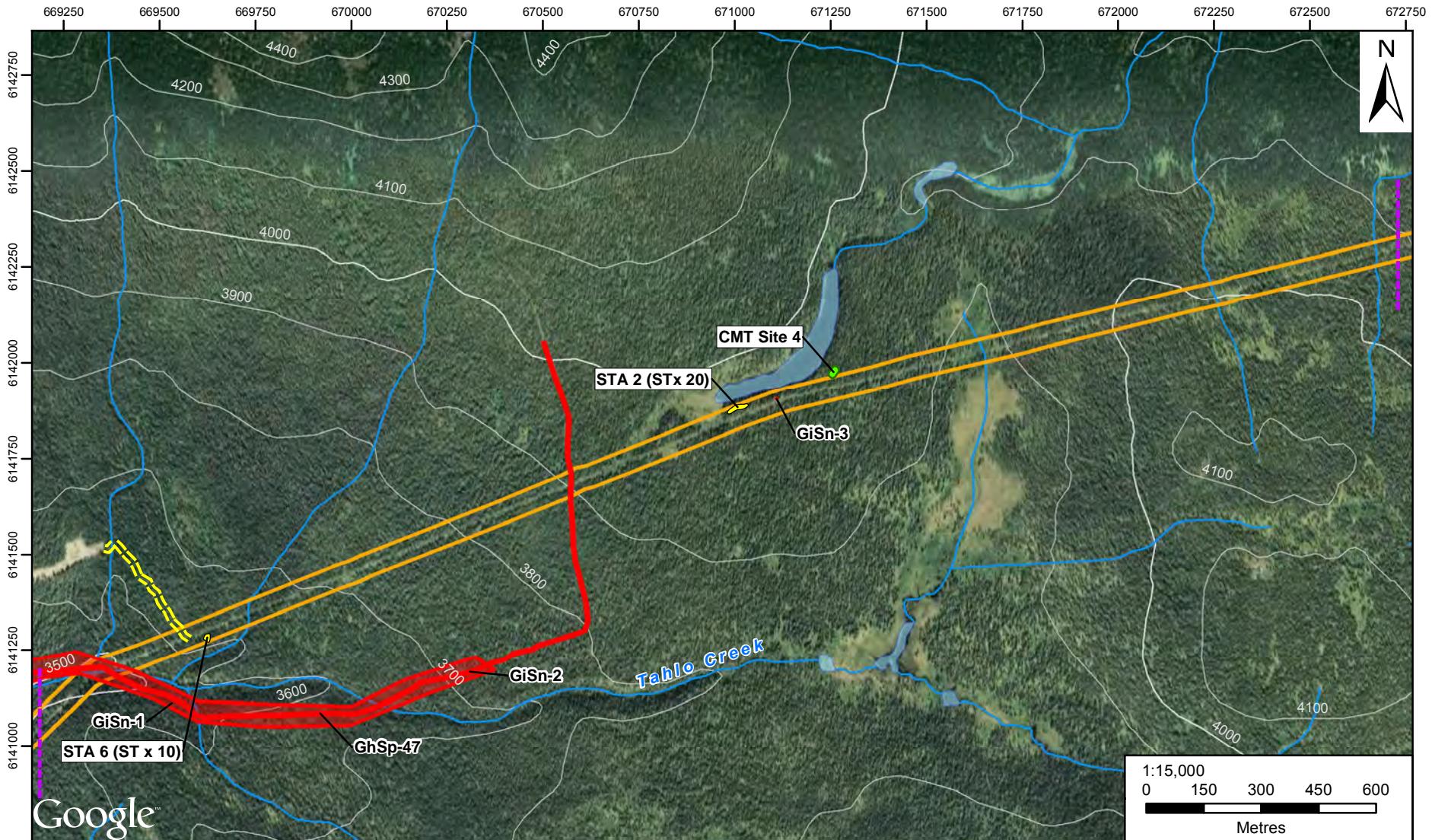
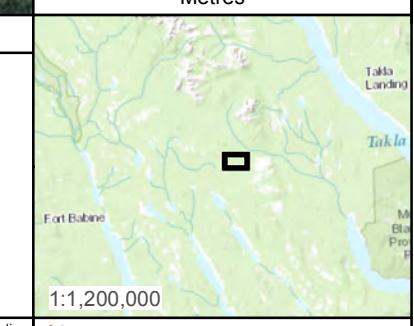
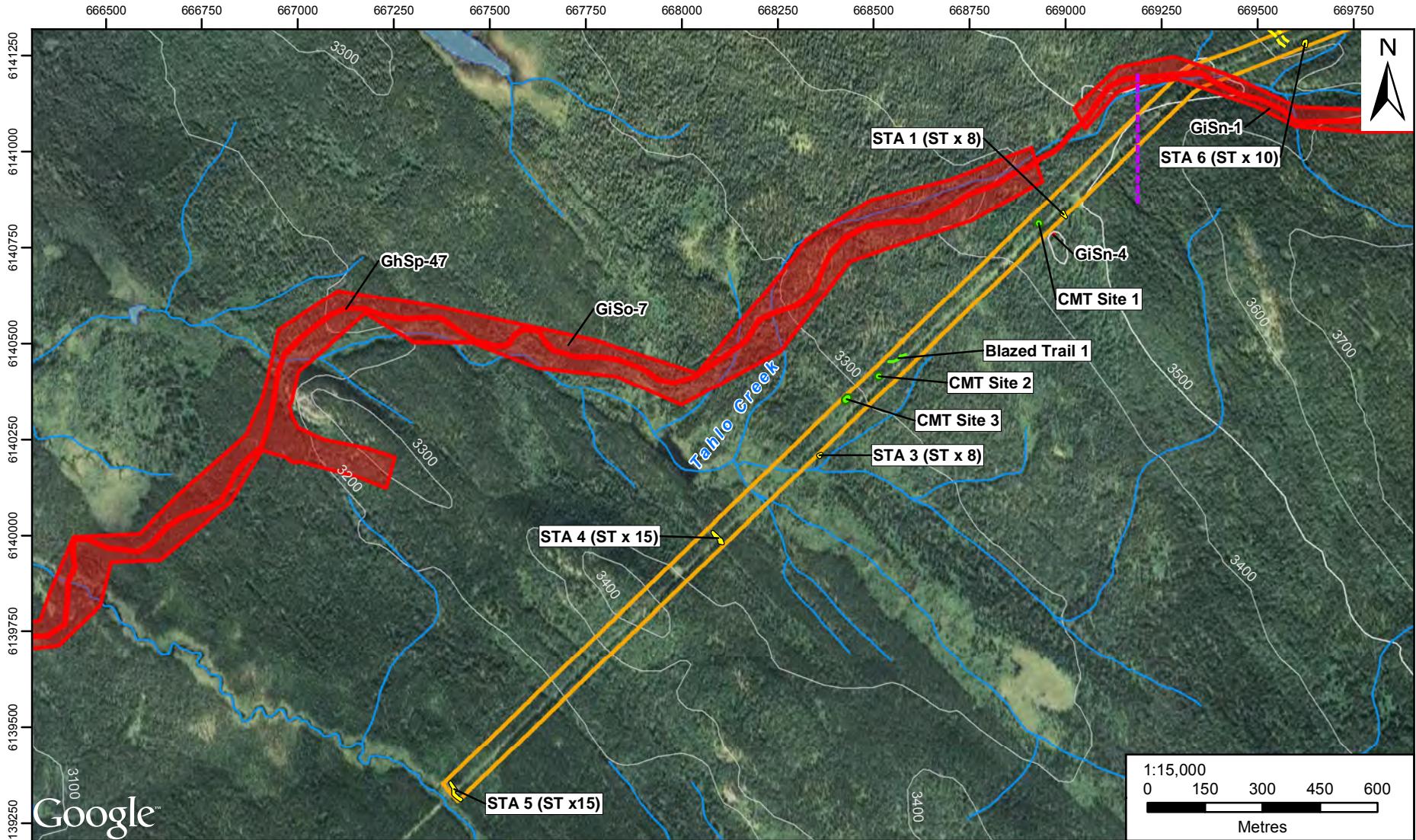


Figure 3. Babine-Takla Distribution Line

Terra ID:	16-0957-035
Client:	BC Hydro
HCA Permit:	2016-0314
Date Produced:	2016-12-20
Coordinate System:	NAD 1983 UTM Zone 9N
Client Data Currency:	2016-09-21
Topographic Data Source:	CanVec courtesy NRCAN – 2016-03-07
Imagery Currency:	2003

- Study Area
- Previously Recorded Site (Post-1846 AD)
- CMT Site
- Shovel Test Area
- Access Trail
- Contour
- River/Creek
- Waterbody
- Match Line



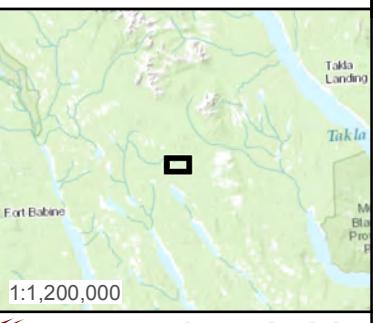


**Figure 4. Babine-Takla Distribution Line**

Terra ID:	16-0957-035
Client:	BC Hydro
HCA Permit:	2016-0314
Date Produced:	2016-12-20
Coordinate System:	NAD 1983 UTM Zone 9N
Client Data Currency:	2016-09-21
Topographic Data Source:	CanVec courtesy NRCAN – 2016-03-07
Imagery Currency:	2003

- Study Area
- Previously Recorded Site (Post-1846 AD)
- CMT Site
- Blazed Trail
- Shovel Test Area
- Access Trail
- Contour
- River/Creek
- Waterbody
- Match Line

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Terra Project Name: Babine-Takla Dist Line  
 Terra Project Number: 16-0957-035  
 Site Number: CMT Sites 1 - 4; BT 1

Date Range: Oct 4-11, 2016  
 Permit Number: 2016-0314  
 Recorded by: SKM/HAM

## CMT Table

NUM	SP	A/D	CL	T/Sh	STS	DBH (cm)	SLP (%)	LEN (cm)	WD (cm)	HAG (cm)	SDE	TMK	THK (cm)	NT	COR	SA and/or TA	Notes																																		
1	PI	DS	BS	T	L	42	37	163	14.5	0	U	N	9.5	N	Y	SA = 10, TA = 86; 1940 ± 5 yrs	CMT Site 1																																		
1	BL	DS	BS	T	L	25.5	5	95.5	7	97	U	N	2.5	N	Y	SA = 16, TA = 97; 1945 ± 10 yrs	CMT Site 2																																		
1	PI	DS	BS	T	L	23	12	56	7	29	U	Y	2.5	N	Y	SA = 16, TA = 69; 1963 ± 5 yrs	CMT Site 3																																		
2	BL	DS	BS	T	L	24	12	51.5	4.5	96.5	D	N	3	N	Y	SA = 32, TA = 79; 1970 ± 10 yrs	CMT Site 3																																		
1	PI	A	BS	R	R	51	0	99	20	46	D	N	5	N	Y	SA = 20, TA = 78; 1970 ± 5 yrs	CMT Site 4																																		
2	PI	A	BS	T	L	47	0	119	11	13	D	N	9	N	Y	SA = 12, TA = 89; 1939 ± 10 yrs	CMT Site 4																																		
4	PI	DS	B	O	L	20.5	0	31	1.5	42	U	Y	1.3	N	Y	SA = 19, TA = 70; 1965 ± 5 yrs	Blazed Trail 1																																		
NUM.....	CMT Identification (1, 2, 3, etc.)	SP.....	C.....	PI.....	Species: PI (lodgepole pine), C (cedar), H (hemlock), B (birch), BL (balsam)	A/D.....	Alive/Dead (also include if standing)	CL.....	Class: BS (bark-strip), AL (aboriginally logged), B (blaze), CH (chopped/kindling removal), OM (other modified tree)	T/Sh.....	Type (See Bark-striped and Aboriginally-logged features lists at far right)	STS.....	CMT top of scar shape, only applicable to Interior pine bark stripped CMTs; an overall rectangular (R) shaped pine CMT could have an angle, square, or round top: T (taper), R (round); S (square), Ar (angled down to right), Al (angled down to left), L (L-shaped), IL (inverted L-shape), X (X-cut), D (dito), I (irregular)	DBH.....	Diameter at breast height (diameter = circumference/pi)	SLP.....	Slope in % not degrees (indicates slope of general area, not just under CMT)	LEN.....	Maximum length of each feature	WD.....	Maximum width of each feature	HAG.....	Height of scar above ground. Note: if scar extends to ground, only measure if tool marks present at scar bottom	SDE.....	Scar facing side of tree: standing trees: U (Upslope), D (Downslope), S (Side slope), also record which general cardinal direction and degrees the scar faces	TMK.....	Toolmarks present (Y) or absent (N) and if possible, type of tool used, number, measurement, and location of scars in notes	THK.....	Thickness (*record if lodgepole pine kindling removal)	NT.....	Nursing tree present (Y) or absent (N)	COR.....	Yes/No, if yes enter SA	SA.....	Scar age or TA (tree age) or both (e.g., SA = 85 years, TA = 125 years)	Bark-striped (shape of pine scar)	(shape of pine scar)	T=Taper (Cedar only)	R	=Rectangular	=Rectangular	=Undercut	F=Felled	S=Sectioned	Aboriginally-logged features	T=Test hole	U=Undercut	N=Notched	P=Planked	C=Canoe	St=Stump: describe in notes

# **Request for Quotation (“RFQ”)**

**THIS IS NOT AN ORDER**

RFQ #: 7994

Title: Babine to Takla 45km ROW Widening Heritage Services

Contact Person: Jacob Abraham

Email: [jacob.abraham@bchydro.com](mailto:jacob.abraham@bchydro.com)

**This RFQ Package consists of:**

**PART 1**

- 1 Invitation
- 2 Background
- 3 Scope of Work
- 4 Instructions to Respondents
- 5 Appendices

**PART 2**

**Form of Quotation composed of:**

- Schedule 1 – RFQ Criterion;  
Schedule 2 – Compensation;  
Schedule 3 – References;  
Schedule 4 – Personal Information Consent Form;  
Schedule 5 – Conflict of Interest Statement;  
Schedule 6 – Confidentiality Agreement.

## PART 1

### 1 INVITATION

BC Hydro is performing a secondary selection Request for Quotation (“**RFQ**”) in accordance with the terms and conditions outlined in RFSQ 1422 to select the Respondents for the work described herein. Respondents are invited to provide a quote for certain **BABINE TO TAKLA DISTRIBUTION LINE HERITAGE SERVICES** (the “**Work**”), as per the terms and requirements outlined in this RFQ.

### 1 BACKGROUND

BC Hydro is a commercial Crown corporation, owned by the Province of British Columbia and regulated by the British Columbia Utilities Commission. BC Hydro’s corporate purpose is to provide reliable power, at low cost, for generations. It is one of the largest electric utilities in Canada, serving more than 1.8 million customers in a diverse geographic area containing over 95% of British Columbia’s population.

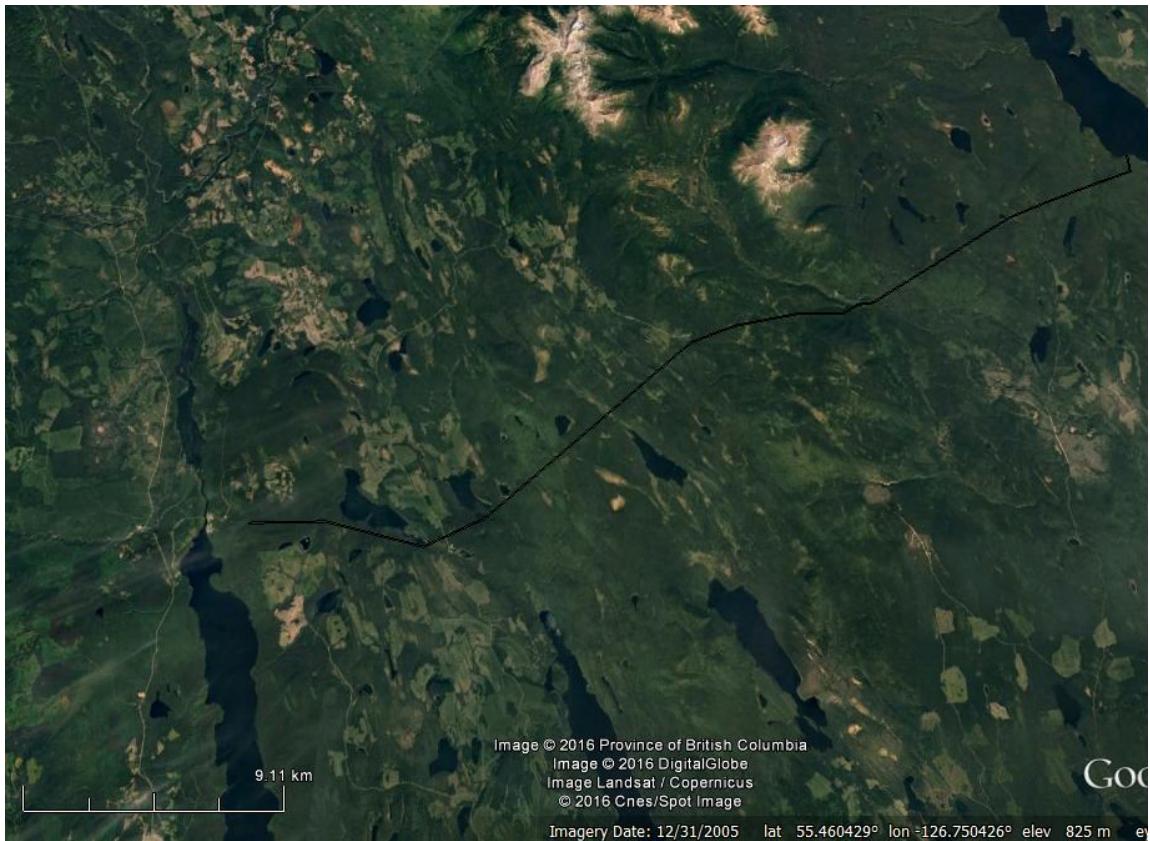
More information on BC Hydro can be found at: [www.bchydro.com](http://www.bchydro.com).

The community of Takla has experienced an increasing number of power outages of which some have lasted several days. These outages are mainly due to the narrow right-of-way currently cleared around distribution line BAB 25F52 and an increasing number of trees falling onto the line. Heavy fog often delays helicopter access required to repair the line and prolongs the duration of the outages. The interruptions also create a significant wildfire hazard.

To increase reliability and safety for the operation and maintenance of BAB 25F52, BCH has proposed to clear target vegetation (vegetation that could come within the safe limits of approach to the power line) within 30m of either side of the line (effectively increasing the ROW to 60m in width).

### LOCATION

As per Figure 1, the works will take place along the Distribution line between Fort Babine and Takla Landing (Start 650800 6133093 to End 688813 6151064 )



**Figure 1. Black line represents Distribution ROW where works to take place.  
Approximate length is 45km.**

### 3 SCOPE OF WORK

The Clearing Strategy will include the following broad components

- Logging in areas identified with Merchantable Timber (skidders will be used)
- Chipping (likely using a Rolly Chipper) in areas of non merchantable timber
- Hand falling with 15m Riparian Setbacks surrounding all watercourses.

### ASSUMPTIONS

It is assumed that all chipping of non merchantable timber will be done in the winter months with sufficient snow cover to mitigate for ground disturbance

Logging operations will include hand falling and skidding with associated ground disturbance. Access road creation is unknown at this time and will not form part of this RFQ.

All riparian Zones will be machine free zones to mitigate for riparian impact and ground disturbance

Areas indicated in Appendix 1 as non vegetated as well as Winter 2017 Rolly Chipping will not need an Archaeology Impact Assessment.

See Appendix 1 for approximate location of areas of Merchantable and Non Merchantable Timber, as well as areas where no AIA is required.

## CULTURAL HERITAGE INFORMATION

Two Traditional Use Surveys are being completed that will cover the 45km section of distribution line. Upon award, the survey information will be made available to guide the AIA.

The following AIA was conducted in 2001. The AIA covered ~half the distribution line from Fort Babine to the height of land. No subsurface testing was conducted.

Wilson, I. R. (2001). Archaeological Inventory & Impact Assessment: Proposed Right-of-Way Additional Clearing, BC. Hydro Electrical Transmission Line, Fort Babine to Takla Landing, B.C. HCA Permit 2000-299. On file at the Archaeology Branch, Victoria, B.C.

An AIA was completed in October 2016 on a 10km portion of the line (report pending) for emergent work for line security (Appendix 1 Winter 2017 Rolly Chipping). This section of line will not need to be reassessed.

## INVENTORY DESCRIPTION

A field program intended to identify and record heritage resources within the proposed project area. This is undertaken by completing surveys (e.g., foot, vehicle, aerial) throughout the project area, with a focus on areas identified by the AOA or desktop review as having heritage potential. The AIA should include a portion of areas rated as low potential to confirm the assigned potential ratings. Cultural Heritage information identified through ongoing engagement must also be incorporated into the targeted survey areas. While some archaeological sites can be observed on the surface, subsurface testing is used during an AIA to assist in locating buried archaeological sites and to determine the vertical and horizontal dimensions and content of any identified archaeological site. For scheduling and timing purposes, it is important to remember that most archaeological studies cannot occur in winter conditions and require snow-free, unfrozen ground. This and other site conditions that may impede subsurface testing (e.g., asphalt covering) do not negate potential for heritage resources, but will require specific methodologies to be developed (e.g., backhoe testing).

As stated, the 10km section referenced has already been completed and no further assessment is required. The section previously assessed under permit HCA Permit 2000-299 (excluding the section overlapped with the 10km section) will need to be reassessed to reflag heritage features (e.g. CMT's) that may have disappeared since 2001 as well as conduct any necessary subsurface sampling.

## IMPACT ASSESSMENT

The purpose of the impact assessment is to provide site specific recommendations for managing any identified heritage resources at risk of impacts related to the project. Site evaluation involves additional subsurface testing or systematic data recovery (excavations) that allow for evaluation of site significance in accordance with the Archaeological Impact Assessment Guidelines (Archaeology Branch 1989) (scientific, public, ethnic, historic and economic) and to assess project related impacts on the heritage resources (magnitude, severity, duration, range, frequency, diversity, cumulative effect and rate of change).

Upon completion of the AIA, a report will summarize the results of the AIA, along with impact management recommendations for any heritage resources may be impacted by the project. The recommendations will include viable alternatives for managing unavoidable adverse impacts including a preliminary program for implementing and scheduling impact management actions and, where necessary, conducting surveillance and/or monitoring. This can include additional studies to occur in advance of, or concurrent with, construction (excavation or monitoring respectively). Further permitting requirements in advance of construction activities will also be outlined.

Final Permit reports are submitted to the Provincial regulatory authority, the Archaeology Branch of the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) and distributed to all First Nations with an interest in the Project area by the PCA as part of the Provincial Heritage Permit obligations.

## **SCHEDULE OF MILESTONE TASKS AND DELIVERABLES**

Task	Delivery Date
Inspection Permit DRAFT Application	February 17
Inspection Permit Application FINAL to Arch Branch	February 21
Safety Management Plan Submission	May 1
Start of Field Work	May 7
DRAFT AIA	September 7
FINAL AIA	September 14

## **4 INSTRUCTIONS TO RESPONDENTS**

This RFQ is issued under RFSQ 1422, Environmental Consulting Services Pre-Qualification. The Master Services Agreement will apply to any Work awarded under this RFQ process.

Please complete the Form of Quotation including attached Schedules to enable comprehensive evaluation of your quotation:

### Form of Quotation

Schedule 1 – RFQ Criterion;  
Schedule 2 –  
Compensation; Schedule 3  
– References;  
Schedule 5 – Personal Information Consent Form;  
and Schedule 6 – Conflict of Interest Statement.

- RFQ Response**

Please complete and return your response via email to:

**Jacob Abraham**

Email: [jacob.abraham@bchydro.com](mailto:jacob.abraham@bchydro.com)  
Phone: 604-528-1868

Your response must be received **before 11:00 a.m. PST, on Thursday, February 10, 2017.**

Responses received after the Closing Time and Date will not be considered.

Please limit your response to approximately twenty (20) pages (excluding appendices). No links or attachments should be embedded in your response.

The response should be in the English language in MS Word, MS Excel or PDF format. Due to BC Hydro email system restrictions, any single email, including all attachments, should be limited to 10 MB in size to minimize the risk of non-transmission.

The Term within the Work Order Release is anticipated to commence on or about February 16, 2017 through to March 31, 2018. At BC Hydro's sole discretion, any Work Order Release may be extended or modified for additional scopes of work and/or additional term(s).

#### **Anticipated RFQ Timeline**

<b>Activity</b>	<b>Estimated Timeline</b>
Request for Quotation Issued	February 1, 2017
Responses Due	February 10, 2017
Evaluation	February 13, 2017
Award Work Order Release	February 16, 2017
<b>Permit Application Submission</b>	<b>February 20, 2017</b>
Submittals (Safety Management Plan), due to BC Hydro	March 24, 2017
Work Commences pending permit issuance	Mid-April/May, 2017

The anticipated timeline for this RFQ process for the Work to be performed is as follows, however the actual timing and sequence of events may vary and shall ultimately be determined by BC Hydro.

#### **1 EVALUATION PROCESS AND CRITERIA**

- **Evaluation Committee**

The evaluation of Quotations to identify a preferred Respondent(s) will be carried out by a committee of three or more persons appointed by BC Hydro (the "**Evaluation Committee**"). The Evaluation Committee may be assisted by other persons as the Evaluation Committee may determine it requires, including technical, financial, legal and other advisors or employees of BC Hydro.

- **Evaluation Criteria**

The Evaluation Committee will compare and evaluate the Quotations to identify the Quotation(s) which the Evaluation Committee judges to be the most advantageous to BC Hydro by applying the evaluation criteria set out below.

**Stage 1 – Mandatory Requirements**

<b>Criterion</b>	<b>Evaluation Method</b>
Responses must be received at the Closing Location at or before the Closing Time	Pass / Fail
Responses must contain a complete and signed Conflict of Interest Statement	Pass / Fail
1 Key Personnel qualifications: HCA Permit Holder & Field Directors	Pass / Fail
2 Agreement to use BC Hydro prepared HCA Permit Template	Pass / Fail

Respondents that do not meet the minimum mandatory requirements stated above will be disqualified and will not proceed to Stage 2 of evaluations.

**Stage 2 – Evaluated Criterion**

<b>Criterion</b>	<b>Evaluation Weight</b>
3 Capacity/ability to meet schedule	20%
4 Key personnel experience and CVs	20%
5 Analysis and reporting capability	10%
6 Submittals	10%
7 Schedule 2 - Compensation	40%
<b>Total Evaluation Weight</b>	<b>100%</b>

**Evaluation Process**

To assist in evaluation of Quotations, the Evaluation Committee may, in its sole and absolute discretion, but is not required to:

- (a) conduct reference checks and background investigations of the Respondents, and any subcontractors proposed in the Quotation, with internal and/or external sources, and rely on and consider any relevant information received from the references and from any background investigations in the evaluation of Quotations;
- (b) seek clarification or additional information from any, some, or all Respondents with respect to their Quotation, including with respect to their Aboriginal Inclusion, and  
consider such supplementary information in the evaluation of Quotations;
- (c) request interviews/presentations with any, some, or all Respondents to clarify any questions or considerations based on the information included in Quotations, and  
consider any supplementary information received from interviews/presentations in the evaluation of Quotations; and
- (d) seek confirmation that the inclusion of any Personal Information about an individual in a Quotation has been consented to by that individual.

## **Detailed Evaluations**

In conducting an evaluation:

- a) the Evaluation Committee will not be required to complete a detailed evaluation of all Quotations and may, after completing a preliminary review of all Quotations, identify and drop from any detailed evaluation any Quotation which the Evaluation Committee judges to not be in contention to be selected as the Quotation of the preferred Respondent when compared to the other Quotations;
- b) the Evaluation Committee may at any time drop from detailed evaluation a Quotation from a Respondent that the Evaluation Committee judges to not be sufficiently safety oriented;

## **Reservation of Rights**

BC Hydro reserves the right, in its sole and absolute discretion, to:

- (a) at any time, for any reason, reject any or all Quotations and terminate the process under this RFQ, and proceed with the Work as described in this RFQ in some other manner, including reissue a request for Quotations or undertake another procurement process for the same or similar scope of Work;
- (b) not award any of the Work, or all of the Work, to any of the Respondents;
- (c) evaluate a Quotation that includes one or more alteration, modification or amendment to the specifications or drawings or both by applying the evaluation criteria as set out in Section 5.2 to identify the alteration, modification or amendment that BC Hydro determines is most advantageous to itself, and select that Quotation based on the identified alteration(s), modification(s) or amendment(s) together with the corresponding adjustment, if any, to the Quotation Price;
- (d) accept the Quotation which, applying the evaluation criteria as set out in Section 5.2, BC Hydro determines is most advantageous to itself, and, without limitation, select a Quotation which does not have the lowest Quotation Price;
- (e) award separate Work Order Releases or other forms of contract for portions of the Work or additional Work, including with respect to one or more payment items; and
- (f) if only one Quotation is received, reject that Quotation and terminate the process under this RFQ, and proceed with the Work as described in this RFQ in some other manner, including entering into negotiations with that Respondent with respect to any matter, including price.

## **Clarifications and Further Information**

Notwithstanding any other provision of the RFQ, and in addition to the rights reserved under Reservation of Rights, **BC Hydro reserves the right:**

- (a) to seek further information (including any missing non-mandatory items) with respect to, or clarification of, any Quotation submitted by any Respondent, including for the purposes of incorporation of terms and conditions that are or may be different than those contained in the RFQ and/or any Quotation. Such information or clarification

- may be sought from any one or more Respondents, but not necessarily all Respondents, and may be sought at any time either serially or concurrently;
- (b) not to seek further information or clarification from any one or more Respondents;
  - (c) to terminate for any reason the seeking of further information and clarification from any one or more Respondents;
  - (d) to seek different further information or clarifications from different Respondents;
  - (e) to seek confirmation that the inclusion of any “personal information” about an individual in a Quotation has been consented to by that individual; and
  - (f) to request additional information and/or proof of Aboriginal eligibility.

## **2 NO CONTRACTUAL OR LEGAL OBLIGATIONS**

The RFQ documents are not intended to constitute, or be interpreted as, a call for tenders, and the submission of a quotation is not intended to create any contractual or other legal obligations or duties whatsoever owed to the Respondents by BC Hydro, including any obligation or duty to accept or reject a Quotation, to enter into negotiations, to continue negotiations, or to issue a Work Order Release or award another form of contract. Without restricting the generality of the foregoing, no contractual relations shall exist between BC Hydro and the Respondents until the issuance and acceptance of a Work Order Release or execution of a contract with the Respondent, except for any waivers, releases, exclusions or limitations of liability, confidentiality and/or indemnity obligations or other covenants or agreements made, given or accepted by Respondent in the Form of Quotation or otherwise in connection with this RFQ process.

## **3 QUOTATION PREPARATION COSTS AND NO CLAIMS**

Respondents are solely responsible for their own costs and expenses incurred in preparing and submitting a Quotation and for attending any Site visits, meetings, due diligence, negotiations or discussions with BC Hydro or BC Hydro's representatives and consultants, relating to or arising from this RFQ.

By submitting a Quotation, Respondents irrevocably waive any claim against BC Hydro and its employees, directors, officers, advisors or representatives for any compensation of whatsoever nature or kind, including for loss of anticipated profits, loss of opportunity, indirect, incidental or consequential damages or losses if Work Order Release is issued or no contract is entered into for the Work between the Respondent and BC Hydro for any reason whatsoever, including in the event that BC Hydro rejects or disqualifies or for any other reason fails to accept a Quotation.

## **ENQUIRIES**

All enquiries regarding this RFQ should be directed to the Procurement Contact. Information obtained from any source other than the Procurement Contact will not form part of this RFQ and may not be used or relied on by a Respondent for the purpose of preparing its Quotation.

## **ADDENDA**

BC Hydro may, in its sole and absolute discretion, through the Procurement Contact, amend this RFQ at any time by issuing a written addendum (an “**Addendum**”). Written Addenda are the

only means of amending or clarifying this RFQ, and no other form of communication whether written or oral, including responses to enquiries provided pursuant to Section 8, will be included in or in any way amend this RFQ. Only the Procurement Contact is authorized to amend or clarify this RFQ by issuing an Addendum. No other employee or agent of BC Hydro is authorized to amend or clarify this RFQ.

## **OWNERSHIP OF QUOTATION**

Upon delivery to BC Hydro, the Quotation and all its contents become the property of BC Hydro and will not be returned to the Respondents.

## **USE OF RFQ DOCUMENTS**

No person may, without the express prior written consent of BC Hydro, use, copy or disclose any information contained in the RFQ documents for any purpose other than for the purpose of preparing a Quotation.

## **FOIPPA**

Respondents should be aware that BC Hydro is a “public body” defined by and subject to the *Freedom of Information and Protection of Privacy Act* (British Columbia) (“**FOIPPA**”). Subject to FOIPPA and this RFQ, BC Hydro will endeavor to keep the Quotation and its contents confidential.

## PART 2 - FORM OF QUOTATION

### FORM OF QUOTATION

Babine to Takla 45km ROW Widening

### HERITAGE SERVICES

To: British Columbia Hydro and Power Authority ("BC Hydro") Attention: Jacob Abraham

Email: [jacob.abraham@bchydro.com](mailto:jacob.abraham@bchydro.com)

#### RESPONDENT INFORMATION

This Quotation is submitted by:

Legal Name of Respondent (the "Respondent"):	
Address:	
Name of Representative:	
Representative's Telephone Number:	
Representative's Email Address:	

#### RESPONDENT'S DECLARATIONS

The Respondent declares and confirms it:

- 6 received, has examined and understands the RFQ documents, including any issued Addenda;
- 7 agrees to all terms and conditions of the RFQ;
- 8 has full knowledge of the Work that may be required to be performed by it in accordance with the Contract Documents included in Part 3 of the RFQ;
- 9 complied with the RFQ;
- 10 based its Quotation price on the estimated quantities set out in the Compensation Schedule contained in Schedule 2, and understands that actual quantities may vary; and
- 11 has completed and includes with this Quotation all Schedules attached to the Form of Quotation included with the RFQ.

This Quotation is executed by the undersigned as of the date noted below.

Authorized Signatory

Name and Title of Authorized Signatory

Date

## SCHEDULE 1 – RFQ CRITERION

Please respond to the questions under each heading clearly and concisely.

### Criteria 1: Key Personnel Qualifications (Mandatory Requirement)

Respondents are required to provide CVs for a Heritage Permit Holder and Field Directors for the Mitigation Project(s) in this RFQ on which they are responding.

**Respondents that do not confirm they have a senior archaeologist on their team currently eligible to hold the HCA Section 14 Investigation permit and Field Directors for this work who are in good standing with the BC Archaeology Branch will be disqualified and will not be evaluated further.**

Please respond in the following manner, and provide evidence of the following required certifications and professional designations:

- **YES, we [Respondents Company Name] have a senior archaeologist on our team currently eligible to hold the permit for this work who is in good standing with the BC Archaeology Branch.**

**Their name is: [Permit Holder's Name]**

\_\_\_\_\_, (Print Name)

- **YES, we [Respondents Company Name] have a qualified and approved Field Director with the BC Archaeology Branch available to supervise each crew.**

**Their names are: [Field Director Name(s)]**

\_\_\_\_\_,  
(Print Name)

\_\_\_\_\_,  
(Print Name)

\_\_\_\_\_,  
(Print Name)

### Criteria 2: Capacity/Ability to Meet Schedule (Evaluated Requirement)

The field work must be completed by October 20, 2017. The Work Schedule assumes there will be no extenuating circumstances that will impact the Respondent's ability to complete the Work by October 20, 2017. If unforeseen circumstances arise that impact the Respondent's ability to complete the Work by October 20, 2017, BC Hydro and the Respondent will work together to resolve the issue to enable the Contractor to complete the Work without further delay.

### Criteria 4 – Key Personnel Experience and CVs (Evaluated Criteria)

Respondents note in accordance with this RFQ, they must have or obtain a permit under the Heritage Conservation Act which has certain requirements including experience in the area in which the work will take place. Respondents are to provide descriptions of their experience with work of similar size, scope and complexity to the work contemplated in this RFQ,

highlighting any work that has been performed in the Northeast of the Province of BC. Please include CVs for key personnel.

### **Criteria 5 – Analysis & Reporting Capability (Evaluated Criteria)**

*Respondents are to respond to the following questions:*

Do you have in-house capabilities to complete lithic and faunal analysis? Please provide analysts' names. If not, who would you propose to use as a subcontractor?

\_\_\_\_\_  
(Print Name)

Are you able to complete interim systematic data recovery reports within 28 days of completion of excavation at a specific site, including preliminary lithic and faunal analysis?

### **Criteria 6 – Submittals**

Respondents are to include a typical Safety Management Plan (SMP) for work similar in scope to the Work contemplated in this RFQ, as part of their Quote submission.

Note: The successful Respondent(s) will be required to provide, and have accepted by BC Hydro, all required submittals and plans on or by March 24, 2017 prior to commencement of the field portion of Work in April or May.

### **SCHEDULE 2 – COMPENSATION**

Please provide pricing information, as outlined in the tables below. Pricing will be in Canadian Dollars, and will include all costs associated with performing the work, excluding GST.

The Respondent will provide a summary of their labour rates, disbursements/expense rates, other costs, and will provide an estimated total costs. using the summary table in - Cost Estimate and Rates & Disbursements Sheet Template attached in Exhibit A – Templates. In addition, Respondents will provide a detailed cost estimate to support their response.

#### **When preparing the Cost Estimate, the Respondents must:**

- Use the Cost Estimate and Rates Sheet Templates found in Exhibit A.
- Consider and incorporate all information described in Part 1 Section 3. Scope of Work and all Exhibits listed in this RFQ.
- Respondents are to include all costs associated with delivering the AIA.
- List planning assumptions made in the development of the pricing sheets such as productivity rates, travel times to site, mob/demob time, provision of relevant and required training, make up of crew, etc.

- Please include rates for all possible equipment that may be used even if this equipment is not planned to be used and therefore not included in the cost estimate.
- Key Personnel should be named. Other personnel may be named by rate classification (e.g. Senior Archaeologist, Junior Archaeologist, Field Assistant, GIS technician, etc.).

### **SCHEDULE 3 – REFERENCES**

Provide below three (3) recent customer references where you have provided similar work to that required by BC Hydro described in this RFQ.

Respondent's agrees that BC Hydro may contact any of these references, or any references not provided herein, without further notice.

<b>Client Name</b>	
<b>Address (City and Country)</b>	
<b>Contact Name</b>	
<b>Title of Contact</b>	
<b>Telephone No.</b>	
<b>E-mail Address</b>	
<b>Length of Relationship</b>	
<b>Type of Work provided to this Client</b>	

<b>Client Name</b>	
<b>Address (City and Country)</b>	
<b>Contact Name</b>	
<b>Title of Contact</b>	
<b>Telephone No.</b>	
<b>E-mail Address</b>	
<b>Length of Relationship</b>	
<b>Type of Work provided to this Client</b>	

<b>Client Name</b>	
<b>Address (City and Country)</b>	
<b>Contact Name</b>	
<b>Title of Contact</b>	
<b>Telephone No.</b>	
<b>E-mail Address</b>	
<b>Length of Relationship</b>	
<b>Type of Work provided to this Client</b>	

## **SCHEDULE 4 – PERSONAL INFORMATION CONSENT FORM(S)**

*Respondents that will be submitting to BC Hydro, as part of their quotation, a resume, work history, summary of qualifications or other “personal information”, with respect to any individual, should submit, in relation to each such individual, a consent form, in the following form, completed and signed by that individual.*

***Respondents should note that receipt of these consents is important for BC Hydro to meet its obligations under the (BC) Freedom of Information and Protection of Privacy Act. Quotations that do not include the necessary consent forms may be rejected at BC Hydro's discretion.***

### **PERSONAL INFORMATION CONSENT**

#### **FORM RFQ**

**Reference #618090**

**Title:** Babine to Takla 45km ROW Widening

With the provision of my signature at the foot of this statement I,

,  
(Print Name)

consent to the indirect collection from

(Print Name of Respondent's)

by BC Hydro, of my personal information in the form of a work history, resume or summary of qualifications.

In consenting to this indirect collection, I understand that my personal information, so collected, will be used by BC Hydro for the sole purpose of evaluating the submitted response to the above-noted procurement process. I understand further that my personal information, once collected by BC Hydro, will be handled by BC Hydro in accordance with the provisions of the (BC) *Freedom of Information and Protection of Privacy Act*.

)  
)  
Signature ) Date

BC Hydro is collecting this personal information in furtherance of its mandate under the Hydro and Power Authority Act and/or Utilities Commission Act. If you have any questions about how BC Hydro collects, uses or discloses your personal information, you may contact Jennifer McCarthy at [SCProcurement@bchydro.com](mailto:SCProcurement@bchydro.com) or 604-699-7222.

## **SCHEDULE 5 – CONFLICT OF INTEREST STATEMENT**

Respondent's hereby represents and warrants to BC Hydro that it has read the Contractor Code of Conduct a copy of which is available at  
[http://www.bchydro.com/toolbar/about/who\\_we\\_are/corporate\\_citizenship/code\\_of\\_conduct.html](http://www.bchydro.com/toolbar/about/who_we_are/corporate_citizenship/code_of_conduct.html)  
or by contacting Hydro's Representative and, at the time of submitting this Quotation, there is no actual, apparent, or potential conflict of interest with BC Hydro.

**In accordance with the above at the time of submission of the Quotation (check one box from below):**

There is no actual, apparent, or potential conflict of interest between our organization and BC Hydro, or

We hereby declare that the following may be seen to be an actual, apparent, or potential conflict of interest between our organization and BC Hydro, at this time, and we undertake to take the following actions to resolve the conflict of interest:

**SCHEDULE 6 – CONFIDENTIALITY AGREEMENT**

## **CONFIDENTIALITY AGREEMENT**

**(To be completed by every individual working on the Scope of Services)**

Babine to Takla 45km ROW Widening

Name:

Company/Employer and Position

You have been invited to participate in the Babine to Takla 45km ROW Widening Project (collectively the “Project”) on behalf of BC Hydro (“BC Hydro”). Your participation may be as a consultant, contractor, advisor or employee of a consultant, contractor or BC Hydro. In the course of your participation you may receive, have access to, or otherwise obtain **“Confidential Information”** (as defined below). As a condition of your participation or continued participation, BC Hydro requires you to agree to the following confidentiality terms and conditions, on which BC Hydro will rely:

- (g) You will not use the Confidential Information in any way or for any purpose other than as reasonably required for your participation in the Project. You will disclose the Confidential Information (or any portion thereof) only on a “need-to-know” basis to those persons with whom you work on the Project, and only on the condition that all such information be retained by each of those persons as strictly confidential.
- (h) If communication with the public or interested parties is part of your scope of work or responsibilities with BC Hydro then in order to provide clear and consistent communication about the Project, you will follow the protocols as may be provided to you by BC Hydro in disclosing any Confidential Information.
- (i) Subject to any disclosure requirements of the law, and subparagraphs(a) and(b), you will keep all Confidential Information that you receive, have access to, produce or otherwise obtain strictly confidential for a period of ten years after the date of this agreement, and you will not, without the prior express written consent of an authorized representative of BC Hydro, use, divulge, give, release or permit or suffer to be used, divulged, given or released, any portion of the Confidential Information to any other person, firm, corporation or other entity for any purpose whatsoever.
- (j) For the purposes of this agreement **“Confidential Information”** means:
  - all information, documents and materials, whether in writing, oral or in electronic form, relating in any way to the Project, and includes: all schedules and budgets and other planning information; all reports (including draft reports) and correspondence; all procurement-related materials; and all proposals and submissions and tenders from any party relating to the Project;
  - any other information, documents or materials relating in any way to the Project, including any information, documents or materials provided to you by a representative of BC Hydro or other person working on the Project; and

- any information, documents or materials produced by you or any other person based on or developed out of any of the information, documents or materials described above.

(k) For the purposes of this agreement "Confidential Information" does not include:

- information that is, or subsequently becomes, publicly available other than through a breach of this agreement or through a breach of a confidentiality agreement which another person has entered into concerning the Confidential Information;
- information which you already possessed before commencing to participate in the Project;
- information which is rightfully received from a third party without breach of any obligation of confidence to the disclosing party; or
- information which is independently developed without the use of the Confidential Information.

(l) You will return any Confidential Information in your possession to BC Hydro immediately upon receiving a written request to do so from BC Hydro.

(m) The Confidential Information is proprietary and confidential, the disclosure of which would be contrary to the public interest and detrimental to BC Hydro.

(n) The provisions of this agreement will remain in effect regardless of whether you continue to be involved in the Project.

(o) If any portion of this agreement is found to be invalid or unenforceable by law by a court of competent jurisdiction then that portion will be severed and the remaining portion will remain in full force and effect.

(p) If you breach this agreement, BC Hydro may take the benefit of all remedies available at law, including specific performance and equitable relief.

(q) The above obligations are in addition to any confidentiality obligations to which you may be subject under contract with BC Hydro or as an employee under BC Hydro's Code of Conduct.

If you agree to the terms as set out above, kindly so indicate by signing a copy of this agreement.

THE ABOVE TERMS are agreed and consented to this                                  day of                                   , 20

Per:

[Signature of person named above]

# WORK ORDER

Reference # RFQ7994

**[BCO – to be inserted]**

This Work Order is made as of the [Date – to be inserted] between British Columbia Hydro and Power Authority ("BC Hydro"), and [to be inserted] ("Consultant") and incorporates by reference the terms and conditions of the Consulting Services Agreement [BCO - to be inserted] between the parties dated [Date – to be inserted] (the "Master Agreement") and RFQ #618090. In case of conflict between the terms and conditions of this Work Order and the terms and conditions of the Master Agreement, this Work Order shall prevail. However, any changes, including additional terms and conditions, that Consultant may purport to impose in response to this Work Order will not be valid unless and until expressly accepted in writing by BC Hydro's Representative as identified in the Master Agreement or this Work Order.

*[To be completed upon award based upon the RFQ Documentation, the successful Respondent(s) Quotation and negotiations with the successful Respondent(s)]*

**BC Hydro and Consultant agree that Consultant will perform the Services as follows:**

**A. Project Description:**

Babine to Takla 45km ROW Widening Heritage Services

**B. Scope of Services, including required Deliverables:**

[to be inserted – upon award]

**C. Location where Services are to be performed:**

[to be inserted – upon award]

**D. Schedule for performance:**

Start Date: [to be inserted – upon award]

End Date: [to be inserted – upon award]

Options for Renewal: [to be inserted – upon award]

**E. Consultant Key Personnel and Compensation (at least one Key Personnel from the Master Agreement must be named):**

**1. Key Personnel - [to be inserted – upon award]**

Personnel	Role

**2. Compensation**

[to be inserted – upon award]

**F. Description of Security Sensitive Work, if any, for purposes of SC7 of the Agreement:**

N/A

**G. Hydro's Representative:**

Name: Andrew Walter Phone: 604-528-1770

E-mail: [Andrew.Walter@bchydro.com](mailto:Andrew.Walter@bchydro.com)

**H. Consultant's Representative:** [to be inserted – upon award]

Name: Phone: E-mail:

**I. Required insurance:**

[to be inserted – upon award]

**J. Restricted Party designation applicable for purposes of SC4 (indicate yes/no, as applicable):**

No

**K. Other Terms and Conditions, including amendments to the Agreement:**

For the purpose of this Work Order the following Exhibits attached apply to this Work Order. Failure to comply with the requirements of Exhibits will be deemed to be a default under the Work Order to which the provisions of clause 25 will apply.

Exhibit A – Templates

Exhibit B – ABORIGINAL PARTICIPATION AND REPORTING REQUIREMENTS

By signing below, Consultant further warrants and represents that there are no actual, apparent, or potential conflicts of interest that could impact its performance of Services under this Work Order, other than those (if any) already identified to Hydro's Representative in writing and resolved prior to the execution of this Work Order, and that it shall comply with its disclosure obligations under the Contractor Code of Conduct should it become aware of any actual, apparent, or potential conflicts of interest at any time during the performance of the Services.

**APPROVED AND ACCEPTED BY BOTH PARTIES** as of the date first above written.

<b>British Columbia Hydro and Power Authority</b> , by its authorized signatory:	<b>[CONSULTANT NAME]</b> by its authorized signatory:
Signature:	Signature:
Print Name:	Print Name:
Title:	Title:
Date:	Date:

## EXHIBIT A TEMPLATES

### 1 Cost Estimate and Rates & Disbursements Sheet Template

#### EXHIBIT G 1 - COST ESTIMATE TEMPLATE

Phase #	Phase Description	Task #	Task Description	Scope of Work / General Assumptions for Task	Fees				Disbursements								
					Name Role/Level	Name Role/Level	Name Role/Level	Name Role/Level	Rate	Rate	Rate	Rate					
					Hours	Hours	Hours	Hours		Amount	Amount	Amount	Amount				
					Hours	Hours	Hours	Hours		Amount	Amount	Amount	Amount				
					Hours	Hours	Hours	Hours		Amount	Amount	Amount	Amount				
<b>Total Hours</b>																	
<b>Subtotal</b>																	
<b>Grand Total</b>																	

List Planning Assumptions below per

**Schedule 2- Compensation**

Crew productivity rates, travel times to site, mob/demob time, provision of relevant and required training, make up of crew; etc.

**INSTRUCTIONS:**

**When preparing the Cost Estimate, the Respondents must:**

Consider and incorporate all information described in Part 1 Section 3. Scope of Work and all Appendices listed in this RFQ.

Include costing information provided in Exhibit A and FN inclusion in Exhibit B.

Prepare one Cost Estimate for each Mitigation Project that the Respondent is bidding on.

List planning assumptions such as crew productivity rates, travel times to site, mob/demob time, provision of relevant and required training, make up of crew; etc.

If the Respondent is bidding on more than one Mitigation Project, provide a response to item A) Cost Savings of Schedule 2 - Compensation.

Key Personnel should be named. Other personnel may be named by rate classification (e.g. Senior Archaeologist, Junior Archaeologist, Field Assistant, GIS technician, etc.).

Respondents are to include all costs associated with delivering the Mitigation Project.



## **Disbursements Rates Sheet**

<b>Item</b>	<b>Rate</b>	<b>Back-up information to be provided on invoices</b>
-------------	-------------	---

NOTE: please include items (eg, equipment, medic, portapotties, etc.) that you may use even if they are not included in your cost estimate.

**EXHIBIT B**  
**ABORIGINAL PARTICIPATION AND REPORTING REQUIREMENTS**

**INTERPRETATION**

**Definitions**

For the purposes of this Exhibit B:

**“Aboriginal”** means First Nation, Metis or Inuit;

**“Aboriginal Business”** means any business arrangement in which Aboriginal individuals and/or Aboriginal communities have an ownership or other interest, and includes any business entity identified by an Aboriginal community as its designated business partner;

**“First Nation Business”** means a business that the one of following First Nations has selected as their designated business partner for the purpose of fulfilling directed procurement commitments, provided that the Chief and Council of the relevant First Nation has confirmed in writing to BC Hydro and the Consultant that provision of the contracting opportunity (as specified in the written confirmation) to the designated business partner will contribute, to the value of the contract, to the fulfilment of BC Hydro’s commitment with the First Nation in regards to directed procurement opportunities:

•

**“Aboriginal Engagement”** means the protocol to be implemented by the Consultant for communicating with applicable Aboriginal communities, Aboriginal Businesses and Aboriginal individuals concerning the scope and schedule of the Services;

**“Aboriginal Participation”** means the measures for, or benefits to, Aboriginal communities, Aboriginal Businesses, First Nation Businesses or Aboriginal individuals to be implemented or provided by the Consultant in connection with the Services, such as, by way of example only and without limitation:

- the Consultant having Aboriginal communities, Aboriginal Businesses, First Nation Businesses or Aboriginal individuals participating in the Contractor’s business, through ownership interests, employment or otherwise;
- the Consultant subcontracting performance of part of the Services to an Aboriginal Business, a First Nation Business or an Aboriginal individual; and/or
- the Consultant providing training and/or mentoring programs for Aboriginal employees and/or Aboriginal Subcontractors.

**“Statement of Aboriginal Principles”** means the statement of BC Hydro’s commitments to First Nations communities, a copy of which is available at <http://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/community/our-commitment-ten-principles-ar.pdf> or by contacting Hydro’s Representative.

## ABORIGINAL ENGAGEMENT AND ABORIGINAL PARTICIPATION

- Aboriginal Engagement and Aboriginal Participation

BC Hydro is committed to respecting and supporting the interests of Aboriginal communities, Aboriginal Businesses and Aboriginal individuals in British Columbia. BC Hydro has its Statement of Aboriginal Principles, which the Consultant hereby acknowledges. The Consultant will support BC Hydro in the fulfilment of the Statement of Aboriginal Principles by complying with all express obligations contained in the Contract regarding Aboriginal Engagement and Aboriginal Participation, if any. Where no such express obligations are included in the Consultant, the Consultant is nonetheless strongly encouraged to, wherever practicable, provide meaningful opportunities and benefits to Aboriginal communities, Aboriginal Businesses and Aboriginal individuals in British Columbia (particularly for those in whose traditional territory the Services is performed).

### REPORTING

The Consultant will prior to the 15<sup>th</sup> day of a calendar month submit monthly Aboriginal Engagement and Aboriginal Participation data to report the actual following amounts as of the end of the previous calendar month:

- (a) the number and value of contracts with Aboriginal Businesses relating to the performance of the Services that were awarded in the previous calendar month, and cumulative with respect to all Services performed to the end of the previous calendar month and, for each such contract:
  - the type of contract (e.g. "Project site perimeter security");
  - the company to which the contract was awarded;
  - the total value of the contract; and
  - the amount paid on the agreement, as supported by invoices, as of the end of the previous calendar month and cumulative with respect to all Services performed under the agreement to the end of the previous calendar month;
- (b) the number of Aboriginal persons, and number of hours, employed in the performance of the Services in the previous calendar month, and cumulative with respect to all Services performed to the end of the previous calendar month; and
- (c) the number of Aboriginal persons, and number of hours, who have received training, and the type of training received in the previous calendar month, and cumulative with respect to all Services performed to the end of the previous calendar month,

All Aboriginal Engagement and Aboriginal Participation data will be separated to identify the specific Aboriginal groups that have been involved in the reporting period.

The Consultant will submit the Aboriginal Engagement and Aboriginal Participation data online in such form as Hydro's Representative may from time to time require.

The Consultant will submit the Aboriginal Engagement and Aboriginal Participation data with its invoices for payment issued as described in Schedule 2 – Compensation of the Work Order Release.

D. Other

Appendix D1: BC Hydro Approved Work Practices for Water Crossings

Appendix D2: BC Hydro Occupational Safety & Health Standards

# Approved Work Practices

## FOR WATER CROSSING INSTALLATION, MAINTENANCE AND DEACTIVATION



Canada 



**BC hydro**   
FOR GENERATIONS



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## Foreword

BC Hydro recognizes the importance of protecting aquatic, marine and riparian ecosystems from adverse impacts related to the development and operation of their facilities and infrastructure, and is committed to ensuring the long-term sustainability of these critical habitats. The following document, called the Approved Work Practices for Water Crossing Installation, Maintenance, and Deactivation (AWPWC), was developed to ensure the protection and sustainability of the freshwater habitats associated with water crossings, while simultaneously streamlining the necessary regulatory agency activities related to these developments. The AWPWC represents a component (Appendix B) of the Protocol Agreement for Maintenance Work In and Around Water between BC Hydro, the Province of B.C. and Fisheries and Oceans Canada. Specifically, the AWPWC describes and references the work practices and regulatory processes associated with installation, upgrades, maintenance, and deactivation of water crossings on BC Hydro access roads, tracks, and trails in the province of British Columbia.

**The main agreements of the AWPWC are that:**

- This Approved Work Practice document serves as an agreement between BC Hydro, and the Province of B.C., to allow BC Hydro to conduct water crossing works as described herein under the *Fish-stream Crossing Guidebook* (2012 edition);
- BC Hydro agrees to apply the work practices as described and referenced in this document while installing, upgrading, maintaining and deactivating water crossings on their access roads in freshwater environments;
- The Province of B.C. agrees that proposed works, undertakings or activities that are fully consistent with the AWPWC, do not require individual review and Approval under the *Fisheries Act* and *Water Act*, respectively. Notifications pursuant to the *Water Act* will continue to be made for information purposes and future monitoring only;
- Work proposed, which is not fully consistent with the AWPWC, may be subject to review and may require Approvals, submission of Notification, Letters of Advice, or Authorization; and
- This agreement shall be reviewed upon any significant changes to applicable regulatory policy or legislation affecting resource road development.



FOR GENERATIONS

**Signatories:**

Dec 22/2014

Edie Thome  
Director  
Environmental Risk Management  
BC Hydro

Date

DEC 01 2014

Tom Ethier  
Assistant Deputy Minister  
Resource Stewardship Division  
Ministry of Forests, Lands and Natural Resource  
Operations

Date

RE: Water Crossing Installation, Maintenance and Deactivation Work Practices

Dear [Recipient],

I am writing to you today to provide you with the attached document, "Approved Work Practices for Water Crossing Installation, Maintenance and Deactivation". This document outlines the required work practices for the installation, maintenance, and deactivation of water crossings. It is intended to ensure that all work is conducted safely and in accordance with best practices.

The document includes information on the following topics:

- Work Permitting
- Site Assessment
- Tool Selection
- Personal Protective Equipment (PPE)
- Work Sequence
- Communication
- Emergency Response
- Deactivation

Please review the document carefully and let me know if you have any questions or concerns. If you require further information or assistance, please do not hesitate to contact me.

Thank you for your attention to this matter.

Best regards,

[Signature]

Edie Thome

Director

Environmental Risk Management

BC Hydro

Tom Ethier

Assistant Deputy Minister

Resource Stewardship Division

Ministry of Forests, Lands and Natural Resource Operations

## 1.0 RATIONALE AND APPLICATION OF THE AWPWC

### 1.1. BC Hydro Requirements

BC Hydro is responsible, through the BC *Utilities Commission Act*, for providing a reliable supply of electricity to customers throughout the province while ensuring public and worker safety. The authority of BC Hydro to conduct its business is derived from the *Hydro and Power Authority Act*, and land tenure is granted through various property rights instruments including those issued under the *Land Act* and the *Land Title Act*. The applicable sections of the *Hydro Act* include sections 20 and 32. BC Hydro builds and maintains access in order to operate the provincial generation, transmission and distribution infrastructure. The access roads, tracks and trails allow BC Hydro to perform operational duties and respond to emergencies on and around their assets and facilities. For the purposes of electrical generation, transmission and distribution, fish and wildlife habitat work, public safety and recreation management, BC Hydro performs the following activities in or about streams (the Work):

- Install or upgrade stream crossings;
- Maintain and replace (as required) existing stream crossings;
- Deactivate stream crossings that are no longer required; and
- Emergency works.

BC Hydro performs the Work at hundreds of water crossings associated with their network of roadways (11,000+ kilometres) each year. These stream crossings occur on roads, tracks and trails that lead to, along and through existing Rights of Way, industrial areas, recreational sites and hydroelectric facilities and other infrastructure operated and maintained by BC Hydro. At times, the Work is also conducted on roads leading to Rights of Way where BC Hydro works cooperatively with forest tenure holders, private forest companies and landowners in cost-share arrangements.

### 1.2. Regulatory Agency Requirements

DFO is the regulatory body responsible for the protection of fisheries resources across Canada. According to the terms of the federal *Fisheries Act*: No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery (Section 35 (1)), unless authorized by the Minister (Section 35 (2)(b)), and no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish (Section 36(3)), unless so authorized under regulations established by the Minister. In addition, the *Fisheries Act* legislates the protection of fish migration during construction and operation of barriers (dams, culverts etc.) to fish passage (Sections 22 (1) and (2)).

Ownership of water and most lake and stream beds is vested in the Province of B.C. The Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) regulates changes in and about a stream under Section 9 of the *Water Act* to protect values, resources and legal rights associated with waterbodies in British Columbia. Part 7 of the *Water Act* regulation ensures that water quality, fish and wildlife habitat, and the rights of licensed water users are not compromised. Section 44 identifies specific activities that may be carried out under the approval and notification processes.

### 1.3. Intent

The intent of the AWPWC is to mitigate potential impacts of the Work on fish and fish habitat, and to streamline regulatory activities associated with water crossing works that are deemed routine and low impact. As indicated above, BC Hydro must perform the Work at hundreds of water crossings associated with their network of roadways each year. Currently, Notifications must go through Front Counter BC. To reduce an otherwise impractical and continual volume of notifications, BC Hydro will commit to applying the AWPWC measures and notification procedures contained herein.

#### **1.4. Application**

The AWPWC applies to BC Hydro's Work on water crossings in freshwater systems in the Province of British Columbia and serves as an agreement between the signatory partners to allow BC Hydro to conduct the Work (as described in Section 1.1) according to the conditions and measures outlined in the *Fish-stream Crossing Guidebook* (FSCG; 2012 edition), other than the exceptions noted in the sections below. This guidebook is endorsed by both the provincial and federal regulatory agencies.

By adopting the standards and guidelines outlined in the FSCG as well as those described herein, the Work carried out under the AWPWC will constitute accepted practice and comply with the regulations of the provincial *Water Act* and federal *Fisheries Act*. The AWPWC will also allow BC Hydro to proceed with the Work without the requirement for formal review or authorization by DFO or MFLNRO provided the conditions defined within this document are met. This agreement shall be in force from the date of signatory approval and shall be reviewed upon any significant changes to regulatory policy or legislation applicable to resource road legislation.

This AWP does not release BC Hydro from the responsibility to comply with any other legislation (e.g., the provincial *Wildlife Act*, and federal *Species at Risk Act* and *Navigable Waters Protection Act*) that may apply to the Work being carried out. If the conditions of this AWP cannot be followed, BC Hydro will follow the conventional Approval/Notification and project review procedures for all applicable regulating bodies.

Consistent with the *Protocol Agreement for Work In and Around Water*, BC Hydro, DFO and MFLNRO agree to review the results of AWPWC application at the Governance Management Committee meeting, to assess compliance and effectiveness in achieving the regulatory requirements related to the *Fisheries Act* and *Water Act*, and the workability of the approved practices for accomplishing the required works by BC Hydro. This meeting will also provide the context to consider any adjustments to the AWP that may be necessary to ensure compliance and effective implementation. Regional meetings, to be coordinated by BC Hydro, will be conducted every other year as per the *Protocol Agreement*, or as-needed based on interest indicated by the regulatory agencies. The purpose of the regional meetings would be to review monitoring and post-construction reports of previous years' Work, and review planned future Work as available.

#### **1.5. Scope of the Work**

The work activities under the AWPWC include the installation, upgrade, maintenance, and deactivation of water crossings on BC Hydro access roads, tracks, and trails in the province of BC. This AWP applies to the following stream crossing structures and ancillary works as described in the FSCG:

1. Open-bottom structures (i.e., Bridges and Open-bottom culverts);
2. Embedded closed-bottom structures (i.e., Corrugated pipe);
3. Ice bridges and snow fills; and,
4. Stream protection measures (e.g., Erosion and Sediment Control)

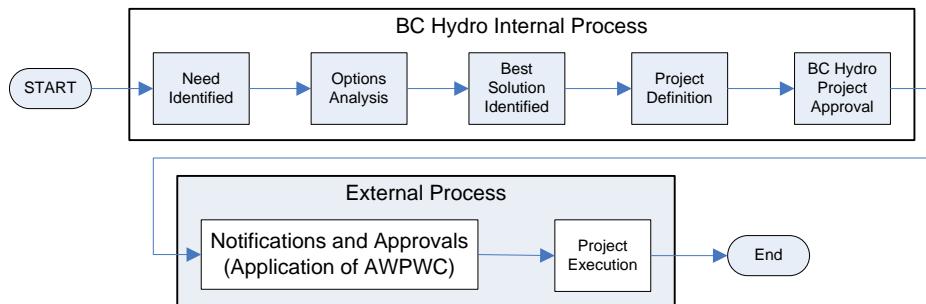
Additional stream crossing types under this AWP which are specific to BC Hydro access requirements, but are not prescribed in the FSCG include:

5. Fords (i.e., Constructed, Modified, or One-time Use for construction/deactivation of crossing structures)
6. Temporary crossings (e.g., for stream channels that are seasonally dry or frozen to the bottom)

Note: Erosion control or other civil works that are not associated with water crossings (such as debris deflectors for electrical structures) are not included in the scope of Work under the AWPWC.

A typical project lifecycle flow is shown in Figure 1. This flow diagram is included for reference on how proposed works are implemented, and at what stage of a project this AWP would apply.

**Figure 1: Typical Project Lifecycle Flowchart**



### 1.6. Pre Work Notification and Reporting Procedures

BC Hydro agrees to follow these notification procedures for the Work under this AWP:

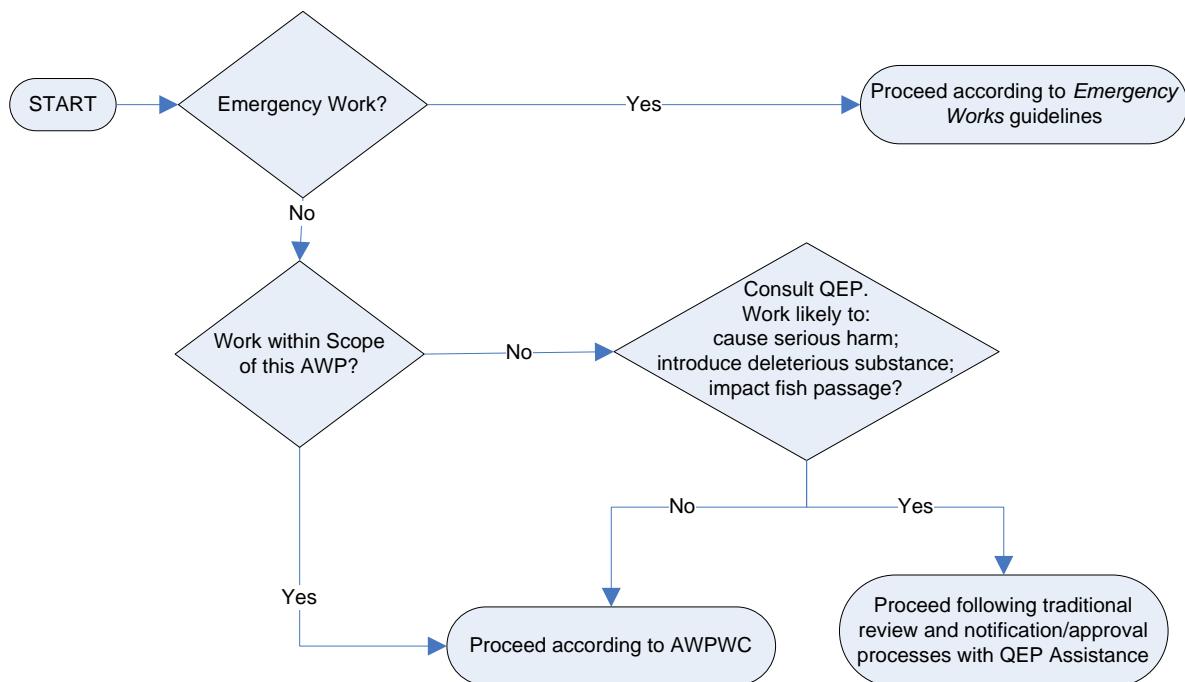
- Notification of individual water crossings will not be required for Works completed consistent with the FSCG or the approved work practices described and referenced herein.
- For instream works on fish-bearing streams or Community Watersheds (as defined in the FSCG and Bill 18-1995 *Forest Practices Code of B.C. Amendment Act* (June 1995), BC Hydro will consult a qualified environmental professional (QEP) to determine if the project is likely to cause serious harm to fish, cause a material adverse effect on fish passage, or introduce any substance that is harmful to fish or human health. If so, the work may require review and approval by the agencies (see Non-Compliance Review Process, below). If not, work may proceed without further notification to DFO and, as per Section 3.3.1 of the FSCG, notification through FrontCounter BC will not be required;
- For annual workplan projects, including crossing type and locations known at the start of the year that involve low risk or routine work activities, a single blanket Notification<sup>1</sup> will be sent to the FLNRO Ecosystems Section Head for each region across the Province.
- For work on streams that are non-fish bearing and not within a Community Watershed, dry, or frozen to the bottom during the construction or maintenance period, additional individual Notifications will not be required.
- For Type 1 and Type 2 Emergencies, Work will be conducted according to the B.C. Ministry of Environment *Specific Standards and Best Practices: Emergency Works* as per the British Columbia Water Regulation (Section 44 (o & p)). During an emergency, BC Hydro takes all measures necessary to repair or safeguard its power infrastructure as soon as possible. Wherever feasible, BC Hydro will incorporate into the emergency work methodology practices that are consistent with this AWP. For emergency works, BC Hydro will notify the nearest regional MFLNRO office and
  - a. Determine whether serious harm will occur;
  - b. If not, no notification to DFO required, whether emergency or not.
  - c. If likely, recommend at minimum, a notification via email or verbal discussion. This would be directed at the Triage & Planning Unit; Helpline 1-866-845-6776 or [ReferralsPacific@dfo-mpo.gc.ca](mailto:ReferralsPacific@dfo-mpo.gc.ca)

<sup>1</sup> The blanket notification will include a list of crossing locations including stream names, crossing coordinates, and type and size of crossing proposed (e.g., 800 mm closed bottom metal culvert, clear span bridge and whether embedded culverts will be used).

Non-Conformity Review Process

During the Project Definition phase (see Figure 1), BC Hydro will evaluate whether the Work will apply within the scope of this AWP based on the process summarized in Figure 2 and sections 1.3 and 3.3 of the FSCG. If the conditions of this AWP or the FSCG cannot be followed, or the project is likely to cause serious harm to fish, cause a material adverse effect on fish passage, or introduce any substance that is harmful to fish or human health, BC Hydro shall conform to the traditional project review and approval process established by DFO and MFLNRO.

**Figure 2: Notification Flowchart**



## 2.0 SITE ASSESSMENT AND PROJECT PLANNING

### 2.1 Site Assessment

As per the FSCG, a Qualified Registered Professional (QRP) will be responsible for planning Work that involves installation or replacement of stream crossing structures. During the project planning phase, the QRP will: i) conduct a Site Assessment to confirm whether the Work can be done in accordance with the AWPWC; ii) determine if the site is fish-bearing<sup>2</sup> and evaluate the fish habitat at the crossing location (as per Section 3.1 of the FSCG); iii) determine whether or not the site is within a Community Watershed; iv) assess the potential for use of the road and crossing structure by the public; and v) determine if there are any potential adverse impacts to aboriginal rights and title that will trigger the duty to consult with First Nations. This information will be used to decide which form of Notification is required (Figure 2), which

<sup>2</sup> See definition of Fish Stream in Appendix C: Glossary. Fish-bearing status will be determined by a QRP using standard stream classification criteria that include: fish presence, stream gradient, connectivity to known fish-bearing waters, and the absence or occurrence of barriers to fish passage.

type of crossing structure is best-suited or required at the crossing site, or if a different location must be identified (Figure 3).

In cases where the fish-bearing status of a watercourse cannot be determined according to the criteria in the FSCG, the stream will be considered fish-bearing for the purposes of the crossing site assessment and project planning.

## **2.2     *Location of Stream Crossing***

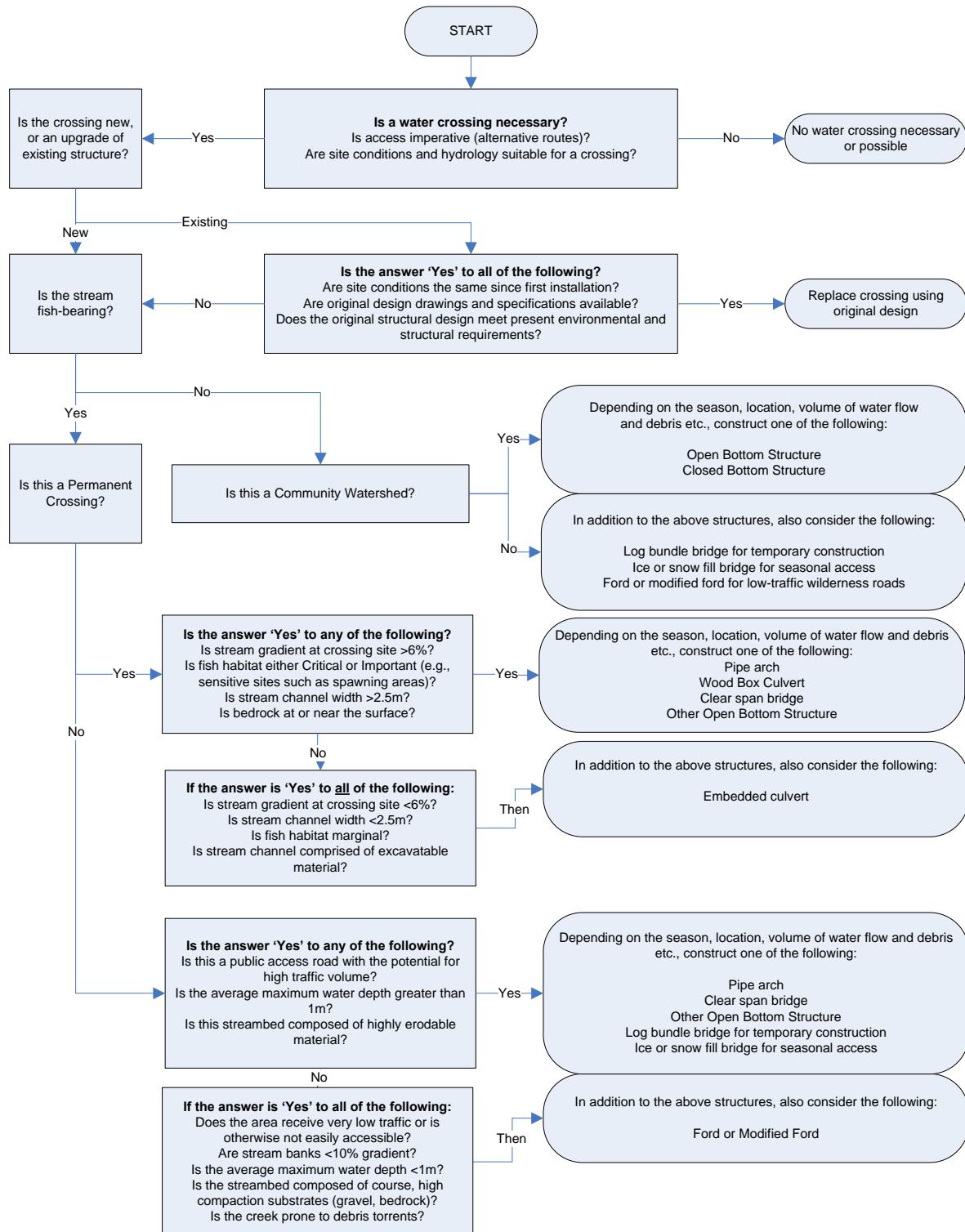
Appropriate siting of a new or replacement water crossing is critical to ensuring compliance with legislation and minimizing impacts to the environment. In order to determine a site that meets the criteria included in the FSCG and provides the access that BC Hydro requires, a site assessment will be completed in advance of the Work at prospective locations.

During the site assessment and, if required, additional site surveys, the QRP will assess whether the proposed crossing location is appropriate according to the criteria in the FSCG, or whether a new location must be identified. Factors that will be considered in this evaluation include fish presence and habitat type (i.e., Marginal, Important, or Critical as defined in the FSCG) at the crossing site, as well as upstream and downstream of the proposed location; occurrence of any species-at-risk or their critical habitats; possible impacts to a Community Watershed; potential adverse impacts to aboriginal rights and title; previous disturbances; existing channel morphology and flow regimes; safe passage of vehicles; the ability to access, repair and maintain the works with minimal impact; and specific design considerations for the type of structure being considered.

## **2.3     *Type of Stream Crossing***

Selection of the most appropriate type of crossing structure is also critical to ensuring compliance with legislation and minimizing impacts to the environment. The QRP will use the sequential approach presented in Figure 3 as a process to determine the need for and type of crossing. This approach incorporates the criteria from the decision-making matrix (Section 3.2) in the FSCG. For fish-bearing streams, instream works will take place during the appropriate fisheries timing windows (refer to Appendix A).

Figure 3: Flow Chart to Determine Type of Water Crossing Structure



## **2.4 Design of Stream Crossings**

A QRP familiar with this AWPWC will have the responsibility for overseeing the new design of stream crossings. Designs shall comply with the current and applicable standards and specifications as included in the *Forest Road Engineering Guidebook*, and where applicable the FSCG and the *Guidelines for Professional Services in the Forest Sector – Crossings* (refer to Appendix A). For most permanent access routes the minimum road design standard will accommodate a BCL-625 truck. Larger design vehicles may be used as required. For permanent routes, the preferred structures are those made of long-life materials (for example steel and concrete).

### **2.4.1 General Design Guidelines**

1. Existing crossing locations should be used wherever appropriate (where bank, substrate and road alignment conditions are suitable), in order to minimize impact to riparian vegetation and bank stability;
2. Consider the retention of riparian vegetation in the design, and avoid grubbing vegetation in riparian areas;
3. Use inert and clean materials.

### **2.4.2 Culverts and Bridges**

1. Crossing design will conform to the *Guidelines for Professional Services in the Forest Sector – Crossings*, the *Forest Road Engineering Guidebook*, and where applicable the *Fish Stream Crossing Guidebook* (sections 4.1 and 4.2).
2. Where concrete is to be used in the design, pre-cast structures are preferred;
3. The design of culverts and bridges will satisfy the peak flow requirements outlined in Section 4 of the FSCG.
4. All culverts or bridges installed on a fish bearing stream must ensure fish passage is not impeded. If a closed-bottom culvert is proposed, the culvert must be embedded into the stream substrate to facilitate fish passage as outlined in Section 4.2 of the FSCG or an alternate structure will be used to ensure fish passage.

### **2.4.3 Ice Bridges and Snow Fills**

1. Crossing design will conform to the criteria in the FSCG (sections 4.3 and 4.4);
2. Crossings will be constructed only of clean (ambient) water, ice and snow; materials such as gravel, rock and woody material shall not be used;
3. Snow fills will be constructed in such a way that they will not restrict water flow at any time;
4. The Work shall not include realigning the watercourse, dredging, placing fill, or grading or excavating the bed or bank of the watercourse;
5. The crossing shall not run along the length of a water body.

#### 2.4.4 Fords

The use of constructed fords, have the potential for environmental impacts if this type of crossing is improperly sited, poorly designed, or crossed too frequently. However, in the case of BC Hydro's access routes, there are some specific contexts (low-volume roads at crossing sites with marginal instream habitat or seasonally dry channels) where fords may be the lowest impact alternative and most cost-effective means for crossing a stream. In order for this type of crossing to be considered, the following key siting, design and use criteria must be met to minimize the potential for impacts to the aquatic environment:

1. Installation of fords shall only occur on low-volume roads, tracks and trails that are maintained in a Semi-Permanent Deactivated state (see Appendix C: Glossary for definitions);
2. Where BC Hydro requires higher levels of traffic over a crossing, or anticipates frequent use by the public based on professional judgement or proximity of the site to populated areas, a different crossing structure will be installed according to the criteria in Figure 3;
3. Fords will not be constructed at sites where there is a water licence immediately downstream of the crossing;
4. For fish-bearing streams, fords may only be sited in Marginal habitats as defined in the FSCG and assessed by a QRP, or channels that are seasonally dry; Sensitive sites such as spawning areas must be avoided or crossed using an appropriate open-bottom structure;
5. Construct and use fords during the driest periods of the year to avoid unnecessary disturbance of the channel or suspension of sediments. An exception to this may be for emergency use by BC Hydro (e.g., during the winter storm season) for maintaining its infrastructure;
6. Retain the natural streambed elevation at the crossing site to ensure the maintenance of fish passage over the ford;
7. Fords shall allow the passage of natural channel debris and accommodate 1 in 10 year flows without the loss of the ford or impacts from the crossing on the stream, for the duration of the period the ford is in place;
8. Rock armouring of fords shall be designed and implemented so that the constructed crossing is self-maintaining and stable;
9. Locate crossings at straight sections of the stream with low gradient, stable banks. Avoid crossing on meander bends, braided streams, alluvial fans or any other areas that are unstable and may result in erosion and scouring of the stream bed. Do not site fords through marshes or low compaction substrates;
10. Where necessary for controlling run-off water from the road, as determined by a QRP during the project design phase, each approach to the ford must have a rolling dip or cross ditch to divert any water that may otherwise enter the stream from the road. Dips or cross ditches should drain into dense vegetation or filter strips;
11. Align the approaches and crossing perpendicular to the channel and where the streambed is at or near its shallowest;
12. The crossing must be designed for one-lane traffic width (5m);
13. Select a crossing site with coarse streambed and bank materials (e.g., gravel, solid rock outcroppings) to limit the suspension of sediments, limit substrate compaction and adequately bear the weight of the intended traffic. If bank soils or instream substrates are highly erodible and cannot be adequately stabilized, use an alternate crossing method or location;
14. In cases where a road does not previously exist, select a site with early stage or shrub and grass riparian vegetation where practicable to minimize the amount of riparian clearing necessary. Avoid thick riparian canopies and mature growth;
15. Vehicles and machinery crossing the ford on BC Hydro-related business must be clean, well maintained, and free of fluid, oil, and grease leaks or other contaminants.

Note: It is important to clarify that there is a key difference between fording a stream for construction or other purposes (as per sections 4.5 and 5.5 of the FSCG), and a constructed ford (as defined above). The application of constructed fords in this AWPWC is specific to where established roads cross bodies of water, and is distinct from the one-time fording of streams for crossing construction or deactivation purposes as defined in the FSCG.

#### **2.4.5      Temporary Crossings**

In some cases, BC Hydro's access requirements may be short-term and timing may be flexible to accommodate seasonal periods when a stream channel is dry or frozen to the bottom. This may be the case for specific activities such as occasional structure maintenance or civil protective works, etc. In these cases, the frozen or dry conditions would preclude fish presence and water quality considerations during the period of use. As such, snow fills (as per section 4.3 of the FSCG), or temporary fords (as per sections 4.5 and 5.5) would be the most likely crossing types selected in these circumstances. Once access is no longer required, and before seasonal thaw or the return of stream flows, the temporary crossing will be removed and pre-access site conditions will be restored.

#### **2.5      Permanent Deactivation of Water Crossings**

The objectives of stream crossing deactivation are i) to return the crossing site to a stable state, and ii) to prevent unauthorized access. As with installation and maintenance activities, removal of an existing crossing must be completed in a manner that prevents serious harm to fish and their habitats, impacts to fish passage, or the introduction of deleterious substances into the watercourse. As such, deactivation activities will conform to industry technical standards including the *Forest Road Engineering Guidebook* and the FSCG. Additionally, the QRP responsible for the Work will follow environmental best practices as appropriate, to ensure that removal works are undertaken in a manner that minimizes impact and returns the area to pre-disturbance conditions. This will include practices such as restoring the stream banks to their natural contours and re-planting or seeding to stabilize disturbed areas. Note that roads which are in a state of Semi-Permanent Deactivation may still have active water crossing structures on them

### **3.0 OPERATIONAL MITIGATION MEASURES**

#### **3.1      Pre -Job Meeting**

Prior to any Work occurring under the AWPWC, the QRP and the contractor hired by BC Hydro shall hold a Pre-Job Meeting. The occurrence of and details discussed at this meeting shall be documented and kept in the project files. At the meeting the QRP will review all the Work prescriptions and designs, as well as the Standard Operating Procedures and, where applicable, the Environmental Management Plan for the Work.

#### **3.2      Standard Operating Procedures**

BC Hydro will implement and maintain Standard Operating Procedures (SOPs) that cover the operational mitigation measures associated with the Work (Appendix E). The relevant SOPs provide direction about environmental responsibility; emergency preparedness and response; road construction, maintenance and deactivation; rainfall shutdown; managing petroleum and chemical products; fire preparedness; and, general rights of way. These SOPs shall apply to all Work conducted under this AWPWC, and shall be available to managers, QRPs responsible for site assessment and project planning, as well as employees, contractors and subcontractors performing the Work.

#### **3.3      Environmental Management Plans**

In addition to the SOPs, a site-specific Environmental Management Plan (EMP) shall be prepared when the Work requires in-stream operations on fish-bearing streams or within a Community Watershed. Refer to Appendix B for guidelines on the content of Environmental Management Plans. A QEP will be responsible for developing Environmental Management Plans.

#### **3.4      Inspection and Monitoring**

Construction monitoring under the AWPWC will be coordinated by the QRP responsible. For Work conducted under only the SOPs (i.e., for non-fish bearing streams outside of a Community Watershed), much of the construction monitoring will be completed during final contract inspections, as the construction contracts will typically include many activities other

than the Work under this AWPWC. Additional specific monitoring and/or assessment of in-stream Work on fish-bearing streams or within a Community Watershed shall be documented in the EMP.

For works under an EMP, a QEP will be present at the work site for the critical stages of the work, including but not limited to:

- The pre-work meeting with the contractor
- Initial monitoring of the works, including any water diversions or fish salvage
- Installation of any in-stream structures
- Any works involving uncured concrete;
- Final inspection of works prior to machinery departing the project site

Following construction, upgrade, or maintenance, the crossing structures will be monitored according to existing inspection practices. Most of the crossings for BC Hydro's access routes are associated with low-use roads. Currently, crossings are inspected at an overview level during routine transmission/distribution line and vegetation maintenance inspections. Further detailed inspections are completed either as a result of deficiencies noted during an overview inspection, as part of an access assessment for specific projects, or for engineered structures on a 5-year cycle.

## APPENDICES

### **Appendix A:Information and Reference Documents**

#### **Information**

*Approved Work Practice for Riparian Vegetation*, DFO, MOE, BCTC and BCH, 2002

*Environmental Best Management Practices*, unpublished internal documents, BCH, 2009.

*Protocol Agreement for Maintenance Work In and Around Water*, DFO, MOE, BCTC and BCH, 2009.

*Transmission Maintenance Standards, Access Roads*, unpublished internal documents, BC Hydro, 2012.

Regional Fisheries Timing Windows (Refer to links below for detailed information):

- Cariboo Region: [http://www.env.gov.bc.ca/wsd/regions/car/wateract/terms\\_conditions\\_car.pdf](http://www.env.gov.bc.ca/wsd/regions/car/wateract/terms_conditions_car.pdf)
- Kootenay Region: [http://www.env.gov.bc.ca/wsd/regions/kor/wateract/least\\_risk\\_kor.pdf](http://www.env.gov.bc.ca/wsd/regions/kor/wateract/least_risk_kor.pdf)
- Lower Mainland Region: [http://www.env.gov.bc.ca/wsd/regions/sry/wateract/work\\_windows\\_sry.pdf](http://www.env.gov.bc.ca/wsd/regions/sry/wateract/work_windows_sry.pdf)
- Okanagan Region: <http://www.env.gov.bc.ca/wsd/regions/okr/wateract/workwindows.html>
- Omineca Region: [http://www.env.gov.bc.ca/wsd/regions/omr/wateract/omineca\\_water\\_act\\_terms\\_conditions.pdf](http://www.env.gov.bc.ca/wsd/regions/omr/wateract/omineca_water_act_terms_conditions.pdf)
- Peace Region: [http://www.env.gov.bc.ca/wsd/regions/nor/wateract/terms\\_conditions\\_per.pdf](http://www.env.gov.bc.ca/wsd/regions/nor/wateract/terms_conditions_per.pdf)
- Skeena Region: [http://www.env.gov.bc.ca/wsd/regions/ske/wateract/work\\_windows\\_measures\\_030205.pdf](http://www.env.gov.bc.ca/wsd/regions/ske/wateract/work_windows_measures_030205.pdf)
- Thompson Region: [http://www.env.gov.bc.ca/wsd/regions/thr/wateract/work\\_windows\\_jan17\\_2007.pdf](http://www.env.gov.bc.ca/wsd/regions/thr/wateract/work_windows_jan17_2007.pdf)
- Vancouver Island Region: [http://www.env.gov.bc.ca/wsd/regions/vir/wateract/terms\\_conditions\\_vir.pdf](http://www.env.gov.bc.ca/wsd/regions/vir/wateract/terms_conditions_vir.pdf)

#### **References**

*Emergency Works according to the British Columbia Water Act Regulation* (Subsections 44 (o & p)), MOE.

*Erosion and Sediment Control Practices for Forest Roads and Stream Crossings*, FP Innovations, Vancouver, 2007.

*B.C. Ministry of Forests, Lands and Natural Resource Operations, B.C. Ministry of Environment, and Fisheries and Oceans Canada, 2012. Fish-stream crossing guidebook. Rev. ed. For. Prac. Invest. Br. Victoria, B.C.*

*Fisheries Act, Canada*

*Forest Road Engineering Guidebook*, BC Ministry of Forests, 2002.

*Guidelines for Professional Services in the Forest Sector-Crossings*, Association of BC Forest Professionals and Association of Professional Engineers and Geoscientists of BC, 2008.

*Hydro and Power Authority Act*, British Columbia

*Land Act*, British Columbia

*Utilities Commission Act*, British Columbia

*Water Act*, British Columbia

**Appendix B: Environmental Management Plan Guidelines**

The following guideline is intended to aid in the preparation of an Environmental Management Plan (EMP) specific to the Work. The EMP is to be prepared by a Qualified Environmental Professional (QEP) who is familiar with the work location. The contents of the EMP will vary depending on scope of work and specific habitat conditions. The EMP will be generally consistent with the following layout:

**1.0 Introduction**

- 1.1. Project Background and Description of Work
- 1.2. Purpose of the EMP

**2.0 Description of Work**

- 2.1. Work Procedures
- 2.2. Access

**3.0 Environmental Responsibilities**

- 3.1. General
- 3.2. Summary of Responsibilities
- 3.3. Permits, Approvals and Contracts
- 3.4. Environmental Monitoring
- 3.5. Forest Fire Prevention

**4.0 Valued Ecosystem Components**

- 4.1. Fisheries Resources
- 4.2. Vegetation and Wildlife
- 4.3. Socio-economic Resources
- 4.4. Archaeological and Heritage Resources

**5.0 Potential Environmental Impacts and Mitigation Measures**

- 5.1. Timing of in-stream works, and reduced-risk work windows
- 5.2. Access to Sites near Streams/Wetlands
- 5.3. Material Storage and Waste Disposal
- 5.4. Operation of Heavy Equipment During Construction
- 5.5. Site Restoration Following Completion of Work

**Appendices**

Environmental Incident Reporting

Job Details/Drawings

Standard Operating Procedures applicable to Job

Other appendices as appropriate

The QRP and Project Manager (if separate) will ensure all appropriate project personnel review and confirm their understanding of the EMP. Post-construction monitoring requirements will be outlined in the EMP based on site sensitivity and type of crossing.

## **Appendix C: Glossary**

**BCL-625 truck** Is the standard design vehicle for highway roads and bridges in British Columbia, as defined in the *Bridge Standards and Procedures Manual, Supplement to Canadian Highway Bridge Design Guide, S6-06, Section 3, BC Ministry of Transportation, 2007.*

**Bridge** is a temporary or permanent Open Bottom Structure carrying a road above a stream or other opening.

**Clear Span Bridge** is a bridge that is designed in such a way that all parts of the structure and abutments are located outside of the High Water Mark of the stream.

**Closed Bottom Structure** is a stream crossing structure that encloses the bed of the stream (such as a metal or plastic pipe, or concrete box). The opposite of an Open Bottom Structure.

**Community Watershed** (as defined in Bill 18-1995 *Forest Practices Code of B.C. Amendment Act* (June 1995) which amends section 41(8) of *Bill 40*, is:

the drainage area above the most downstream point of diversion on a stream for a water use that is for human consumption and that is licensed under the Water Act for:

- (i) a waterworks purpose, or
- (ii) a domestic purpose if the licence is held by or is subject to the control of a water users' community incorporated under the Water Act

if the drainage area is not more than 500 km<sup>2</sup> and the water licence was issued before June 15, 1995.

**Composite bridge** is one where a deck and girders are intimately connected such that they act as a unit to support the design load. These complex structures require a greater level of technical knowledge with respect to design and installation. Other structures included in this category are those with components that do not act independently of each other, such as concrete slab or box girders with welded or grouted shear connectors, or structures requiring field welding during installation.

**Critical Habitat:** Habitat that is critical in sustaining a subsistence, commercial, or recreational fishery, or any species at risk (i.e., terrestrial or aquatic red- and blue-listed species, those designated by the Committee on the Status of Endangered Wildlife in Canada, or those SARA-listed species), or because of its relative rareness, productivity, and (or) sensitivity (as defined in the *Fish-stream crossing guidebook* (2012)).

**Culvert** is a transverse drain pipe or log structure covered with soil and lying below the road surface. Culverts are usually Closed Bottom Structures; however, Pipe Arch Culverts and Wood Box Culverts are Open Bottom Structures.

**Deactivation** can be used in the context of Water Crossing Deactivation or road deactivation. Water Crossing Deactivation is defined in section 2.5 of the AWPWC, and road deactivation may fall into these categories:

**Temporary Deactivation** (also **Seasonal Deactivation**): is the installation of cross-drains on the surface of a permanent road during wet seasons and/or for times when the road is only going to be used for low-volume traffic for a period of up to three years, to protect the running surface of the road from erosion. Culverts, bridges and other point features on the road are left intact.

**Semi-Permanent Deactivation:** is applied to a permanent road to make it self-maintaining insofar as is possible. It is prescribed for roads where only light traffic is expected, and which may be remote or isolated in some way from the public road network. In addition to the work done for Temporary Deactivation, drainage culverts that are

at risk of overtopping or becoming blocked may either be replaced with water bars, or have swales cut over the top of them to take peak flow. Typically major crossing structures are left in place if their condition allows it, else they are removed and either blocked or replaced with fords. Additionally, roads in this state may become overgrown. Roads in this state may also be designated by the Ministry of Forests as 'Wilderness Roads'.

**Permanent Deactivation:** is the total removal of the road, including all crossing and drainage structures, and in some cases the re-contouring of the ground to its original state. Permanent Deactivation of a road implies the permanent deactivation of the water crossings.

**Distribution** is the portion of BC Hydro's business that includes the maintenance of the lower voltage circuits that electrically connect substations to residential and smaller commercial customers. On the BC Hydro system, this includes line voltages of 35kV and below.

**Embedded Culvert** is placed in a fish stream to continue to provide natural streambed habitat value. It is placed on a low gradient with the bottom just below the gradient of the channel, and partially filled with channel bed material.

**Emergency Works** are those works that fall under one of the two following categories:

**Type 1** emergencies are situations that require immediate attention during a flood event or as designated under the Provincial Emergency Program. These situations have caused, or present in the immediate future (i.e. within 24 hours), a high potential danger to human life, significant damage to property, or significant adverse impacts to fish or wildlife populations or their habitats. *Specific Standards and Best Practices: Emergency Works.*

**Type 2** emergencies are situations that require attention in the near future, immediately prior to the next flood event. These situations would present a high potential danger to human life, significant damage to property, or significant adverse impacts to fish or wildlife populations or their habitats if not addressed immediately prior to the next flood event. *Specific Standards and Best Practices: Emergency Works.*

**Fish Stream** (as defined in the Fish-stream Crossing Guidebook) is a watercourse that:

- a. is frequented by any of the following species of fish:
  - (i) anadromous salmonids;
  - (ii) rainbow trout, cutthroat trout, brown trout, bull trout, Dolly Varden char, lake trout, brook trout, kokanee, largemouth bass, smallmouth bass, mountain whitefish, lake whitefish, arctic grayling, burbot, white sturgeon, black crappie, yellow perch, walleye or northern pike;
  - (iii) a species identified as a species at risk;
  - (iv) a species identified as regionally important wildlife, or
- b. has a slope gradient of less than 20%, unless the watercourse
  - (i) does not contain any of the species of fish referred to in paragraph (a),
  - (ii) is located upstream of a barrier to fish passage and all reaches upstream of the barrier are simultaneously dry at any time during the year, or
  - (iii) is located upstream of a barrier to fish passage and no perennial fish habitat exists upstream of the barrier (*Forest Planning and Practices Regulation under the Forest and Range Practices Act*).

**Ford** is a dip in a road constructed to facilitate crossing a stream. The objective of a ford is to maintain drainage and provide a safe, erosion-free, and storm-proof crossing that requires little or no maintenance without compromising the integrity and stability of the stream channel.

**Generation** is the portion of BC Hydro's business that is responsible for converting mechanical or thermal energy into electricity.

**Habitat Value Criteria** (adopted from *Fish Stream Crossing Guidebook*) is a classification of habitat value on any given stream, and generally results in one of the three following designations:

**Marginal Habitat:** An area that has low productive capacity and contributes marginally to fish production. The absence of suitable spawning habitat, and habitat with low rearing potential (e.g. locations without deep pools, undercut banks or stable debris, and with little or no suitably sized spawning gravels for the fish species present).

**Important Habitat:** An area used for feeding, growth, and migration of fish but not defined as critical. Usually contains a large amount of similar habitat that is readily available to the local fish stock.

**Critical Habitat:** An area that is crucial in sustaining a subsistence, commercial, or recreational fishery, or is in some other way particularly rare, productive or sensitive. This includes streams where there is the presence of high-value spawning or rearing habitat (e.g. locations with abundance of suitably sized gravels, deep pools, undercut banks, or stable debris, which are critical to the fish population downstream of the proposed crossing).

**High Water Mark** of a stream is normally the top of the stream channel, typically identified as the highest point of typical seasonal scour marked by the lack of vegetation.

**Ice Bridge:** a water crossing of a frozen stream, river or other body of water where the depth of water prevents the ice from reaching to the bottom.

**Important Habitat:** Habitat that is used by fish for feeding, growth, and migration but is not deemed to be critical. This category of habitat usually contains a large amount of similar habitat that is readily available to the stock (as defined in the *Fish-stream crossing guidebook* (2012)).

**Log Bundle Bridge:** a temporary water crossing made by cabling logs together in a bundle, and then placing the log bundle in a stream channel in order to drive a piece of machinery over the top.

**Low-Volume Road:** For the purposes of this AWP, this is a remote, isolated road that is primarily used by crews or contractors for accessing BC Hydro infrastructure, and rarely used by the public. Low-volume roads will typically be situated away from populated and other high-use areas.

**Marginal Habitat:** Habitat that has low productive capacity and contributes marginally to fish production (as defined in the *Fish-stream crossing guidebook* (2012)).

**Modified Ford** is a Ford that has been constructed overtop of a Culvert. The culvert passes the stream under the road during normal conditions, and during peak flow the stream overtops the road. The objective of a Modified Ford is to accommodate peak flow without the need for a very large structure, and to provide a crossing that is safe for passage and that requires little maintenance or risk of washout.

**Open Bottom Structure** is a stream crossing structure that does not enclose the bed of the stream (such as an arch, open-bottomed box, or bridge). The opposite of a Closed Bottom Structure.

**Permanent Crossing** in the context of this agreement one that is located on a road that is expected to be in place for more than 15 years.

**Pipe Arch** is an arched Open Bottom Structure that resembles the top half of a culvert, with a small abutment on each side to receive the outward force and to prevent the arch from spreading.

**Pre-Job Meeting** or **Pre-Work Meeting** is defined in section 3.1 of the AWPWC.

**Protocol Agreement** is the *Protocol Agreement for Maintenance Work In and Around Water, DFO, MOE, BCTC and BCH, 2009*.

**Qualified Environmental Professional** is an applied scientist or technologist specializing in a relevant applied science or technology and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise. The QEP may also be a QRP

**Qualified Registered Professional** is defined as a person who has appropriate qualifications and experience to carry out the planning of the Work, and is a member of, or licensed by, a regulatory body in British Columbia that has the legislated authority to regulate its members' performance of these activities. In the context of the AWPWC, this may include engineers, biologists and foresters.

**Reduced Risk In-stream Work Windows** are those times when Work in streams will have the least impact. Refer to Appendix A.

**Replacement structures** are defined as those that occupy the same riparian management area and crossing location in plan view as the original structure.

**Site Assessment** is the initial review of a crossing site by a Qualified Registered Professional, for the purposes of identifying what Work is required, and planning that Work. See section 2.1 of the AWPWC.

**Snow Fill:** a water crossing of a shallow frozen stream, river or other body of water, constructed using snow taken from the areas immediately around the crossing site.

**Standard Operating Procedure** is a document written to apply in general to a task, meant for the individuals and contractors carrying out the task, outlining the generic safety, quality and environmental conditions that must be followed.

**Stream Channel Width** is defined as the horizontal distance between the stream banks on opposite sides of the stream, measured at right angles to the general orientation of the banks. The point on each bank from which width is measured is usually indicated by a clearly visible change in vegetation and sediment texture. This border is sometimes shown by edges of rooted terrestrial vegetation. Above this border, the soils and terrestrial plants appear undisturbed by recent stream erosion. Below this border, the banks typically show signs of both scouring and sedimentation deposition.

**Temporary Crossing:** A bridge, ford, or other structure installed across a stream or watercourse for short-term use during construction or for temporary access to a site.

**Transmission** is the portion of BC Hydro's business that includes the maintenance of the higher voltage circuits that electrically connect generation facilities to substations and larger commercial customers. On the BC Hydro system, this includes line voltages of 69kV and above.

**Wilderness Road** is a designation by the MOF denoting a forest road that is in a state of Semi-Permanent Deactivation, and which is not regularly maintained.

**Wood Box Culvert** is a simple Culvert and Open Bottom Structure made by placing sill logs on either side of the stream, and then stringer logs on top of the sills spanning the width of the stream. The structure is then topped with filter fabric and road ballast.

**Work** in the context of this agreement is defined in Section 1.1.

**Appendix D: Acronyms**

**AWPWC** Approved Work Practices for Water Crossing Installation, Maintenance and Deactivation

**CBS** Closed Bottom Structure

**CMP** Culvert, Metal Pipe

**DFO** Fisheries and Oceans Canada

**EMP** Environmental Management Plan

**MFLNRO** British Columbia Ministry of Forests, Lands and Natural Resource Operations

**MOE** British Columbia Ministry of Environment

**OBS** Open Bottom Structure

**PA** Protocol Agreement for Maintenance Work In and Around Water

**QEP** Qualified Environmental Professional

**QRP** Qualified Registered Professional

**SOPs** Standard Operating Procedures

**WBC** Wood Box Culvert

**Appendix E: Applicable BC Hydro documents:**

Standard Operating Procedures (SOP) and Field Guides may be updated by BC Hydro to meet changing requirements beyond the scope of the AWPWC. Applicable SOPs and Field Guides are listed below and copies will be available upon request.

**Standard Operating Procedures**

- SOP-01 General Rights-of-Way
- SOP-02 Fire Preparedness
- SOP-03 Petroleum and Chemical
- SOP-07 Road Construction, Maintenance and Deactivation
- SOP-08 Rainfall Shutdown
- Field Marking Guide

**Access Road Maintenance: Field Guides**

- Valley Roads - Overview of Activities
- Hillslope Roads - Overview of Activities
- Access Tracks - Overview of Activities
- Culvert Replacement, Installation and Maintenance
- Cross Ditches, Water Bars and Modified Armoured Swales
- Ditching
- Insloping and Outsloping
- Subdrains and Seepage Management
- Grading
- Road Surfacing
- Road Stability and Soil Placement
- New Road Development
- Erosion and Sediment
- Site Revegetation

# **BC Hydro's Occupational Safety & Health Standards**

BC Hydro does not accept any liability or responsibility of any kind arising from inappropriate use of this information. This version of this safety document is intended solely as an example for prospective BC Hydro contractors. Any other use is strictly prohibited without the written consent of BC Hydro.

Contractors working for BC Hydro are responsible to work to the expectations specified in their contract, including adherence to BC Hydro rules and standards.

The version of the Occupational Safety & Health (OSH) standards included in this document is designed to provide prospective contractors with an understanding of the safety expectations related to their work with BC Hydro. Once a contract is awarded, however, contractors must adhere to our most current safety policies and procedures—including the latest OSH standards—which can be found on the password-protected Safety Extranet.

Prospective contractors must also be familiar with our Life Saving Rules and our Safety Practice Regulations, which aren't included in this document.

## How the OSH standards are used

These standards cover expectations for managing safety. They complement and reinforce existing safety legislation, including WorkSafeBC's Occupational Health and Safety regulations.

The OSH standards are applied in conjunction with our Safety Practice Regulations. It's expected that contractors working for BC Hydro will meet the performance expectations expressed in the OSH standards.

Note that work procedures used by contractors to meet these OSH Standards are the responsibility of the contractor, but they must be acceptable to BC Hydro.

# **OSH Standard**

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- 6O8 Fall Protection
- 6O9 Ladders
- 8O1 Employees Working Alone

# **OSH Standard 122**

## **Job Planning**

# Osh Standard 122

## Job Planning

### 1. Scope

1.1 This standard sets out the safety requirements associated with job safety planning folders, preliminary job safety planning (planning work during job safety planning activities that typically take place prior to arriving on site), pre-job conferences, tailboards and post-job activities. It does not cover the planning associated with the development of annual safety plans.

### 2. Purpose

2.1 The purpose of this standard is to set out the requirements for planning work to ensure:

- The risk of serious incidents occurring is reduced.
- An opportunity to identify and control hazards through application of multiple independent barriers is provided before work begins.
- Safety is integrated into the work planning, design and scheduling phases.
- Managers, supervisors and workers (engineers, designers and tradespersons) practise effective communication.
- Changes that occur during a project or job are effectively identified and managed.

2.2 Contractors are expected to follow their own planning process. BC Hydro's expectation of contractors is that all hazards are identified and multiple independent barriers are applied for each identified hazard.

### 3. Standard

3.1 BC Hydro shall achieve and maintain continuous compliance with the Workers Compensation Act, Part 3, Division 3 – General Duties of Employers, Workers and Others. The Job Planning Process shall be structured to assist to fulfil the Act's expectations regarding the identification and communication of hazards in the workplace, and remedying workplace conditions that are hazardous to the health or safety of workers.

#### 3.2 Job Safety Planning Requirements

3.2.1 All BC Hydro personnel that plan, assign, and/or supervise the performance of work having the potential to result in injury to workers (e.g., Managers, Designers, Engineers, Project Managers, Supervisors, and Crew Leaders) shall ensure that the Job Safety Planning activities described in this standard (e.g., job planning folders, pre-job conferences, job activity sheets, and/or tailboards) are effectively completed and communicated to workers involved in the work, and use current process, materials, and forms available from the Job Planning webpage or your Business Group.

3.2.1.1 All BC Hydro field personnel (e.g., Managers, Supervisors, Crew Leaders, Workers) must complete initial Job Planning training, and refresher training every two years. Refresher training must include conducting effective Tailboards.

3.2.2 All Job Safety Planning activities must incorporate:

3.2.2.1 The identification of all hazards with the potential to result in a fatality or permanent disability.  
Refer to Appendix 4 for common high hazard work activities at BC Hydro.

### 3.2.2.2 The selection of the most effective barriers as practicable to prevent injury.

**Engineers and Designers.** For each identified hazard, every effort must be made to eliminate, minimize, or substitute the hazard through design decisions prior to assignment of work to field crews (e.g., application of Safety by Design). Refer to OSH 110 Hazard Identification and Risk Assessment sections 3.4, 3.5, and 3.6 for requirements to use Safety by Design, the Hierarchy of Controls, and the Safety Decision Making Principles.

**Field Crews (e.g., Managers, Project Managers, Supervisors, Crew Leaders, Workers).** For each hazard that remains in the workplace, identify or confirm multiple independent barriers to protect workers from each hazard. Refer to the Hazard Barrier Reference sheet on the Job Planning webpage for guidance.

- The Hazard Barrier Reference (HBR) sheet is a job-aid and is not required to be filled out. The requirement is for the HBR sheet to be used as guidance in the selection of barriers, and for those barriers to be identified and recorded in Design Reviews (section 3.3.1), Pre-job conferences (section 3.3.2), and on Tailboards (section 3.3.3).
- Barriers are shown on the HBR sheet in sequence from MOST effective to LEAST effective. When identifying or confirming multiple independent barriers for each hazard, there must be at least one barrier utilized from the MOST effective column for each hazard.
- For work situations where there is no barrier identified in the MOST effective list, work may only proceed if the work can be completed following existing safety rules or approved safe work procedures.

### 3.2.2.3 Managers are responsible to report all work situations where it is discovered that there is no barrier identified in the MOST effective column of the HBR sheet. This reporting is to be done using the Hazard Barrier Deficiency on-line entry form available on the Job Planning webpage. The information will be captured in a Hazard Barrier Registry which will be used by BC Hydro Safety to identify where new barriers must be developed.

NOTE – Only newly discovered work situations are required to be reported. If the situation is already known and shows on the Hazard Barrier Registry it does not need to be repeated

### 3.2.3 Crews who are assigned work must be capable of identifying the hazards described in section 3.2.2.1, and selecting and implementing multiple independent barriers in response to those hazards.

### 3.2.4 All job planning activities must consider and document emergency response plans, including rescue, appropriate rescue equipment and first aid provisions.

#### 3.2.4.1 Per WorkSafeBC Regulation 4.13 ⑧ written rescue and evacuation procedures plus specialized rescue equipment and techniques are required for but not limited to the following types of work:

- Work at high angles (worker is in a location or position that has constrained access, and cannot be reached for rescue purposes by a standard stairway or elevator, e.g., on a ladder or pole, in an excavation, on a tower, crane, or swing stage, etc.).
- Work in confined spaces or where there is a risk of entrapment
- Work with hazardous substances (e.g. chemicals)
- Underground work
- Work on or over water
- Workplaces where there are persons who require physical assistance to be move

- 3.2.4.2 Rescue procedures and equipment shall be confirmed to be available prior to work commencing.
- 3.2.4.3 Designated personnel to conduct rescue shall be identified and documented on the tailboard, and their training confirmed as current, prior to work commencing (per WorkSafeBC Regulation 32.2 and Safety Practice Regulation 203).
- 3.2.5 For jobs that require protective grounding/bonding, a documented grounding plan must be completed before work begins. In areas where worker protection practices exist (i.e. lockout in generating stations), group or personal lockout sheets and associated switching orders suffice as the required documented grounding plan.
- 3.2.6 Each BC Hydro Business Group must determine the scope of work activities required to use the Job Safety Planning process, and to develop and maintain the tools required to support the Job Safety Planning process (e.g., Job Planning folders, tailboards, job activity sheets, etc.), in a manner consistent with the requirements of this Standard.
- 3.2.6.1 Transmission and Distribution Business Group has delegated these responsibilities to the T&D Technical Working Groups (alternative arrangements must be made should eligible work activities not be covered by the T&D Technical Working Groups).
- 3.2.6.2 Generation Business Group has delegated these responsibilities to Planning Managers, or others as required.

### 3.3 Job Safety Planning Process

Safety shall be integrated into each phase of the job planning process and barriers identified for use will be documented.

Note:

Job Safety Plan documents consist of, but are not limited to, any combination of:

- Job Safety Planning Folders
- Pre-job Conference forms
- Job Activity Sheets (used in Generation) and work/business-specific Tailboard forms (used in T&D)
- Safety Management Plans, used in Construction Services for projects deemed too complex to use a Job Planning Folder

3.3.1 Preliminary Job Safety Planning. The following requirements for preliminary job safety planning will be met, where applicable.

3.3.1.1 Hazards, barriers, residual risks and required safety equipment will be identified.

3.3.1.2 Design Review. Where hazards with a potential to result in a fatality or permanent disability are present, designers/project managers will involve Field Crews (e.g., Managers, Supervisors, Crew Leaders, Workers) as early as possible, by asking them to review preliminary designs/job specifications to design out specific hazards where practicable.

Using the Hazard Barrier Reference (HBR) sheet as guidance Field Crews will advise if there is any difficulty identifying and implementing barriers from the MOST effective column of the HBR sheet for each hazard. If there are no barriers available in the MOST effective column for any hazard, an interim solution must be identified (see section 3.2.2.2).

When contractors will be carrying out the work, designers/project managers are encouraged to involve contractors in the same manner wherever possible.

Note: Eliminating, substituting or minimizing hazards through design is the primary objective

3.3.1.3 Establish the scope and task sequence of the planned work.

- 3.3.1.4 Establish crew complement for numbers and types of trades.
  - 3.3.1.5 Establish safety management plans and, if the job may lead to environmental impacts, suitable environmental mitigation measures.
  - 3.3.1.6 Establish emergency response plans, including rescue and first aid provisions.
- 3.3.2 Pre-job Conferences
- 3.3.2.1 Pre-job conferences will be completed for large or complex jobs.
  - 3.3.2.2 Pre-job conferences will ensure Job Safety Planning folder is reviewed, procedures reviewed and signed off, isolation plan and additional barriers finalized.
  - 3.3.2.3 Pre-job conferences will review all identified hazards with the potential for fatality or permanent disability in the planned work area, and will identify, confirm, and document multiple independent barriers that will be implemented to perform the work.

Using the Hazard Barrier Reference (HBR) sheet as guidance Field Crews (e.g., Managers, Supervisors, Crew Leaders, Workers) will determine if there is any difficulty identifying and implementing barriers from the MOST effective column of the HBR sheet for each hazard. If there are no barriers available in the MOST effective column for any hazard, an interim solution must be identified (see section 3.2.2.2).
  - 3.3.2.4 Pre-job conferences will confirm that the resources that are allocated to the job meet the following conditions:
    - Workers are qualified to perform their assigned tasks, or there is a process in place to make this determination prior to work commencing.
    - The tools and equipment that will be used are in a safe condition and appropriate for the job, or a process is in place such that this determination will be made prior to work commencing.
    - Emergency response plans, including rescue, appropriate rescue equipment, and first aid provisions are identified and will be available.
- 3.3.3 Tailboards
- 3.3.3.1 As per Safety Practice Regulation rule106, documented tailboards will be held for all hazardous work involving one or more worker:
    - Before work commences
    - And/or whenever there is a significant change in the work plan

Work is considered hazardous, and therefore requiring a documented tailboard, where the hazardous energy of the activity being performed has a credible and realistic potential to cause death or probable permanent disability. For more information on hazardous work definition, refer to Section 7 Definitions and Appendix 4 Common High Hazard BC Hydro Activities.
  - 3.3.3.2 For low hazard work, verbal tailboards can be used. As per Safety Practice Regulation rule 718, when working under Group Lockout, hold a documented tailboard meeting to ensure all workers understand which energy sources have been controlled and which equipment is in a protected state.
  - 3.3.3.3 Everyone involved in the on-site work must participate at the tailboard meeting.
  - 3.3.3.4 Each hazard with the potential for fatality or permanent disability must be confirmed and individually

recorded on the applicable job planning documentation (Job Planning Folder, Tailboard).

Using the Hazard Barrier Reference (HBR) sheet as guidance, Field Crews (e.g., Managers, Supervisors, Crew Leaders, Workers) must list multiple independent barriers, in order of effectiveness, for each hazard.

Barriers are shown on the HBR sheet in sequence from MOST effective to LEAST effective. When identifying or confirming multiple independent barriers for each hazard, there must be at least one barrier utilized from the MOST effective column for each hazard.

For work situations where there is no barrier identified in the MOST effective column, work may only proceed if the work can be completed following existing safety rules or approved safe work procedures.

Supervisors, Crew Leaders, and/or Workers are responsible to ensure their Manager is made aware of any work situation where it is discovered that there is no barrier identified in the MOST effective column. Managers are to report any newly discovered work situations of this nature (see section 3.2.2.3 for reporting method).

- 3.3.3.5 The tailboard discussion must review, confirm availability, and document emergency response plans, rescue equipment, and first aid provisions.
- 3.3.3.6 All tailboard documentation will be retained for two years.

#### 3.3.4 Safe Work Observations

- 3.3.4.1 During regular Safe Work Observations, managers must ensure and verify application of the Job Safety Planning requirements and completion of accompanying Job Safety Planning documents. This includes:

- Having Workers identify to the Manager each hazard with the potential for fatality or permanent disability in the work zone.
- Having Workers show and explain to the Manager the barriers used to protect Workers from each hazard, in order of effectiveness, with at least one barrier from the MOST effective column of the Hazard Barrier Reference sheet.
- The Manager confirming that each hazard has been recorded on the Tailboard or Job Activity sheet with corresponding barriers written in order of effectiveness.
- The Manager confirming that emergency response plans, including rescue and first aid provisions have been discussed, and that rescue equipment is available.

#### 3.3.5 Post-Job Debriefs

- 3.3.5.1 Where key safety issues have been identified in the course of work, post-Job Debriefs will be held to ensure that safe work observations are shared to allow for improvements to be incorporated in future jobs.

If work situations have been identified where there is no effective barrier identified in the pertinent MOST effective column on the Hazard Barrier Reference sheet, then the work situation must be reported in the Hazard Barrier Deficiency process (see section 3.2.2.3 for reporting method)

- 3.3.5.2 All tailboards will be reviewed by managers until they are satisfied with their quality. Once satisfied,

tailboard reviews will be carried out periodically, but more frequently for large, complex jobs.

#### 4. Roles and Responsibilities

##### 4.1 Managers

###### 4.1.1 General roles and responsibilities for managers are to ensure that:

- Proper safety planning of all work is completed.
- Pre-job conferences are conducted and documented where applicable.
- Contractors and/or subcontractors have WorkSafeBC coverage and liability insurance.
- The qualification and authorization of workers under their authority and direction is appropriate for the work to be performed.
- Work procedures and safety standards will be followed and maintained.
- Workplace risk assessments are completed and issues are corrected as required.
- Orientation of all workers to the job site and associated hazards are completed.
- Emergency response equipment and personnel certification are up-to-date.

##### 4.2 Senior Managers (i.e. M3/M4)

###### 4.2.1 Senior managers are responsible for:

- Ensuring Safe Work Observations occur on a pre-determined frequency in order to be satisfied that the processes are carried out in a manner that meets their expectations.
- Ensuring there is a process for monitoring the quality and effectiveness of Job Safety Plan documents and Safe Work Observations which is sufficient to ensure Senior Management is knowledgeable of the process.
- Ensuring that work situations where there is no effective barrier identified in the MOST effective column on the Hazard Barrier Reference sheet are reported; that new barriers are being considered to provide additional protection in these circumstances, and that work is being done safely until additional barriers are available.

##### 4.3 First Line Managers (i.e. M1/M2)

###### 4.3.1 First line managers are responsible for:

- Ensuring workers are qualified to identify the hazards described in section 3.2.1, by conducting a hazard assessment prior to work and to select and implement effective barriers in response to those hazards.
- Ensuring Job Safety Plan documents are completed.
- Conducting documented Safe Work Observations as often as is required to ensure quality of the Job Safety Planning process.
- Ensuring Safe Work Observations include querying Workers on workplace hazards with the potential for fatality or permanent disability.
- Providing feedback to workers on the quality of Job Safety Plan documents.
- Conducting a documented assessment of completed Job Safety Plan Folders as often as is required to ensure quality of the Job Safety Planning process.
- Reporting new work situations where there is no effective barrier in the MOST effective column of the Hazard Barrier Reference sheet (refer to section 3.2.2.3).

- Ensuring Pre-job conferences are held and that all relevant parties understand and are prepared to discharge their roles and responsibilities.
- Disallowing addition of significant work to the work plan within ten days of the work taking place (applicable to BC Hydro's Generation Business Group).
- Maintaining a file of Job Safety Planning documents for a minimum of two years.

#### 4.4 Supervisors (i.e. Crew Leaders, Work Leaders, Foremen, Sub-Foremen)

- 4.4.1 Participate and contribute during Pre-job Conferences and Tailboard Discussions to ensure understanding of the potential hazards, barriers, and any specific rescue considerations required in the event of an incident.
- 4.4.2 Prepare written Job Safety Plan documents in advance.
- 4.4.3 Review and sign-off Job Safety Plan documents.
- 4.4.4 Ensure that hazards are identified and barriers are in place and communicated to workers, with at least one barrier utilized from the MOST effective column of the Hazard Barrier Reference sheet for each hazard. If no barrier is identified in the MOST effective column for any particular hazard, ensure the work is completed following existing safety rules or approved safe work procedures, and ensure any work situations where this condition is discovered is reported to the responsible Manager.
- 4.4.5 Ensure tailboard discussions are held with workers.
- 4.4.6 Use the Job Safety Plan documents to record identified changes during the work that may require specific action.
- 4.4.7 Monitor the work in reference to the plan.

#### 4.5 Workers

- 4.5.1 Participate and contribute during Pre-job Conferences when requested to ensure understanding of the potential hazards, barriers, and any specific rescue considerations to be used in the event of an incident.
- 4.5.2 Participate and contribute during tailboard discussions to ensure:
  - Identification and understanding of any hazards with the potential for fatality or permanent disability,
  - Implementation of multiple independent barriers for each hazard with at least one barrier per hazard from the MOST effective column of the Hazard Barrier Reference sheet, and
  - Review specific rescue considerations to be used in the event of an incident.
- 4.5.3 Review Job Safety Plan documents for identified changes during the work that may require specific action.

#### 4.6 Occupational Safety and Health (OSH) Specialists

- 4.6.1 Participate and contribute as required during Pre-job Conferences as Subject Matter Expert on potential hazards, barriers, and any specific rescue considerations to be used in the event of an incident.
- 4.6.2 Develop safety documents associated with Job Safety Planning as required.
- 4.6.3 When at worksites, query Workers on work zone identification of hazards and barriers.

#### 4.7 Trades Training Instructors (TTIs)

- 4.7.1 Provide Job Safety Planning training as required.

4.7.2 Act as Job Safety Planning Subject Matter Experts.

4.7.3 When at worksites, query Workers on work zone identification of hazards and barriers.

#### 4.8 Safety Advocates

4.8.1 Act as Job Safety Planning Subject Matter Experts.

4.8.2 When at worksites, query Workers on work zone identification of hazards and barriers.

#### 4.9 Office Administrators

4.9.1 Maintain a file of Job Safety Planning documents for a minimum of two years.

### 5. Records and Documentation

#### 5.1 Job Safety Planning Folders

#### 5.2 Pre-Job Conference forms

#### 5.3 Tailboard Forms for Specific Business Groups and Jobs

#### 5.4 Specific Work Procedures and Operating Orders

#### 5.5 Hazard Barrier Reference Sheet (see Job Planning website)

#### 5.6 Hazard Barrier Deficiency Process and Hazard Barrier Registry (see Job Planning website)

### 6. References

#### 6.1 WorkSafeBC Part 3, Division 3 – General Duties of Employers, Workers and Others

#### 6.2 Power System Safety Protection, System Operating Order (SOO) IT-12L – Module 2, Section 3, Module 3, Section 3

#### 6.3 BC Hydro Safety Practice Regulations Book

#### 6.4 BC Hydro Job Planning Webpage

### 7. Definitions

#### High Hazard Activity

Activity is considered high hazard if the hazardous energy of the activity being performed has a credible and realistic potential to cause death or probable permanent disability. Refer to **Appendix 4** for examples of common BC Hydro high hazard activities.

**Hazardous Energy:** Any electrical, mechanical, hydraulic, pneumatic, chemical or thermal energy, or force such as gravity that could potentially harm workers (Source: BC Hydro Safety Practice Regulations Glossary)

#### Attention:

BC Hydro defines high hazard activity for the general purpose of job planning/documenting tailboards.

Note that WorkSafeBC Regulation 9 and OSH Standard 3O3 “Confined Space”, distinguishes between “high”, “moderate” and “low hazard atmosphere”. Workers involved in confined space activities must determine and record through tailboards confined space atmosphere hazard accordingly.

**Preliminary Job Safety Planning:** Planning and coordination activities, including Design Review, that are carried out with sufficient lead time such that work can be safely and successfully completed when the workers arrive on site.

**Pre-Job Conferences:** Meetings that are held in advance of large or complex jobs to ensure that all relevant parties understand and are prepared to discharge their roles and responsibilities.

**Tailboards:** On-site discussions that shall be held immediately before work commences or during the course of work when there is a change in the job or crew composition to ensure that all workers understand the hazards, barriers in place, risks and procedures associated with the job.

**Post-Job Debriefs:** Discussions that are held following large or complex jobs to ensure that key safety issues are discussed, allowing for improvements to be incorporated for future jobs.

**Personal Protective Equipment:**

- **Personal Barrier – PPE** means any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards during accidents.

**Rescue/Medical Aid** – The worker is rescued in some way following contact with the hazard.

**Preventative Barriers** – Barriers that are put in place to prevent the loss of control of a hazardous energy source.

**Mitigating Barriers** – Barriers that are put in place to reduce or eliminate the potential for harm to workers in instances where there has been a loss of control of a hazardous energy source (i.e. in instances where preventative barriers fail).

**Revision Rationale:**

**OSH Standard 122 V5:** This standard has been revised in response to the corrective actions related to November 2014 electrical contact at the New Westminster Substation.

**OSH Standard 122 V5-1 (Updated February 10, 2016):** Additional edits made to rescue section 3.2.4 in response to WorkSafeBC orders related to November 2014 electrical contact at the New Westminster Substation.

**OSH Standard 122 V5-2 (Updated July 12, 2016):**

- Removal of content from Appendix 1 and edits to section 3.2.2.2 to reflect and point to the new OSH Standard 110 Hazard Identification and Risk Assessment that replaces this information.
- Update section 3.2.4.1 to provide clarity on the term “high angle” when considering rescue requirements.

## Appendix 1

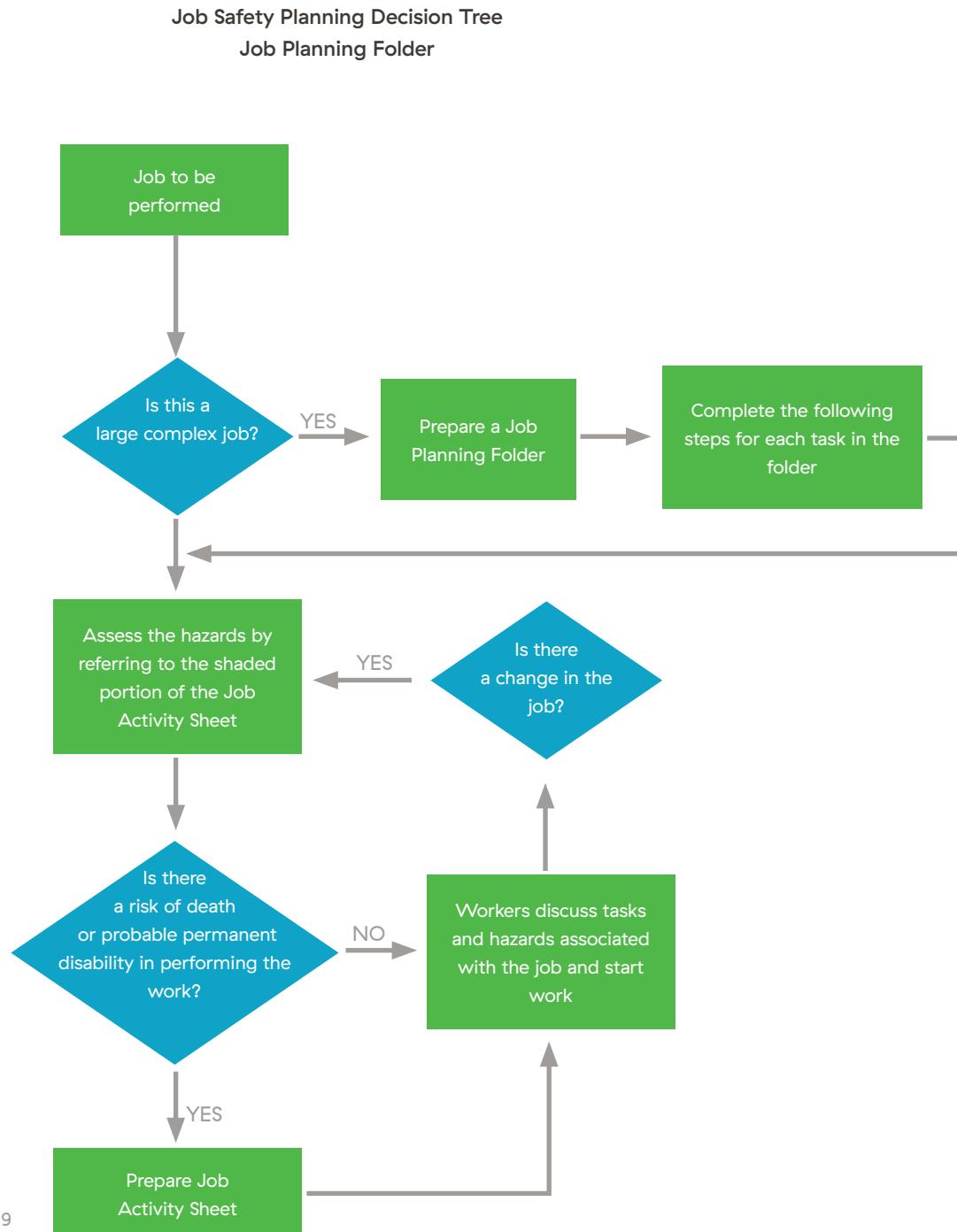
### Hierarchy of Accident Sequence Controls

Please note that the contents of this appendix have been moved from this standard to a new location in Appendix 4 of the July 2016 updated version of OSH Standard 110 Hazard Identification and Risk Assessment.

## Appendix 2

### Generation Safety Planning Decision Tree for the Job Planning Folder

(Stand Alone Jobs)

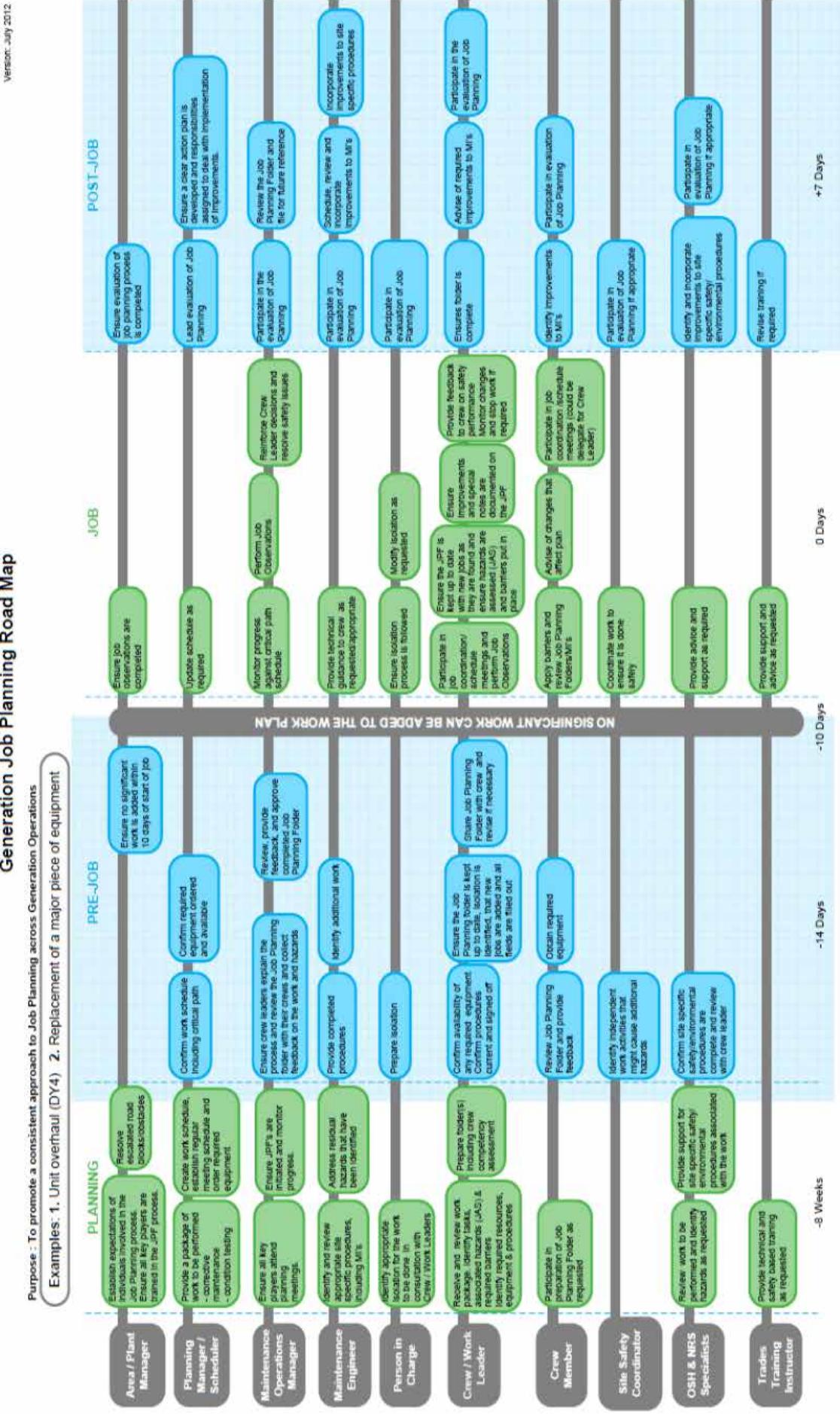


Revised: June 9, 2009

## Generation Job Safety Planning Folder Road Map for Larger Jobs

Purpose : To promote a consistent approach to Job Planning across Generation Operations  
**Examples 1. Unit overhaul (D4) 2. Replacement of a major piece of equipment**

### Generation Job Planning Road Map



Version: July 2012

## Appendix 3

### Additional Requirements for Preliminary Job Safety Planning,

#### Pre-Job Conferences and Tailboards

##### Preliminary Job Safety Planning

- As required, ensure that system and local component training for workers assigned to the job is current.
- For multiple employer worksites ensure that a site safety coordinator is designated
- Documented preliminary grounding plans, including isolation requirements, will be prepared. The preliminary job safety plan will consider the effects of having more than one set of grounds applied on the same isolated section of line at different work locations.
- Obtain applicable operating orders, BC Hydro OSH Standards, and written procedures
- Ensure an authorized worker to act as the Person in Charge (PIC), when operating responsibility is assigned by Fraser Valley Operations (FVO) to BC Hydro for the planned work.
- Ensure that all required specialized tools and equipment meet applicable BC Hydro standards (inspections, etc) and will be on the job site (e.g., air monitors, live line tools, vehicles, man lifts).
- Worksite risk assessments are completed where applicable
- Documentation (e.g., WHMIS, Notice of Project (NOP), etc.) and permits (e.g., Transportation of Dangerous Goods (TDG), diving, etc.) are obtained.

##### Pre-Job Conferences

- A risk assessment will be done, or reviewed if a pre-existing risk assessment is applicable, for the work to be carried out so that related safety and health hazards are identified and appropriate barriers are put in place to control these hazards.
- For work involving contractors, BC Hydro's relationship with the contractor (e.g., dependent, independent or prime contractor) will be reviewed as per the Workers Compensation Act.
- All relevant work groups are to be represented at the pre-job conference.
- For large or complex jobs involving contractors and/or subcontractors, a pre-job conference will be held in accordance with BC Hydro's OSH Standard covering contract management.
- A safety plan will be developed as required. It will include, as a minimum, emergency response details specific to the planned work, and worker job/site orientation.
- Pertinent operating orders and BC Hydro OSH Standards are to be identified and reviewed.
- Establish a method of communication between the work groups for emergency response purposes.

## Tailboards

- Workers who are working alone shall apply the tailboard requirements, set out in below, prior to commencing work.
- Tailboard discussions shall include the following topic areas:
  - The scope and task sequence of the planned work, including any applicable procedures.
  - A review of any relevant preliminary or pre-job documentation.
  - The location and boundaries of the work and the placement of signage/demarcation of safety zones to establish safety zones as required.
  - Environmental conditions which could impact the work.
  - Communication requirements and systems.
  - Rules and regulations applicable to the work being performed.
  - All the known hazards and the required barriers.
  - Required personal protective equipment.
  - Safety management plans and environmental management plans, including requirements for emergency response, rescue plans and first aid.
  - Other work that could affect the work area.
  - Worker experience and knowledge of the job at hand.

## Appendix 4

### Common High Hazard BC Hydro Activities

The table below is not all inclusive but is meant to list examples of most common high hazard

BC Hydro activity/work situations broken down by hazard category. Documented tailboard is required prior to any of these (or similar) activities/work situations.

Hazard Category	Activity/Work Situation	Potential Consequences
Electrical	<ul style="list-style-type: none"> <li>Working on energized lines and/or equipment (<math>\geq 150</math> V DC or <math>\geq 30</math> V AC)</li> <li>Working in close proximity of energized/exposed lines and/or equipment [closer than Column 4 Limits of Approach (LOA)]</li> <li>Working with hazardous test energy</li> <li>CT work</li> <li>Working with equipment isolated not de-energized per SPR rule 512 ①</li> <li>Working on/near failed equipment</li> <li>Electrofishing</li> </ul>	<ul style="list-style-type: none"> <li>Electrocution</li> <li>Electrical burns</li> <li>Ventricle fibrillation</li> </ul>
Gravity	<ul style="list-style-type: none"> <li>Working at height</li> <li>Working with objects at height</li> <li>Working in or above excavations</li> <li>Working above water</li> </ul>	<ul style="list-style-type: none"> <li>Falling</li> <li>Falling objects, crushing</li> <li>Asphyxiation</li> <li>Drowning</li> </ul>
Mechanical	<ul style="list-style-type: none"> <li>Working on or near moving equipment or equipment that may move unexpectedly</li> <li>Working on or near power tools or machinery/equipment with moving parts or stored energy <ul style="list-style-type: none"> <li>Spring</li> <li>Pulling cable</li> <li>Stringing conductor</li> <li>Jacking conductor (“sucking bubbles”)</li> <li>Replacing insulators</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Crushing</li> <li>Entanglement</li> <li>Component failure</li> <li>Struck by cable/conductor or jack</li> </ul>
Chemical	<ul style="list-style-type: none"> <li>Working in a toxic atmosphere or with hazardous substances: asbestos, lead, mercury, PCBs, ammonia, chlorine, silica dust, acid, caustic, flammables (gasoline, hydrogen), radioactivity etc.</li> </ul>	<ul style="list-style-type: none"> <li>Harmful exposure</li> <li>Burns</li> <li>Asphyxiation</li> </ul>
Pressure	<ul style="list-style-type: none"> <li>Sudden uncontrolled release of high pressure gas or fluid</li> </ul>	<ul style="list-style-type: none"> <li>Harmful exposure</li> <li>Burns</li> </ul>
Thermal	<ul style="list-style-type: none"> <li>Working in proximity to high temperature sources</li> <li>Implusive sleeves</li> </ul>	<ul style="list-style-type: none"> <li>Fire</li> <li>Burns</li> <li>Explosion</li> </ul>
Biological	<ul style="list-style-type: none"> <li>Working in proximity of rodent droppings</li> <li>Working in proximity of blood-borne pathogens</li> </ul>	<ul style="list-style-type: none"> <li>Hanta virus</li> <li>HIV, hepatitis</li> </ul>
Other	<ul style="list-style-type: none"> <li>Working in confined space</li> <li>Working in water including the use of divers</li> </ul>	<ul style="list-style-type: none"> <li>Asphyxiation</li> <li>Drowning</li> </ul>

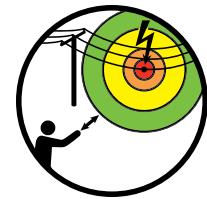
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# **OSH Standard 201**

## **Worker Qualifications for Limits of Approach Authorization**

# Osh Standard 201

## Worker Qualifications For Limits Of Approach Authorization



### 1. Scope

This standard applies to the process of authorization for workers intending to work for BC Hydro on or in proximity to exposed energized conductors or equipment of BC Hydro's power system in accordance with Safety Practice Regulation (SPR) Rule 4O1 or other regulation addressing Limits of Approach (LOA).

### 2. Purpose

The purpose of the standard is to:

- Identify the workers who can be authorized for LOA
- Establish what worker qualifications are expected for each authorization level
- Assist managers accountable for authorization in carrying out their responsibility for assigning LOA authorization to their workers based on worker qualification experience and competence.

### 3. LOA Authorization Requirements

- 3.1 Each worker must be authorized by their manager to a specific Column of LOA specified in Table 4O1 of the SPR. Managers will base authorization upon obtaining assurance of each worker's understanding of the electrical hazards to which he or she will be exposed.
- 3.2 The authorization must be recorded in PSSP/VWPP Manager.
- 3.3 When workers transfer, their LOA authorization must be reviewed by their new manager and be confirmed or changed as required.

### 4. Specific Worker Qualification Requirements

The specific requirements below (by category) apply to the four categories of worker that may be seeking LOA authorization.

#### 4.1 Qualified Electrical Workers

- 4.1.1 Only experienced electrical utility trades or technical workers who have achieved and maintained their qualifications may be designated as Qualified Electrical Workers. Recognized trades or technical classifications consist of Power Line Technicians, Electricians, Operators, Cable Splicers, Winders, CPC Technologists, P&C Technologists (Engineering), Instrumentation & Controls Technologists, Meter Technicians, Project Equipment Specialists and Electrical Engineers.
- 4.1.2 These workers may be authorized to work up to distances specified in Column 2 LOA if they are authorized to at least PSSP Category 5 or VWPP Category C.
- 4.1.3 These workers may be authorized to work up to distances specified in Column 1 LOA only if their job specifically requires this.
- 4.1.4 Only qualified electrical workers are permitted to act as safety watchers in relation to high voltage electrical hazards.

#### 4.2 Apprentice Electrical Workers

- 4.2.1 These workers may be authorized to work up to distances specified in Column 3 LOA if they are authorized to at least PSSP Category 3 or WPP Category B.
- 4.2.2 These workers may work up to distances specified in Column 2 LOA if all of the following are met:
- They are working under the direct and continuous supervision of a Qualified Electrical Worker authorized to either Column 1 or 2 LOA.
  - They are working in accordance with the Level Requirements of their apprenticeship.
- 4.2.3 These workers may work up to distances specified in Column 1 LOA if all of the following are met:
- They are apprentice Power Line Technicians working on the Transmission System at voltages of 138 kV and above, and they are working in accordance with the term requirements of their apprenticeship (in this circumstance, term 5).
  - They are working under the direct and continuous supervision of a Qualified Electrical Worker (Power Line Technician) authorized to Column 1 LOA.
  - They are performing work in accordance with an Approved work procedure.
  - For training of this nature, the Apprentice shall not be considered a Qualified Electrical Journeyperson for the interpretation of Safety Practice Regulation crew complement requirements.
- 4.2.4 These workers may participate in high voltage rubber glove field training if all of the following are met:
- They are apprentice Power Line Technicians working in accordance with the Level Requirements of their apprenticeship.
  - They are working under the direct and continuous supervision of a Qualified Electrical Worker (Power Line Technician) authorized to Column 1 LOA and certified in rubber glove work procedures
  - They have received formal classroom rubber glove training by a Trades Training Instructor, and have demonstrated technical competence at an approved training facility.
  - For training of this nature, the Apprentice shall not be considered a Qualified Electrical Journeyperson for the interpretation of Safety Practice Regulation crew complement requirements.

#### 4.3 Qualified Workers – Specially Trained

- 4.3.1 These are typically non-electrical workers who have received special training in order to work closer than the distances specified in Column 4 LOA.
- 4.3.2 These workers may be authorized to work up to distances specified in Column 1 LOA if all of the following are met:
- They are apprentice Power Line Technicians working on the Transmission System at voltages of 138 kV and above, and they are working in accordance with the Level Requirements of their apprenticeship (in this circumstance, term 5).
  - They are working under the direct and continuous supervision of a Qualified Electrical Worker (Power Line Technician) authorized to Column 1 LOA.
  - They are performing work in accordance with an Approved work procedure.
  - For training of this nature, the Apprentice shall not be considered a Qualified Electrical Journeyperson for the interpretation of Safety Practice Regulation crew complement requirements.

- 4.3.3 These workers may be permitted to work to Column 2 but only under a specific, dedicated work procedure that is approved by the BC Hydro's Senior Vice-President of Safety, Security and Emergency Preparedness.
- 4.3.4 These workers are not permitted to act as safety watchers in relation to high voltage electrical hazards.

#### 4.4 Unqualified Workers

- 4.4.1 Workers that do not meet the requirements stated in sections 4.1 – 4.3 are considered unqualified. These workers may still be authorized, but only to Column 4 LOA and if they hold PSSP Category 2 or WPP Category A authorization.

### 5. References

- 5.1 BC Hydro Safety Practice Regulations Rule 401 Limits of Approach to Exposed Energized Conductors and Equipment.
- 5.2 WorkSafeBC Occupational Health and Safety Regulation Part 19 “Electrical Safety”.

#### Revision Rationale:

- a) Section 4.2.3: This change is made to align with current training practices, and to ensure proper permission of these practices in this standard. Some work on the transmission system is required to be done closer than Column 2 LOA (e.g., working the cold end of an insulator string). In order for apprentices to learn this work under the supervision of a qualified journeyman, they must be allowed to work closer than Column 2. This training has traditionally been done, but the creation OSH Standard 201 section 4.2 did not previously take this into account, so disrupted the ability to do this training.
- b) Section 4.2.4: This change is made to align with current training practices, and to ensure proper permission of these practices in this standard. LOA authorizations are required in order to permit the placement of appropriate cover-up prior to performance of rubber glove work procedures.

November 12, 2014 minor edit:

- a) Update the wording of 4.2.2 and 4.2.4 to match that now used by the Industry Training Authority and by the Apprentice Training Program.

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# **OSH Standard 203**

## **Welding, Cutting and Hot Tapping**

# Osh Standard 203

## Welding, Cutting And Hot Tapping



### 1. Scope

1.1 This standard covers safety aspects and hazards associated with welding, cutting and hot tapping (hot tapping is welding on vessels that contain liquids or gases).

### 2. Purpose

2.1 This standard identifies requirements associated with welding, cutting and hot tapping which must be in place for reducing the risk associated with these hazards.

### 3. Standard

#### 3.1 Hazard Assessment

A detailed hazard assessment of welding and cutting operations conducted by a person with a thorough understanding of the process hazards is required which includes:

- Type of welding or cutting that needs to be done;
- Air contaminants generated from the welding or cutting operation, including by-products;
- Physical hazards in the area;
- Fire and explosion hazards;
- Other hazards resulting from associated processes (e.g. cleaning the metal, grinding, chipping, removing existing coatings) such as electricity, UV exposure, noise and burns from slag.

3.1.1 Written procedures will be developed to control hazards identified in clause 3.1.1 and will address the following:

- Hazard control;
- Administration controls (i.e. Hot work permit);
- Engineered controls;
- Personal protective equipment.

Small welding contractors without occupational health & safety resources may accomplish this by following procedural guidelines contained in CSA Standard W117.2-94.

#### 3.2 Exposure Control Plan

Due to the potential exposure to designated hazardous substances, an exposure control plan must be developed.

### 3.3 Safe Work Procedures

3.3.1 Written procedures must be developed to control hazards identified in the hazard assessment and will follow the hierarchy of controls:

- Elimination or substitution (e.g. use of welding rods with lower concentration of hazardous contaminants);
- Engineering controls (e.g. ventilation);
- Administrative controls (i.e. Hot work permit);
- Personal protective equipment.

3.3.2 For all welding operations appropriate personal protective equipment is required, including flame resistant clothing, helmet, eye protection and respiratory protection appropriate to the job and location.

3.3.3 Protection is to be in place (e.g. welding screens, ventilation, barriers and signage) so that other workers in the area will not be exposed to arc flashes and other welding related hazards.

## 4. Roles and Responsibilities

### 4.1 Managers

4.1.1 Managers are responsible for providing risk assessments, safe work procedures and approved equipment for welding, cutting and hot tapping.

4.1.2 Managers must ensure that employees who perform welding, cutting or hot tapping are qualified for the assigned work and have reviewed the Exposure Control Plan and safe work procedures.

### 4.2 Workers

4.2.1 Workers who operate gas or electric welding equipment are responsible for doing so safely, including using appropriate personal protective equipment.

4.2.2 Workers are responsible for identifying and reporting potential high risk areas and following written work procedures.

4.2.3 Workers must only carry out work they are trained and qualified for.

## 5. References

- 5.1 WorkSafeBC OHS Regulation Part 12.
- 5.2 CSA W117.2-94 (referred to by WorkSafeBC Part 12)
- 5.3 National Fire Code, N.F.P.A. 51B Fire Prevention in Use of Cutting and Welding Processes, 1994 edition
- 5.4 ANSI Z49.1 1973 Safety in Welding and Cutting
- 5.5 BC Fire Code, Division B, Part 3 (Indoor and Outdoor Storage) and Part 5 (Hazardous Processes and Operations)
- 5.6 BC Hydro Electric Arc Welding, Welding Fume Exposure Control Plan and Welding Work Procedures
- 5.7 BC Hydro OSH Standard 313 and OSH Standard 601

**OSH Standard Key Contact:** Andre Bock 604 528 2027

**Subject Matter Expert:** Randy Urbanowski 250 549 8670

### Revision Rationale:

Wording throughout this standard was revised based on comments received from knowledgeable persons in order to add more clarity, including the following:

- Added a requirement for an Exposure Control Plan in accordance with Safety Directive 2016-7-D
- Moved supplementary information into Appendix 1
- Additional references added such as the BC Fire Code, BC Hydro Exposure Control Plan and Work Procedures

## Appendix 1

### Additional Information

#### Gas Welding and Oxy-fuel Cutting

- Grease or petroleum products shall not be used on oxygen fittings or hoses because as oxygen is released from a cylinder, it expands and can form an explosive mixture with oil. Oil and grease should also be kept clear of rubber hoses because they cause deterioration. See that jointing surfaces in cylinder valves and regulators are free from oil or grease. If they are found to be oily, do not attempt to clean them; return them to the supplier for exchange.
- Acetylene cylinders will not be used when cylinder pressure is less than 103 kPa (15 lb/in<sup>2</sup>). Oxygen cylinders will not be used when cylinder pressure is less than 172 kPa (25 lb/in<sup>2</sup>).
- Acetylene and oxygen cylinders are not permitted inside confined spaces.
- Regulators will be set such that safe working pressures recommended by the manufacturer are not exceeded.
- Acetylene, in contact with certain metals, particularly alloys of copper, can form explosive compounds. Acetylene should therefore never be allowed to come into contact with copper or any alloy containing more than 70% copper.
- All cylinders must be secured upright when they are in use. Only sufficient spare cylinders for one day's use may be stored at the immediate work area. Others must be in an approved storage space elsewhere. When stored, cylinders must be upright and secured (against a wall by an adjustable chain where possible). Oxygen will be grouped separately from acetylene (a half-hour fire-rated partition between them is ideal). When transported in a vehicle or trailer, cylinders must be secured. Regulators, hoses and torch assemblies must be removed from cylinders and cylinder safety caps screwed on, hand tight, to protect valve heads from damage in an accident. Gas lines must be bled. Use appropriate equipment (e.g. dolly) to transport cylinders. Never drag, slide, or roll cylinders.

Note: If the valve breaks off, a pressurized cylinder becomes a lethal torpedo.

- Valves, hoses and torches shall be kept free of dust, dirt or any such obstruction.
- Inspect for leakage or defects prior to each use and test frequently for leaking connections. Escaping acetylene can generally be detected by the odour. Test with soapy water, never with an open flame.
- Should any compressed gas cylinder develop a leak, take it out in the open air, keep it well away from ignition sources, secure it in an upright position and notify the supplier at once.
- Flashback arrestors must be used.
- Use only friction lighters for lighting torches. Do not attempt to re-light a torch that has blown out without first closing both torch valves.
- Remember: oxygen regulators use right hand threads, acetylene regulators use left hand threads but to increase pressure they both turn clockwise. Always use the correct wrench supplied for the regulators. The nut for oxygen is purposely different from the acetylene nut to avoid mixing accessories.
- The key for opening the acetylene cylinder valve must be kept on the valve stem while the cylinder is in use so that the acetylene may be quickly turned off in an emergency. Use the "turn of the wrist" rule.
- Acetylene cylinder pressure is greatly affected by heat and cold. Pressure gauge readings do not indicate contents.
- When welding is stopped for a long period (lunch, or overnight), first turn off the acetylene torch valve, then the oxygen torch valve. Close the cylinder valves. Remove the residual pressure in the lines and regulators relieving the oxygen first, then the acetylene. Do not open the cylinder valves suddenly.
- Torches and hoses must be removed from a confined space when not in use and when the confined space is vacated.

## Electric Welding

- Never change the polarity or the rotary switch of an electric welding machine when the machine is under a load. If done under load, the switch contacts will probably be burnt, and the resulting arc may injure the operator.
- The welding machine must be properly grounded. Pipelines carrying gasses or flammable liquids and conduits carrying electrical conductors must not be used for grounding the welding machine.
- The polarity or the rotary switch of an electric welding machine must not be switched when the machine is under a load.
- Compressed gas cylinders not required for the welding operation will be kept clear of the work area. Those in the work area will be protected from arc flash.

## Welding or Hot Tapping on Equipment that Contain Flammables

- The contents of the equipment being welded must not unintentionally alter the metallurgical or chemical properties of the material being heated.
- Welding will not be performed on equipment that is operating above its rated working pressure and temperature, or on equipment that is operated at less than atmospheric pressure.
- Check that the material to be welded is of sufficient strength and thickness for the welding.
- Where flammable vapours are likely to be present in equipment, work may not proceed until a qualified person has conducted tests to ensure that work may be safely performed.
- Positive flow in the line being welded should be maintained, at least until after welding operations have been completed so that heat is dissipated. Where there is insufficient flow, the line must be flushed with steam, inert gas or hydrocarbon gas. Such steam or gas should be kept flowing through the line during the welding operation.
- Air lines or vessels must be free from lubricating oils (e.g. those that could be distributed through the system by a compressor) prior to welding.
- Prevent the ignition of a flammable atmosphere in the vapour space due to the application of external heat or release of flammable vapours from vents.
- A suitable fire extinguisher (minimum 4A-40BC) or a pressurized fire hose must be ready at the job-site. It is highly recommended that extinguishers with a hose as opposed to a stubby discharge nozzle and spark blankets be used. A water pressure or water mist type extinguisher may also be appropriate depending on the hazard.
- Never pump fluid in or out of tanks, agitate the contents or cause venting while hot work is in progress. Personal lockout should be applied to:
  - Agitator switches
  - All valves on product lines at the tanks
  - Gas-blanketing valves
  - Heater coil valves

## Flashback

- When the flame flashes back into the mixing tube and sustains itself there, it is called “flashback”. It is caused by:
  - Overheating the tip and torch mixer tube
  - Keeping the tip in a small space so long that it cannot be cooled by the air around it
- A shrill hissing or squealing usually accompanies a flashback.
- Extinguish a flashback immediately by shutting off the preheat oxygen valve. Without oxygen, the flame cannot burn inside the torch.
- To protect the welder, check valves must be installed. Some are placed in each hose-line just behind the torch; other types are installed at the regulator.

# **OSH Standard 204**

## **Personal Lockout**

# Osh Standard 204

## Personal Lockout



### 1. Scope

- 1.1 The scope of this standard is limited to personal locks and lockout requirements.
- 1.2 WorkSafeBC Regulations Part 1O applies when work is conducted on equipment that is not part of the Power System.
- 1.3 On the Power System:
  - 1.3.1 System Operating Order 1T-12 Power System Safety Protection (PSSP) applies within the PSSP boundaries. Refer to System Operating Order (SOO) 1T-12 A and 1T-12B and SPR 6OO in combination with this standard to identify what equipment is subject to personal lockout and how the lockout is to be applied.
  - 1.3.2 Work Protection Practices (WPP) applies for all work performed on equipment within the Generation boundaries. See SOO 1T-12A 6.O and SPR 7OO for further clarification on how personal lockout procedures apply.
- 1.4 All work performed on customer equipment will be in accordance with SOO 1T-12H. Customer lockout will:
  - Follow WorkSafeBC personal lockout procedures.
  - Be isolated by the customer using the customer's procedure.
  - Be over-locked with BC Hydro worker personal locks and a lockout tag.

### 2. Purpose

- 2.1 The purpose of this standard is to clarify how WorkSafeBC Regulations Part 1O is applied within BC Hydro in conjunction with System Operating Order (SOO) 1T-12 (PSSP-SPR 6OO) and Work Protection Practices (WPP-SPR 7OO). The requirements for safe lockout, published in WorkSafeBC Regulations Part 1O, should be reviewed in combination with this standard.

### 3. Standard

- 3.1 Equipment not on the power system requires specific written procedures. The specific written procedure is to include the following steps:
  - Identify the equipment to be locked out.
  - Stop the equipment.
  - Disconnect the hazardous energy sources.
  - Verify lockout effectiveness.
  - Apply personal locks.

3.2 Workers must use only locks that are assigned to them.

- 3.2.1 Personal locks that are assigned to workers will have affixed labels that clearly identify the name (first and surname) of the designated user.
- 3.2.2 Personal locks provide worker protection. A personal lock may be utilized only by its designated user.
- 3.2.3 Within PSSP boundaries, Lockout Tags are to be used to draw attention to locks. Tags designated for use on the Power System (Section 500 of the Safety Practice Regulations) must not be used for personal lockout. See Appendix 1 for tags used in personal lockout.
- 3.2.4 Locks may be issued to workers for retention throughout their career in BC Hydro. It is also acceptable to issue personal locks for the duration of a job.

3.3 All electrical power supplies must be individually lockable – with the exceptions of the following two scenarios and their resolutions:

- 3.3.1 The machine receives power from a plug.
  - If the work will be out of the immediate and direct control of the worker, the plug must be locked in a short stop.
- 3.3.2 The machine is hard-wired to a circuit breaker panel.
  - The appropriate circuit breaker must be individually locked in the open position.
  - A circuit breaker that cannot be individually locked open may be safeguarded by opening the circuit breaker and securing the circuit breaker panel door with a personal lock, only if:
    - There is a main switch to kill all power to the locked panel, and;
    - Either the worker is the only person required to lock out the equipment; or the panel door is transparent – allowing other workers to view the breaker status before applying their own locks.

3.4 Scissor clips may be used when two or more workers have to apply locks and when the isolation point cannot accept more than one lock.

- In the event that a scissor clip has to be attached to an isolation point that is already locked out, the original lock holder must remove the lock. The scissor clip may now be inserted and all workers must apply their locks to it.

3.5 All external contractors working on BC Hydro equipment subject to personal lockout must follow BC Hydro procedures when working within the Power System boundary area (PSSP or WVPP boundaries). This requirement will be written into contracts, and the person responsible for the equipment will ensure that applicable BC Hydro procedures are followed.

3.6 Lighting circuits exceeding 250V are subject to personal lockout.

## 4. Roles and Responsibilities

### 4.1 Workers

- 4.1.1 Each worker is personally responsible for the isolation and lockout of all hazardous energy sources that may jeopardize their safety during the course of their work.
- 4.1.2 The worker must have full knowledge of: the hazardous energy sources that will be isolated; the boundaries of the safe work area; and the safety procedures for the job.
- 4.1.3 Follow written lockout procedures during all maintenance work. The written procedures must be readily accessible for every job.
- 4.1.4 Remove the last lock. Ensure that all persons are clear and that the machinery or equipment can be operated safely.

### 4.2 Managers

- 4.2.1 Master or spare keys must be kept in a secure place accessible only to the manager for emergency use.

## 5. Records and Documentation

- 5.1 Lockouts must be conducted in accordance with documented procedures. The procedures must be readily available to all workers that are required to work on the machinery or equipment.
- 5.2 A checklist must be used when the number of personal lockout points is three or more.
- 5.3 The manager's removal of a worker's lock in an emergency must be recorded.

## 6. References

### 6.1 WorkSafeBC Regulations Part 10 De-energization and Lock

## 7. Glossary

- 7.1 **Control device** – A means of isolating machinery or equipment from the flow of energy. The control device may be a switch, circuit breaker, valve, latch or clutch. Electrical switches or push buttons that control current flow remotely by means of relays or contactors are not considered suitable isolating devices for the purpose of lockout.
- 7.2 **Hazardous energy** – Energy that could injure or endanger a worker (e.g. electric, compressed gas, steam, chemical, hydraulic, tensioned spring or elevated object.).
- 7.3 **Lockout** – Use of lock(s) to render machinery or equipment inoperable or to isolate an energy source in accordance with written procedures.
- 7.4 **Maintenance** – Work of keeping machinery or equipment in a safe operating condition and includes, but is not limited to, repairing, adjusting, cleaning, lubricating and the clearing of obstructions to the normal flow of material.
- 7.5 **Personal lockout** – The use of personal locks to secure the control devices which regulate the release of hazardous energy. It is intended to provide safety for workers during maintenance work.
- 7.6 **Short Stop** – A lockable plastic cover that clamps over the male end of an electric plug to prevent its connection to a power supply.

**Revision Rationale:**

OSH Standard 204 R1 June 10, 2011: The scope of this standard was revised to include maintenance of low voltage equipment in Non-Integrated Generating Stations in the application of lockout procedures, consistent with Safety Practices Committee Bulletin 134. This is a change in practice where previously workers were required to follow Power System Safety Protection (PSSP).

OSH Standard 204 R1 June 10, 2011 (R1-1 Updated December 4, 2014): The scope of this standard was revised to reflect the implementation of Work Protection Practices (WPP) within the non-integrated Generating Stations and Substations.

## Appendix 1

### Lockout Equipment

The BC Hydro stores catalogue and list of stationery items for lockout.

**Personal Lock** – Stores stock #11O O510. This padlock is issued with two keys: one for the assigned lock holder; and one for the supervisor. All locks are uniquely keyed.

**Scissor Clip** – Stores stock #11O O511. This multiplex device allows six padlocks to be locked on to one isolating point.

**Short Stop** – Stores stock #11O O512. This is a plastic lockable box that clamps over an electric plug to prevent its connection to a power source.

**Lockout Clip** – Stores stock #11O O513. This device is used to immobilize a circuit breaker. It is designed to fit over several varieties of panel mounted circuit breakers (up to 15 amp).

**Lockout Clip** – Stores stock #11O O514. This is similar to 11O O513 but specifically designed for FPE circuit breaker, style AB, type NEG311O15.

**Lockout Sticker** – Stationery form #1O236. This is a circular orange adhesive tag, 3.8 cm diameter, which draws attention to equipment that is subject to personal lockout procedures.



**Attention Tag** – Stationery form #LGO2-20. This yellow tag can be attached to equipment that is not locked out but which needs attention.



**Locked Out Tag – Stationery form #1O243.** This red tag can be attached to equipment that is locked out. The tag is used to supplement the personal lock – not replace it.



Notes:

- It is recommended that, where appropriate, electrical supplies to machinery should be fed through individual disconnect switches that can be locked, or through removable plugs. In single-phase supplies, it is often easy to insert an in-line plug and socket such as a Twistlok in a flexible supply cable.
- Other items of hardware for lockout may be obtained from outside the BC Hydro stores system. Suppliers of many types of panel mounted circuit breakers have single-pole and multi-pole clips and other lockout devices.

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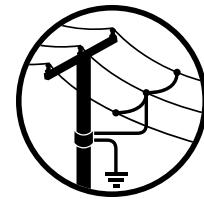
# **OSH Standard 206**

## **Worker Protection**

## **Grounding/Bonding**

# Osh Standard 206

## Worker Protection Grounding/Bonding



### 1. Purpose

- 1.1 To establish and communicate the safety and health requirements and responsibilities for Worker Protection Grounding/Bonding devices, practices, and procedures.

### 2. Scope

- 2.1 This standard shall apply to all work on being done by or for BC Hydro on its Power System, either conducted and supervised by BC Hydro employees or assigned to contractors.

### 3. Requirements

- 3.1 BC Hydro shall have and maintain Worker Protection Grounding/Bonding procedures that meet the requirements of:

- WorkSafeBC Occupational Safety and Health Regulation Part 19 Electrical Safety Section 22 Grounding and Blocking, and
- The BC Hydro Safety Practice Regulations, specifically Rules 512 and 513

- 3.2 All grounding system components including grounding cable, ball studs, clamps, ferrules, and accessories must meet the requirements of ASTM Standard F855 Standard specification for Temporary Protective Grounds to be used on De-energized Electrical Power lines and Equipment, and have the appropriate fault current rating for the application. Grounding equipment that meets ASTM F855 is approved for use.

Only the following exceptions are permitted. For more details refer to the Worker Protection Grounding/Bonding Manual.

- Chance C-Clamp C600-2256 is approved for use in tower grounding up to 20kA only on 1 ¾" steel angle iron where the angle iron is completely inside the jaw of the clamp.
- Universal clamps are only approved for use on flat bar when the bar is completely inserted inside the jaw of the clamp.
- Flat faced ground clamps are not approved for use since they have been shown during testing to come off during a fault.

- 3.3 The point at which ground leads are applied to electrical equipment and the ground lead assembly must have current carrying capabilities/ratings equivalent to or greater than the maximum fault current available at the location of grounding (e.g. attaching ground leads to corona rings is not acceptable). Required ground lead sizes are listed in:

- System Operating Order (SOO) 2T-05 (Transmission/Distribution lines and Stations).
- Generation Operating Order (GOO) 2G-44 specifies local fault levels which are used to determine appropriate ground lead sizes, which are listed in Local Operating Orders (Generating Stations).

**3.4** Ground Leads must be tested in accordance with ASTM Standard F2249 Standard Specification for In-Service Test Methods for Temporary Grounding Jumper Assemblies Used on De-Energized Electric Power Lines and Equipment or equivalent standard at one-year intervals.

- 3.4.1** Testing and maintenance instructions for Ground Leads are located in Section E of the BC Hydro Testing and Maintenance Instructions for Safety Service Shops manual. Responsibility for the development and maintenance of this manual is delegated to the BC Hydro Safety Engineering Department.
- 3.4.2** A tag or label must be attached to grounding leads identifying the lead's length and test due date. Untagged or unlabeled ground leads are not to be used.

**3.5** Any Worker Protection Grounding/Bonding device that has been subject to a fault must be immediately removed from service and disabled in a manner that ensures it cannot inadvertently re-enter service.

**3.6** BC Hydro Business Groups shall ensure that work procedures developed for the application of grounding and bonding are aligned with the requirements of this Standard, and with the requirements of the Safety Practice Regulations. These work procedures are found in:

- The Worker Protection Grounding/Bonding Manual (Transmission/Distribution lines and Stations).
- Generation Maintenance Instruction O1.2O.MTCE.O3 (Generating Stations).

Contractors are responsible for creating their own work procedures, which must be acceptable to BC Hydro.

**3.7** Executive Vice Presidents shall ensure implementation of this Standard and related procedures in their business units.

**3.8** The Senior Vice-President of Safety, Security and Emergency Preparedness shall provide oversight of BC Hydro performance and compliance with this standard, and shall report status to the CEO and Board of Directors according to the schedule set out in the audit plan.

#### **4. Roles and Responsibilities**

**4.1** Managers, Foremen/women, Sub-Foremen/women, and Crew Leaders are responsible for understanding and meeting their responsibilities as defined in this Standard and related manuals, operating orders, and work procedures, including but not limited to:

- 4.1.1 Planning and supervising work.
- 4.1.2 Ensuring workers are trained and competent.
- 4.1.3 Responding to, reporting and investigating incidents and non-conformances.

**4.2 Workers who carry out work within the scope of this Standard are responsible for:**

- 4.2.1 Completing any required instruction and training prior to work.
- 4.2.2 Adhering to work procedures that are approved for this work, including the selection and application of grounding/bonding equipment, and the appropriate matching to fault currents.
- 4.2.3 Development of a grounding/bonding plan for each job, and documenting as part of the Job Plan or Tailboard
- 4.2.4 Stopping work immediately if they encounter unsafe conditions, and reporting any problems or concerns to their work/crew leader or manager.

**5. Regulation and Related Documents**

5.1 WorkSafeBC OHS Regulation, Part 19.22 Grounding and Blocking

5.2 BC Hydro Safety Practice Regulations

5.3 ASTM F855 – Standard specification for Temporary Protective Grounds to be used on De-energized Electrical Power lines and Equipment

5.4 ASTM Standard F2249 – Standard Specification for In-Service Test Methods for Temporary Grounding Jumper Assemblies Used on De-Energized Electric Power Lines and Equipment

5.5 Worker Protection Grounding/Bonding Manual

5.6 Recommended Grounding Practices for the Maintenance Work, Major Repair Activity, and Testing of Synchronous Generators – Standard Number: O1.20.MTCE.O3

**Revision Rationale:** Complete re-write to align the content of this Standard to the Safety Practice Regulations and to Business Group work procedures in the T&D Worker Protection Grounding/Bonding Manual and Generation Maintenance Instruction O1.20.MTCE.O3. Duplicated material has been removed and placed in appropriate documents to ensure contradictions between documents is prevented.

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# **OSH Standard 208**

## **Chainsaws and Portable Power Tools**

# Osh Standard 208

## Chainsaws And Portable Power Tools

### 1. Purpose

1.1 To communicate acceptable and required safety equipment and practices for the use of chainsaws and other portable power tools.

### 2. Scope

2.1 This standard shall apply to all BC Hydro work whether conducted and supervised by BC Hydro employees or assigned to contractors.

### 3. Requirements

3.1 Chainsaws and power tools will be operated in accordance with WorkSafeBC (WSBC) Occupational Health and Safety Regulation (OHSR), plus other references as identified in Section 5 of this standard.

#### 3.2 Chainsaws

3.2.1 Chain Saw – a power-driven tool designed to cut wood with a saw chain and consisting of an integrated compact unit of handles, power source, and cutting attachment, designed to be supported with two hands.

Note: A “Hot Saw,” which is a saw mounted on an extended pole, is not considered a chainsaw for the purposes of this standard since it is not a compact unit. Therefore only section 3.4 of this standard would apply.

3.2.2 All chainsaws used at BC Hydro must have the following safety features:

- Chain brake (inertial)
- Chain catcher
- Bumper or bucking spikes (“dogs”)
- Hand guards front and rear
- Reduced radius chain bar tip on top-handled saws
- Spark arresting muffler (gas powered saws)

3.2.3 Basic personal protective equipment (PPE) (including hard hat, hearing protection, safety glasses, gloves and steel toed boots) must be worn when using a chainsaw.

3.2.4 Additional PPE for all chainsaw use must include:

- Face shield
- Leg protection such as pants, chaps or apron meeting the requirements of WSBC OHSR 8.21, Schedule 8-A.

### 3.3 General Rules for Safe Chainsaw Operation

3.3.1 Any BC Hydro employee who uses a chainsaw at work must have had formal training in safe chainsaw operation. Minimum training is BC Hydro SAFE-529 (Chainsaw Operation).

3.3.2 Any worker who falls a standing tree larger than 6 inches in diameter must be certified to the BC Faller Training Standard or be a Certified Utility Arborist (CUA) with falling certification acceptable to WSB.

Note: this requirement does not apply to work related to clearing trees that have already fallen (e.g.: storm damage).

3.3.3 The saw must be in good operating condition with all safety features in place, chain tension properly adjusted, and the chain brake confirmed to be working properly.

3.3.4 Saw use must be restricted to cutting wood only.

3.3.5 Workers must not work alone when operating chainsaws except as specified in Safety Practice Regulation 8O1.1.

### 3.4 Portable Power Tools Including Powder Actuated Tools

This section applies to all portable power tools include nailers, drills, grinders, saws and others where energy operating the tool is electrical, pneumatic, hydraulic, internal combustion or explosive cartridge (i.e., powder actuated).

3.4.1 Any employee required to use portable power tools must be instructed in the safe use of those tools.

3.4.2 Any employee using portable power tools will wear applicable basic PPE as well as any additional PPE, such as respiratory protection, as identified in safe work planning.

3.4.3 All power tools will be used only for their intended purpose and as per the manufacturer's instructions.

3.4.4 All guards and other safety devices provided by the tool's manufacturer must be kept in good working condition and never defeated.

3.4.5 Powder actuated tools – refer to WSB OHSR 12.51 through 12.57 for specific requirements on the selection, use, and storage of these tools.

## 4. Roles and Responsibilities

### 4.1 Workers

4.1.1 Comply with the provisions of this standard and all referenced regulations, standards and rules as applicable.

4.1.2 Follow all BC Hydro safe work procedures and Work Methods applicable to the work.

### 4.2 Supervisors

4.2.1 Supervisors must ensure that workers are instructed on the safe use of portable power tools and trained in the safe use of chainsaws.

4.2.2 Supervisors must ensure all elements of a safe work plan are in place before work begins.

## 5. Regulation and Related Documents

- 5.1 CSA Standard Z62.1-95 Chainsaws
- 5.2 CSA Standard Z62.1-15 Chainsaws
- 5.3 WSBC OHSR 26.1 and Guideline Part G26.1-1
- 5.4 WSBC OHSR 8.21 and Guideline Part G8.21
- 5.5 WSBC OHSR and Guideline "Powder Actuated Tools" Parts 12.51 to 12.57
- 5.6 WSBC OHSR Part 12.72 to 12.73
- 5.7 WSBC OHSR and Guideline Part G26.21
- 5.8 BC Forest Safety Council
- 5.9 BC Hydro Safety Practice Regulations rules 310 and 801.1
- 5.10 BC Hydro SPR 405
- 5.11 BC Hydro OSH Standard 601
- 5.12 SAFE 529 Chainsaw training

## 6. Information Controls

### 6.1 Revision History

Revision History		
Date	Version	Comments
July 14, 2016	V1-0	Complete re-write

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# **OSH Standard 209**

## **Isolation of Mechanical Apparatus**

# Osh Standard 209

## Isolation Of Mechanical Apparatus



### 1. Scope

The scope of this safety standard is to address acceptable isolation of mechanical devices including such equipment as:

- Intake and spillway gates
- Large valves – penstock inlet valve, turbine inlet valve, pressure regulating valve
- Wicket gates, deflectors, needles
- Any other hydraulic operated equipment
- Piping systems
- Generating Units

### 2. Purpose

The purpose of this standard is to establish a consistent approach to the isolation and blocking of mechanical apparatus used as isolating devices. Where it is not practicable to apply the minimum standard, the facility WPP/PSSP local operating order shall specify alternate procedures which achieve an equivalent level of worker safety (e.g. engineered systems).

### 3. Standard

See Appendix 1 to learn about design concepts for isolation of mechanical devices.

#### 3.1 Application Concepts

##### 3.1.1 General Requirements

Prior to worker access to mechanical apparatus, all hazardous energy sources shall be isolated.

Due to the wide variety of systems and designs in use, specific energy control measures shall be designed on a system by system basis, by first analyzing every energy source individually and then in combination with the other energy sources present.

##### 3.1.2 Isolating Devices

Isolating devices shall be rated to withstand the maximum credible pressure and/or forces that could be applied to them in their isolated state. All isolating devices shall be lockable.

##### 3.1.3 Reliance on Pressure

It is not acceptable to rely on fluid pressure to maintain isolation or blocking of mechanical apparatus. Exemptions may be made with approval in writing from both the Safety Practices Committee (SPC) and a Professional Engineer.

### 3.1.4 Reliance on Check Valves

It is not acceptable to rely on check valves to maintain isolation.

### 3.1.5 Verification

#### i) Concept for Blocking

Blocking shall be verified by confirming that the correct blocking device is installed and locked (tagged if PSSP) in the correct position.

#### ii) Concept for Piping Systems

The isolation of a piping system shall be verified by one of the following methods, listed in order of preference. In each case, several attempts could be used to demonstrate the cause and effect relationship between the drain and the observation.

- Visually monitor the dissipation of stored energy from the system into the drain as a direct result of opening the valve. Shortly after opening little or no flow should exist.
- Audibly monitor pressure dissipation from the system into the drain by hearing flow noise as direct result of opening the valve. Shortly after opening, no flow noise should exist.
- Using a pressure gauge, observe the pressure in the system decrease as a result of opening the drain valve. The pressure gauge must originally record pressure present, to check its operation, and then decrease to zero.
- Open a drain valve to atmosphere and confirm it is not plugged, possibly by inserting a rod long enough to reach the main pipe into the drain.

### 3.1.6 Visual Check

#### i.) Concept for Blocking

Blocking shall be visually checked by confirming that the correct blocking device is installed and locked (tagged if PSSP) in the correct position.

#### ii.) Concept for Piping Systems

Isolation of a piping system shall be visually checked by confirming all valves are in the correct position and are locked (tagged if PSSP) in that position.

## 3.2 Large Gates and Valves

### 3.2.1 Hydraulically Operated

Acceptable methods of isolating hydraulically operated devices include, in order of preference:

1. Complete depressurization of the system with a drain open, and isolation of all energy sources. If the device must be held in position to prevent it from moving, positional blocking must be installed as well.
2. Single valve and drain with full-force blocking.
3. Double valve and drain with a second drain line to ensure the actuator remains without any pressure, and positional blocking.

For large gates and valves held in place by gravity, refer to A (iii) in Appendix 1, which defines gravity as fulfilling the requirements of positional blocking in some situations.

### 3.2.2 Water Operated

Acceptable methods of isolating water operated devices are the same as for hydraulically operated devices.

If a water-operated device receives its energy from a line or header which has already been isolated in accordance with this document, the energy source for the water operated device can be considered isolated as well. Note that blocking may still be required.

### 3.2.3 Wire Rope

Wire rope devices shall be isolated by disconnecting electrical power to the devices, isolating any manual/auxiliary operators, and using positional blocking to maintain the device in position.

Blocking applied to the hoist braking mechanism such as brake clamps shall be considered an acceptable method of blocking the gate in a desired position, provided the design of the clamp and the suitability of the system has been approved by a Professional Engineer.

### 3.2.4 Crane and Lifting Beam

When a device is solely operated using a crane with a lifting beam, the device may be isolated using one of the following methods, in order of preference:

1. Removing the lifting beam from the device and locking the access for the beam to the gate slot.
2. Removing the lifting beam from the device and locking the lifting beam.

### 3.2.5 Direct Drive

A direct drive device such as belt, chain or shaft driven shall be isolated by disconnecting electrical power to the device and isolating any manual/auxiliary operators. Positional blocking is required unless the system is approved as self locking by a Professional Engineer.

## 3.3 Hydroelectric Generating Units

Each generating unit must be considered individually. The subsections here set out guidelines for isolating the higher hazard sources of energy. It is not intended to be a complete list of all points to isolate a generating unit, but rather a list to address the major sources of energy. Although not specifically listed, consideration must be given to the other sources of energy present such as fire protection and brake air systems.

### 3.3.1 Servomotors and Wicket Gates

Isolation of the wicket gates shall be by one of the following three methods:

1. Depressurizing the accumulators and opening a drain, isolating the air supply, electrically isolating the oil pumps, and installing positional blocking on the servomotors; or
2. Isolating the hydraulic and pneumatic energy using single valve and drain of the piping, and installing full force blocking on the servomotors.
3. Isolating the hydraulic and pneumatic energy using double valve and drain of the piping, and installing either positional or full force blocking on the servomotors. If this method is used, the possibility of stored energy in the servomotors must be addressed, as described in Appendix 1, Section B iv.

### 3.3.2 Unit Rotation

Full force mechanical blocking of the rotating components is not practical. Therefore, isolation of the hazardous energy is necessary and shall include the following components:

1. Intake operating/maintenance gate, penstock inlet valve and associated bypass valves, turbine inlet valve and associated bypass valves, or other device closed to block the flow of water into the turbine;
2. Penstock or scroll case drain valve open (or equivalent, such as an open scroll case door) to drain leakage from item 1 above;
3. All raw water valves necessary to prevent back flow shall be closed;
4. Generator electrical isolation – perform as required by local operating order and the Recommended Grounding Practices for Hydroelectric Generators Maintenance Standard (O1.20.MTCE.O3); generally it includes:
  - a. Disconnect open or flex links removed and grounded, neutral disconnect open or secondaries open, and neutral ground installed; and
  - b. Inadvertent rotor movement blocked by:
    - i. Isolating the energy from the generator lift pump; if a unit does not have a lift pump inadvertent movement can be considered blocked; and
    - ii. Restricting backflow of water through the turbine by installing draft tube gates or isolating and blocking the wicket gates in the closed position; and
    - iii. Isolating the energy from the unit jacking system.

### 3.3.3 Unit Rotation – Brushgear Maintenance

Note:

Brushgear maintenance generally includes measuring brushes, replacing brushes, and/or cleaning the slipring and collector assemblies. It does not generally include removing the speed switches, PMG, slipring assembly or collector assembly. Due to the risk of rotation while performing work, adequate safe work procedures are required to prevent minor worker injury due to pinch hazard. If the unit creeps for any reason the Brushgear maintenance is stopped and established isolation reviewed.

#### 1. Hazard

The residual magnetism in the rotor is only a hazard if the rotor is able to spin allowing this magnetism to interact with the stator winding. This can result in an undetermined amount of continuous current flow (rotor

speed dependant) in the stator winding Worker Protection Grounds which may affect their integrity. These grounds are applied on the stator to protect the workers from inadvertent energization of the stator and their integrity must be maintained.

- Rotation hazard of the slip rings – pinch factor or loose clothing getting caught between the brush holders and slippings
2. Equipment Protection Methodology Associated with a Pressurized Scroll Case
- Generator brakes must remain applied to prevent unit rotation:
    - To mitigate residual magnetism interacting with the stator to ensure integrity of the worker protection stator grounds
    - Enable creep detection systems to protect the generator bearing
  - Governor in an active, but shutdown condition to maintain gate squeeze
  - Lift pump operational and NOT isolated to protect the generator bearing:
    - Creep detection systems protect the generator bearing and must be in an operational state. If a creep operation initiates gate opening to take the unit to speed-no-load, the scroll case must be drained
3. Isolation of Prime Mover Methodology
- Wicket gates blocked closed, verified and locked or nozzles blocked closed, verified and locked

#### 3.3.4 Water Passages

Some water passages are considered confined spaces. Check with area Occupational Safety and Health (OSH) Specialist to confirm classification. For water passages which are classified as confined spaces, refer to Section 3.5 of this standard.

#### 3.3.5 Pressurized Air Admission Systems

Pressurized air is considered a hazardous substance as it could cause injury in a confined space, even if it is considered breathable air.

For entry of personnel into the water passages of generating units equipped with synchronous condense operation or pressurized air injection, isolation will be determined by the classification of the water passage:

1. Confined Space – isolation to meet the requirements of WorkSafeBC OSHR Part 9 and OSH Standard 3O3 for confined space entry; or
2. Not a Confined Space – isolation to be single valve and drain.

#### 3.4 Work on Piping Systems

This section is intended to outline the isolation required for working on a piping system, not entry into the piping system or a confined space connected to the piping system. Entry into confined spaces is subject to additional considerations to meet the requirements of WorkSafeBC OSHR Part 9 and OSH Standard 3O3.

Isolation may not be required for all piping system work provided an alternate approved work procedure is followed (e.g. hot tapping).

When establishing isolation, a drain might be remote to the work. Best practice for disconnecting or opening a pipe is to treat it as live until it is obviously open to atmosphere. For example, flange bolts should be loosened on the side opposite the worker.

A piping system, including pipes for air, oil, and water, can be isolated in any of the following three manners, listed in order of preference.

#### 3.4.1 Depressurizing

It is preferable to remove the hazard by depressurizing, but often this is not practical. Note that the section of piping may have to be specifically depressurized in addition to depressurizing the equipment at the source.

#### 3.4.2 Disconnecting

Removing a section of piping to ensure the hazardous energy cannot reach the work area.

#### 3.4.3 Blanking

Installing a blank in the line and draining the line section to be worked on.

#### 3.4.4 Single Valve and Drain

At a minimum, depressurizing will consist of isolating the energy source and opening a drain line in the section of piping to be worked on.

### 3.5 Confined Spaces

For entry into a confined space, the requirements of WorkSafeBC OSHR Part 9 and OSH Standard 3O3 must be fulfilled in addition to those presented in this Standard.

Isolation options for hazardous substances in lines adjacent to a confined space include disconnecting, blanking, double block and bleed, and single device isolation. For details and formal definitions, see the references.

### 3.6 Cranes

Cranes have both electrical and gravitational hazards. Electrical isolation shall be made using the main disconnect. Isolation for the gravitational hazard is required when movement of the load bearing components would endanger a worker (e.g. replacing the brake pads or the brake assembly); this requires the hoist to be dogged or the hook placed on the floor.

### 3.7 Auxiliary Equipment (i.e. Pumps and Compressors)

For work on auxiliary equipment, electrical isolation is required as per WPP/PSSP, in combination with isolation and draining of the piping system connected to the equipment. Piping system isolation shall be by single valve and, if necessary, a drain. The drain is required if pressure could be stored or built up in the isolated area.

#### 4. Roles & Responsibilities

##### 4.1 Managers

- 4.1.1 Required to manage the work for the requirements of this standard are met
- 4.1.2 For generating stations, ensure the WPP local operating order contains necessary procedures.
- 4.1.3 Ensure spaces which workers are required to enter are reviewed to determine if they are confined spaces. A written entry procedure is required for workers to enter a confined space.

##### 4.2 Workers

- 4.2.1 Follow applicable safe work practices and procedures

#### 5. References

- 5.1 WorkSafeBC OSHR Part 9 Confined Spaces
- 5.2 BC Hydro Safety Practice Regulation (SPR) Rule 518
- 5.3 OSH Standard 3O3 – Confined Spaces
- 5.4 Recommended Grounding Practices for Hydroelectric Generators Maintenance Standard (O1.2O.MTCE.O3); (accessible by using the FileNet Search Engine and login with BC Hydro login and password )

#### 6. Glossary

**Blocking** – Physically securing mechanical equipment against inadvertent movement, or maintaining a physical opening in the case of electrical installations.

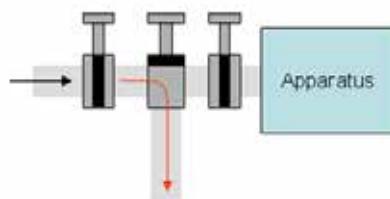
**Brake Clamps** – A device applied to a brake disk or assembly meeting the requirements of blocking.

**Direct Drive** – A system where the rotational energy is transmitted by a belt, chain or shaft.

**Dissipating** – Reducing hazardous energy to a level that is required by regulation or is otherwise safe for humans, including measures such as releasing pneumatic, gas, or hydraulic pressure; releasing spring energy; and applying Worker Protection Grounding/Bonding or Blocking.

**Double Valve and Drain** – To close two designated isolating valves in the piping and open a designated drain valve located in between the two designated isolating valves. The drain line can be less than the diameter of the line being isolated. This does not meet the requirements of WorkSafeBC OSHR Part 9.1 – additional requirements must be met for Confined Space Entry. If the drain line is the diameter of the line being isolated then this is Double Block and Bleed.

**Double Block and Bleed (for confined space entry)** – The closure of adjacent piping by locking out a drain or vent in the open position in the line between two locked out valves in the closed position. The diameter of the bleed line must be no less than the diameter of the line being isolated, unless certified by a Professional Engineer.



**Drain** – A method for the safe release of a liquid or a gas.

**Hazardous Energy** – Any electrical, mechanical, hydraulic, pneumatic, chemical, or thermal energy, or force such as gravity that could potentially harm workers.

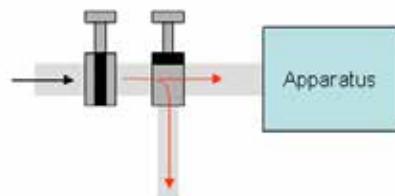
**Hydraulically-Operated Device** – A device, the movement of which is controlled by fluid pressure.

**Isolated** – For electrical equipment, the normal sources of hazardous energy have been disconnected by opening and securing all associated switches or by making a line or bus cut. For mechanical equipment, the equipment has been rendered and secured non-operational by installing a blank in a pipe line, closing a valve, depressurizing, draining, venting, or other effective means.

**Isolating Device** – A device that physically prevents the transmission or release of hazardous energy to equipment, such as a switch, line or bus cut, fuse, or valve.

**Single Valve and Drain** – To close a designated isolating valve in the piping and open a designated drain valve. Does not meet the requirements of WorkSafeBC OHSR Part 9 – additional requirements must be met for Confined Space Entry.

**Vent** – a safe opening for the escape of a gas or liquid or for the relief of pressure



**Revision Rationale:**

The following changes and their accompanying references are as follows:

- Added unit jacking to isolation for unit rotation (3.3.2)
- Clarified scope of brushgear maintenance (3.3.3)
- Changed brushgear maintenance section to apply to a pressurized scroll case rather than a primed penstock (3.3.3)
- Expanded requirements for considering gravity when working on cranes (3.6)

## Appendix 1

### DESIGN CONCEPTS FOR ISOLATION OF MECHANICAL APPARATUS

This section outlines the underlying design concepts which form the basis for the standard. It is intended to provide background information for the more specific cases outlined in Section 3 of this standard.

#### A. Blocking

The intention here is to clarify the requirements in SPR Rule 518 by providing guidelines for the design and use of blocking while still meeting Rule 518. Two categories of blocking, full force and positional, are defined for use in different situations.

##### i) Design

Devices used for blocking shall be designed by a Professional Engineer to withstand the maximum credible force on the mechanical apparatus for the specific position(s) in which the apparatus is secured. Determination of the maximum credible force will take the following factors into consideration:

- Actuator or hydraulic forces acting on the device (e.g. actuator forces resulting from leakage of isolation points)
- Other forces acting on the device (e.g. worker climbing on mechanical linkages)
- Weight of the components acting to hold the device in the required position (e.g. lever arm, piston, rod, etc.)
- Effects of friction where the co-efficient of friction can be shown to be predictable over time
- Forces required to maintain a positive seal on the device (e.g. to keep a large valve from leaking)

Blocking must have provision for being secured and locked in position.

##### ii) Full Force Blocking

Full-force blocking of mechanical apparatus shall be designed to withstand the maximum credible actuator force in combination with other forces.

Since full force blocking is designed to a higher standard than positional blocking, full force blocking may always be used in place of positional blocking when positional blocking is called for in the standard.

##### iii) Positional Blocking

Positional blocking does not need to consider actuator forces.

Positional blocking is generally a device designed to hold an isolating device in an open, closed, or incremental position. However, for the purposes of this standard, if gravity is holding the device in position, the device is considered to have positional blocking applied. In other words, gravity can perform as positional blocking if the physical configuration is appropriate.

## iv) Application

All blocking devices shall be visually inspected for deformation or damage prior to use and removed from service if unacceptable.

## v) Testing

All blocking must be tested at least once, generally as a commissioning test when it is first fabricated or constructed, to ensure it withstands its maximum credible force without significant damage or deformation.

**B. Vents and Drains**

## i) Design

Devices used for vents and drains shall be designed to dissipate stored or residual energy. Vents and drains shall be designed with consideration to the following factors:

- Minor leakage from the isolating device
- Fluid expansion/contraction resulting from thermal effects.
- Provision for verification and visual checking as defined by Safety Practice Regulations (SPRs)
- Prevention of introduction of air into a system or drainage of residual oil from a system when it could cause erratic operation or equipment damage
- Provision to prevent accidental oil spills
- Dissipation of stored or residual energy

All components of vent and drain piping must meet the minimum diameter requirements given in B (ii) below.

Vent and drain valves used for immobilizing an isolating device shall not be used to accommodate excessive leakage from an isolating device. As a general guideline, the drain shall have free space available in the pipe and fluid must not be ‘spraying’ from the outlet.

## ii) Sizes

Drains and vents shall be sized to accommodate reasonably anticipated leakage. In general, the diameter of the drain line should be no less than 10% of the diameter of the supply line.

The intention is for the drain to accommodate minor leakage through the valve and to act as a telltale for the condition of the isolating valve, not to fully relieve pressure in the case of a complete isolating valve failure.

## iii) Sizes of Vents and Drains for Confined Spaces

The requirements in B (ii) do not meet the requirements of WorkSafeBC OHSR Part 9.18 for entry into confined spaces. For piping where a harmful substance could enter an occupied confined space, double valve and drain with a drain line equal in size to the isolating valve size, a blank in the line, or a Single Device Isolation Certificate must be in place. See Section 3.5 of this Standard for more details.

iv) Trapped Pressure

Double valve and drain does not necessarily drain the pressure from piping and equipment downstream of the isolation. Pressurized oil or gas could be trapped in a device or build up due to thermal expansion.

When used on a hydraulic device where complete immobilization of the device is critical for worker safety, double valve and drain shall incorporate a second drain line on the actuator to bleed off any residual pressure. This second drain shall be a minimum of  $\frac{1}{4}$  inch nominal diameter for dissipating energy. The second drain line is not required if minor movements of the device are deemed to be not hazardous by a Occupational Safety and Health (OSH) Specialist or Professional Engineer.

Additionally, a proper switching sequence must be followed to prevent trapping pressure in piping or equipment.

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# **OSH Standard 210**

## **Rigging Components**

# Osh Standard 210

## Rigging Components

### 1. Scope

1.1 This standard covers the selection, inspection, maintenance, and application of ropes, slings, and rigging components. It also covers the requirements for the dielectric properties of Live Line rope and Barehand rope.

### 2. Purpose

2.1 This standard outlines the requirements for the use of slings and ropes and rigging components. There are three classes of non-conductive rope:

- Live Line Rope used for voltages 60kV or less
- Live Line Rope used for voltages 500 kV or less
- Barehand Rope used for Barehand work

### 3. Standard

#### 3.1 Slings

3.1.1 Web slings and rope slings must be visually inspected each time before use and defective equipment must be immediately removed from service.

Note:

- Sling Rejection criteria can be found in the WorkSafeBC OH&S regulations
- Manufactured web strap slings are preferred for use

3.1.2 Slings must be properly stored when not in use. See Appendix 4.

3.1.3 Workers that splice rope must have received suitable training from a recognized authority (e.g. a rope manufacturer) and must maintain an acceptable level of rope splicing proficiency.

#### 3.2 Rope

3.2.1 Ropes must comply with applicable specifications, referenced in Appendix 1.

3.2.2 Rope must be visually inspected each time before use and defective rope must be immediately removed from service (see Appendices 2 and BC Hydro Testing and Maintenance Instructions for Safety Service Shops (section E7)).

3.2.3 Fibre ropes will be protected from being damaged by sharp edges. Pads must be inserted between the rope and any sharp edge that the rope may contact.

3.2.4 Metal eye thimbles are recommended to protect rope eyelets. Thimbles or shackles should be in place when coupling fibre to wire rope.

3.2.5 A fibre rope that is cut shall have its ends bound or whipped.

- 3.2.6 Natural fibre ropes must not be used for hoisting with a powered hoist.
- 3.2.7 Fibre ropes must be properly stored when not in use. See Appendix 4.
- 3.2.8 Synthetic ropes must not be exposed to corrosive chemicals or excess heat.
- 3.2.9 Wire ropes and metal components are to be periodically lubricated in accordance with manufacturers' recommendations.

### 3.3 Non-Conductive Rope

- 3.3.1 Non-conductive rope shall not be used for any purpose other than Live Line or Barehand work. It shall be kept clean, dry, and free of foreign substances.
- 3.3.2 Live Line rope used for work on up to 60 kV shall have the following attributes in addition to those listed in 3.3.1 above:
  - It will be white in colour and will include manufacturer's colour tracers.
  - It will be of double braid polyester-polyester construction.
  - It is not dielectrically tested.
  - It can be used such that it comes into direct contact with energized lines having voltages of no more than 60 kV. It may be used at voltages greater than 60 kV, but for such applications it is not to come into contact with energized conductors, rather it may only approach them up to ½ absolute limits of approach.
- 3.3.3 Live Line rope used for work on up to 500 kV shall have the following attributes in addition to those listed in 3.3.1 above:
  - It will be green in colour.
  - It will be tested in accordance with the test protocols of BC Hydro Testing and Maintenance Instructions for Safety Service Shops (section E7) prior to going into service and at an interval of no less than once per year.
  - It will have a label affixed to it identifying the electrical test due date.
  - It can be used such that it comes into direct contact with energized lines having voltages of up to 500 kV.
  - It will be field tested prior to use.
  - Rope that is purchased for the purpose of Live Line applications will meet the electrical test requirements (part 13) of ASTM F1701.
- 3.3.4 Barehand Rope shall have the following attributes in addition to those listed in 3.3.1 above:
  - It will be orange in colour.
  - It will be tested in accordance with the test protocols of Appendix 3 prior to going into service and at an interval of no less than once per year.
  - It will have a label affixed to it identifying the electrical test due date.
  - It will be used only for Barehand work.
  - It will be field tested prior to use.
  - Rope that is purchased for the purpose of Barehand applications will meet the electrical test requirements (part 13) of ASTM F 1701.

### 3.4 Rigging Components

- 3.4.1 The design, construction, maintenance and use of work platforms that are suspended from cranes or hoists will comply with WorkSafeBC Standard: WPL 2-2004 Design, Construction and Use of Crane Supported Work Platforms.
- 3.4.2 Adjustable Strain poles shall have their pole clamps subject to non-destructive testing on an annual basis.
- 3.4.3 Hoists
  - Hoists will be subject to a pre-use inspection, in accordance with manufacturer's instructions, prior to use on each shift. This includes ensuring the hoist is clean and its chain/wire is adequately lubricated.
  - Hoists will be subject to a shop inspection at intervals of either 1 year or as specified by the hoist manufacturer. Approved shops for hoist maintenance are as specified in writing by the hoist manufacturer or as listed in the "Approved Safety Service Shops" list.
  - The Tractel Tirfor TU model is the only hoist authorized for use in applications where hoists are required to support workers at elevation. This hoist model may also be used for general applications.
  - Hoists that are suspected of being deficient will be immediately tagged and then shop inspected prior to returning to service.
  - Hoists are to be stored and transported in a manner that promotes prolonged service life.

## 4. Roles and Responsibilities

### 4.1 Workers

- 4.1.1 Rigging and slinging work will only be done by qualified workers or under the direct supervision of a qualified worker. Competencies held by the qualified worker will include:
  - Familiarity with the equipment to be used and familiarity with applicable manufacturer's instructions.
  - The ability to avoid conditions where any component could be subject to unsafe loads.
  - The ability to reject rope, fittings and slings that are unfit for service.
  - The ability to prevent workers and the public from being exposed to hazardous conditions.

## 5. Records and Documentation

- 5.1 Labels will be affixed to rope that has passed the Dry and Wet Dielectric Tests (See BC Hydro Testing and Maintenance Instructions for Safety Service Shops (section E7). Information on the label will include an identification of the applied test; the name of the testing agency; and the due date for the next test (one year from the date of the test).
- 5.2 Slings and rigging components will be identified with their Working Load Limits (WLLs).

## 6. References

- 6.1 WorkSafeBC Occupational Health & Safety Regulation Part 15
- 6.2 BC Hydro Safety Practice Regulations
- 6.3 BC Hydro Employee's Guide to Safety Rigging, Tel-A-Train Safety Training Series, 1989
- 6.4 BC Hydro Rigging for the Line Trade Manual
- 6.5 BC Hydro Testing and Maintenance Instructions for Safety Service Shops
- 6.6 Videos on Safe Rigging
- 6.7 ASME B30.9 1990, Slings

**Revision Rationale:** Appendix 3 (Non-conductive Rope Test Requirements) has been removed from this standard and has been added to the BC Hydro Testing and Maintenance Instructions for Safety Service Shops (section E7).

## Appendix 1

### Rope and Sling Specifications

BC Hydro specifications pertaining to this standard are listed in Table 1, copies of which may be obtained from either Store 1 or Materials Management.

Specification Number	Title	Purchasing Specification	Performance Specification
106-0000	Synthetic or Wire Rope		✓
106-0200	Synthetic Rope Slings	✓	
106-0270	Synthetic Rope Bulk	✓	
106-0275	Synthetic Rope Winch Lines	✓	
106-0318	Wire Rope Sling – Vertical Lift	✓	
106-0327	Webbing Sling	✓	

Table 1

Table 2 below lists the BC Hydro stock numbers and qualities of various double braided rope.

Application Table for Double-Braided Ropes						
Rope Type & BCH Stock #	Diameter Inches	Stringing Lines	Winch Lines	Rope Blocks	Slings	Safety Belts
Type 1 Nylon-Cover Core (106-0295)	5/8	Fair	Fair	Good	Good	Excellent
Type 3 Polyester Cover-Polyester Core (106-0280) (106-0281) (106-0282) (106-0283) (106-0284)	3/8 1/2 5/8 7/8 1	Excellent	Good	Excellent	Good	Good
Type A Nylon Polyester Composite (106-0289)	1	Good	Excellent	Excellent	Excellent	Fair

Table 2 Note: These tables are from the BC Hydro “Rigging for the Line Trade” Manual, reference 3.3.4.

## Appendix 2

### Rejection Criteria for Fibre Ropes

The remaining service life of fibre ropes is to be continually evaluated. The following criteria will be used when deciding whether or not to discard a rope:

- If the individual cover strands have been worn to below 50% of their original bulk over an extended length of the line, then the line shall be discarded.
- A fibre rope shall be discarded if its surface feels excessively dry and brittle (this is evidence that the rope has been in contact with a source of heat).
- A fibre rope shall be discarded if it shows serious discolouration (this is evidence of the rope's exposure to an acid).
- A fibre rope that is suspected of being unfit for use should be immediately destroyed by cutting it up into short lengths so that it can no longer be inadvertently used for hoisting purposes.
- If as many as half of the cover strands are cut at any point, then the damaged section must be removed from the line.

## Appendix 3

### Storage of Fibre Ropes

- Fibre ropes are to be stored in a dry cool room that has good air circulation. A temperature of between 10 and 21°C and a humidity of 40 – 60% are recommended.
- Fibre ropes are not to be stored on the floor, in boxes, or in cupboards where the air circulation is restricted.
- Fibre ropes should be protected from the weather, dampness and sunlight. They should be kept away from boilers, radiators, steam pipes and other sources of heat, including exhaust gases.
- If a wet rope becomes frozen, it must not be disturbed until it is completely thawed. If a sour odour is detected on natural fibre ropes, the rope should be aired until the odour disappears.

## Appendix 4

### Testing Contractors for Slings

Contractors are available in various locations that will test, certify and mark rigging fittings and slings.

Two such contractors are:

- Powertech Labs Inc., 12388 88th Avenue, Surrey, BC, V3W 7R7
- Midway Chain, 13412 72nd Avenue, Surrey, BC, V3W 2N8, Telephone: **604 591 5366**

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# **OSH Standard 212**

## **Safe Handling of Oils, Liquids, and Compressed Gases**

# Osh Standard 212

## Safe Handling Of Oils, Liquids, And Compressed Gases



### 1. Scope

1.1 This standard describes the safe handling of oils, liquids, and compressed gases.

### 2. Purpose

2.1 This standard identifies the potential safety problems and mitigation of hazards for oil handling and transportation as well as the safe handling and storage of compressed gases. It does not cover the environmental issues and procedures for spill protection and response.

### 3. Standard

#### 3.1 Transferring Oil

- 3.1.1 Oil transfer practices must prevent a static charge from accumulating and discharging whenever flammable vapours may exist.
- 3.1.2 Before commencing an oil transfer, all components from the receiving vessel to the dispensing vessel (including all equipment such as pumps and hoses) shall be bonded to a common ground. A bonding plan must be prepared as required by the system used to transfer oil.
  - 3.1.2.1 Except as permitted in clause 3.1.2.2, all hoses shall be fitted with a bond consisting of a continuous spiral wire securely connected at each end to the camlock fitting. This bond shall be physically inspected and electrically tested for continuity before each use. Annual date due test tags should be allocated to the transfer hose.
  - 3.1.2.2 When transferring oil using a 1" diameter hose in a substation or switchyard, conditions may exist where the use of a hose fitted with a spiral bonding wire would create a touch or step potential hazard created through induction. This will typically occur when the hose is positioned so that the free end is moved a significant distance—either horizontally or vertically—from the location where the fixed end is bonded. The preferred method for dealing with this hazard is to apply a draining wire to the transfer hose to dissipate induced charges. Alternatively, it is permissible to use a hose that does not contain a spiral bonding wire only when the hazard created by touch or step potential is deemed to be greater than that created by the use of a non-bonded hose. All other requirements for grounding and bonding of equipment still apply.
  - 3.1.2.3 After transferring oil, wait at least 30 minutes to allow dissipation of static charges before connecting anything to ground.

#### 3.2 Liquids and Compressed Gases

- 3.2.1 Low lying spaces in which denser than air gases are used or stored must have suitable detection devices in place and have adequate ventilation (natural or forced).
- 3.2.2 Loose fitting, well-insulated gloves and eye protection must be worn when handling super cooled liquids. E.g. SF<sub>6</sub>, propane, and natural gas.

3.2.3 Cylinders of compressed gas must be handled with care.

- 3.2.3.1 Cylinders must not be allowed to fall or strike each other. They must be transported and stored securely with an adjustable chain or other suitable securement clamp and be in the upright position with the contents identified.
- 3.2.3.2 Cylinders shall be stored in a cool, dry, well ventilated area protected from sparks, flames, excessive heat, physical damage, electrical contact or corrosion. Full cylinders must be separated from empty ones.
- 3.2.3.3 Valve protection caps will be left in place until cylinders are individually secured and ready for connection to their intended equipment.
- 3.2.3.4 Cylinder valves are to be opened fully when in use and closed fully at other times, even when the cylinder is empty.

#### 4. Roles and Responsibilities

##### 4.1 Managers

- 4.1.1 Ensure storage facilities are in place, regularly inspected, and in compliance with this standard and WorkSafeBC OHS Regulations.
- 4.1.2 Ensure bonding plans are checked and in place before each oil transfer
- 4.1.3 Ensure spill response procedures and equipment are in place when handling oil.

##### 4.2 Workers

- 4.2.1 Handle oils, liquids, and gases in accordance with this standard.
- 4.2.2 Report all spills as required.

#### 5. References

- 5.1 WorkSafeBC OHS Regulations Part 4, 5, and 23.
- 5.2 BC Fire Code 4.6.4.5 – Bonding and Grounding
- 5.3 NFPA 77 – Recommended Practice on Static Electricity

#### Revision Rationale:

OSH Standard 212 RO August 2006: (VO-1 Updated February 2, 2015): Minor edit to Section 3.2.3.2—Revision made to respond to WorkSafeBC concern regarding storage conditions at a specific site, and an expectation that wording in this standard clearly reflect WorkSafeBC regulatory requirements.

## Appendix 1

### Additional Information

#### Oil Handling Hazards

- Insulating oils release flammable vapours in amounts dependent on the oil condition, temperature and quantity of gases present. Insulating oil, particularly when removed from a tap changer, or a diverter on reactive equipment, can contain dissolved hydrogen and/or acetylene gas. These gases are extremely flammable.
- Containers, including oil tanks, barrels and station equipment that are not completely filled with oil will have a space above the oil level where flammable vapours can accumulate. Vapour concentrations that fall between the Lower Flammable Limit (LFL) and Upper Flammable Limit (UFL) are extremely hazardous. Hydrogen and Acetylene have exceptionally wide flammable ranges, from 4.0% to 75% and 2.5% and 81% respectively.
- Whenever oil is handled, there is the potential for a static charge to be established both within the oil and its processing equipment and will dissipate if given enough time. It can rapidly dissipate by discharging to ground. If this discharge to ground requires the charge to jump an air gap, sufficient energy may be released to ignite flammable vapour.
- There is a direct relation between the rate at which static charge accumulates, and the speed with which oil is pumped.
- Dry and cold weather greatly increases the possibility of static activity. Extra care should be taken under such conditions to reduce charge accumulation. It has also been observed that wind can generate charge accumulation on tank surfaces.

#### Cylinder Hazards

- Gaseous vapours are dangerous if allowed to spill and accumulate. Some, like propane and SF<sub>6</sub>, are colourless and denser than air, and they tend to settle in sumps and drains.
- Sudden release of pressure could cause a cylinder to become a missile capable of being projected through a concrete wall.
- See OSH Standard 203 – Welding, Cutting, and Hot Tapping for more information on oxygen and flammable gases.

## Additional Care For Handling oil

In addition to bonding and grounding, take the following steps to minimize the production of static charge:

- When filling containers, all efforts shall be made to avoid splashing or agitation of the oil, as this promotes the accumulation of static charge and the release of dissolved combustible gases.
- Where possible, fill the container from the bottom. If this is not possible, employ a down tube constructed of metal piping to allow the oil to be gently delivered to the bottom of the container.
- Ensure pumping speed not exceed 1 metre per second, particularly when non-bonded hoses are used.
- The use of grounded metallic screens on pump outlets are effective in removing or reducing charge from high speed oil flow.
- Certain types of pumps and oil filters can act as charge generators particularly if they produce high exit velocities. Extra care should be taken when transferring oil using such equipment. Transfer lines should be steel or cast iron, rather than PVC or other non-conducting materials.
- Oil that is transported in containers, particularly large tanks that do not have internal bafflers, may become statically charged due to sloshing.
- Before removing a container cover, provide bonding between the lid and the equipment.
- When connecting a hose to a valve located above the liquid level of the tank, ensure that the valve is in the fully closed position. This will minimize the quantity of flammable vapour present should a spark occur.
- When planning any oil or gas operations, make sure all environmental concerns are addressed before commencing work.

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# **OSH Standard 214**

## **Electrical Measuring Instruments**

# Osh Standard 214

## Electrical Measuring Instruments



### 1. Scope

1.1 This standard covers the safety aspects of electrical measuring instruments.

### 2. Purpose

2.1 This standard outlines the rules for the safe operation of electrical measuring instruments.

### 3. Standard

3.1 Appropriate steps must be taken to eliminate hazards before instruments are used.

3.2 Voltage test indicators and test lamps must be clearly marked with their voltage range and be protected against glass breakage.

3.3 Voltage test indicators and test lamps must be tested on a known live source before each use.

3.4 When measuring current with a clip-on ammeter, the ammeter's jaws must not be used to provide mechanical support.

- The magnetic circuits of clip-on ammeters must not be grounded.

Note:

Refer to the multimeters section in Appendix 1 – Recommendations for Electrical Measuring Equipment

3.5 When testing a device that may incur a potential rise, ensure that the test meter is isolated from the user before the device is energized.

- Before and after taking readings, de-energize the device before touching the meter or leads.

3.6 When testing voltage or current, determine beforehand the maximum possible value the source can produce and ensure the instrument and test leads are rated for that amount. When using a meter for resistance testing, ensure there is no potential difference on the device being tested.

3.7 Some instruments are sensitive to transient voltages, which are commonplace in many BC Hydro substations. Digital instruments are more susceptible to transients than are moving coil instruments. Therefore, when applicable:

- Use instruments that have transient protection incorporated.
- Disconnect instruments while switching takes place.

### 3.8 Metering and Testing

- 3.8.1 The person in charge of hazardous testing (e.g. Hi Pot) shall ensure that no person is endangered by the tests. The test area must be cordoned off with approved barriers to secure access.
- 3.8.2 Recommended metering and testing practices include:
  - Avoid taking measurements in cramped spaces, if possible.
  - Remove sufficient covers to gain access to measurement points.
  - Provide adequate lighting.
  - Deploy rubber blankets, if necessary.
- 3.8.3 Circuits should be isolated, tested and grounded before measuring instruments are connected or disconnected.
- 3.8.4 Grounds can be removed as per 'SPR 515 High Voltage Capacitors' for testing if required, but they must be re-applied once the tests are complete.
- 3.8.5 An instrument should be connected on the load side of the protective device having the lowest rating if possible.

## 4. Roles and Responsibilities

### 4.1 Workers

- 4.1.1 Only qualified persons are to use, calibrate, repair or modify electrical measuring instruments.
- 4.1.2 Users must be aware of the limitations of the instruments and of any potential hazards that may exist. Refer to Appendix 1 for more information.

## 5. References

- 5.1 WorkSafeBC OHS Regulation, Part 19 Electrical Safety

## Appendix 1

### Recommendations for Electrical Measuring Equipment

This appendix provides general guidance to workers who purchase, maintain and operate electrical measuring equipment. Specific instructions should be sought from manufacturers' literature.

#### Instrument Cases

- Non-metallic cases are preferred for instruments that are utilized near live conductors.

#### Terminals

- Terminals should be shrouded, if possible.

#### Multimeters: common error

A common mistake is to attempt a voltage measurement: with the test leads erroneously plugged into the multimeter's current jacks, or; with the multimeter's range selector improperly set to measure current.

The latter scenario usually involves multimeters equipped with a rotary-switch range selector. If the operator misidentifies the selector end of the rotary-switch, this could possibly result in an inadvertent selection for current instead of voltage.

If the above mismatch occurs, then a direct short will be placed across the source voltage through a low value resistor – the multimeter's current shunt. This short allows a high level of current to flow unrestricted through the multimeter, which could possibly result in:

- extreme damage to the multimeter;
- extreme damage to the circuit;
- serious injury to the operator.

#### Multimeters: model considerations

Multimeters vary considerably in price. Some inexpensive models are unsuitable for industry use – despite their manufacturer's claims to the contrary. Their circuitry may provide good sensitivity, accuracy and resolution, but the units could be fragile, inadequately insulated, and/or poorly fused – rendering them unsafe. High quality multimeters are recommended for industry use.

Recommended features for a multimeter are:

- Robust case
- Good insulation
- Non-arcng fuse rated to 600V
- Unambiguous range markings
- Alert triggered by a mismatch of input jack with meter range selection

#### Test Leads

Test Leads should be:

- Adequately insulated (most leads are not rated for high voltage)
- Of different colours
- Flexible, robust, and of suitable length for the job
- Fitted with probes that have no more than 5 mm of bare conductor
- Should be physically inspected for any defects before they are put into use.

**Caution Note: Hioki Recording Voltmeter–Milliammeters**

Concern has been expressed over possible danger with the use of the Hioki Recording Voltmeter–Milliammeters because:

- The recording paper is conductive and loosely dangles – a potential hazard in environments with exposed energized conductors – e.g. inside a P&C panel.
- The test leads have male banana-type plugs, which can cause a short circuit.

To improve the safety of these Hioki meters, the following recommendations are offered:

- Attach a warning label to each instrument. The labels are available from BC Hydro Stationery under form number D92–64.
- Replace exposed banana plugs with the shielded types that have a spring-loaded protective shield. Available are suitable plugs called the TPI Safety Plug, reference number 122505 (black) and 122506 (red).

**Technical Information Source**

Much of the information in these standards is located at the Telecom Support and Resource Centre. For many years this section of Telecom Services has evaluated and repaired instruments, and they have a library of information on the suitability of instruments to various functions.

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# **OSH Standard 216**

## **Underwater Diving at BC Hydro Facilities**

# Osh Standard 216

## Underwater Diving At BC Hydro Facilities

### 1. Scope

1.1 This standard specifies the requirements associated with diving at BC Hydro facilities.

### 2. Purpose

2.1 This standard is intended to ensure that contractor work practices and procedures are adequately planned and implemented.

### 3. Standard

#### 3.1 General

3.1.1 Diving activities are frequently carried out at BC Hydro power generating plants, dams, lakes, reservoirs, power intakes, tailraces and cable installations. Nearly all of our diving operations are performed by outside contractors. The work performed includes a wide range of underwater activities such as:

- inspections or repair of structures (concrete, steel, timber and soil) and support cables
- removing accumulated debris from power intake trash-racks
- underwater construction
- underwater salvage
- underwater cable installations
- vegetation control

3.1.2 Occupational or commercial diving is exhausting and it exposes the divers to risks. Because of this, it is important that all diving operations be conducted in a prudent manner that will prevent or minimize the potential for personal injury, loss of life, occupational illness and property damage. The requirements for underwater operations are published in WorkSafeBC OHS Regulations Part 24, should be reviewed in combination with this standard.

#### 3.2 Requirements

The following information must be obtained from a prospective diving contractor; some of which is required before the contract is awarded, and some before the work commences.

##### 3.2.1 WorkSafeBC Coverage

- It is mandatory that individuals and companies contracted to perform work for BC Hydro arrange and maintain compensation coverage through the WorkSafeBC for themselves and all of their employees whose duties may include the provision of service to BC Hydro under the terms of the contract. Evidence of such coverage must be supplied to BC Hydro before work begins, and periodically as required during the life of the contract.

### 3.2.2 Safe Diving Procedures

- Each contractor must submit a complete set of safe diving instructions (overall safe diving program) before commencing any diving activities. This document must include the contractor's entire diving program as required by the WorkSafeBC OHS Regulation, Part 24. The procedures must be kept at the dive location and made readily available to dive team members, BC Hydro representatives and to WorkSafeBC officers.

### 3.2.3 Diver Qualification/Certification

- Only divers who meet the minimum requirements of CSA Standard Z275.4 M97 (or alternatively CSA Standard Z275.4-O2) shall be hired as required by the WorkSafeBC OHS Regulation, Part 24. No Recreational Diving Certificates will be accepted. For each diver, a certified copy of competency documents must be available on site for inspection. Divers, including standby divers, must be trained and equipped to operate at the depths and circumstances of the dive.
- Work on BC Hydro facilities, equipment and structures where construction work, entrapment or pressure differentials (i.e. upstream face of dams, power intakes, gates, canal linings, etc.) are involved require divers certified to a standard acceptable to WorkSafeBC, which are:
  - Diver Certification Board of Canada (DCBC), or a school accredited by DCBC. A list of accredited schools may be found at [www.divercertification.com](http://www.divercertification.com)
  - National Energy Board of Canada. Refer to National Energy Board – Application for Diving Certification

For questions about whether a diver has been certified to a standard acceptable to WorkSafeBC, please contact WorkSafeBC's diving coordinator at (604) 276-3100.

Note:

Many divers have occupational training/certificates (2 to 4 weeks training) meeting the minimum requirements of CSA. Some divers with occupational certificates may have been upgraded due to experience or documentation, but do not have the full commercial training provided by those schools listed in Appendix 1. A diver that has attended a 6 month commercial course is more qualified to handle surface or in water emergencies than a diver with only 2 to 4 weeks training.

- All divers, diving supervisors and divers' tenders must be trained in CPR, oxygen therapy and diving accident management as required by the WorkSafeBC OHS Regulation, Part 24. Records of this training must be available at the dive site. The qualifications of each diver can be verified by the WorkSafeBC Occupational Health department.

### 3.2.4 Standby Divers

- A Standby diver and tender must be present at all times and utilized as outlined in WorkSafeBC Regulation, Part 24. The standby diver must be equipped for the same mode of diving that is taking place. The diver, if situated on the surface, must be able to render immediate assistance at all times when diving operations are in progress.

### 3.2.5 Contractor Diving Operations Plan

- A diving operations plan (job specific daily dive plan) must be developed by the contractor or their dive supervisor for each specific diving activity taking place as per the WorkSafeBC OHS Regulation, Part 24. This diving plan must be submitted to the BC Hydro representative for review before diving operations commence. As a minimum, the diving operations plan must contain the following information:
  - detailed description of the mission
  - date, time and location of operation
  - description of any known potential hazards
  - nature of the work to be performed by the divers and other workers
  - names and duties of the dive team members
  - diving mode to be utilized (scuba or surface supplied air) including a description of the backup air supply

Refer to Appendix 2 of this standard for additional information on contractor diving requirements.

### 3.2.6 Medical Certification

- Contractors must have available on site, up to date medical certificates prepared by a physician knowledgeable and competent in diving medicine for all divers working on the project, as required by the WorkSafeBC OHS Regulation, Part 24. This certification must be renewed every two years up to age 39 and annually from age 40 onwards.
- The Occupational Health Section of the WorkSafeBC website contains a list of physicians recognized by the Board to be knowledgeable and competent in diving medicine. This list can verify the medical certification of each diver, if required. They can be reached at (604) 276 5140. A copy of a "WCB Medical Certificate" is shown in Appendix 3.

### 3.2.7 Surface Supply Diving

- Underwater diving work on BC Hydro facilities or structures must comply with WorkSafeBC OHS Regulation Part 24, including:
  - A minimum crew of 3 shall be present if planned dive does not exceed 40m (130ft) or the decompression limits, and when there are no hazards present with roles and qualifications as defined in WorkSafeBC Part 24.
  - For planned dives exceeding 40m (130 ft), or the decompression limits, the dive crew must consist of a minimum of 4 workers with roles and qualifications as defined in WorkSafeBC Part 24
  - Diver qualification and certification. See additional requirement in Section 3.2.3.
  - Divers shall use full-face mask or helmets with effective hardwired two way voice communication to the surface. Hooke equipment is not permitted.

- Use of bail out bottles in the event of a malfunction of the primary breathing gas supply.
- Where pressure differentials (i.e. upstream face of dams, power intakes, gates, canal linings, etc.) or entrapment are involved, additional precautions shall be taken. These include a minimum crew of 4 present at the dive site (i.e. dive supervisor, 2 divers, diver's tender).

### 3.2.8 Scuba Diving

- Refer to WorkSafeBC OHS Regulation, Part 24. Underwater diving at BC Hydro facilities using only scuba equipment is restricted to all of the following:
  - Minimum Crew Size for depths 18 meter (60 feet) is 3 workers.
    - Supervisor tender
    - 2 divers
  - Minimum Crew size for diving beyond 18 meter (130 feet)
    - Supervisor/Tender
    - 2 divers
    - Surface dressed standby diver/tender
  - Dives exceeding 40 meters (130 feet) must have prior authorization from the Board.
  - Areas away from dam and powerhouse facilities (i.e. reservoirs, rivers) or areas of open water where there is no risk of entrapment or pressure differential and the diver(s) have free access to the surface.
  - Work that does not involve underwater construction, burning, welding, salvage operations, demolition, jetting/suction dredging, exposure to a contaminated environment or pressure differential structures (i.e. a draft tube gates when draft tubes unwatered).

### 3.2.9 Notice of Project for Diving (NOPD)

- As outlined in the WorkSafeBC OHS Regulation, Part 24, the diving contractor must submit a "Notice of Project for Diving Activity" or notify the Board via telephone, at least 24 hours in advance, or in the case of an emergency within the following 24 hours, if a diving operation involves any of the following:
  - construction diving
  - diving in a contaminated environment

- diving for the purposes of engineering inspections
- diving under ice, under or between nets, or into other area of potential entrapment
- exceeding the no decompression limits
- using mixed gas other than nitrox as a breathing medium

The notice must indicate the date, the location, the diving equipment to be used and the scope of the diving operation. A copy of the notice must be posted at the work site before diving commences.

### 3.3 Safety

- 3.3.1 Before diving operations commence, safety inspections of the dive site must be conducted and recorded. Checklists are required for this and they will include, as a minimum, those checks outlined in Appendix 4 – Diving Safety Checklist.
- 3.3.2 Coordination of multiple employer workplaces as per Corporate Safety Management System No.10 must be carried out. All hazards must be identified and communicated to each contractor.
- 3.3.3 Diving contractors working in Generation must be trained and Authorized to the appropriate WPP Category for System and Local Components. Diving contractors working in Field Operations must be trained and Authorized to the appropriate PSSP Category for System and local component.
- 3.3.4 Appendix 5 provides an Environmental Conditions checklist.
- 3.3.5 Appendix 6 provides a list of B.C. emergency contact numbers.
- 3.3.6 Important Safety Reminders
  - Divers must abort a dive if they feel ill in any way.
  - If, for any reason, there is an alteration to the approved dive-operating plan, a tailboard involving all workers must be held prior to the commencement / continuation of the dive operation.

## 4. Roles and Responsibilities

### 4.1 Contractors

- 4.1.1 Contractors must, at all times, comply with Part 24 of the WorkSafeBC OHS Regulation entitled ‘Diving, Fishing and Other Marine Operations’. The diving contractor is the employer as far as the term “employer” is referred to in Part 24 of the WorkSafeBC OHS Regulation.

### 4.2 Managers

- 4.2.1 BC Hydro will be required to manage the contractors’ compliance with the basic requirements as outlined in this standard. BC Hydro must inform the contractor of any known BC Hydro operations or site conditions likely to be encountered by the divers as outlined in the WorkSafeBC OHS Regulation, Part 20 – Coordination of multiple employer workplaces. Refer to the BC Hydro Diving Safety Checklist included in Appendix 4 of this standard for additional information.

## 5. References

- 5.1 WorkSafeBC OHS Regulation, Part 24
- 5.2 CSA Standard Z275.4 M97, Competency Standard for Diving Operations
- 5.3 CSA Standard Z275.4 O2, Competency Standard for Diving Operations

## 6. Glossary

6.1 **Scuba** – self contained underwater breathing apparatus utilizing the equipment outlined in the WorkSafeBC OHS Regulation, Section 24.38.

6.2 **Surface Supply Diving** – supplying air or a mixture of gases to a diver through a hose from the surface, utilizing the equipment outlined in the WorkSafeBC OHS Regulation, Section 24.42 to 24.46.

### Revision Rationale:

OSH Standard 216 V1–1 updated to reflect current WorkSafeBC requirements for diver certification. This updated version replaces OSH Standard 216 RO.

## Appendix 1

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## Appendix 2

### Contractors Diving Operations Plan

This appendix contains minimum requirements for the required contractors Diving Operations Plan. Individual contractors may adapt them for each diving mode when preparing to perform diving operations for BC Hydro.

#### Work Plan

- Define objective
- Collect and analyze data
- Job hazard analysis
- Establish operational tasks
- Diving mode and technique
- Means of water entry and exit
- Dive team members assignments and responsibilities
- Written designation of the diving supervisor given to the person in charge of the vessel or facility
- Report on the nature and planned times of the planned diving operations
- Relevant WPP and PSSP training, if necessary.
- Relevant Local Operating Orders referred to (i.e. Site Emergency Procedures, etc.)
- The plan to be available at the dive site to dive team members
- Notice of work location and time to Port Authorities if applicable.

#### Emergency Rescue Aid

- Air or ground emergency transportation
- Hyperbaric facility (off site)
- Nearest hospital or medical treatment facility
- Canadian Coast Guard Rescue Coordination Centres (coastal areas only)
- Emergency rescue source other than Canadian Coast Guard
- Area Control Centre emergency desk
- Two way communications available on site

#### First Aid

- Approved first aid kit (i.e. WorkSafeBC Level 1 Crew First Aid Kit)
- Bag type manual resuscitator
- Oxygen Therapy unit

### Surface Conditions

- Surface vessel traffic and vehicular traffic
- Displayed diver signals (during diving operation only)
- Critical dive system to vessel or platform
- Weather forecast: tides, current and wave action, and temperature

### Underwater Hazards

- Depth and type of bottom
- Diver fouling or entrapment: culverts, penstocks, sluice valves
- Contamination or toxic liquids
- Confined space penetration
- Use of explosives or seismic activities
- Visibility
- Energized cables

### Record Keeping

- Divers personal log
- Treatment records and accident reports
- Diving supervisor's log
- Diver qualification/certification/medical records

**Appendix 3**
**WorkSafeBC Medical Certificate**

Street Address: 8100 Granville Avenue Richmond BC V6Y 3T8

**OCCUPATIONAL DIVER'S**

Mailing Address: PO Box 5350 Stn Terminal Vancouver BC V8V 5L5

**CERTIFICATE OF MEDICAL FITNESS**

Telephone 604 276 3100

**Prevention Division**

This certificate of medical fitness is granted as a result of having passed a comprehensive occupational diver's medical fitness examination conducted by a physician knowledgeable and competent in diving medicine.

**DIVER INFORMATION**

Diver's Last Name (please print)	First Name(s)	Social Insurance Number	Date of Birth (mth/day/yr)
Mailing Address		City	Postal Code
Home Telephone Number		Business Telephone Number	

**OCCUPATIONAL DIVER'S MEDICAL FITNESS EXAMINATION RESULTS**

Classification <input type="checkbox"/> Fit <input type="checkbox"/> Unfit <input type="checkbox"/> Fit with Restrictions (specify restrictions)			
Date of Examination (mth/day/yr)		Date of Medical Certification (mth/day/yr)	
Expiry date of medical fitness certificate (must be renewed at least every 2 years up to age 39 years and annually from age 40 years onwards, or MORE FREQUENTLY IF CLINICALLY INDICATED*)			
<input type="checkbox"/> 2 years from date of examination <input type="checkbox"/> 1 year from date of examination <input type="checkbox"/> Other* -Specify expiry date _____ (mth/day/yr)			
Physician's Signature		Mailing Address	
Physician's Name (please print clearly)		City	Province
		Postal Code	
		Telephone Number	Fax Number

57D1 (R8/98)

VWHITE - Diver's

CANARY - Employer's

PINK - Physician's

GOLDENROD - WCB, Diving

## Appendix 4

### Diving Safety Checklist

Date and Time: \_\_\_\_\_ Contractor: \_\_\_\_\_

Location: \_\_\_\_\_ Verified By: \_\_\_\_\_

Job Description: \_\_\_\_\_  
\_\_\_\_\_

#### Pre Job Meeting

- Copy of BC Hydro Contract Safety Procedures
- Copy of BC Hydro OSH Standard 216 – Underwater Diving at BC Hydro Facilities
- WorkSafeBC coverage for all individuals and companies contracted to perform the work
- Safe diving procedures
- Contractors “Diving Operations Plan” (including crew requirements, environmental conditions and emergency rescue) as outlined in Appendix 3.
- Diving method used is appropriate for the work being done (surface supplied or scuba). No Scuba to be used in confined areas (entrapment), upstream of structures or plants (pressure differential) or construction work.
- Verification of dive team qualifications and experience (Medical certificates, oxygen therapy certification, CPR certification, dive accident management, etc.)
- MSDSs for potentially hazardous substances to be used
- Safe means for entering and exiting the water (ladders, staging, etc.)
- Notice to Shipping Authority or Port Authorities if in an applicable shipping lane.

#### At the Dive Site

- Copy of Diver's Medical Certification and Competency Certification (CPR, oxygen therapy and diving accident management)
- Copy of the Contractor Diving Operations Plan and Safe Diving Procedures
- An approved first aid kit for the size of the crew including an oxygen therapy unit with sufficient capacity to reach emergency medical services is available on site
- Communication equipment is properly functioning (cellular, VHF radio, etc.)
- The Notice of Project (NOPD) is posted
- Fire extinguisher and absorbent material readily available
- Accident and emergency procedures list has been posted or made readily available including locations and telephone numbers of the nearest hospital with appropriate medical assistance
- Current list of facilities with hyperbaric chambers capable of providing emergency treatment
- Emergency contacts between BC Hydro and contractor
- Emergency signalling between divers or between divers and attendants
- Logbooks as per WorkSafeBC OHS Regulation, Part 24.
- Diving tables as per WorkSafeBC OHS Regulation, Part 24.
- Environmental conditions (see Appendix 4 of this standard)
- Final briefing or tailboard held and documented
- Documentation of air analysis test for compressor
- Copy of BC Hydro OSH Standard 216 – Underwater Diving at BC Hydro Facilities
- First Aid Attendant BC Hydro or Contractor provided

### Scuba Operation Specific Operational Requirements

- Minimum crew required from zero to 18 m (60 ft) 3 workers:
  - Supervisor/tender
  - 2 divers
- Minimum crew required beyond 18 m (60 ft) 4 workers:
  - Supervisor/tender
  - 2 divers
  - Surface dressed standby diver/tender
- A scuba diver is in constant two way voice communication with the surface or tended by the lifeline from the surface or accompanied by another diver in the water who shall remain in continuous visual or physical contact during the diving operations.
- Scuba operation does NOT include confined spaces
- A time keeping device is available and used by support personnel for recording diving times for all Scuba operations.
- A spare set of scuba gear with fully charged cylinder is ready for emergency purposes.
- Diving depth does not exceed 40 m (130 ft) unless prior authorization from WorkSafeBC
- Operations are not to be conducted against currents exceeding one knot unless line tended

### Surface Supply Operations Specific Operational Requirements

- Minimum crew requirements from zero to 40 m (130 ft) 3 workers for each dive (provided the dive does not have significant hazards present):
  - supervisor/tender
  - 2 divers (one standby)
- Minimum crew required beyond 40 m (130 ft) or on pressure differential structures/hazards present 4 workers:
  - supervisor/tender
  - 2 divers
  - Diver's tender
- A standby diver readily available while a diver is in the water (ready to render assistance at all times)
- A diver must be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
- Divers each have "bailout bottle" in case of compressor failure or loss of primary air supply.
- Divers use a full-face mask or helmets with effective hardwired two-way voice communication to the surface.

## Appendix 5

### Environmental Conditions

#### Surface:

- Visibility
- Wave action
- Current
- Air temperature
- Wind direction
- Cloud description
- Surf visibility
- Local characteristics

#### Sub sea:

- Depth
- Type of bottom
- Visibility
- Water temperature
- Tides
- Pollution
- Obstacles and hazards
- Marina life

#### Others:

- 
- 
- 
- 

#### Others:

- 
- 
- 
-

## Appendix 6

### B.C. Diving Emergency Assistance

#### Emergency Evacuation

- For contact to B.C. Ambulance Services, refer to the Site Local Operating Orders for emergency procedures and contact numbers.

#### Marine Recovery

- Contact a Coast Guard radio station. Frequencies are:
  - VHF 156.8MHz (channel 16)
  - MF 2181kHz

#### Isolated Location (Coastal Emergencies only)

- Contact the Rescue Coordination Centre (RCC). Phone number is:
  - GVRD: (604) 666 4302
  - Outside Lower Mainland: 1 800 742 1313

#### Other Emergency Phone Numbers

- Hyperbaric Chamber
  - Vancouver Hospital: (604) 875 4111
  - Dr. Mike Lepawsky (Hyperbaric Chamber expert): (604) 325 8111
  - Fleet Diving Unit, Victoria, 24 hour emergency: (250) 363 2379

#### Table of Contents

# **OSH Standard 217**

## **Work Near Interprovincial and International Pipelines**

# Osh Standard 217

## Work Near Interprovincial and International Pipelines

### 1. Purpose

The purpose of this Standard is to ensure that all work done near federally regulated interprovincial and international pipelines is done safely and in accordance with National Energy Board (NEB) regulations.

### 2. Scope

- 2.1 This standard shall apply to all BC Hydro work on or near the rights-of-way of interprovincial and international pipelines, either conducted and supervised by BC Hydro employees or assigned to contractors.
- 2.2 This standard does not apply to provincially regulated pipelines (i.e. those that do not cross provincial boundaries) which are regulated separately by the BC Oil and Gas Commission and the BC Safety Authority.

### 3. Requirements

#### 3.1 BC Hydro shall achieve and maintain compliance with:

- The National Energy Board Pipeline Damage Prevention Regulation – Authorizations, SOR/2016-124, and
- The National Energy Board Pipeline Damage Prevention Regulations – Obligations of Pipeline Companies, SOR/2016-133 (Jointly referred to as the “Damage Prevention Regulations”) The Damage Prevention Regulations and the NEB’s guidance document Pipeline Damage Prevention – Ground Disturbance, Construction and Vehicle Crossings (June 2016) are available on the NEB’s website at <http://www.neb-one.gc.ca>.

The Damage Prevention Regulations and the NEB’s guidance document Pipeline Damage Prevention – Ground Disturbance, Construction and Vehicle Crossings (June 2016) are available on the NEB’s website at <http://www.neb-one.gc.ca>.

#### 3.2 Any BC Hydro work done on or near pipeline rights-of-way must be authorized in accordance with the Damage Prevention Regulations. Work that requires authorization under the Regulations includes Facility Construction, Ground Disturbance and Crossing a Right of Way (ROW). Definitions and procedures are provided in Appendix 1 to 4.

#### 3.3 Any known breach of the Damage Prevention Regulations, or any communication from the NEB or the pipeline company of an actual or suspected unauthorized activity, must be reported on the BC Hydro Safety, Health and Environment Incident Management System (IMS).

#### 3.4 Executive Vice Presidents shall ensure implementation of this Standard and related procedures in their business units.

#### 3.5 The Senior Vice-President, Safety, Security & Emergency Management shall provide oversight of BC Hydro performance and compliance with this standard, and shall report status to the Chief Executive Officer and Board of Directors according to the schedule set out in the audit plan.

#### 3.6 Overhead Lines: Consent of the pipeline company under this Standard is not required to construct an overhead line across a pipeline provided that ground disturbances do not occur or that the construction does not involve vehicle or mobile equipment crossing. Other regulatory requirements exist for constructing overhead lines, which are outside of the scope of this Standard.

#### 4. Roles and Responsibilities

4.1 Managers, Foremen/women, Sub-Foremen/women, and Crew Leaders are responsible for understanding and meeting their responsibilities as defined in this Standard and related Business Group planning and work procedures, including but not limited to:

- 4.1.1 Planning and supervising work.
- 4.1.2 Ensuring workers are trained and competent.
- 4.1.3 Responding to, reporting and investigating incidents and non-conformances.

4.2 Workers who carry out work within the scope of this Standard are responsible for:

- 4.2.1 Completing any required instruction and training prior to work.
- 4.2.2 Adhering to work procedures that are approved for this work.
- 4.2.3 Stopping work immediately if they encounter unsafe conditions, and reporting any problems or concerns to their work/crew leader or manager.

#### 5. Regulation and Related Documents

5.1 The National Energy Board Pipeline Damage Prevention Regulations – Authorizations, SOR/2016-124, and

5.2 The National Energy Board Pipeline Damage Prevention Regulations – Obligations of Pipeline Companies, SOR/2016-133

5.3 NEB's guidance document Pipeline Damage Prevention – Ground Disturbance, Construction and Vehicle Crossings

**Revision Rationale:**

The National Energy Board has replaced their Pipeline Crossing Regulations with the Pipeline Damage Prevention Regulations. As a result of this change, the process of obtaining a permit from the pipeline company for certain activity remains much the same in the new regulations, however, there are some changes and new duties to note:

- Ground disturbance requiring a permit is now measured to be within 3 metres (10 feet) of either side of the edge of the pipe (it used to be larger and measured from the outer boundary of the pipeline ROW).
- Any ground disturbances within 3 metres (10 feet) of either side of the edge of the pipe is prohibited unless additional actions are taken (outlined in Appendix 1 of this Standard).
- New obligation to submit a locate request at least 3 days before work begins. Authorization isn't valid unless a locate request was made.
- New obligation to ensure you have received, before beginning work, an explanation of the pipeline locate markings and any safety practices the pipeline company may have in place for working near the pipe.

OSH Standard 217 has also been re-formatted to align with current templates where the procedural information is moved to the Appendix.

## Appendix 1

### Facility Construction and Ground Disturbance

#### 1) Definitions

- Facility Construction: Any construction or installation of a Facility on, across, along, or under an interprovincial or international pipeline, including the pipeline right-of-way. ‘Facility’ includes overhead or underground transmission or distribution structures, pipes, fences, roads, walkways, parking lots, drainage, retaining walls, etc...
- Ground Disturbance: Any activity that causes ground disturbance that is within 30 meters (100 feet) of either side of the centreline of the pipe. Excluded from this requirement is any ground disturbance to a depth of less than 30cm and that does not reduce the depth of earth cover over the pipeline. Ground disturbance includes pole hole digging, with or without power operated equipment.

#### 2) The following must be completed to obtain authorization for Facility Construction and Ground Disturbance:

- a) At least three working days before work begins, BC Hydro must make a locate request to BC One Call.
- b) Before beginning work, BC Hydro must have received from BC One Call an explanation of the pipeline locate markings and any safety practices the pipeline company may have in place for working near the pipe.
- c) Before beginning the work, obtain consent from the pipeline company via a written permit. To obtain consent, contact the pipeline company for their technical guidelines, which will outline the application process. The pipeline company is required to either grant or deny an application for consent within 10 working days of receiving it.

#### 3) Regardless of the above, ground disturbances within 3 metres (10 feet) of either side of the edge of the pipe is prohibited unless:

- a) If the excavation runs parallel to the pipe, the pipe has been exposed by hand at sufficient intervals to confirm the pipe's location or the pipeline company has used a method that would permit it to confirm the pipe's exact location and has informed BC Hydro of that location,
- b) If the excavation crosses the pipe, the pipe has been exposed by hand at the point of crossing or the pipeline company has used a method that would permit it to confirm the pipe's exact location, has informed BC Hydro of that location and has confirmed that the pipe is at least 60 cm deeper than the proposed excavation, and
- c) If ground conditions render it impractical to locate the pipe using any of the methods set out above, the pipeline company directly supervises any excavation.

## Appendix 2

### Crossing a Right of Way (ROW)

#### 1) Definition

- Crossing an ROW: Operation of a vehicle or mobile equipment across a pipeline right-of-way unless that travel is on a highway or public road.

#### 2) The following must be completed to obtain authorization for Crossing a ROW before beginning work:

- a) Obtain consent from the pipeline company via a written permit. To obtain consent, contact the pipeline company for their technical guidelines, which will outline the application process.
- b) The pipeline company is required to either grant or deny an application within 10 working days of receiving it.

## Appendix 3

### Business Group Planning

- 1) In addition to the above requirement for authorization, compliance includes but is not limited to:
  - Work must be completed within 2 years of obtaining consent unless the permit provides a different timeline.
  - Work must comply with any instructions in the pipeline company's permit or instructions from a pipeline company representative.
  - Before beginning work, BC Hydro must inform all persons working on its behalf of their obligations under the Damage Prevention Regulations. This includes informing employees and contractors.
  - Any changes to the design, location or type of work made after the pipeline company has issued its permit must be communicated and agreed to by the pipeline company before that work starts.
  - For emergency work, BC Hydro must make an emergency call to BC One Call, and the pipeline company must be notified as soon as practicable.
  - A pipeline company must be given 24 hours–notice before any backfilling occurs over a pipe.
  - Any contact with a pipe or its coating must be reported to the pipeline company immediately along with any other damage that may have occurred.

## Appendix 4

### Contractor Work Planning

- 1) For work done by BC Hydro contractors that is within the scope of this Standard, the BC Hydro Contract Manager shall ensure it is done in compliance with NEB direction. This includes:
  - a) Provision of a copy of the NEB's Pipeline Damage Prevention – Ground Disturbance, Construction and Vehicle Crossings publication to the contractor.
    - Confirmation prior to the commencement of work that the contractor has acceptable work procedures in place to perform the work in compliance with the Damage Prevention Regulations, in the same manner as described in this Standard.
    - Confirmation that the contractor's procedures are implemented in the performance of the work.
  - b) BC Hydro shall have a representative on-site where the work is being performed to ensure:
    - All necessary written permissions and safety instructions have been obtained from the pipeline company prior to the start of work.
    - That the contractor is complying with any conditions and instructions set out by the pipeline in the permit or from a pipeline company representative.
  - c) The BC Hydro on-site representative must have the qualifications and authority to stop the contractor's work, and must do so, in any situation where the contractor has not obtained the necessary written permissions from the pipeline company, or is not in compliance with written permissions that have been obtained.
  - d) In the case of contractor contraventions of the Damage Prevention Regulations or conditions of the pipeline company's written permission, BC Hydro must re-evaluate the acceptability of the contractor's work procedures, ensure deficiencies are remedied by the contractor, and verify implementation of the updated procedure.

# **OSH Standard 301 WHMIS 2015 and Hazardous Materials**

# Osh Standard 3O1 WHMIS 2015 and Hazardous Materials



## 1. Purpose

1.1 The purpose of this standard is to ensure that hazards of hazardous products used, stored or handled in BC Hydro are identified, assessed and controlled, to ensure applicable WHMIS 2015 and WorkSafeBC requirements are met. For assistance with implementing this standard managers should contact their Occupational Safety and Health (OSH) Specialist.

## 2. Scope

2.1 This standard applies to all “Hazardous Products” (see Glossary, Appendix 1) that are used, stored or handled in BC Hydro, including products that are covered by the Workplace Hazardous Materials Information System (WHMIS) 2015 legislation and products/materials that are partially or completely exempted from WHMIS 2015 legislation.

### 2.2 WHMIS 2015–Exempted Hazardous Materials

2.2.1 Some hazardous materials are partially exempted (e.g. pesticides, consumer products) or completely exempted (e.g. hazardous waste, manufactured articles) from WHMIS 2015 legislation (see Glossary Appendix 1 for definitions of bolded terms).

2.2.2 If a worker is exposed to a hazardous product that does not fall under the WHMIS 2015 legislation, then the “General Information Requirement” in Section 5.2 of the OSHR must be met (see Glossary, Appendix 1 for details).

## 3. Standard

### 3.1 Inventory and Hazard Information

Every BC Hydro work site/location must prepare and maintain a local inventory of all hazardous materials handled, stored or used at that location (Stationery Form #8O42O – Toxic/Hazardous Product Inventory – is available to assist with inventory preparation).

Note: To minimize the work required to prepare/maintain the local inventory, assess/control hazards (Section 3.3) and train workers (Section 3.4.2):

- Dispose of products that are no longer used (Contact Surrey Disposal for assistance);
- Standardize on one product and supplier for each type of product used and establish purchasing controls to ensure that only the “approved” products are purchased in the future; and
- Whenever possible, select the least hazardous of the available alternatives.

3.1.1 The SDS or other required hazard information for all products in the inventory must be readily available for review by workers. One source of information is BC Hydro’s SDS database. The SDS system also has a “Location Binding” feature that can be used to create and update local inventories.

3.1.2 If hazard information cannot be obtained for a hazardous product, the product must not be used. Interim storage while actively seeking hazard information is permitted but must be kept to a minimum.

### 3.2 Labeling

- 3.2.1 All hazardous products must be labeled, in accordance with the applicable regulatory requirements. A summary of requirements for labeling and hazard information is provided in Appendix 2 of this standard.
- 3.2.2 Supplier labels must be attached and clearly visible on all containers originating from the supplier or manufacturer.
- 3.2.3 Workplace labels must be provided for containers when supplier labels are lost or illegible, and when hazardous products are transferred from a supplier container to another container in the workplace. Workplace labels are provided for many of the products on BC Hydro's SDS database system.
- 3.2.4 Other means of identifying the hazardous product must be used where workplace labels are impractical (e.g. products in piping).

### 3.3 Risk Assessment and Control

- 3.3.1 If a worker is or may be exposed to a hazardous material, the potential for overexposure must be assessed in accordance with **Section 5.53 of the OSHR** (Workplace Monitoring) and, if necessary, controls must be implemented.
- 3.3.2 If exposure to a product exceeds 50% of the applicable exposure limit (ACGIH TLV) the exposure must, whenever practicable, be eliminated or reduced to less than 50% of the exposure limit by **substitution** with a less hazardous product or **engineering controls** (e.g. local exhaust ventilation).
- 3.3.3 An exposure control plan that meets the requirements of **Section 5.54 of the OSHR** must be implemented if a worker is or may be exposed to an air contaminant in excess of 50% of its exposure limit and the exposure cannot be eliminated or reduced via substitution or engineering controls.

### 3.4 Education and Training

- 3.4.1 **WHMIS education** must be provided to all workers who use, store or handle hazardous materials. Education must include WHMIS 2015 program elements, rights and responsibilities of workers and employers, hazard classes, and the content and significance of the information required on labels and SDSs. Education must be repeated, as deemed necessary, based on the results of the program review (Section 3.5 of this standard).
- 3.4.2 Job/product-specific training including, if applicable, training in written work procedures, must be provided to all workers use, store or handle hazardous materials. Workers shall be considered adequately trained when they understand the applicable work procedures and know:
  - The hazards of the controlled product;
  - How to protect themselves from those hazards;
  - What to do in the event of an emergency or spill; and
  - Where they can get more information on the product.

Retraining must be done if the products used, hazard information or conditions of use in the workplace change.

### 3.5 Program Review

- 3.5.1 The local VWHMIS 2O15 and Hazardous Material program must be reviewed at least annually, in consultation with the local OH&S Committee or Key Safety Person (KSP). The purpose of the review is to confirm that the program elements are in place and, if necessary, to take corrective actions (e.g. update inventory, SDSs, hazard assessment and/or education/training).

## 4. Roles and Responsibilities

### 4.1 Managers

- 4.1.1 Managers at locations where hazardous product are used, stored or handled are responsible for implementing the requirements of this standard, in consultation with the OH&S Committee or KSP.

### 4.2 Workers

- 4.2.1 Workers must use, store and handle hazardous products in a safe manner, in accordance with the education and training provided, and must inform their manager or work leader if they have questions or concerns about the products that they use.

## 5. References

- 5.1 Hazardous Products Regulations.
- 5.2 WorkSafeBC OHSR Part 5 (Chemical and Biological Substances) and Part 6 (Substance Specific Requirements).
- 5.3 VWHMIS Core Material Manual.
- 5.4 WorkSafeBC publication “VWHMIS at Work” (BK 4O).
- 5.5 BC Hydro Stationery Form #8O4O2 (Toxic/Hazardous Products Inventory).
- 5.6 BC Hydro Stationery Form #8O487 (Workplace Label).

## 6. Information Controls

### 6.1 Revision History

Date	Version	Comments
January 8, 2016	V1-O	<p>This standard (renamed to VWHMIS 2O15 and Hazardous Materials) has been updated to reflect current regulatory changes to hazardous materials legislation including:</p> <ol style="list-style-type: none"> <li>1) Repeal of Health Canada, Controlled Product Regulations</li> <li>2) New Health Canada Regulation, Hazardous Product Regulations that came into force in February 2015</li> <li>3) Updated VWSBC Regulations Part 5 (VWHMIS) to align with Health Canada.</li> </ol> <p>Updating housekeeping items such as MSDS to SDS, changes to VWHMIS Classification.</p>

## Appendix 1

### Glossary

- 1.1 **Hazardous Waste:** A hazardous material that is intended for disposal or is sold for recycling or recovery. Hazardous wastes are exempted from WHMIS 2015, but there are requirements in the OHSR to ensure safe handling and storage of hazardous wastes (Sections 5.3④ and 5.76–5.81).
- 1.2 **Hazardous Product:** Any hazardous product, material or substance that meets the criteria specified in Part 7 and Part 8 of the Hazardous Products Regulations (HPR) for Physical and Health Hazards.
- 1.3 **Partially Exempted Product:** A hazardous product that is regulated Federally by legislation other than the HPR (e.g. Pest Control Products Act or the Consumer Chemicals and Containers Regulations). Note that the OHSR contains specific requirements for pesticides in Sections 6.7O–6.1O9.
- 1.4 **Manufactured Articles:** Articles that are manufactured prior to purchase. Manufactured articles may contain hazardous products but do not present an exposure risk during normal conditions of use (e.g. thermometers, fossil-fueled equipment, asbestos-containing floor tiles and batteries).
- 1.5 **WorkSafeBC General Information Requirement (Section 5.2)** requires that, if a worker is or may be exposed to a chemical or biological substance which could cause an adverse health effect, the employer must ensure that:
  - The identity of the substance, its possible effects on worker health and safety and any precautions are clearly indicated (e.g. labels, SDS);
  - The content and meaning of the hazard information is clearly communicated to the worker;
  - Effective written procedures are prepared and implemented to prevent exposures that could cause an adverse health effect, and to address emergency and cleanup in the event of a spill or release; and
  - The supervisor and the worker are trained in and follow the established procedures.

## Appendix 2

### Labeling & Hazard Information Requirements For Hazardous Products

Product	Label	Hazard Information (See Section 3.1.2, Page 2)
1. Controlled/Hazardous Product that falls under VWHMIS 2015	VWHMIS 2015-compliant Supplier Label	VWHMIS 2015-compliant SDS from the supplier
2. Hazardous Product that is Partially Exempted from VWHMIS 2015 (e.g. Pesticides, Consumer Products)	Normal supplier label	Latest SDS or other hazard information from the supplier
3. Hazardous Waste	Any form of identification	Hazard information applicable to the waste material (e.g. Waste Profile Sheet)
4. Hazardous Product that are Completely Exempted from VWHMIS 2015 (e.g. manufactured articles)	Any form of identification (e.g. asbestos labels as per OSH Standard 3O6)	Latest SDS from the supplier, if available, or other hazard information
5. Products listed in 1 & 2 when decanted into a secondary storage container	VWHMIS 2015-compliant Workplace Label	See 1 or 2, above
6. Products listed in 1 & 2 when decanted into a “controlled use” container (i.e. used by one worker for one shift)	Any form of identification known to the user	See 1 or 2, above

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# **OSH Standard 302**

## **Safety During Spill Response**

# Osh Standard 3O2

## Safety During Spill Response



### 1. Scope

1.1 This standard covers the requirements and procedures associated with spill response safety.

### 2. Purpose

2.1 Pre-planning, training and written procedures are required to prevent exposures to hazardous materials and to ensure regulatory compliance during spill response. The purpose of this standard is to outline the requirements to ensure the safety of workers involved in spill response. For information about environmental requirements, including notification procedures, emergency contacts, spill response equipment and waste handling, refer to Waste Management Standard WM-11O Spill Response.

### 3. Standard

#### 3.1 General

3.1.1 Standard spill response protocol requires the following sequence of events:

- Ensure safety;
- Stop the flow;
- Secure the area;
- Contain the spill;
- Notify and report;
- Clean up.

3.1.2 This standard deals exclusively with the regulatory requirements governing the safety of spill responders.

3.2 The primary regulation governing spill response safety is Occupational Safety and Health Regulation (OSR), Section 5.97 to 5.102 Emergency Procedures, Section 5.3 to 5.21 “WHMIS” and Section 5.2 “General Information Requirement”. The intent of the regulation is to ensure that workers are fully informed about the hazards of the products that they are required to handle, and that they have the training and the equipment needed to protect themselves from those hazards.

3.3 Regulatory compliance requires pre-planning, training and written work procedures. For assistance with implementing this standard, contact your Occupational Safety and Health (OSH) Specialist.

3.4 Develop an inventory of the hazardous materials used or stored in the workplace and obtain all the required hazard information (MSDS, label, identifier) for each product (see OSH Standard 3O1 WHMIS and Hazardous Materials). Hazardous materials are pesticides, hazardous wastes, consumer products and products covered by WHMIS.

3.5 Carry out an MSDS and site review to identify those products which pose serious concern from an environmental or safety point of view.

3.5.1 Spills to the environment that exceed “reportable volumes” must be reported to the Provincial Emergency Region, this is specified in Waste Management Standard WM-11O. For further assistance, contact the Waste Management Specialist in each SBU environmental department.

3.5.2 Products are a potential safety spill concern if they would require special precautions during spill response or clean-up. Examples include:

- Solvents;
- Mercury;
- PCBs and PCB contaminated oils ;
- Asbestos;
- Carbon dioxide (fire suppression systems);
- Corrosives (e.g. battery acid, ammonia, chlorine).

- 3.6 Carry out a hazard assessment of each product identified as a potential spill concern. The potential hazard to spill responders will depend on a number of factors including product toxicity, product volume and where the spill response will take place (e.g. outdoors vs. an enclosed or confined space). It is possible to develop a single spill response procedure for a group of products with similar hazards (e.g. flammables, oils) provided that selection of personal protective equipment is based on the worst case scenario. Procedures will consider evacuation, notification, clean-up and re-entry. These procedures must, however, be specific to location and situation to ensure that appropriate personal protective equipment, particularly respiratory protection, is selected (e.g. mercury). Appendix 1 of this standard contains a Spill Response Hazard Assessment Form to assist with the hazard assessment process.
- 3.7 Develop written procedures for each product and situation, integrating safety and environmental (WM-11O) requirements. Procedures will consider evacuation, notification, clean-up and re-entry. Procedures must describe how and where the spill response will be carried out, and the required personal protective equipment. Attach a current MSDS to the spill response procedures.
- 3.8 Provide training on product hazards, spill response procedures, and the use and location of the required equipment for all workers who are expected to respond to spills.
- 3.9 Drills should be conducted regularly to test the adequacy of procedures and training.

#### 4. Roles and Responsibilities

##### 4.1 Managers are responsible for:

- Development of a hazardous products inventory;
- Provision of all required hazard information;
- Development of spill response procedures
- Provision of the required equipment and materials;
- Training of spill responders;
- Training on appropriate and safe use of personal protective equipment.

##### 4.2 Workers are responsible for carrying out spill response in accordance with the procedures and training provided.

## 5. Records and Documentation

- 5.1 Keep records of spill response procedures on file at the applicable work site, review them annually with responders, and update them if and when there are changes in any of the factors that impact on the hazard assessment.

## 6. References

- 6.1 WorkSafeBC, Occupational Health and Safety Regulations
- 6.2 Provincial WHMIS Regulations
- 6.3 Waste Management Standard WM-110
- 6.4 SMS 9 – Emergency Preparedness

## Appendix 1

### Spill Response Hazard Assessment

#### Situation

1. Product: \_\_\_\_\_ (Attach MSDS)  
Permissible Concentration: \_\_\_\_\_
2. Estimated Maximum Spill Volume: \_\_\_\_\_
3. Product/Spill Location: \_\_\_\_\_
4. Ventilation:
  - Poor (Indoors with no mechanical ventilation, or enclosed, or confined space)
  - Moderate (Indoors with mechanical dilution ventilation – Note: If ventilation must be turned off during spill response to prevent contamination of occupied areas, then rate ventilation as poor)
  - Good (outdoors, or indoors with local exhaust ventilation)

#### Hazards (Refer to MSDS)

TDG – UN# and emergency response Guide if spilled product cannot immediately be identified.

1. Fire Hazard:
  - High (Flash point 100°F (37.8°C) or lower)
  - Moderate (Flash point higher than 100°F but lower than 200°F (93.3°C))
  - Low (Flash point higher than 200°F)
2. Health Hazards (Routes of Exposure):
  - Inhalation
  - Skin
  - Eyes
  - Ingestion

**Required Hazards Controls (Refer to MSDS)**  
**(For assistance contact your OSH Specialist)**

**1. Personal Protective Equipment:**

Respiratory Protection: (Refer to BC Hydro Guide to Respiratory Protection, Stationery #10008)

- Not Required  
 Required; Type: \_\_\_\_\_

Gloves:

- Not Required  
 Required; Type: \_\_\_\_\_

Eye Protection:

- Not Required  
 Required; Type: \_\_\_\_\_

Body Protection:

- Not Required  
 Required; Type: \_\_\_\_\_

Protective Footwear:

- Not Required  
 Required; Type: \_\_\_\_\_

**2. Control of Ignition Sources:**

- Not Required  
 Required; Details: \_\_\_\_\_

**3. Other**

Access Control:

- Not Required  
 Required; Details: \_\_\_\_\_

Ventilation Control:

Turn off Building Ventilation

- No or N/A

Yes; Details: \_\_\_\_\_

Provide local exhaust ventilation

No or N/A

Yes; Details: \_\_\_\_\_

Provide Air Blowers (Dilution Ventilation)

No or N/A

Yes; Details: \_\_\_\_\_

Evacuation:

Not Required

Required; Details: \_\_\_\_\_

Additional Comments:

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# **OSH Standard 303**

## **Confined Spaces**

# Osh Standard 3O3

## Confined Spaces



### 1. Purpose

- 1.1 To establish and communicate the safety and health requirements for management of confined spaces at BC Hydro worksites.

### 2. Scope

- 2.1 This standard shall apply to all BC Hydro work, either conducted and supervised by BC Hydro employees or assigned to contractors.
- 2.2 This standard shall apply to all properties owned by BC Hydro.

### 3. Requirements

3.1 BC Hydro shall achieve and maintain continuous compliance with confined space requirements of Part 9 of the Occupational Health and Safety Regulation and the Workers Compensation Act section 119.

3.2 Owners and managers of BC Hydro assets, including equipment and infrastructure, shall maintain an inventory, provide information on known hazards and conduct hazard assessments of all confined spaces that workers may need to enter, and they shall make the inventory available to managers, workers and contractors.

Note: A Functional Lead Model has been approved to be developed, and once finalized the standard and program will be updated to reflect this as appropriate.

3.3 When planning, designing, constructing, acquiring or modifying assets, owners and managers shall seek to minimize risks associated with confined spaces, through elimination where practicable. The Senior Vice-President of Safety, Security and Emergency Preparedness shall identify the means for oversight of the BC Hydro Confined Space Program, including identification of the program administrator(s) and assignment of sustainment accountabilities. For information on this program, go to the Confined Space webpage on HydroWeb.

Note: A Functional Lead Model has been approved to be developed, and once finalized the standard and program will be updated to reflect this as appropriate.

3.4 Executive Vice-Presidents shall ensure implementation and sustainment of the BC Hydro Confined Spaces Management Program through the assignment of people and resources in their business units to implement the Program.

3.5 Before assigning work, BC Hydro managers and work leaders shall ensure that work planning identifies all confined spaces that may be accessed, and shall implement barriers and controls to manage the risks in accordance with the BC Hydro Confined Spaces Management Program.

3.6 For work assigned to a contractor, the BC Hydro Contract Representative shall provide the inventory of all confined spaces to the contractor at the beginning of the job planning process, and ensure the contractor has included all required elements of an acceptable confined space management program in their safety plan.

3.7 The Senior Vice-President of Safety, Security and Emergency Preparedness shall provide oversight of BC Hydro performance and compliance with this standard, and shall report status to the Chief Executive Officer and Board of Directors.

#### 4. Roles and Responsibilities

- 4.1 Managers, Foremen/women, Sub-Foremen/women, and Crew Leaders are responsible for understanding and meeting their responsibilities as defined in the Confined Space Management Program, including but not limited to:
- 4.1.1 Planning and supervising work.
  - 4.1.2 Ensuring workers are trained, competent, and using work and rescue procedures.
  - 4.1.3 Responding to, reporting and investigating incidents and non-conformances.
- 4.2 Workers who carry out work at locations where there are confined spaces are present are responsible for:
- 4.2.1 Completing required instruction and training prior to work.
  - 4.2.2 Adhering to operational work and rescue procedures that are approved for the facility and task.
  - 4.2.3 Stopping work immediately if they encounter unsafe conditions, and reporting any problems or concerns to their work/crew leader or manager.

#### 5. Regulation and Related Documents

- 5.1 Workers Compensation Act Section 119 'General duties of owner'
- 5.1.1 Part 9 – Sections 9.6: Administration, 9.7: Supervision, 9.9: Hazard Assessment, 9.10: Procedures and 9.11: Qualifications.
- (Additional confined space references found in WorkSafeBC OHSR subsections 9.12 to 9.51)
- 5.2 WorkSafeBC Publication – Confined Space Entry Program (BK 84)
- 5.3 WorkSafeBC Publication – Hazardous of Confined Spaces (BK 83)

#### 6. Information Controls

##### 6.1 Revision History

Revision History		
Date	Version	Comments
March 21, 2016	V2-1	<p>Minor administrative improvements made to reflect:</p> <ol style="list-style-type: none"> <li>1. Requirements of section 119 or Workers Compensation Act – general duties of employers regarding confined space information</li> <li>2. References to hazard assessment requirements as per WorkSafeBC OHSR part 9.</li> <li>3. Reference to the Chief Safety Officer changed to the Senior Vice-President of Safety, Security and Emergency Preparedness.</li> <li>4. Revisions were made to reflect a Functional Lead Model for assigning sustainment accountabilities which was approved at the Safety Accountability Meeting on March 21, 2016. A "SMS Hazard Management – Governance, Roles and Responsibilities" project is still underway which may result in future changes.</li> </ol>
Sept. 5, 2014	V2-O	This standard has been completely revised to reflect WorkSafeBC Occupational Health and Safety Regulation requirements and the creation of a BC Hydro Confined Space Management Program and supporting documents.

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# **OSH Standard 304**

## **Polychlorinated Biphenyls (PCBs)**

# OSH Standard 3O4

## Polychlorinated Biphenyls (PCBs)



### 1. Scope

1.1 This standard covers hazard aspects and safe handling of polychlorinated biphenyls.

### 2. Purpose

2.1 This standard outlines the hazards associated with PCBs and the procedures which must be followed to prevent employee overexposures during work involving PCBs or PCB-contaminated (>50 PPM) materials (e.g. oils, wastes, equipment).

### 3. Standard

#### 3.1 General

3.1.1 Polychlorinated Biphenyls (PCBs) are a group of synthetic fluids that have been widely used in electrical equipment because of their stability, fire resistance and excellent insulating and thermal properties. However, the inherent stability of PCBs also causes them to persist in the environment, which resulted in the banning of PCB manufacture in 1977 and the subsequent regulation of their use, transportation, storage and disposal.

3.1.2 For information about PCB-related environmental and fire standards and regulations, refer to the following BC Hydro Waste Management standards:

- WM-310 – Management of Materials Containing PCB
- WM-340 – Transport of PCBs

#### 3.2 Hazards

##### 3.2.1 Environmental Contamination

3.2.1.1 PCBs have been identified as an environmental contaminant because they persist in the environment where they accumulate in the food chain. As a result of past environmental releases of PCBs, they are found worldwide in water, air, soil, sediments, fish, birds and mammals, including man.

3.2.1.2 The main goal of current PCB-related environmental regulations is to minimize the release of PCBs into the environment and prevent further environmental effects.

##### 3.2.2 Occupational Exposure

3.2.2.1 Workers may be exposed to PCBs through inhalation, skin contact or accidental ingestion. PCB exposure due to inhalation may occur if fluids are heated enough (>50°C) to produce vapors, if fluids are aerosolized (e.g. sprayed) or if PCB-contaminated dusts are disturbed. PCBs can also enter the body through skin absorption. Ingestion can occur whenever PCBs are transferred to food, drink or other items that may get into the mouth (e.g. pencils, cigarettes).

3.2.2.2 Studies of human occupational exposures by the U.S. National Institute for Occupational Safety and Health (NIOSH) have linked PCBs to skin/eye irritation and chloracne – a reversible skin condition which resembles severe acne. There have been no reported cases of chloracne among BC Hydro workers.

- 3.2.2.3 Although animal studies have identified other possible PCB health effects (e.g. cancer, reproductive effects), these effects have not been confirmed in human occupational studies, and there have been no significant differences in death rates between workers who handled PCBs for years, and those who did not.
- 3.2.2.4 Levels and durations of PCB exposure in the studied workers were typically in excess of 100 times the exposure levels that have been measured during routine BC Hydro PCB-related work. BC Hydro worker exposures have been confirmed to be very low via medical monitoring of PCB levels in blood.

### 3.2.3 Fire Hazards

- 3.2.3.1 PCBs are fire resistant but, under arcing or fire conditions, they can break down and produce highly toxic by-products, including polychlorinated dibenzofurans (PCDFs), hydrogen chloride and polychlorinated dibenzo-p-dioxins (PCDDs).
- 3.2.3.2 The health hazards resulting from fires involving PCBs are primarily due to the inhalation of PCB vapours or the vapours of toxic PCB by-products. After a fire has been extinguished, workers may be further exposed to these contaminants if they contact or inhale fire residues.

### 3.2.4 Safe Handling Procedures for Routine Activities

- 3.2.4.1 PCB-related activities that BC Hydro employees are routinely required to carry out include: sampling, pouring, transporting and inspecting PCBs, PCB-contaminated materials and/or related equipment or storage containers.
- 3.2.4.2 Only employees trained in the hazards and safe handling of PCBs shall work in areas where PCBs are used or stored, and the procedures outlined in clauses 3.2.4.3 through 3.2.4.5 must be followed to prevent skin contact, ingestion and inhalation if/when the nature of the PCB-related activities could result in exposure via those routes.
- 3.2.4.3 Protective equipment must be used to prevent potential eye or skin contact. Depending on the nature of the planned work, the required equipment may include goggles, gloves (nitrile), aprons, coveralls, jackets, pants and footwear (e.g. rubber or neoprene boots/overshoes or disposable boot covers). Protective clothing must be disposable (e.g. Tyvek) or reusable (neoprene). If reusable protective clothing is used, then it must be used only for PCB-related work and must be cleaned and maintained in accordance with the instructions provided in clause 3.2.8 of this Standard.
- 3.2.4.4 PCB exposure through ingestion can best be prevented through good personal hygiene practices. In addition to wearing gloves to prevent skin contact, employees involved in PCB-related activities must wash their hands prior to breaks and prior to eating, drinking or smoking. Hand washing may be done using disposable wipes, waterless cleaners or soap and water.

3.2.4.5 PCB exposure through inhalation must be prevented by providing adequate ventilation to minimize exposure levels and/or by using respiratory protection (NB respiratory protection is required when exposure levels exceed 50% of the WorkSafeBC's Permissible Exposure levels). There is normally no inhalation hazard associated with the routine PCB-related activities carried out in BC Hydro unless fluids are heated ( $>50^\circ\text{C}$ ) or sprayed/misted, or if contaminated dust is disturbed. For assistance with determining if/when respiratory protection is required, contact your local Occupational Safety and Health (OSH) Specialist. For information about the proper selection, use and maintenance of respiratory protective equipment, refer to OSH Standard 313 – Respiratory Protection.

### 3.2.5 Handling of Electrical Equipment After Failure Due to Arcing or Lightning Strike

- 3.2.5.1 Small amounts of toxic PCB by-products (e.g. PCDFs, PCDDs) may be produced when electrical equipment arcs or is struck by lightning, but the exposure risk associated with handling this equipment after the event is low if the following conditions apply:
- the fire, if any, has been completely extinguished and the fluids in the equipment have cooled ( $<50^\circ\text{C}$ ),
  - the fire was minor (i.e. its spread was limited to the immediate vicinity of the transformer/capacitor involved, and
  - there is no fire residue which could become airborne and inhaled during the planned work.
- 3.2.5.2 If the above conditions apply, then the potential exposure risks are limited to eye/skin contact and ingestion and, if the nature of the planned work could result in exposure via those routes, then, appropriate protective equipment must be worn (clauses 3.2.4.3 and 3.2.4.4).

### 3.2.6 Spill Response Procedures

- 3.2.6.1 Managers of locations where there is a potential for a leak or spill involving PCBs or PCB-contaminated fluids must develop and implement response/emergency plans, in accordance with the requirements outlined in Environmental Standard WM 11O – Spill Response and OSH Standard 3O2 – Safety During Spill Response.
- 3.2.6.2 The type/level of personal protective equipment required during spill response will depend on the volume of the spill and other site-specific conditions (see OSH Standard 3O2), but the general exposure prevention guidelines provided in clauses 3.2.4.3 through 3.2.4.5 and clause 3.2.7 of this Standard will apply.

### 3.2.7 Fire Response and Post-Fire Clean-Up Procedures

- 3.2.7.1 Any fire involving PCBs or PCB-contaminated ( $>50 \text{ PPM}$ ) fluids must be treated as a serious event. Safe and effective handling of a PCB fire and the post-fire clean-up requires pre-planning, specialized equipment and thorough training of designated response personnel.
- 3.2.7.2 Post-fire clean-up requires specialized safety and environmental procedures, and must be carried out only by properly trained and equipped workers. Whenever practicable, post-fire clean-up work should be carried out by qualified internal CBU employees or external contractors. If regular BC Hydro employees must be assigned to this type of work, contact your local Occupational Safety and Health (OSH) Specialist for assistance with developing safe work and decontamination procedures. For further information about environmental standards and regulations refer to Environmental Standard VWM 35O – PCB Fire Clean-Up.

### 3.2.8 Cleaning of PCB-Contaminated Protective Clothing and Equipment

- 3.2.8.1 Contaminated protective clothing and equipment must be cleaned immediately after use and cleaning must be carried out in a well-ventilated area, preferable outdoors. Wear nitrile gloves to prevent PCB contact with the skin.
- 3.2.8.2 The following procedure must be used to clean reusable protective clothing (e.g. gloves, aprons, jackets, pants, footwear):
- First, wipe with dry disposable wipes,
  - Secondly, wipe with disposable wipes saturated with a terpene or hydrocarbon degreasing solvent, such as PF Degreaser (NB wear protective gloves to prevent skin contact – refer to applicable MSDS for details),
  - Allow clothing to air dry, and
  - Label clothing “PCB Free” and store in a separate locker or bag ready for the next use.
- Reusable protective clothing should be disposed of and after 10 days (80 hours) use or when material becomes cracked/worn, whichever occurs first.
- 3.2.8.3 To clean other PCB-contaminated protective equipment (e.g. goggles, respirators), first wipe with dry disposable wipes and then wash with soap and hot water.
- 3.2.8.4 All materials used to clean contaminated clothing and equipment must be treated as PCB waste.

## 4. References

- 4.1 NIOSH Criteria for a Recommended Standard, Occupational Exposure to Polychlorinated Biphenyls (PCBs). DHEW Publication No. 77 255, September 1977
- 4.2 Criteria Document for PCBs prepared for the EPA, July 1976. Report No. EPA 440/9 76 21
- 4.3 National Cancer Institute, Bioassay of Arochlor 1254 for Possible Carcinogenicity. Technical Report Series No. 38, 1978
- 4.4 BC Hydro Waste Management Standards: 110, 310, 340

## Table of Contents

# **OSH Standard 305**

## **Sulphur Hexafluoride ( $SF_6$ )**

# OSH Standard 305

## Sulphur Hexafluoride ( $SF_6$ )



### 1. Scope

1.1 Sulphur hexafluoride ( $SF_6$ ) is used as an insulating and arc quenching gas in many types of electrical equipment, including circuit breakers, circuit switchers, current transformers, switchgear and buses. In its pure state,  $SF_6$  is an odourless, tasteless, colourless, non-toxic gas. Under normal operating conditions, the gas is totally enclosed within the equipment.

1.2 The following potential hazards are associated with  $SF_6$  filled equipment.

- $SF_6$  gas used in electrical equipment is usually pressurized.
- $SF_6$  gas is much heavier than air and at high concentrations (>20 %) it may collect in low points of containers or the buildings housing indoor  $SF_6$ -filled equipment, thereby displacing the air and creating a potential asphyxiation (oxygen starvation) hazard in the affected area.
- When exposed to high temperatures  $SF_6$  will decompose producing a complex mixture of gaseous and solid by-products. A few of these  $SF_6$  decomposition products are highly toxic and most are highly corrosive and irritating when they come into contact with moisture (e.g. in the mouth, eyes or respiratory tract). The composition of the by-product mixture depends on a number of variables, including temperature, moisture, electrode/casing materials and type of arc.
- Some  $SF_6$  breaker enclosures are confined spaces and, if they are entered, the requirements of OSH Standard 303 (Confined Spaces) must be met.

### 2. Purpose

- 2.1 The purpose of this standard is to establish the requirements that must be met and the procedures that must be followed to identify, assess and control the potential hazards associated with operating and maintaining  $SF_6$  equipment. For assistance, managers should contact their Occupational Safety and Health (OSH) Specialist.
- 2.2 For information on  $SF_6$  related environmental issues (e.g. spill reporting, waste disposal and transportation) go to the Environmental Best Management Practices (EBMP) website.

### 3. Standard

Requirements:

#### 3.1 General Requirements

3.1.1  $SF_6$  Cylinders must have WHMIS-compliant labeling (OSH Standard 301) and the normal safe handling procedures for pressurized gas containers must be followed.

Note:  $SF_6$  is normally supplied in cylinders with 52 kg (115 lbs.) of liquefied SF<sub>6</sub>. Cylinder pressure is typically 21 MPa (300 psig) at 20 degrees Centigrade (68 F).

3.1.2 Eliminate all sources of heat and open flame (e.g. welding, propane torch and smoking) in indoor work areas when there is an increased risk of  $SF_6$  release (e.g. during filling or evacuation of SF<sub>6</sub> equipment).

Note:  $SF_6$  gas may decompose when exposed to temperatures as low as 200°C.

3.1.3 When working around  $SF_6$  equipment, care must be taken to avoid sudden impact contact (e.g. dropped tools) with pressurized porcelain and epoxy bushings as this could cause a major gas discharge.

- 3.1.4 SF<sub>6</sub>-filled equipment that is pressurized to 40 psi absolute pressure or more (25.3 psi gauge pressure @ 1 atmosphere) is classified as a compressed gas under WHMIS. A peel-and-stick, 4" x 4" label #10086 available from BC Hydro stationery must be applied to the equipment. An 8.5" x 11" digital print version #10086-1 of the label is also available for printing at your cost.



- 3.1.5 Where an accidental, indoor release of SF<sub>6</sub> may result in overexposures to SF<sub>6</sub> or its decomposition products, warning signs must be posted on all doors leading into the rooms or buildings housing the SF<sub>6</sub> equipment. The above label can also be used for this purpose.

### 3.2 Risk Assessment

- 3.2.1 Prior to starting work on SF<sub>6</sub> equipment, carry out a risk assessment to determine if the planned work will present a low, moderate or high risk to workers with respect to decomposition product exposures, and to ensure that the applicable requirements are met (Sections 3.3, 3.4 and 3.5 of this standard). The flowchart in Appendix 1 (Pages 7 and 8) of this standard is provided to assist with carrying out a risk assessment.
- 3.2.2 If the planned work will involve maintenance of existing SF<sub>6</sub> equipment (i.e. SF<sub>6</sub> gas removal and inspection/repair/cleaning of enclosures), the risk assessment must include the collection of a gas sample from the in-service equipment (i.e. before evacuating gas and opening enclosure) to determine level of total gaseous decomposition products inside the equipment. For assistance with sample collection and analysis, contact Powertech Laboratories.

### WARNING

Never use the sense of smell to locate a fault or leak. This practice is unsafe and may result in overexposure to SF<sub>6</sub> decomposition products.

### 3.3 Low Risk Requirements

3.3.1 The potential SF<sub>6</sub>-related hazards associated with low risk work are limited to exposure to pressurized gas and, in indoor installations, the accumulation of SF<sub>6</sub> gas in poorly ventilated areas (This refers to minor leaks only. A major, abnormal release is classified as High Risk – see Section 3.5.1 of this standard).

Note: The SF<sub>6</sub> decomposition products that may be formed by arcing or by low-energy discharges and released due to normal leakage from SF<sub>6</sub> equipment will not reach significant levels in the workplace.

3.3.2 The following requirements must be met during low risk work activities.

- Carry out work only in well-ventilated areas.
- Wear protective eyewear and gloves (e.g. leather) when working on high-pressure piping, valves or connectors where there is a risk of a sudden pressure release.
- If work involves entry into SF<sub>6</sub> breaker enclosures, the requirements of OSH Standard 3O3 (Confined Spaces) must be met. Note: 23O kV Westinghouse (WCL) SF<sub>6</sub> breakers are not confined spaces if both access ports are kept fully open.
- If work involves the use of solvents, the requirements of OSH Standard 31O (Selection and Use of Solvents) must be met.
- Practice good personal hygiene at all times during SF<sub>6</sub>-related work:
- Do not eat, drink or smoke in work areas; and
- Before breaks, and at the end of the work/shift, wash hands and face before eating, drinking or smoking.

### 3.4 Moderate Risk Requirements

3.4.1 Routine maintenance of switching equipment, and non-switching equipment that has not been trouble-free, is initially classified as moderate risk because there is a potential for exposure to SF<sub>6</sub> decomposition products when the enclosure is opened for inspection.

3.4.2 Before proceeding with the planned maintenance work the equipment must be opened and inspected to determine the exposure risk, as follows.

- In accordance with established procedures, evacuate SF<sub>6</sub> gas and draw a vacuum on the enclosure (3O mm. Hg).
- Before opening equipment, put on a half-facepiece respirator equipped with combination P1OO (HEPA), acid gas and organic vapour cartridges and safety goggles (refer to OSH Standard 313 for respiratory protection requirements).
- Open access cover(s) and carry out the initial inspection from the outside. DO NOT ENTER, or put head inside, the enclosure.
- If there is no visible dust/powder, or if the contamination is minor and localized (i.e. only around contacts), and the enclosure is free from pungent (“rotten egg”) odours, then subsequent work can be considered Low Risk with respect to decomposition products exposure (See Section 3.3), but wear gloves (nitrile or neoprene) if contact with powder is required.

- If there is a significant amount of dust visible on enclosure surfaces and/or a pungent (“rotten egg”) odour is detectable, immediately close access door(s) and implement High Risk procedures (See Section 3.5.2).

### 3.5 High Risk Requirements

- 3.5.1 Although very rare, abnormal releases can occur and the local Emergency Response Plan (ERP) must include written procedures for building evacuation and re-entry in the event of a major indoor release of SF<sub>6</sub>. Appendix 2 (pages 9–11) of this standard outlines the SF<sub>6</sub>–related safety and health issues that must be addressed in the ERP.
- 3.5.2 High Risk work, including evacuation and clean-up of SF<sub>6</sub> enclosures that are contaminated with decomposition products requires specialized equipment, training and procedures. Field Services Safety and Work Methods have prepared written work procedures and a kit with the required equipment and materials for use by designated, trained workers. For more information and assistance, contact your OSH Specialist.

### 3.6 Instruction and Training

- 3.6.1 Workers who are required to carry out SF<sub>6</sub>–related work must be given instruction in the requirements of this standard.
- 3.6.2 Where applicable (indoor installations), workers must be given instruction in the SF<sub>6</sub>–related requirements of the local Emergency Response Plan (ERP).
- 3.6.3 Workers who are required to carry out work on contaminated SF<sub>6</sub> equipment and/or have responsibilities under the ERP must be given training in the applicable written work procedures.

## 4. Responsibilities

- 4.1 Managers are responsible for implementing the requirements of this standard. For assistance, managers should contact their OSH Specialist.
- 4.2 Workers are responsible for carrying out SF<sub>6</sub> related work in accordance with the instructions and training provided.

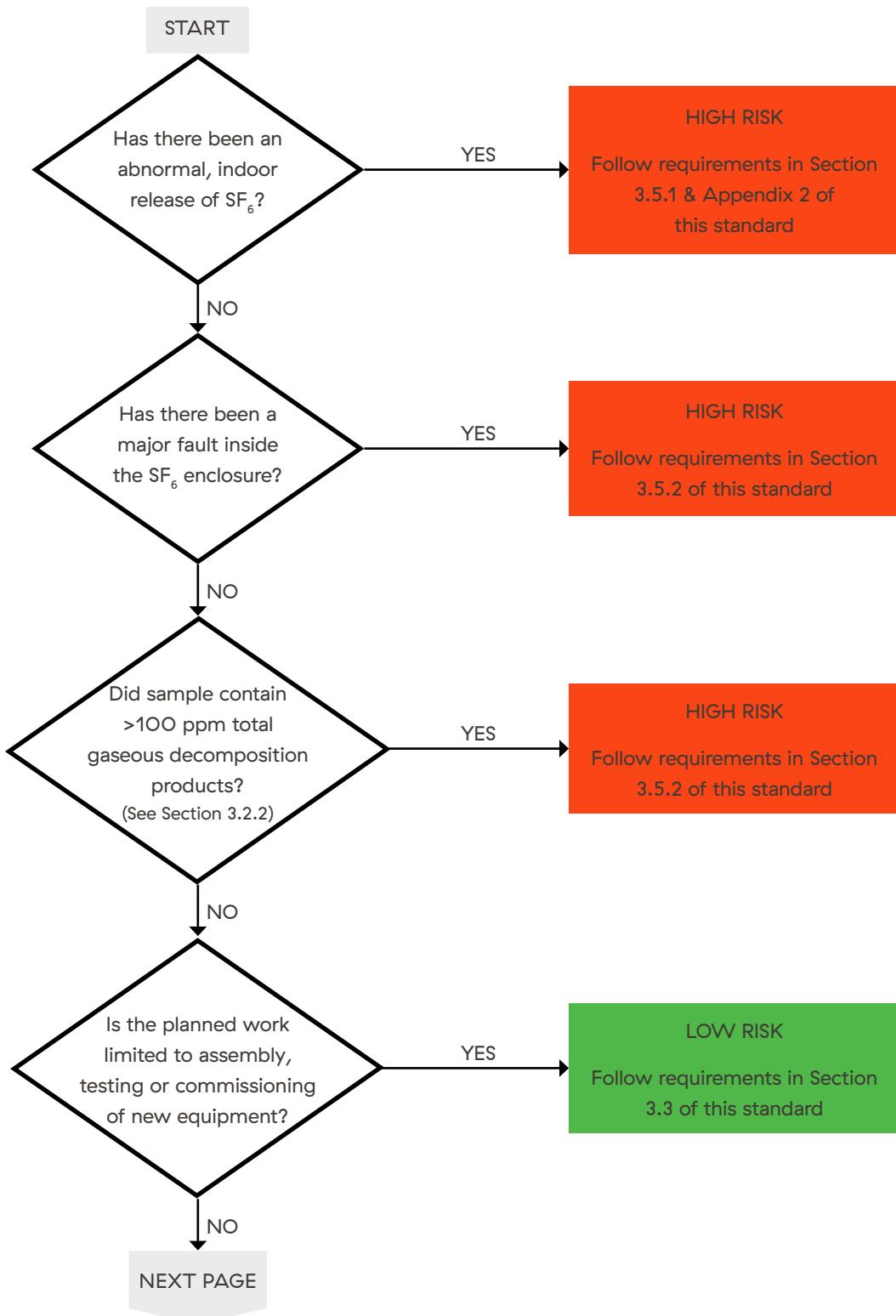
## 5. Records & Documentation

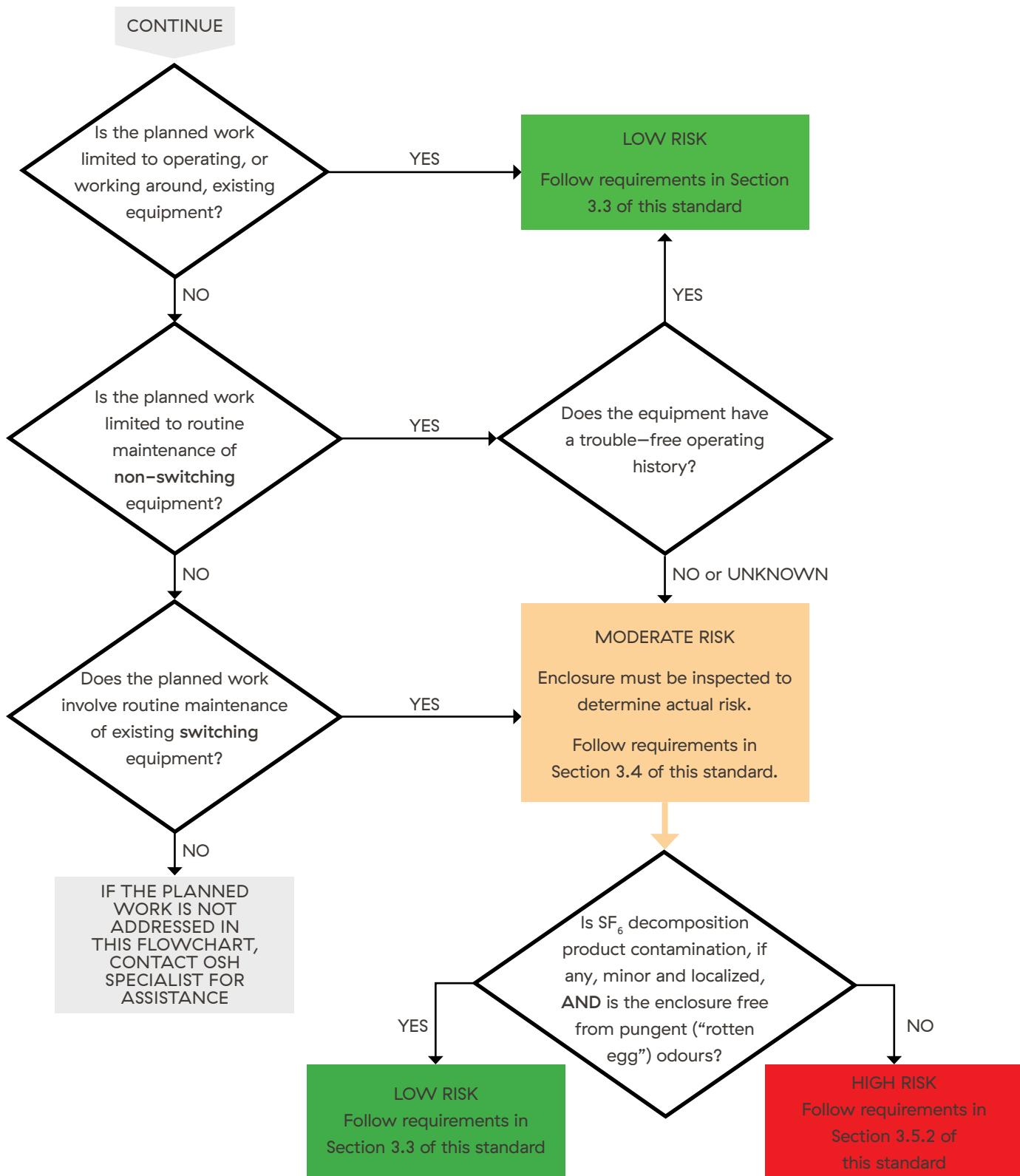
- 5.1 Required records and documentation include:
- Worker instruction and training;
  - Respirator fit test records; and
  - Where applicable, an Emergency Response Plan that includes written procedures for building evacuation and re-entry in the event of a major indoor release of SF<sub>6</sub>.

## 6. References

- 6.1 WorkSafeBC OH&S Regulation, Parts 5, 8 and 9
- 6.2 BC Hydro OSH Standards 3O1 (WHMIS and Hazardous Materials), 3O3 (Confined Spaces), 3O10 (Selection and Use of Solvents) and 3O13 (Respiratory Protection)
- 6.3 BC Hydro SF<sub>6</sub>, Workplace Label, Form #1OO86 and #1OO86–1
- 6.4 Practical Guide to SF<sub>6</sub> Handling Practices, EPRI, November 1999.

**Appendix 1**  
 **$SF_6$ -Related Work Risk Assessment**





## Appendix 2

### Guidelines for Preparing Emergency Evacuation and Re-Entry Procedures for Indoor SF<sub>6</sub> Installations

#### BUILDING EVACUATION

##### Situations Requiring Evacuation

If any of the following situations occur, personnel must immediately evacuate the building via the nearest exit and, where applicable, sound the general building evacuation alarm:

- The audible SF<sub>6</sub> detection alarm sounds (where applicable);
- A pungent odour (like rotten eggs or a burning battery) is detectable;
- A burning sensation on the skin or difficulty in breathing is experienced; **or**
- A fault inside the SF<sub>6</sub> equipment results in the release of SF<sub>6</sub> decomposition products.

**Note:** If the release is in conjunction with a fire, follow the local **Fire Emergency Plan**.

##### Assembly, Head Count and Access Control

- Following exit from the building, all personnel must assemble at a pre-determined location, away from building exhaust points, and a head count must be carried out to ensure that all personnel are accounted for.
- If required, re-entry to rescue personnel who are not accounted for must only be attempted by properly trained and equipped personnel – see **Building Re-Entry**.
- Following the evacuation and head count, secure all building entrances to prevent re-entry by personnel who may not be aware of the evacuation order.

##### Ventilation

- If the building ventilation fans are not running, they must be started as soon as possible to initiate dilution and exhaust of any SF<sub>6</sub> gas and decomposition products that may be present. If activation of the ventilation fans requires re-entry into potentially contaminated areas it must be done by properly trained and equipped personnel – see **Building Re-Entry**.
- If there is no mechanical ventilation in the building, or if it is not functioning, open all doors and windows to maximize natural ventilation. Again, do this only if it can be done from the outside without exposing unprotected personnel to hazardous decomposition products.

#### CAUTION

Ensure that the area(s) around the building's exhaust point(s) are evacuated and, if necessary, secured with barrier rope/tape to prevent access and exposure of workers and/or the public to SF<sub>6</sub> and its decomposition products.

## BUILDING RE-ENTRY

Always delay re-entry into the building as long as possible to maximize dilution and minimize risk to workers (see Monitoring section, below).

### Protective Equipment & Clothing

If required, re-entry into the building to rescue personnel who are unaccounted for, to turn on ventilation system(s) and/or to determine the cause/extent of the SF<sub>6</sub> equipment problem must only be done by **trained workers wearing SCBA** (self-contained breathing apparatus). A minimum of four SCBA-equipped workers – two who will enter and two standby workers – must be on site before re-entry can proceed.

If the cause of the evacuation is known, or suspected, to be an internal fault that has resulted in pressure relief or enclosure burn-through, then:

- The personnel involved in re-entry must also wear disposable coveralls, gloves (neoprene or nitrile) and rubber boots; and
- Personal decontamination may be required. Immediately contact OSH Specialist for assistance.

### Communication

Personnel who are re-entering the building **must be able to communicate with outside standby workers** and must have pre-established contact intervals (e.g. report every 5 minutes). The standby workers must be fully trained/equipped and prepared to carry out an investigation and/or rescue in the event that contact cannot be made with the workers inside the building.

### Initial Entry & Investigation

The duration of the initial entry into an evacuated SF<sub>6</sub> building must be minimized. Personnel must leave the building as soon as the cause of the evacuation has been determined and, if applicable, the building ventilation system has been turned on. Initial equipment investigations should be done using “hands off inspection” to minimize the risk of skin contact with any potentially hazardous solid decomposition products.

If it is determined that a gas leak has occurred, then subsequent re-entry into the building must be delayed as long as possible to maximize dilution and minimize risk to workers.

### WARNING

If a major burn-through or pressure relief operation has occurred, solid and gaseous SF<sub>6</sub> decomposition products ejected into the ambient air will remain at high concentrations for several hours after their release.

### Monitoring

If the cause of the evacuation was a SF<sub>6</sub> release, monitoring must be carried out to confirm that the SF<sub>6</sub> and gaseous decomposition product's concentrations have been reduced to safe levels by ventilation before restrictions on building access can be lifted and, if applicable, clean up can proceed.

Monitoring must be done by **trained personnel wearing SCBA and appropriate protective clothing** (see Protective Equipment & Clothing section, above). Whenever possible, re-entry into the building to carry out monitoring should be delayed until ventilation has reduced SF<sub>6</sub> levels at building exhaust points to, or below, the criteria in the table provided below. Monitoring must be thorough with particular emphasis on low-lying areas where SF<sub>6</sub> may accumulate.

## WARNING

$SF_6$  levels measured at building exhaust points are not necessarily representative of levels that will be encountered inside the building. Much higher levels will likely be present in low-lying and/or poorly ventilated areas inside the building.

### Monitoring Method & Criteria

There is currently no practical and accurate method for directly measuring the concentrations of hazardous decomposition products in air, and there is no single decomposition product that can reliably be used as an indicator of exposure risk. An alternative method for monitoring the work environment is to use the  $SF_6$  concentration as an indicator of the risk of exposure to decomposition products and measure the  $SF_6$  in the air using a battery-powered, portable detector capable of sensing  $SF_6$  down to 10 parts per million (ppm).

Before permitting general/unprotected re-entry into areas affected by a  $SF_6$  release, the following criteria must be met (Note: unprotected re-entry must only be permitted to areas that are not contaminated with solid decomposition products). After re-entry, continue ventilating until  $SF_6$  levels throughout the building are non-detectable (<10 ppm).

Evacuation Cause	Re-Entry Criteria ( $SF_6$ Concentration)
New $SF_6$ Leak	< 500 ppm
Used $SF_6$ Leak	< 100 ppm
Fault	Non-Detectable (< 10 ppm)

### EQUIPMENT & BUILDING CLEAN UP

After  $SF_6$  (and gaseous decomposition products) concentrations are at a safe level throughout the building, properly trained and equipped clean-up personnel can access the building and equipment.

Clean up of equipment and other areas that are contaminated with solid  $SF_6$  decomposition products requires special equipment, written work procedures and training. Contact OSH Specialist for assistance.

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# **OSH Standard 306**

## **Asbestos Management**

# OSH Standard 3O6

## Asbestos Management



### 1. Purpose

- 1.1 To establish and communicate the safety and health requirements for management of asbestos-containing material (ACM) at BC Hydro worksites.

### 2. Scope

- 2.1 This standard shall apply to all BC Hydro work, either conducted and supervised by BC Hydro employees or assigned to contractors.
- 2.2 This standard shall apply to all properties owned by BC Hydro.

### 3. Requirements

- 3.1 BC Hydro shall reduce exposure of workers to airborne asbestos fibres to exposure levels acceptable to WorkSafeBC. This includes:
  - 3.1.1 Reducing exposure at least to the airborne exposure limits as defined in regulation.
  - 3.1.2 Further minimizing exposure to levels as low as reasonably achievable (ALARA).
  - 3.1.3 Substituting asbestos materials with less hazardous materials wherever this is practicable, and where it is not able to be done ensure that documented reasons are available to workers and the Joint Health and Safety Committee.
- 3.2 The Senior Vice-President of Safety, Security and Emergency Preparedness shall oversee the BC Hydro Asbestos Management Program as the program administrator. For information on this program, go to the Asbestos webpage on the HydroWeb. Responsibility is delegated for development and support of the Program, which shall include:
  - 3.2.1 A coordinated inventory of ACM for all BC Hydro work places, equipment and other assets where asbestos may be present.
  - 3.2.2 Processes and procedures for inventory, inspection, risk control and training, and for monitoring, evaluating and reporting on compliance across BC Hydro.
  - 3.2.3 Clearly assigned duties outlining the required actions of BC Hydro personnel and departments (e.g. asset owners, procurement, operations management, safety).

Note: A Functional Lead Model has been approved to be developed, and once finalized the standard and program will be updated to reflect this as appropriate.

- 3.3 Executive Vice-Presidents shall ensure implementation of the BC Hydro Asbestos Management Program.
- 3.4 BC Hydro Managers assigning work that involves demolition, renovation, maintenance, or construction of buildings, equipment or structures at BC Hydro or non-BC Hydro worksites shall confirm the presence or absence of ACM in the workplace.
  - 3.4.1 For worksites with confirmed presence of ACM, BC Hydro Managers shall document in their Annual Safety Plan all required inspection, control and training requirements as defined by the BC Hydro Asbestos Management Program.

- 3.5 For work assigned to a contractor that involves demolition, renovation, maintenance, or construction of buildings, equipment or structures, the BC Hydro Contract Representative shall confirm the presence or absence of ACM and provide this information to the contractor at the beginning of the job planning process.
  - 3.5.1 For worksites with confirmed presence of ACM, the BC Hydro Contract Representative shall ensure the contractor has included all required elements of an Asbestos Management Program in their Safety Plan.
- 3.6 Any BC Hydro Manager receiving a WorkSafeBC inspection report regarding asbestos materials shall promptly forward the results of the inspection to the Senior Vice-President of Safety, Security and Emergency Preparedness.
- 3.7 The Senior Vice-President of Safety, Security and Emergency Preparedness shall oversee audits of the Asbestos Management Program, and shall report on compliance to BC Hydro Executive Management and the Board of Directors according to the schedule set out in the audit plan.

#### 4. Roles and Responsibilities

- 4.1 Managers, Foremen/women, Sub-Foremen/women, and Crew Leaders are responsible for:

- 4.1.1 Ensuring that workers and contractors are qualified and comply with the requirements of this Standard, and the BC Hydro Asbestos Management Program.
  - 4.1.2 Reporting and investigating incidents and non-conformances.

- 4.2 Workers who carry out work at locations where ACM is present are responsible for:

- 4.2.1 Participating in the instruction and training provided.
  - 4.2.2 Following operational work procedures approved for the facility.
  - 4.2.3 Stopping work immediately if they encounter suspected asbestos-containing material, and reporting any problems or concerns to their work/crew leader or manager.

#### 5. Regulations and Related Documents

- 5.1 WorkSafeBC Occupational Health and Safety Regulation (OHSR):

- 5.1.1 Part 5 – Sections 5.54 (Exposure Control Plan), 5.70 (Ventilation – Discharged Air), 5.82 (Personal Hygiene) and Table 5–4 (Exposure Limits)
  - 5.1.2 Part 6 – Sections 6.1 to 6.32 (Asbestos)
  - 5.1.3 Part 12 – Section 12.98 (Risk Assessment – Blasting & Pressure Washing)
  - 5.1.4 Part 20 –Section 20.2 (Notice of Project)
  - 5.1.5 Part 20 – Section 20.112 (Hazardous Materials)
- 5.2 WorkSafeBC Guidelines Part 6 – Asbestos
- 5.3 WorkSafeBC Publication – Safe Work Practices for Handling Asbestos (BK27)

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## 6. Information Controls

### 6.1 Revision History

Date	Version	Comments
March 23, 2016	V3-1	<p>The new OSH Standard format was adopted.</p> <p>References to the Chief Safety Officer were changed to the Senior VP of Safety, Security and Emergency Preparedness.</p> <p>A notation was made to reflect a Functional Lead Model for assigning sustainment accountabilities which was approved at the Safety Accountability Meeting on March 21, 2016. Once finalized, the standard and program will be updated to reflect this and any other related changes as appropriate.</p>
March 28, 2012	R3	This standard has been completely revised to reflect WorkSafeBC Occupational Health & Safety Regulation requirements and the creation of a BC Hydro Asbestos Management Program.

# **OSH Standard 307**

## **Drinking Water**

# OSH Standard 307

## Drinking Water

### 1. Scope

1.1 This standard covers regulation and safety aspects of drinking water in BC Hydro facilities.

### 2. Purpose

2.1 The purpose of this standard is to ensure that safe drinking water is provided at all BC Hydro facilities and that the requirements defined by legislation, regulation and government directives under the Drinking Water Protection Act are met.

### 3. Standard

#### 3.1 General

3.1.1 The domestic water provided to many homes and businesses in British Columbia is supplied by regional, municipal or private water suppliers. They typically carry out water treatment and testing to ensure that the quality of the water meets standards specified under the Drinking Water Protection Regulation or CCME Guidelines for Canadian Drinking Water Quality.

3.1.2 BC Hydro has a number of premises which are not supplied by municipalities or private water suppliers. In some cases, drinking water is taken from a well. In other cases, the domestic water is taken from a surface water source. Surface water means water which is open to the atmosphere and includes streams, lakes, rivers, creeks, springs, shallow wells and any other water source that is under the influence of surface water.

3.1.3 Surface water is vulnerable to microbiological contamination. Sewage from nearby communities and fecal material from wildlife are examples of potential sources of disease-producing organisms (e.g., Giardia, Cryptosporidium and E.coli) which may contaminate surface water supplies.

3.1.4 To minimize the potential health risk associated with surface domestic water sources, the Province of British Columbia enacted the Drinking Water Protection Act in 2001. Parts of the Act were brought into force by the Drinking Water Protection Regulation in 2003 with most recent amendment in 2005. Section 5 of this Regulation requires that water suppliers of small water supply systems (<500 people) must disinfect all water which is taken from a surface water source and used for human consumption or food preparation. Larger water systems (>500 people) must provide potable water for all domestic purposes including human sanitation.

3.1.5 All domestic water systems, except water supply systems that service only one single family residence are regulated by the Drinking Water Protection Act. Employers, like BC Hydro, who provide domestic water to their employees are considered to be “water suppliers” and must comply with the requirements of the Act and Regulation.

3.1.6 Wells that provide drinking water must also meet the standards of construction set by the Groundwater Protection Regulation.

3.2 All facilities with domestic water supply systems must have a valid operating permit issued by the Regional Health Authority. These permits will establish whether a facility requires water treatment, the level of treatment that will be required and other requirements such as emergency planning and sampling. An exemption for providing water treatment may apply to sites that do not use water for human consumption and/or food preparation. The applicability of the exemption will be determined during the permit application process.

- 3.3 Generation and Engineering Environmental Services (representing Distribution and Transmission facility interests) are developing a plan to bring facilities into compliance. The plan will involve working with Ministry of Health and the Regional Health Authorities to establish consistent approaches to water system requirements across the province.
- 3.4 To address interim health and safety risks while BC Hydro develops plans to ensure long term compliance with the requirements of the Drinking Water Protection Act, effective immediately:
- 3.4.1 Managers of facilities with water systems that are **permitted** and supply **potable** water will comply fully with all permit requirements (including sampling, operation and maintenance requirements, reporting and communication protocols).
- 3.4.2 Managers of facilities with water systems that are **non-permitted** must assume that the water supply is **not potable** and will:
- only use bottled drinking water for drinking and for food preparation or will boil water for 1 minute before using
  - ensure signage at all faucets indicating water is not potable
  - continue to use and maintain stand-alone (reservoir-type) emergency eyewash units
  - use boiled water to rinse dishes or use disposable dishes and cutlery
  - provide a disinfecting hand wash at washroom and lunchroom sinks
- Note: Showering may continue at non-permitted facilities. However, staff must be aware that the water may not be suitable for ingestion.
- 3.4.3 Non-permitted facilities may provide potable water only in circumstances where sampling, operation and maintenance requirements, reporting and communication protocols that are consistent with those in clause 3.4.1 are in place and indicate that the drinking water supply is potable.
- 3.5 If you have any questions regarding compliance with drinking water legislation, please contact BC Hydro Safety or BC Hydro Environmental Risk Management.

\*Note: these are interim measures to mitigate risk at facilities with non-potable water. Permanent solutions to provide potable water at all Generation facilities are currently under development. This procedure does not apply to facilities that are directly connected to municipal water systems

**4. Roles and Responsibilities**

This section is currently under development and will be finalized at a later date.

**5. Records and Documentation**

This section is currently under development and will be finalized at a later date.

**6. References**

6.1 Drinking Water Protection Act., 2001.

6.2 Drinking Water Protection Regulation, Order in Council No 879, December 8, 2005.

6.3 CCME Guidelines for Canadian Drinking Water Quality.

6.4 Groundwater Protection Regulation, 2004

6.5 BC Health Files, Water-borne Diseases, Ministry of Health

6.6 BC Health Files, How to Disinfect Drinking Water, Ministry of Health

6.7 BC Health Files, Giardiasis (“Beaver Fever”), Ministry of Health

6.8 BC Health Files, Cryptosporidiosis, Ministry of Health

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# **OSH Standard 308**

## **Video Display Terminal Workstations Ergonomics**

# OSH Standard 308

## Video Display Terminal Workstations Ergonomics

### 1. Scope

- 1.1 This standard describes the requirements and responsibilities for identifying, assessing and controlling VDT (Video Display Terminal) workstation ergonomic risk factors pursuant to Sections 4.46 to 4.53 of the Occupational Health and Safety Regulation.
- 1.2 For non-VDT ergonomic requirements, refer to OSH Standard 316 – Field Ergonomics.

### 2. Purpose

- 2.1 The purpose of this Standard is to eliminate or, if that is not practicable, to minimize the risk of musculoskeletal injury (MSI) and to assist managers with identifying, assessing and controlling VDT-related ergonomic risk factors. For assistance, managers should contact their Occupational Safety and Health (OSH) Specialist.

### 3. Requirements

#### 3.1 Workstation Design and Layout

- 3.1.1 VDT workstations must be designed and equipped so that they can be easily adjusted to meet the needs of the user(s), in accordance with the applicable ergonomic principles (see BC Hydro Form #3O411). This requirement applies to all workstations where a user spends an average of three hours or more per day doing VDT-related work (see also Section 3.5.2 of this standard).
- 3.1.2 For assistance with workstation adjustments, contact your OSH Specialist. If a formal ergonomic assessment is deemed appropriate between the employee and manager, an assessment can be requested by completing an Ergonomic Assessment Request Form and sending it to the e-mail address provided on the bottom of the form. The safety administration team will then assign the request to the appropriate OSH Specialist.
- 3.1.3 For assistance with purchasing, installing and repairing Steelcase chairs and workstations, and auxiliary ergonomic equipment (keyboard/mouse trays, monitor risers/stands), contact Space Planning Management.

#### 3.2 Lighting

- 3.2.1 To ensure good screen visibility and prevent eye strain, the ambient/background lighting level should be maintained in the 300–500 lux range and sources of glare that impair legibility (e.g. unshielded windows or overhead light fixtures) must be eliminated. Glare can be eliminated by moving the monitor or the source, or by shielding the source (e.g. blinds on windows, diffusers on fixtures).
- 3.2.2 If it is not possible to eliminate all sources of glare that interfere with legibility, then “glare screens” can be used. Glare screens may reduce glare at the cost of some clarity and should only be used when other control options aren’t practicable.
- 3.2.3 The low level background lighting must be supplemented with task lighting to facilitate reading of printed material. Steelcase workstations come equipped with adjustable task lighting (under overhead storage bins). Additional task lighting may be required to illuminate printed material on document holders, where used.

### 3.3 VDT Prescription Eyewear

- 3.3.1 Because reading a VDT screen is more visually demanding than reading paper, proper eye care and regular visual exams are very important. If a worker who is experiencing visual discomfort has not had his/her vision checked within the last two years, this should be done to ensure that the problem isn't caused by an outdated prescription.
- 3.3.2 Depending on the type of lenses/prescription they have, VDT users who wear prescription eyewear may require user-specific workstation adjustments or prescription eyewear designed for VDT use. The first step in evaluating the need for a special prescription for VDT use must be to carry out an assessment of the affected worker's workstation to ensure that all ergonomics-related potential causes of vision problems are identified and corrected (contact OSH Specialist for assistance).
- 3.3.3 In some situations it isn't possible to solve VDT-related vision problems through ergonomic interventions alone and a special prescription for VDT use is needed. In such cases the worker will qualify for a reimbursement if the lenses meet the criteria outlined in Appendix 1 of this standard – VDT Prescription Eyewear Reimbursement Criteria.

### 3.4 Office Environment

- 3.4.1 For work requiring a high level of concentration, a maximum background noise level of 55 dBA is recommended. Whenever possible, potentially distracting noise sources such as printers, photocopiers and fax machines should be located in a separate room/area, away from occupied workstations.
- 3.4.2 Office heating and ventilation systems must be designed, constructed and operated in accordance with WorkSafeBC requirements (see Section 6 – References). If office air quality is a suspected problem, your OSH Specialist can assist with further investigation.
- 3.4.3 Office safety programs must include regular inspections to ensure that all safety and health issues are addressed. BC Hydro's Office Safety and Health Inspection Report (Form #8O496) is available to assist Managers and Safety Committees with identifying and evaluating office safety and health issues.

### 3.5 Education and Training

- 3.5.1 In order to reduce the risk of ergonomics-related stresses and injuries, VDT users must be aware of the potential problems associated with VDT use and must know how to make the required workstation adjustments.
- 3.5.2 All workers who spend an average of three hours or more per day doing VDT-related work must be given VDT Ergonomics education/training, which is offered via web-based training (SAFE-O7O).

#### 4. Roles and Responsibilities

- 4.1 Managers are responsible for implementing the requirements outlined in this Standard.
- 4.2 Workers are responsible for applying the information provided in training sessions to their work environment and reporting ergonomic problems and concerns to their work leaders or managers.
- 4.3 Safety Committees are responsible for assisting with implementing and monitoring VDT-related ergonomic activities.

#### 5. Records and Documentation

- 5.1 Records must be kept of activities relating to VDT ergonomics including:

- VDT workstations ergonomics assessments and recommended improvements (controls); and
- Worker education and training.

#### 6. References

- 6.1 WorkSafeBC Occupational Health & Safety Regulation, Sections 4.46 to 4.53 (Ergonomics) and 4.70 to 4.82 (Indoor Air Quality and Environmental Tobacco Smoke).
- 6.2 BC Hydro Form #3O411: VDT Workstations – Ergonomic Adjustments.
- 6.3 BC Hydro Form #8O496: Office Safety and Health Inspection Report.
- 6.4 BC Hydro Ergonomics Webpage

#### 7. Glossary

- 7.1 Ergonomics—An applied science that seeks to fit the job to the worker by taking the worker's capabilities and limitation into account when assessing and designing jobs, workstations and tools. The goal of ergonomics is to prevent adverse health effects by creating an optimal match between the worker's capabilities and limitations and the demands of the job.
- 7.2 Musculoskeletal Injury (MSI) – An injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels or related soft tissue including a sprain, strain and inflammation, that may be caused or aggravated by work.

## Appendix 1

### VDT Prescription Eyewear Reimbursement Criteria

In some cases it isn't possible to solve VDT-related vision problems through ergonomic interventions alone (See Section 3.3 of this standard). In such cases a special eyewear prescription for VDT use is needed and the worker may claim a reimbursement. For more information contact Human Resources.

In order to qualify for reimbursement the worker must already have non-VDT prescription lenses and the new lenses must be specifically designed for VDT use. VDT-specific prescription lenses may be suitable for purposes other than VDT viewing, but are not suitable for all purposes (i.e. can't be worn as an only pair). Examples include the following:

- Task-specific, single-vision lenses corrected for the eye-to-screen viewing distance. The problem with this option is that the user will have to switch to his/her regular glasses when doing non-VDT work, which can be a nuisance unless s/he spends most or all of the workday doing VDT work.
- Customized bifocals with the bottom portion of the lens corrected for near vision (i.e. reading) and the top part corrected for the VDT screen distance. Again, the user may need to switch to his/her regular glasses for distance viewing but, if his/her tasks are primarily a combination of VDT use and close work (i.e. reading, writing), then the VDT bifocal is a good option.
- Trifocals with distance viewing in the top part of the lens, VDT viewing in the middle (widest), and near vision at the bottom. VDT trifocals will allow the user to see the screen and still look up at distant objects, or down at reading material, without switching glasses.
- Progressive Addition Lenses (PALS) that are designed for VDT use. Unlike regular PALS, these lenses have a wider midrange to allow increased flexibility in head positioning and improved comfort during VDT use. These lenses are suitable for all tasks, including walking around, but are not suitable for driving (i.e. can't be worn as an only pair). The main disadvantage of this option is that it may be difficult for some people to get used to progressive lenses.

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# **OSH Standard 309**

## **Hearing Conversation**

# OSH Standard 3O9

## Hearing Conservation

### 1. Scope

1.1 Hundreds of BC Hydro workers are exposed to hazardous noise levels that, over time, can cause Noise-Induced Hearing Loss (NIHL). This standard outlines the requirements for the implementation and maintenance of an effective Hearing Conservation Program (HCP). The following program elements are covered:

- Roles and Responsibilities (Section 4)
- Identification of Hazardous Noise Sources (Section 3.1)
- Engineering and Administrative Controls (Section 3.2)
- Hearing Protection (Section 3.3)
- Audiometric (Hearing) Testing (Section 3.5)
- Education and Training (Section 3.6)
- Program Review (Section 3.7)
- Records and Documentation (Section 5)

### 2. Purpose

2.1 The purpose of this standard is to assist managers with meeting the requirements of Sections 7.1 through 7.23 of the WorkSafeBC Occupational Health and Safety Regulation, and to reduce the incidence of Noise-Induced Hearing Loss (NIHL) in BC Hydro. For assistance, managers should contact their Occupational Safety and Health (OSH) Specialist.

### 3. Requirements

#### 3.1 Identification of Hazardous Noise Sources

- 3.1.1 Noise measurements must be carried out to identify all hazardous (>85 dBA) noise sources that are present in the work environment of noise-exposed workers (see Sections 3.4 and 7). All noisy areas, equipment and tools (stationary and portable) must be included in the survey.
- 3.1.2 All noise sources that exceed 85 dBA must be identified as hearing protection areas/equipment/tools by posting signs or applying labels instructing workers to wear hearing protection.
- 3.1.3 Noise measurements must be carried out by qualified personnel if information identifies a worker may be exposed to a level exceeding 82 dBA Lex, and must be updated when there are changes in equipment, tools or worker activities that affect noise exposures. Contact your OSH Specialist for assistance.

#### 3.2 Engineering and Administrative Noise Controls

- 3.2.1 Whenever practicable, engineering and/or administrative controls must be implemented to reduce or eliminate noise exposures. Examples of engineering controls include mufflers, acoustical barriers and vibration mounts. Examples of administrative controls include operating noisy equipment at times when fewer workers are exposed, rotating jobs in noisy areas and ensuring that areas used for work breaks are quiet.

3.2.2 When purchasing new tools and equipment, a “buy quiet” purchasing policy must be applied whenever practicable to minimize noise exposures and eliminate the need for future noise control measures.

### 3.3 Hearing Protection

3.3.1 If it's not possible to eliminate hazardous noise exposures through engineering or administrative controls, then workers must be provided with and wear hearing protection (muffs or plugs) at all times when noise levels exceed 85 dBA. This requirement also applies to employees whose cumulative/annual exposures are not high enough to require their inclusion in the hearing testing program, but who occasionally visit work sites when noise levels are >85 dBA.

3.3.2 Non-disposable hearing protectors must be maintained in accordance with the manufacturer's instructions and must be repaired or replaced when, due to wear or damage, they no longer provide the protection that they were designed for.

### 3.4 Audiometric (Hearing) Testing

3.4.1 The purpose of Audiometric (hearing) Testing is to identify workers who are showing early signs of NIHL so that controls can be implemented to prevent further hearing loss and future hearing loss claims.

3.4.2 Within BC Hydro, all noise-exposed workers (see Glossary) have been identified and included in the testing program. Measurement of worker noise exposure (dose/duration calculations or dosimetry) must be carried out prior to removing workers in a given location or job classification from the testing program. Contact OSH Specialist for assistance.

3.4.3 All noise-exposed workers must be tested each calendar year. New workers must be tested within six months of the start of their employment in a noise-exposed job classification. Annual testing must be completed before the end of September to ensure that the results are included in WorkSafeBC's annual testing reports.

3.4.4 After the initial (baseline) audiogram, each worker's subsequent annual (periodic) audiograms are checked for Abnormal Changes (medical problems) and Early Warning Changes (early sign of noise induced hearing loss). The percentage of workers showing an Early Warning Change (EWC) is used by WorkSafeBC and BC Hydro as an indicator of the effectiveness of HCPs.

3.4.5 Scheduling of hearing tests is the responsibility of managers who have noise-exposed workers. The summarized test results (audiogram categories) must be reviewed by managers and used to identify and counsel workers showing EWCs. Counselling of workers with EWCs must include a review of the following topics:

- The meaning of the test results.
- Hearing protector use, on and off the job.
- Designated hearing protection areas, tools and equipment at the worker's work location(s).

3.4.6 Employees who are not noise-exposed must not be included in the testing program. If a local manager chooses to test non-exposed workers, then the testing contractor must be instructed not to send the applicable audiograms to WorkSafeBC.

### 3.5 Education and Training

- 3.5.1 All workers who are included in the hearing testing program must be given hearing conservation education as part of the local indoctrination and refresher education must be provided as required, based on the results of the program reviews (section 3.6).
- 3.5.2 Hearing conservation education can be arranged through your OSH Specialist and must include the following topics:
- Effects of noise on hearing.
  - Results of noise exposure measurements, including designated hearing protection areas, tools and equipment.
  - Proper selection, use, fitting, and care of hearing protectors.
  - Purpose of the hearing testing program and the meaning of the results.
  - Importance of off the job hearing protection.
- 3.5.3 If local noise controls include the use of engineering or administrative controls to minimize exposures, workers must be given training in the applicable controls.

### 3.6 Program Review

- 3.6.1 To ensure its effectiveness, the HCP must be reviewed annually, in consultation with the local safety committee/representative. The review must address:
- The need for further noise measurement.
  - The education and training of workers regarding noise exposure.
  - The adequacy of noise control measures.
  - The selection and worker use of hearing protection.
  - Audiometric testing results (%EWC and hearing loss claims).

## 4. Responsibilities

- 4.1 Managers of noise-exposed workers are responsible for implementing and maintaining a HCP that meets the requirements of this standard.
- 4.2 Workers are responsible for wearing hearing protection at all times when noise levels exceed 85 dBA, and for using and maintaining hearing protectors in accordance with the instructions provided

## 5. Records and Documentation

- 5.1 Records of HCP-related activities must be kept on file, including:
- Up-to-date noise measurement results.
  - List of noise-exposed workers and date of each worker's most recent annual hearing test.
  - Hearing test results (audiograms), which must be kept on file for as long as the worker is employed by BC Hydro.
  - Education and training.

## 6. References

6.1 WorkSafeBC Occupational Health and Safety Regulation, Sections 7.1 to 7.23

6.2 WorkSafeBC Booklets :

- Hear for Good – Preventing Exposure at Work (BK9);
- Sound Advice – A Guide to Hearing Conservation Programs (BK12); and
- Testing Your Hearing – How and Why (BK18)

6.3 Hearing Conservation Webpage

## 7. Glossary

7.1 Noise-Induced Hearing Loss (NIHL) – Hearing loss due to irreversible damage to the hair cells in the cochlea (inner ear) caused by overexposure to noise, typically over time (i.e. damage is cumulative).

7.2 dBA – Decibel of noise, measured with an A-weighted filter (Note: WorkSafeBC uses a 3 dB exchange rate – i.e. when the sound energy is doubled, the decibel level increases by 3).

7.3 Noise-Exposed Worker – Worker whose total (cumulative) daily or annual exposure to noise in dBA exceeds the equivalent of an average, daily exposure of 85 dBA for 8 hours.

### Revision Rationale:

OSH Standard 3O9 R1 March 12, 2012: Minor edits to Section 5.1 and Appendix 1 (#2 and #4) changing service provider ABSU Health Services to BC Hydro, Health and Recovery Services.

OSH Standard 3O9 R1 March 12, 2012 (R1-1 Updated April 11, 2014): Edit to Section 3.4.5, 3.4.6 and removal of Appendix 1, both sections have been replaced by current content on the Audiometric Testing Toolkit webpage.

## Table of Contents

# **OSH Standard 310**

## **Selection and Use of Solvents**

# OSH Standard 310

## Selection And Use Of Solvents



### 1. Purpose

The purpose of this standard is to provide guidelines for the evaluation, selection and safe use/handling of solvents. For assistance with implementing this standard, contact your Occupational Safety and Health (OSH) Specialist..

### 2. Scope

2.1 This standard covers the safety requirements associated with selection and use of solvents.

2.2 General hazardous material requirements can be found in OSH Standard 301: WHMIS and Hazardous Materials, and Parts 5 and 6 of the WorkSafeBC OHS Regulations.

### 2.3 Background Information

2.3.1 A solvent is any liquid, which is used to dissolve other substances. Within BC Hydro, solvents are primarily used for removing dirt, grease and oil from tools, parts and equipment; and for thinning paint.

2.3.2 The nature and extent of the hazards associated with the use of solvents depend on their physical, chemical and toxicological properties. Aside from the fire and explosion risks associated with some solvents, harmful effects result mainly from skin contact or the inhalation of vapour or mist. The harmful effects of exposure to solvents are extremely varied and, depending on the solvent involved, may include acute and chronic effects such as irritation of the respiratory system, eyes or skin; dermatitis; narcosis; damage to the nervous system, kidneys or liver; cardiac effects and cancer

### 3. Standard

#### 3.1 General

3.1.1 This standard is based on the requirements outlined in the relevant sections of Parts 3, 5 and 8 of the WorkSafeBC OHS Regulation.

#### 3.2 Solvent Selection

3.2.1 All solvents must be screened by the BC Hydro purchaser before they are purchased. The following categories of solvents must not be purchased or used unless a thorough review finds a suitable less hazardous solvent is not available (refer to the Safety Data Sheet for the product):

- Solvents in which any ingredient present at greater than 5% has an exposure limit (or T.L.V./P.E.L.) of less than 100 parts per million (ppm).
- Solvents that are flammable (flash point below 100°F [38°C]) e.g. isopropanol, ethanol. If a suitable replacement can't be found, the special conditions outlined in sections 5.27–5.38 of the WorkSafeBC OHS Regulation must be met.
- Solvents with any ingredients which are Designated or “ALARA (As Low as Reasonably Achievable)” substances as defined in section 5.57 of the WorkSafeBC OHS Regulation:
  - a) ACGIH A1 or A2, or IARC 1, 2A or 2B carcinogen;
  - b) ACGIH reproductive toxin;
  - c) ACGIH sensitizer;

- d) ACGIH L endnote.
- Solvents for which complete hazard information is not available (VWHMIS-compliant, where applicable).
- 3.2.2 Solvents that are listed on the **BC Hydro Banned Substance List** must not be used. If you discover any of these substances in your workplace, arrange for their disposal.
- 3.2.3 An inventory must be kept locally of the solvents in use at a workplace and information about the hazards must be readily available to workers. (e.g. Safety Data Sheets, labels; see OSH Standard 3O1).
- 3.2.4 General Selection Guidance
- For general cleaning of oil, dirt and grease, always select the safest solvent that will do the job. Apply the following hierarchy, and step to a lower option only when the requirement for increased cleaning efficiency is balanced with the cost of more stringent exposure control precautions:
1. Water or a mild water-based cleaner.
  2. Natural terpene (e.g. d-limonene).
  3. Terpene and aliphatic hydrocarbon blend
  4. Aliphatic hydrocarbon.
- Appendix 1 of this standard provides names and suppliers of the classes of solvent recommended for general cleaning.
- 3.2.5 Some cleaning jobs in BC Hydro require the use of more hazardous solvents in order to meet specifications related to performance (e.g. high solvency; non-conductivity; low residue; compatibility with materials; fast evaporation). Examples of these special cleaning applications include generator stator bars and rotors, SF6 substation components, and cables.

### 3.3 Solvent Use

#### 3.3.1 General

No single control measure guarantees safe use of all solvents. Whenever possible, over-exposures must be eliminated or minimized by engineering or administrative controls. Personal protective equipment must be used as it is designed in order to be effective, and should only be used if other types of controls are not practicable or do not reduce exposures to less than 50% of the Exposure Limit (EL) (as outlined by the principles in OSH Standard 11O: Hazard Identification & Risk Assessment, and OSH Standard 6O1: Personal Protective Equipment).

#### 3.3.2 Exposure Control Plan

As per section 5.54 of the WorkSafeBC OHSR, an exposure control plan, including written work procedures and worker training, is required when:

- Potential exposures during solvent work will exceed 50% of the exposure limit, or
- The solvent is classified as a Designated or “ALARA” substance as per section 5.57 of the WorkSafeBC OHS Regulation.

The work procedures must incorporate all the applicable controls outlined in sections 3.3.4 and 3.3.5 of this standard and must also address spill response and clean-up (see OSH Standard 3O2 – Safety During Spill Response).

### 3.3.3 Use of Flammable Solvents

If a suitable non-flammable substitute is not available, a flammable liquid must not be used as a manual solvent unless the requirements of section 5.32 of the WorkSafeBC OHS Regulation are met. The section includes but is not limited to:

- Written work procedures submitted to WorkSafeBC.
- Minimizing the quantity of the liquid used.
- Worker instruction and training.

### 3.3.4 Engineering and Administrative Controls

The following engineering and administrative controls must be considered and, if practicable and applicable, implemented to prevent over-exposure during work with solvents.

- Substitute with a less hazardous solvent.
- Work outdoors.
- Use an enclosed system for cleaning to minimize inhalation hazard.
- Use mechanical assists (e.g. wire baskets, tongs) to minimize skin contact.
- When working indoors, use local exhaust ventilation or maximize general dilution ventilation (natural or mechanical).
- Control sources of ignition in accordance with the applicable electrical and fire codes.
- Reduce or limit duration of exposures by controlling access to the work area or by scheduling solvent work when there are no workers present in nearby areas.

### 3.3.5 Work Practices and Personal Protective Equipment

When applicable, the following safety precautions must be included in the solvent work practices and procedures:

#### General:

- Engineering and administrative controls listed in the previous section.
- Hazard information from the Safety Data Sheet for the solvent (accessed through BC Hydro's Safety Data Sheet Database).

#### Storage:

- Use as little solvent as possible and keep containers closed when not in use.
- Minimize the volume of solvents in the work area to the amount needed for the work in progress (normally in one shift) (as per WorkSafeBC OHSR 5.23).
- Minimize the volume of solvents stored on site and store all solvents in approved storage cabinets or rooms separate from the work area, in accordance with the applicable fire and electric codes.
- Ensure that metal or bulk containers of flammable solvents are bonded or grounded during dispensing.
- If solvents are decanted from a supplier's container into other containers, apply Workplace Labels, (see OSH Standard 301 – WHMIS and Hazardous Materials).

**Skin and Eye Protection:**

- Avoid hand contact by using mechanical assists or by wearing impervious gloves. Refer to Safety Data Sheet for recommended type of gloves.
- Avoid skin contact and contamination of personal clothing or footwear by wearing appropriate protective clothing when there is a chance of solvent contact with skin or clothing (e.g. chemical-resistant apron or a disposable coverall and rubber boots or foot covers).
- Avoid eye contact by wearing chemical goggles and face-shield when there is a chance of solvent splashing.

**Respiratory Protection:**

- Avoid solvent over-exposure via inhalation of vapours or mists by wearing appropriate respiratory protection when solvent concentrations exceed 50% of the applicable exposure limit. For assistance with monitoring exposure, contact your local OSH Specialist.

**Spills:**

- Clean up all solvent spills promptly.
- Store waste rags and other solvent-contaminated waste in sealed containers and dispose of them in accordance with applicable environmental and Transportation of Dangerous Goods regulations. For assistance with disposal, contact Environmental Field Services personnel or Waste Management Personnel

**4. Roles and Responsibilities****4.1 Managers**

- 4.1.1 Ensure all applicable requirements are met and that solvents are selected and used in a manner which does not result in the over-exposure of workers.

**4.2 Workers**

- 4.2.1 Ensure that the selection, use and storage of solvents are carried out in accordance with instructions and procedures that are provided.
- 4.2.2 Remove stock of solvents no longer in use.

**5. References**

- 5.1 WorkSafeBC, Occupational Health and Safety Regulations, Parts 3, 5 and 8
- 5.2 BC Hydro OSH Standard 3O1: WHMIS and Hazardous Materials
- 5.3 BC Hydro OSH Standard 3O2: Safety During Spill Response
- 5.4 BC Hydro OSH Standard 11O: Hazard Identification & Risk Assessment
- 5.5 BC Hydro OSH Standard 6O1: Personal Protective Equipment

## 6. Information Controls

### 6.1 Revision History

Date	Version	Comments
January 8, 2016	V1-O	<p>Removed outdated reference to: Solvents in the Workplace Industrial Accident Prevention Association, Toronto, Ontario, 1987.</p> <p>This standard has received a general update to align with current organizational structure, WHMIS 2015 legislation, and WorkSafeBC Part 5 requirements.</p>

## Appendix 1

### Recommended Solvents for General Cleaning

(This list is not exhaustive. Other products with similar chemical compositions may be available and are acceptable. See Safety Data Sheet.)

#### Mild Water-Based Solvents

Mild household cleaners such as dishwashing detergents, Mr. Clean, Fantastik, etc.

#### Terpenes

Product	Ingredients	Supplier
d-Limonene	>99% d-Limonene	Univar Canada Ltd 604 273 1441 or  Fisher Scientific Ltd. 800 234 7437
Citrasafe	>99% d-Limonene	Inland Technology Inc. 800 552 3100

#### Aliphatic Hydrocarbon and Terpene Solvents

Product	Ingredients	Supplier
P.F. Degreaser	70–90% Aliphatic 10–30% Terpene	Winford Insulation 604 420 9609
Pensolv 805	70–90% Aliphatic 10–30% d-Limonene	West Penetone Inc. 780 454 3919
Action 316	60–90% Aliphatic 10–30% d-Limonene	Active Chemicals 800 663 6090
Citrex	60–90% Aliphatic 10–30% d-Limonene	Guardian Chemicals 800 661 6544

#### Aliphatic Hydrocarbon Solvents

Product	Ingredients	Supplier
Mineral Spirits	100% Aliphatic H.C.	Univar Canada Ltd 604 273 1441
T.P.C. Solvent	100% Aliphatic H.C.	West Penetone Inc. 780 454 3919
Magkleen 4	60–80% Heavy Hydrotreated Naphtha	Magnus Chemicals Ltd. 800 363 9929
Vanishing Oil	60–80% Heavy Hydrotreated Naphtha	Magnus Chemicals Ltd. 800 363 9929

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# **OSH Standard 311**

## **Mercury**

# OSH Standard 311

## Mercury



### 1. Scope

- 1.1 Workers who work with or near mercury-containing equipment are at risk of exposure to metallic mercury. Electrical equipment that may contain metallic mercury includes voltage regulators, switches, contacts, seals, rectifiers, transformers and lamps. Mercury may also be present in barometers, manometers, pressure gauges, hydrometers, thermometers, current meters, vacuum pumps and fire detection/suppression systems.
- 1.2 Metallic mercury (a.k.a. elemental or inorganic mercury) is a shiny, silver-white liquid at room temperature that can readily evaporate to form colourless, odourless mercury vapours. Mercury exposure can occur through inhalation of vapours, absorption through skin and/or ingestion.
- 1.3 Potential health effects resulting from exposure to hazardous mercury levels may include damage to the central nervous system (tremors, mood/personality changes) and body organs (kidney, liver and spleen).
- 1.4 Metallic mercury is regulated under Part 5 of the Occupational Health & Safety Regulation (OHSR) and it is assigned the following exposure limit and designations.
  - Exposure Limit: 0.025 mg/m<sup>3</sup> (8 hour Time-Weighted Average).
  - Skin: May be absorbed through intact skin to contribute to overall exposure.
  - R: Has adverse reproductive effects.

Note: Section 5.57(1)(b) of the OHSR requires that substances designated as having reproductive critical effects must be replaced or substituted, whenever practicable, with a less hazardous material. If that is not practicable, measures must be taken to keep exposures as low as is reasonably achievable (see Section 3.2 of this Standard).

- 1.5 Mercury is also a persistent, mobile and a bio-accumulative hazard in the environment. For more information about environmental requirements, contact your Regional Environmental Coordinator or go to the Environmental Best Management Practices website.

### 2. Purpose

- 2.1 The purpose of this Standard is to ensure that the hazards associated with mercury are identified, assessed and effectively controlled, and to assist managers with meeting the requirements of Part 5 of the OHSR. For assistance, managers should contact their Occupational Safety and Health (OSH) Specialist.

### 3. Requirements

#### 3.1 Inventory & Labelling

- 3.1.1 The mercury-containing equipment at each work site/location must be identified and an inventory must be developed and kept up to date.
- 3.1.2 All mercury-containing equipment must be labelled with a peel-and-stick, 4" x 4" Mercury workplace label (Form #80486) available from BC Hydro Stationery.



#### 3.2 Exposure Control

- 3.2.1 Whenever practicable, mercury exposures in the workplace must be eliminated via replacement or substitution of mercury-containing equipment. For assistance with carrying out exposure risk assessments and identifying control options, contact your OSH Specialist.
- 3.2.2 If it is not practicable to eliminate the risk of mercury exposure, an **Exposure Control Plan** must be developed and implemented to maintain workers' exposure as low as reasonably achievable below the exposure limit. The exposure control plan must meet the requirements of section 5.54 of the OHSR.
- 3.2.3 Work involving exposure to mercury must only be carried out by properly trained and equipped workers, in accordance with job-specific, written work procedures.

#### 3.3 Spill Response

- 3.3.1 Mercury spills involving more than 10 ml are considered large spills and present a significant exposure risk. Depending on spill conditions (e.g. temperature and location), even small mercury spills (less than 10 ml) can present a risk of exposure. The volume of mercury in electrical equipment ranges from a few millilitres (switches) to several hundred millilitres (large flow meters, fire systems), to several litres (mercury rectifiers at Arnott and VIT).
- 3.3.2 Locations with mercury-containing equipment must develop appropriate procedures for responding to mercury spills. For more information, refer to OSH Standard 302 – Safety During Spill Response.
- 3.3.3 Clean up of mercury spills must only be carried out by properly trained and equipped workers, in accordance with job-specific, written work procedures.

#### 3.4 Medical Monitoring

- 3.4.1 Mercury-in-urine monitoring is required for workers who are routinely exposed to airborne mercury levels exceeding 50% of the exposure limit and/or perform short-term, high-risk work that may result in an unacceptable mercury dose (e.g. spill responders). For more information, refer to OSH Standard 312 – Medical Monitoring.

### 3.5 Education & Training

- 3.5.1 Workers who work with or near mercury-containing equipment or instruments must be given Mercury Hazards Awareness and Avoidance education.
- 3.5.2 Workers who do work involving exposure to mercury must be given training in the applicable job-specific written work procedures.
- 3.5.3 For assistance with delivery of mercury-related education and training, contact your OSH Specialist.

## 4. Responsibilities

- 4.1 Managers are responsible for implementing the requirements outlined in this Standard, in consultation with their OH&S Committee or Key Safety Person (KSP).
- 4.2 Workers are responsible for carrying out mercury-related work in accordance with the instruction and training provided and for immediately reporting mercury spills to their manager or supervisor.

## 5. Records & Documentation

- 5.1 Mercury-related activities must be documented and kept on file, including:
  - Inventory of mercury-containing equipment;
  - Education and training; and
  - If required, Mercury Exposure Control Plan and all related documentation, including risk assessments, exposure monitoring, medical monitoring and written work procedures.

## 6. References

- 6.1 WorkSafeBC Occupational Health & Safety Regulation, Part 5
- 6.2 OSH Standard 312 – Medical Monitoring
- 6.3 OSH Standard 3O2 – Safety During Spill Response
- 6.4 BC Hydro Mercury Workplace Label, Form #8O486

## Table of Contents

# **OSH Standard 312**

## **Medical Monitoring**

# OSH Standard 312

## Medical Monitoring



### 1. Scope

1.1 This standard covers medical monitoring of workers.

### 2. Purpose

2.1 This standard provides an overview of medical monitoring of workers.

### 3. Standard

#### 3.1 General

3.1.1 Medical monitoring is the periodic testing of selected workers to detect subtle physiological changes related to workplace exposures. Workers may be tested to detect the concentration of workplace contaminants (or their by-products) in body fluids (blood, urine) or to measure hearing acuity, lung function or other parameters. The results of these tests are compared with values expected for healthy, non-exposed individuals.

3.1.2 The purpose of medical monitoring is to confirm that the required workplace exposure controls are effective and that workers are not receiving unacceptable chemical (e.g. mercury, lead) or physical (e.g. noise) exposures.

3.1.3 Not all workplace exposures result in physiological changes that can be detected through medical monitoring. Medical monitoring is only used where:

- Workplace exposure levels are high enough to require routine use of personal protective equipment such as respirators or hearing protectors (i.e. exposures exceed the WorkSafeBC “action level” or 50% of the applicable Exposure Limit – EL);
- Exposure to chemical or physical contaminants in the workplace results in physiological changes that can be effectively and safely detected; and
- Detection of physiological changes can result in action to lower current workplace exposures and/or diagnose occupational disease earlier thereby benefiting exposed workers.

#### 3.2 Exposure Assessment and Control

3.2.1 Workers who are exposed to chemical or physical hazards exceeding the applicable action level (i.e. 50% of the EL or, for noise, an 8-hour average of 85 dBA) must be identified and, whenever practicable, exposures must be eliminated or minimized by implementing workplace engineering and/or administrative controls.

3.2.2 If engineering/administrative controls are not practicable, or do not reduce exposures to below the action level, personal protection controls (e.g. respirators or hearing protectors) must be used and a medical monitoring program must be implemented for the affected workers to ensure that those controls are effective.

### 3.3 Implementation of Medical Monitoring Programs

- 3.3.1 Medical Monitoring Program criteria, administration and follow-up requirements depend on the type of hazard and, where required, medical monitoring programs must be implemented in accordance with the directions provided in the following references.
- Audiometric (Hearing) Testing – see OSH Standard 3O9 Hearing Conservation.
  - Lung Function Testing (Asbestos) – see Appendix 1 of this Standard.
  - Lead Medical Monitoring – see Appendix 2 of this Standard.
  - Mercury Medical Monitoring – see Appendix 3 of this Standard.

## 4. Roles and Responsibilities

### 4.1 Managers

- 4.1.1 Implement medical monitoring programs, where required, in accordance with this Standard. For assistance contact your Occupational Safety and Health (OSH) Specialist.

### 4.2 Workers

- 4.2.1 Workers have a responsibility to participate in medical monitoring programs, where required. Workers have the right to refuse medical monitoring provided that they are informed of the medical significance of their refusal. Where work involving exposures to specific chemical or physical hazards is designated by the WorkSafeBC as requiring medical monitoring, workers who refuse medical monitoring can not perform such work.

## 5. References

- 5.1 WorkSafeBC, Occupational Health & Safety Regulation, Part 5 Chemical and Biological Substances
- 5.2 WorkSafeBC, Occupational Health & Safety Regulation, Part 6 Substance Specific Requirements
- 5.3 WorkSafeBC, Occupational Health & Safety Regulation, Part 7 Noise
- 5.4 WorkSafeBC, Occupational Medicine Section's Procedures/Guidelines
- 5.5 OSH Standards 3O6 – Asbestos
- 5.6 OSH Standards 3O9 – Hearing Conservation
- 5.7 OSH Standards 311 – Mercury
- 5.8 OSH Standards 314 – Lead Abatement

## Appendix 1

### Lung Function Testing

#### 1. Purpose

- Lung function testing is normally performed before identified exposed workers are added to the **Corporate Asbestos Exposure Registry**. The purpose of the test is to obtain baseline function data for the worker's medical file.
- For information about BC Hydro's asbestos-related standards and policies, refer to OSH Standard 3O6 Asbestos.

#### 2. Identifying Exposed Workers

- In the early 1980's surveys were conducted of workers who had worked in BC Hydro locations with significant asbestos exposure potential (e.g. Burrard Thermal Generating Station, Georgia Generating Station, etc.). This survey identified the original asbestos study group.
- Since the original survey, the few workers that have begun work involving routine exposure to asbestos above the action level (50% of the Exposure Limit) have been added to the program.
- With very few exceptions, BC Hydro workers no longer perform work with significant asbestos exposure potential. Qualified internal (CBU) or external asbestos contractors normally perform high and moderate risk asbestos work
- All workers who have been identified as having had significant potential asbestos exposures as a result of past or present work in BC Hydro are added to the Corporate Asbestos Exposure Registry.

#### 3. Testing

- Lung function testing measures the rate and volume of exhalation using a spirometer. Genetic factors, smoking and previous illness can cause lung function test results to vary widely in non-occupationally exposed individuals.
- Measured lung function parameters are compared with normally expected values and grouped into categories of normal, mild, moderate and severe impairment. Test results indicating moderate or severe (and, in some cases, mild) impairment are further evaluated.

#### 4. Follow Up

- Medical Follow Up – The testing contractor administers a brief questionnaire to all participants in the program. When indicated by the results, the individual is contacted by BC Hydro, Health Services and referred to their family physician for further assessment and diagnosis. The test results and questionnaire information are provided in confidence to the physician performing the follow-up examination.
- Work Environment Follow Up – Using lung function testing as an indicator of asbestos exposure is an unusual application of medical monitoring since it takes more than 10 years for exposures to produce detectable effects. No relevant workplace exposure investigation is usually possible when asbestos-related disease is diagnosed.

#### 5. Program Administration

- Baseline lung function testing for identified exposed workers can be arranged through BC Hydro, Health and Recovery Services.

## Appendix 2

### Lead Medical Monitoring

#### 1. Purpose

Workers significantly exposed to airborne lead dust or fumes are monitored for lead concentration in the blood to allow for:

- The detection of unacceptable internal doses of lead before the onset of the symptoms of lead poisoning;
- The removal of workers receiving unacceptable internal doses from further exposure while their lead body burden returns to normal; and
- Ongoing monitoring of the effectiveness of workplace exposure controls (refer to OSH Standard 314 Lead Abatement).

#### 2. Identifying Exposed Workers

Lead medical monitoring is indicated for:

- Workers routinely exposed to airborne lead levels exceeding 50% of the Exposure Limit (i.e. > 0.025 mg/m<sup>3</sup>); and
- Workers performing short-term, high-risk work which may result in an unacceptable lead dose (e.g. lead paint abatement project work).

#### 3. Testing

3.1 To arrange for testing for lead-exposed workers, contact your OSH Specialist.

3.2 The concentration of lead in the blood of the exposed worker is measured and the result is compared with the normally expected values for the non-occupationally exposed population. Lead exposures in BC Hydro fall into one of two categories.

- Category A: Exposure is the result of routine, ongoing work activities involving lead. Refer to the following Table for testing criteria and required follow-up actions.
- Category B: Exposure is due to seasonal or non-routine work activities involving lead (e.g. lead paint abatement project work). Blood testing must be carried out before the start of the project (within one month) and re-testing must be carried out near the end of the project (within one week after the exposures stop). If the duration of the project exceeds 2 months, then blood testing must also be carried out mid-way through the project.

### Test Criteria and Required Action – Lead in Blood

LEVEL (umol/L)	RE-TEST	ACTION REQUIRED
Less than 1.0	Category A: Annually Category B: See above	<b>NORMAL VALUES</b> No specific actions necessary.
1.0 – less than 1.75	Category A: Within 6 months. Category B: See above	<b>CAUTION</b> Minimize exposure by reviewing all sources and improving controls.
1.75 – less than 2.5	Category A: Within 3 months. Category B: See above	<b>ALERT</b> Minimize exposure by reviewing all sources and improving controls.
2.5 or above	Monthly until level is acceptable to a physician	<b>REMOVAL</b> Return worker to previous duties when: <ul style="list-style-type: none"> <li>• Blood lead level is acceptable to a physician; and</li> <li>• Exposure has been minimized through a review of all sources and improvement in controls.</li> </ul>

#### 4. Follow Up

- 4.1 Manager Follow Up – The test result is sent to the local manager and s/he is responsible for ensuring that the result is reviewed with worker. In the event that a test result is unacceptable, workplace exposure controls must be investigated and improved to ensure that health and safety standards are met (refer to OSH Standard 314 – Lead Abatement). Contact your OSH Specialist for assistance.
- 4.2 Medical Follow Up – A copy of the test result is sent to BC Hydro, Health and Recovery Services. Medical follow up including, if required, a treatment plan will be determined by the worker's personal physician in consultation with BC Hydro, Health and Recovery Services. The test result will be filed in the worker's confidential medical file at BC Hydro, Health and Recovery Services.

## Appendix 3

### Mercury Medical Monitoring

#### Purpose

Workers significantly exposed to airborne mercury vapor are monitored for mercury concentrations in urine to allow for:

- The detection of unacceptable internal doses of mercury before the onset of the symptoms of mercury poisoning;
- The removal of workers receiving unacceptable internal doses from further exposure while their mercury body burden returns to normal; and
- Ongoing monitoring of the effectiveness of workplace exposure controls (refer to OSH Standard 311 Mercury).

#### Identifying Exposed Workers

Mercury medical monitoring is indicated for:

- Workers routinely exposed to airborne lead levels exceeding 50% of the Exposure Limit (i.e. > 0.0125 mg/m<sup>3</sup>); and
- Workers performing short-term, high-risk work which may result in an unacceptable mercury dose (e.g. spill responders).

#### Testing

3.1 To arrange for testing of mercury-exposed workers, contact your OSH Specialist.

3.2 The concentration of mercury in the urine of the exposed worker is measured and the result is compared with the normally expected values for the non-occupationally exposed population. Mercury exposures in BC Hydro fall into one of two categories.

- Category A: Exposure is the result of routine, ongoing work activities involving mercury (e.g. mercury rectifier work crews at Arnott and VIT substations). Refer to the following Table for testing criteria and required follow-up actions.
- Category B: Exposure is due occasional or non-routine work activities involving mercury (e.g. mercury spill clean-up resulting from damaged mercury-filled equipment, such as regulators). Urine testing must be carried out as soon as possible following spill clean up. If results are acceptable (< 125 umol/mol) re-test after the next spill clean-up/exposure. If results are unacceptable (125 umol/mol or greater) follow the directions provided in the following Table.

**Test Criteria and Required Action – Mercury in Urine**

Level – umol/mol (ug/L)	Re-Test	Action Required
Less than 75 (<150)	Category A: Within 4 months Category B: See above	<b>NORMAL VALUES</b> No specific actions required.
75–124 (150–250)	Category A: Within 2 months Category B: See above	<b>SURVEILLANCE</b> Occupationally acceptable but surveillance is indicated.
125 – 250 (250–500)	Within 1 month	<b>ALERT</b> Minimize exposure by reviewing all sources and improving controls.
Greater than 250 (>500)	As required until levels are less than 100 umol/mol (200 ug/L).	<b>REMOVAL</b> Remove worker from further mercury exposure. Return worker to previous duties when: <ul style="list-style-type: none"> <li>• Worker is symptom free;</li> <li>• Mercury levels are less than 100 umol/mol (200 ug/L); and</li> <li>• Exposure has been minimized through a review of all sources and improvement in controls.</li> </ul>

**Follow Up**

- 4.1 Manager Follow Up – The test result is sent to the local manager and s/he is responsible for ensuring that the result is reviewed with worker. In the event that a test result is unacceptable, workplace exposure controls must be investigated and improved to ensure that health and safety standards are met (refer to OSH Standard 311 – Mercury). Contact your OSH for assistance.
- 4.2 Medical Follow Up – A copy of the test result is sent to BC Hydro, Health and Recovery Services. Medical follow up including, if required, a treatment plan will be determined by the worker's personal physician in consultation with BC Hydro, Health and Recovery Services. The test result will be filed in the worker's confidential medical file at BC Hydro, Health and Recovery Services.

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# **OSH Standard 313**

## **Respiratory Protection**

# OSH Standard 313

## Respiratory Protection



### 1. Scope

- 1.1 This standard establishes the requirements of BC Hydro's Respiratory Protection Program pursuant to Sections 8.1– 8.9 and 8.32–8.44 of the WorkSafeBC Occupational Health & Safety Regulation (OHSR).
- 1.2 This scope of this standard is limited to work in atmospheres that are not immediately dangerous to life and health (IDLH). If work in an IDLH atmosphere is required a qualified person must carry out a risk assessment, develop written work procedures and provide training to ensure that the risk to worker health and safety is minimized.

### 2. Purpose

- 2.1 The purpose of this standard is to assist managers of workers who are required to use respiratory protection with implementing a Respiratory Protection Program that meets WorkSafeBC requirements and ensures worker safety and health. For assistance, managers should contact their Occupational Safety and Health (OSH) Specialist.

### 3. Requirements

#### 3.1 Determine if Respiratory Protection is Required

- 3.1.1 As per Section 8.32 of the OHSR, respiratory protection must be provided and worn if a worker is or may be exposed to concentrations of an air contaminant in excess of an applicable exposure or excursion limits in Part 5 of the OHSR. It is BC Hydro's policy that, whenever practicable, respiratory protection will be worn when exposures exceed 50% of the applicable exposure limits.
- 3.1.2 As per Section 3.3 of OSH Standard 301 (WHMIS & Hazardous Materials), risk assessments including, where necessary, monitoring of air contaminant concentrations, must be carried out to determine workers' exposures to hazardous products.
- 3.1.3 If exposure to a product exceeds 50% of the applicable exposure limit, the exposure must, whenever practicable, be eliminated or reduced to less than 50% of the exposure limit by substitution with a less hazardous product or engineering controls (e.g. local exhaust ventilation).
- 3.1.4 If exposures can not be eliminated or reduced to less than 50% of the applicable exposure limit, respiratory protection must be provided and the requirements of this standard must be met.
- 3.1.5 If worker exposures do not exceed 50% of the applicable exposure limit, but respirators are provided for extra protection, the requirements of Sections 3.2 (Selection, Use and Maintenance) and 3.4 (Education & Training) of this standard must be met.

#### 3.2 Selection, Use and Maintenance of Respiratory Protection Equipment

- 3.2.1 The selection of correct respiratory protective equipment for specific work tasks must be based upon the type and concentration of the air contaminant(s) present. Respiratory protection equipment must not be issued to a worker unless a risk assessment has been carried out and has confirmed that the equipment issued will provide effective protection against the air contaminant(s) that the worker is exposed to.
- 3.2.2 Only respiratory protection equipment that is acceptable to WorkSafeBC shall be used. To be acceptable, the equipment must meet the standards set by the (US) National Institute for Occupational Safety and Health (NIOSH) or CAN/CSA Standard Z94.4 (Selection, Use and Care of Respirators), or have been given specific acceptance in writing by WorkSafeBC for a proposed use.

- 3.2.3 All workers who are required to use a face seal dependent air purifying respirator must be assigned a personal respirator and issued the required cartridges and filters, based on the type and concentration of the air contaminants present during the work.
- 3.2.4 If Self Contained Breathing Apparatus (SCBA) is used, the equipment must be used, inspected and maintained in accordance with the manufacturer's instructions. For more information, refer to Appendix 1 of this standard (pages 6–7).
- 3.2.5 If supplied air respirators are used, the compressed air system that supplies the breathing air to the respirator must meet the requirements of CAN/CSA Standard Z180.1 (Compressed Breathing Air and Systems). For more information, refer to Appendix 2 of this standard (page 8).
- 3.2.6 If a worker is required to use respiratory protection and there is doubt about the worker's ability to use a respirator for medical reason, the worker must be examined by a physician to determine if s/he is able to use the equipment. The examining physician must be given information about the type of respiratory protection equipment that the worker is required to use, and the frequency, duration and conditions of use.
- 3.2.7 Workers required to wear respiratory protective equipment must inspect, clean, maintain and store their equipment in accordance with manufacturer's instructions and the training provided (see Section 3.4.4 of this standard).

### 3.3 Fit Testing

- 3.3.1 All workers who are required to wear face seal dependent respirators must be fit tested annually to ensure that the respirator provides an effective seal. Fit testing must be conducted under the direction of a person trained in the correct procedures (qualified person). A respirator must not be issued to a worker unless a fit test demonstrates that it provides an effective seal.
- 3.3.2 When carrying out fit testing, the qualified person must complete a BC Hydro Respirator Fit Test Record (Stationery Form #8O484). A copy of the completed form must be given to the worker and kept with the respirator.
- 3.3.3 All workers who are required to wear face seal dependent respirators must be clean shaven where the respirator seals with the face.

### 3.4 Education and Training

- 3.4.1 Before they are required to wear respiratory protection equipment, workers and the work leaders who supervise such workers, must be given respiratory protection awareness education (Section 3.4.3) and job-specific training (Section 3.4.4). Education and training must be repeated as required, based on the results of the annual program review (Section 3.5). Job-specific training must also be updated if workplace changes result in exposure to higher concentrations or to new hazards requiring changes in respiratory protective equipment and/or procedures.
- 3.4.2 Respiratory protection education and training must be delivered by a person with a sound knowledge and practical experience in the principles and practices related to respiratory protection. For assistance, contact your OSH Specialist.
- 3.4.3 Respiratory protection awareness education must include the following topics:
- Respiratory Protection Program requirements and responsibilities.
  - Respiratory hazards and their potential effects on health.
  - Capabilities and limitations of respiratory protection equipment.
  - Fit testing requirements.
  - Medical and physical limitations that affect respirator use.
- 3.4.4 Job-specific training must include:
- The respiratory hazards that are or may be present at the specific worksite.
  - Results of risk assessments including, where applicable, exposure monitoring data.
  - The capabilities and limitations of the respiratory protection equipment that workers are required to use.
  - Putting on the respiratory protection equipment including, if applicable, carrying out positive and negative seal checks.
  - Inspection, maintenance, cleaning and storage of the respiratory protective equipment that workers are required to use.
  - Training in job-specific work procedures, including use/operation of engineering controls and emergency procedures (where applicable).

### 3.5 Program Review

- 3.5.1 The local Respiratory Protection Program must be reviewed at least annually, in consultation with the local OH&S Committee or Key Safety Person (KSP). The review must:
- Assess exposure control measures to ensure that they are still effective.
  - Determine the need for further control measures.
  - Evaluate education and training.
  - Assess the adequacy of exposure monitoring data and the need for further monitoring.
  - Ensure the adequacy of the fit testing program.

#### 4. Roles and Responsibilities

##### 4.1 Managers are responsible for:

- Implementing the requirements of this standard.
- Consulting with the local OH&S Committee or KSP, and workers when selecting respiratory protection equipment.

##### 4.2 Work Leaders are responsible for:

- Providing respiratory protection equipment when required.
- Ensuring that workers are aware of respiratory hazards and use respiratory protection equipment correctly.
- Ensuring that workers who are required to wear face seal dependent respirators
- Ensuring that respiratory protection equipment is properly inspected, maintained and stored.
- Notifying managers if there are changes in working conditions that may result in exposure to higher concentrations of air contaminants, or to new contaminants.

##### 4.3 Workers are responsible for:

- Using respiratory protective equipment when required and in accordance with the instruction and training provided.
- Properly inspecting, cleaning, maintaining and storing the respiratory protection equipment that has been assigned to them.
- Conducting a positive and negative fit check before each use (where applicable).
- Understanding and following written work and emergency procedures (where applicable).
- Immediately reporting any equipment malfunctions or other problems to their Work Leader.

#### 5. Records and Documentation

##### 5.1 Records of activities relating to the Respiratory Protection Program must be kept on file, including:

- Identification and assessment of respiratory hazards including, where applicable, exposure monitoring results.
- Names of workers required to use respiratory protection equipment and, if applicable, any special medical requirements relating to the use of the equipment.
- Fit testing records (completed Forms #8O848).
- Education and training.
- Inspection and maintenance of Self Contained Breathing Apparatus (see Appendix 1).
- Respirable (breathing) air systems maintenance and testing results (see Appendix 2).
- Maintenance of air supplied respirators, powered air purifying respirators and sorbent cartridges and canisters.
- Rescue and evacuation exercises (SCBA).
- Any supplementary procedures, instructions, inspections or other records relating to the correct use of respiratory protection equipment.

## 6. References

- 6.1 WorkSafeBC OHSR Part 8 (Personal Protective Clothing and Equipment), Part 5 (Chemical and Biological Substances), Part 4 (Emergency Preparedness and Response) and Part 32 (Evacuation and Rescue).
- 6.2 WorkSafeBC Booklet: “Breathe Safer: How to Use Respirators Safely and Start a Respiratory Program” (BK75).
- 6.3 OSH Standard 3O1 – WHMIS and Hazardous Materials.
- 6.4 BC Hydro Respirator Fit Test Record, Stationery Form #8O484.
- 6.5 CAN/CSA Standard Z94.4 – Selection, Use, and Care of Respirators.
- 6.6 CAN/CSA Standard Z18O.1 – Compressed Breathing Air and Systems.

## Appendix 1

### USE AND MAINTENANCE OF SELF CONTAINED BREATHING APPARATUS

#### Use Of Self Contained Breathing Apparatus (Scba)

SCBA may be used in BC Hydro facilities for one or more of the following reasons.

- For escape or rescue in buildings where Gaseous Fire Protection Systems (e.g. CO<sub>2</sub>, Halon 1301 or Inergen) or SF<sub>6</sub>-insulated electrical equipment are installed.
- If work or emergency procedures dictate that SCBA is required for Confined Space or other types of rescue.
- If emergency procedures require the use of SCBA to re-enter a building or plant, under the protection of fire fighting personnel, to provide technical assistance or to make the facility safe for fire fighting operations.
- If designated and properly trained and equipped personnel are required to fight fires.

**Note – If SCBA is used for firefighting:**

- A Personal Alert Safety System (PASS) alarm must be used; and
- The requirements of NFPA 1404 (Fire Department Self Contained Breathing Apparatus Program) and NFPA 1981 (Open Circuit Self Contained Breathing Apparatus for Fire Fighters) must be met.

#### Physical Condition

SCBA is often used for emergency response which can be physically and emotionally stressful. Users must be in adequate physical condition to perform the anticipated tasks.

A physician's certificate of fitness must be supplied by any worker who experiences breathing difficulty while wearing the apparatus or is known to have heart disease, impaired pulmonary function, or any other condition that may affect the worker's ability to use SCBA safely and effectively.

**Fit Testing** – SCBA users must be fit tested in accordance with Section 3.3 of this standard (page 2).

#### Education and Training

Workers who are required to use SCBA workers must given education and training (see Section 3.4 of this standard) and training records must be kept. Training must be specific to the SCBA brand and model that the worker is required to use. A good indicator that training is satisfactory is when workers can competently don the equipment when challenged to do so.

**If SCBA is used for firefighting** training must be repeated at least annually and must include training in fire suppression methods, fire prevention, emergency procedures, organization and chain of command, firefighting crew safety and communication (OHSR Section 4.16).

**If SCBA is used to provide rescue or evacuation**, training must include simulated rescue or evacuation exercises and regular retraining, appropriate to the type of rescue or evacuation being provided (OHSR Section 32.2). If SCBA is used for confined space rescue, rescue must be practiced annually or prior to starting work in the confined space (OHSR Part 9).

## Inspection and Maintenance of SCBA

All SCBA requires periodic checks, inspections and maintenance by qualified personnel. Following is a description of the service functions that are typically required. **For detailed requirements, refer to the manufacturer's instructions for your apparatus brand and model.**

### Checks & Inspections

- **Weekly Check:** A weekly check to ensure that all cylinders are full and the apparatus is intact. When SCBA are stored in an area where the public have access, it may be prudent to institute this check on a more frequent basis.
- **Monthly Inspection:** Requirements vary depending on manufacturers but most require a physical inspection and full functional test of the regulator, low air warning device, pressure demand and bypass functions.
- **After Use Inspection:** Generally the same as a Monthly Inspection, in conjunction with cleaning and sanitizing.

**Cylinder Maintenance –** Regardless of the manufacturer, all SCBA cylinders require recharge and testing, as follows.

- **Cylinder Recharge**

Every TWELVE months, regardless of use, or when 10% or more below the rated capacity.

- **Hydrostatic Test**

Every THREE years for composite fiberglass wrapped aluminum cylinders.

Every FIVE years for conventional steel and aluminum cylinders.

**Note:** Composite cylinders have a service life of fifteen years. Standard cylinders may be used indefinitely until they fail a hydrostatic test.

### Calibration/Bench Test

A test of apparatus and calibration to ensure the unit is operating to specifications. Manufacturers typically require a Calibration/Bench Test every one to two years.

### Overhaul

Replacement of wearable or perishable parts is generally done in conjunction with a Calibration/Bench test. Some manufacturers specify the interval; others require it if the SCBA fails the Calibration/Bench Test.

## QUALIFICATIONS OF INSPECTION AND MAINTENANCE PERSONNEL

Personnel assigned to perform SCBA checks and inspections must possess the necessary skills and abilities to perform these tasks competently, in accordance with the manufacturer's instructions.

Cylinder recharges must be performed by a Factory Authorized Service Centre or a Fire Department.

Specialized skills and equipment are required to perform Calibration/Flow tests, Overhauls and Hydrostatic Testing of cylinders. This work must be performed by a Factory Authorized Service Centre. For more information, contact the SCBA manufacturer or an Authorized Distributor.

## Appendix 2

### Compressors Used As Source Of Respirable (Breathing) Air

#### Compressed Air Systems

- Compressed breathing air systems must be installed, commissioned, operated and maintained in accordance with the manufacturer's instructions.
- The **service outlets** for compressed breathing air must be clearly identified and must only be used for providing breathing air.
- Most compressors in BC Hydro are multi-stage, oil-lubricated air compressors driven electrically or by combustion engine. These types of Industrial compressed air systems (e.g. Station air systems) are not designed to provide breathing quality air and manufacturers may specifically prohibit use for this purpose (e.g. warning labels). Such compressed air systems may be used to supply airline respirators only if an air purification system is installed upstream of the respirator connection point.

#### Air Purification Systems

- Air purification systems must be designed to provide air that meets the requirements of CAN/CSA Standard Z18O.1 An air purification system will typically contain purification media that contains the following elements: coalescing filter, chemical sorbent beds and fine particulate filter. For more information, refer to Appendix A of CAN/CSA Standard Z18O.1.

#### Respirable (Breathing) Air Testing

- Where a compressed air system is used to provide breathing air for respiratory protection, a **sample of the system air shall be collected and submitted to an accredited laboratory and analyzed for compliance to CAN/CSA Standard Z18O.1. To arrange for testing, contact your OSH Specialist.**
- Air sampling and analysis must be done **annually or prior to using the system to provide breathing air.**
- **Additional testing is required following a major compressor overhaul and following modifications or extensive repairs to the compressed air system.**
- **The sampling results must be posted in the workplace, adjacent to either the applicable air compressor or air purification system in use.**

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# **OSH Standard 314**

## **Lead Abatement**

# OSH Standard 314

## Lead Abatement



### 1. Scope

1.1 This standard covers requirements and procedures for working with lead.

### 2. Purpose

2.1 The purpose of this standard is to establish safety and health requirements for working with lead to ensure that workers involved in such work are protected against health hazards and to ensure consistent compliance with WorkSafeBC and environmental regulations.

### 3. Standard

#### 3.1 General

- 3.1.1 Within BC Hydro, lead based products have been used as rust and corrosion inhibitors (e.g. paints) and lubricants (e.g. white lead pastes/powders). Lead based paints have been commonly applied to a wide range of structures and equipment, including spillway gates, surge towers, penstocks, scroll cases, draft tubes, breakers and transformers, but may also appear in other areas and applications. Lead pastes/powders were sometimes used to lubricate parts (e.g. wedges in generator rotor poles or bolts). Lead based paints and lubricants are no longer to be used in BC Hydro. Lead removal activities routinely expose workers to lead levels that exceed the WorkSafeBC's Exposure Limits (0.05 mg/m<sup>3</sup>).
- 3.1.2 Because of its toxicity, lead is considered a significant occupational and environmental hazard. Over-exposure to lead can cause health problems, which may be temporary or permanent depending on the amount of lead inhaled or ingested. Common symptoms of acute lead poisoning are loss of appetite, nausea, vomiting, stomach cramps, constipation, insomnia, fatigue, moodiness, headache, joint or muscle aches, anemia and decreased sexual drive. Severe health effects of acute lead exposure include damage to the nervous system, tremors, convulsions, coma and death. Lower levels of chronic over-exposure to lead can result in damage to the blood, nervous system, kidneys, bones, heart and reproductive system.
- 3.1.3 This standard applies to all work involving lead where workers are, or may be, exposed to levels exceeding 0.025mg/m<sup>3</sup> (i.e. >50% of the WorkSafeBC's Exposure Limit). Most lead paint removal tasks commonly result in exposures exceeding this action level, even when the lead content of the paint is very low.

The following table shows typical exposure levels for common tasks:

Task	Typical Exposure Level [mg/m <sup>3</sup> ]
1. Manual scraping, chemical removal, sanding and demolition. Heat gun applications. General clean up. Lead removal using power tools equipped with dust collection systems (local exhaust).	0.025 – 0.50 (.5 to 10 times PC)
2. Lead removal using power tools without dust collection systems or high pressure water. Clean up of dry, used abrasives. Removal or movement of containment.	0.50 – 2.50 (10 to 50 times PC)
3. Abrasive blasting, welding, cutting and torch burning.	> 2.50 (> 50 times PC)

### 3.2 Regulations

3.2.1 Where workers are, or may be, exposed to potentially hazardous lead levels, the WorkSafeBC requires that the employer develop and implement an effective written control program for lead exposure. The program must comply with the requirements outlined section 5.54 (Exposure Control Plan), Sections 5.82 to 5.84 (Personal Hygiene) and sections 6.59 to 6.69 (Lead) of the WorkSafeBC Occupational Health & Safety Regulation (OHSR). Also, in accordance with section 20.2, a Notice of Project (NOP) must be sent to the WorkSafeBC prior to starting any abatement or other activity that will involve significant disturbance of lead containing coatings on buildings or structures.

3.2.2 There are a number of environmental regulations and standards governing the collection, handling and disposal of lead contaminated waste. For assistance with environmental compliance refer to Waste Management (WVM) Standard 410 – Waste Blasting Abrasive Material or contact your Waste Management Specialist or Area Environmental Coordinator.

### 3.3 Planning and Preparation

#### 3.3.1 Documentation

3.3.1.1 Before any lead related work commences, a written work procedure which addresses all the elements of the lead exposure control program, as well as all applicable environmental requirements, must be prepared. The procedures must be posted at the job site throughout the project.

3.3.1.2 When medical monitoring is required during the project, these results must not be posted at the job site (see section 3.6.2) due to employee confidentiality.

3.3.1.3 Depending on the nature of the project, the following documentation must also be available at the job site, when applicable:

- Analysis results (% lead content);
- MSDS for all products used during the project;
- Respirable air test results;
- Respirator fit test records;
- Emergency and evacuation procedures.

### 3.3.2 Selection of Removal Method

3.3.2.1 Although most large scale industrial lead removal projects cannot be carried out effectively and efficiently without using some type of abrasive blasting, alternative removal methods which reduce worker exposure should be considered and selected when practicable. Selection of a lead removal method which results in lower exposures may also reduce or eliminate the need for compliance with other environmental or safety requirements (e.g. containment, decontamination facility).

### 3.3.3 Containment

3.3.3.1 Where the method of lead removal may result in the emission of lead dust or debris or contaminated abrasives into the environment, regulatory agencies may require that a containment be built to fully enclose the removal area. For assistance in determining if containment will be required, contact your Environmental Risk Management. If containment is required, the following safety related criteria must be met:

- The supports must be structurally sound and, where required, approved by a professional engineer.
- Where the containment is not directly attached to a decontamination facility the containment structure must include a pre-decontamination vestibule/airlock. See section 3.5.2 for the required equipment and procedures.
- The containment design must provide adequate ventilation (section 3.3.4) and visibility for workers.

### 3.3.4 Ventilation and Dust Collection

3.3.4.1 For lead removal projects where containment is required, mechanical ventilation must be provided to reduce airborne lead concentrations and to ensure adequate visibility. Ventilation systems must meet the following minimum criteria:

- The ventilation system exhaust fan(s), duct work and make-up air supply (natural or mechanical) must maintain the removal area at negative pressure. This may be confirmed visually or with smoke tubes.
- The exhaust ventilation system must flow into appropriately sized collection and air cleaning devices to control the emission of contaminated particulates into the environment in accordance with applicable environmental regulations and standards.

### 3.3.5 Decontamination Facility

3.3.5.1 To help prevent the overexposure of workers and the spread of hazardous material beyond the work-site, a decontamination facility must be provided when there is a potential for significant contamination of workers' skin, hair and protective clothing. This relates to task categories 2 and 3 in the table in clause 3.1.3 of this standard. The decontamination facility must meet the following general criteria:

- The facility must consist of a separate "dirty area", a "shower area" and a "clean area".
- The facility layout must be designed to prevent cross contamination between the dirty and clean areas. See Appendix 1 for the preferred design.
- The interior surfaces must be smooth and non-absorbent to facilitate cleaning.
- The dirty room equipment must include an appropriately marked waste container (e.g. a poly bag) for disposable garments or clothing that requires laundering.

- Hand washing facilities must be provided in the dirty room or near the containment (if applicable).
- Waste water collection and disposal must comply with the applicable environmental and public health regulations.

### 3.3.6 Access Control and Signage

3.3.6.1 The boundaries of work areas where worker exposures may exceed 0.025mg/m<sup>3</sup> must be clearly defined and access to those areas must be restricted to properly equipped and trained personnel.

3.3.6.2 A peel-and-stick, 4" x 4" Lead workplace label available from BC Hydro Stationery must be posted at all entrances to contaminated work areas.



## 3.4 Protection of Workers

### 3.4.1 Respiratory Protection

3.4.1.1 Respiratory protection must be used to supplement engineering and administrative controls whenever these controls are technologically incapable of reducing worker exposures to below 0.025 mg/m<sup>3</sup>.

3.4.1.2 Pending the collection of air sampling data (section 3.6.1), respirator selection for lead related activities must be based on the highest anticipated potential exposures (see the estimates provided in clause 3.1.3).

3.4.1.3 When respirators are required, a complete respiratory protection program must be implemented. For assistance with program implementation and respirator selection, refer to OSH Standard 313 Respiratory Protection.

### 3.4.2 Protective Clothing and Equipment

3.4.2.1 To provide shielding and to minimize the accumulation of lead on personal clothing, skin and hair, workers who are exposed to airborne dust that contains lead must wear protective clothing. Such clothing must cover the body and head and it must fit snugly at the neck, wrists and ankles (e.g. disposable coveralls with hood). See section 3.5 of this standard.

3.4.2.2 Workers must wear all other protective equipment appropriate to the hazards encountered during their work. Depending on the nature of the lead abatement project, the required protective equipment may include:

- Steel toe footwear (rubber preferred for working inside containments);
- Eye, face and hand protection;

- Hearing protection;
- Specialized protection during abrasive blasting and high pressure (>5,000 psi) washing/jetting (see section 12.111 of the OH&S Regulation).

### 3.5 Decontamination Procedures

#### 3.5.1 Worker Decontamination—Task Category 1

Personal decontamination must be carried out in accordance with the procedures outlined in section 3.5.2 except that a decontamination facility (section 3.3.5) and showering at the end of the work-shift are not required.

#### 3.5.2 Worker Decontamination—Task Category 2 and 3

Before entering a lead contaminated work area, workers must remove personal clothing in the clean area of the decontamination facility and put on clean, disposable coveralls. For activities where additional shielding is needed (e.g. abrasive blasting) or where the decontamination facility is not directly attached to the containment (assumed in clauses 3.5.2.1 and 3.5.2.2) a second (outer) pair of coveralls (disposable or non-disposable) may be required.

3.5.2.1 Before coffee and lunch breaks, workers must carry out personal decontamination procedures as follows:

- Move to an area just outside the work area boundary and thoroughly clean clothing, footwear and protective equipment with a HEPA vacuum cleaner.

**Note:**

This is done in the pre-decontamination area attached to the containment, where applicable, section 3.3.3).

- Remove and hang up outer coveralls and protective equipment.
- Vacuum inner coveralls.
- Walk directly to the nearest washing facility and thoroughly wash face and hands before eating, drinking or smoking.

3.5.2.2 At the end of the work-shift, workers must carry out personal decontamination procedures as follows:

- Move to an area just outside the work area boundary and thoroughly clean clothing, footwear and protective equipment with a HEPA vacuum cleaner (as above).
- Remove outer coveralls and protective equipment, place coveralls in a poly bag and seal the bag.

**Note:**

The bag must be damp-wiped or vacuumed before it is removed for disposal or laundering.

See section 3.5.3.

- Vacuum inner coveralls.
- Walk directly to the nearest washing facility and thoroughly wash face and hands.
- In the dirty area of the decontamination facility, remove footwear and inner (disposable) coveralls, place the coveralls in a waste container and re-seal the container.
- Shower and wash hair in the shower area of the decontamination facility.
- Change into personal clothing in the clean area of the decontamination facility.

3.5.2.3 Protective footwear and equipment and all areas of the decontamination facility must be maintained free of visible dust and debris. All cleaning must be done using wet methods and/or a HEPA vacuum cleaner.

### 3.5.3 Laundering of Non-Disposable Protective Clothing

3.5.3.1 Non-Disposable clothing must be laundered before re-use. If laundering is done at the work site, then the following procedure must be followed:

- Fill washing machine with water;
- Place top of unopened poly bag near the surface of the water, open the bag and slowly transfer the contaminated clothing into the machine, fully submerging each garment;
- Reseal the poly bag and dispose of it as waste.

3.5.3.2 Contaminated clothing may be sent to a commercial laundry if it can be confirmed that the workers at the laundry have been informed of the potential hazards and they are taking adequate precautions to prevent exposures. It is recommended that laundry bags leaving the work site be labelled as follows:

#### CAUTION

CLOTHING CONTAMINATED WITH LEAD  
DO NOT REMOVE DUST BY BLOWING OR SHAKING  
DISPOSE OF CONTAMINATED WASTE WATER  
IN ACCORDANCE WITH APPLICABLE REGULATIONS

## 3.6 Exposure Monitoring

### 3.6.1 Air Monitoring

3.6.1.1 Due to the variability in the lead content of lead based products, the design of containment and ventilation, and other factors which impact on exposures, occupational and ambient air monitoring must be carried out to ensure that engineering controls are effective and respiratory protection is adequate. Minimum monitoring requirements are as follows:

- Occupational sampling must be carried out during the first shift of any lead related activity where exposures may exceed 0.025 mg/m<sup>3</sup>.
- Additional occupational sampling must be carried out during the project if there are any changes in the sampling parameters present during the initial sampling (e.g. increase in the number of blasters inside containment, increase in blasting pressures, decrease in ventilation rate, etc.).
- Ambient and/or occupational air sampling must be carried out outside the containment to confirm that unprotected workers are not exposed to lead concentrations exceeding 0.025 mg/m<sup>3</sup>.
- Ambient monitoring must be carried out in the decontamination facility to confirm the effectiveness of the cleaning program.

### 3.6.2 Medical Monitoring

3.6.2.1 As stated in OSH Standard 312 Medical Monitoring, lead medical monitoring is required for:

- Workers who are routinely exposed to airborne lead levels exceeding 50% of the Exposure Limit; and
- Workers who perform short-term, high risk lead work (e.g. large scale lead abatement projects). See clause 3.6.2.2.

3.6.2.2 Medical monitoring must be carried out before the start (within one month) and near the end of each lead abatement project. The monitoring that is carried out near the end of the project must be completed no later than one week after the exposures stop. If the duration of the project exceeds two months, then medical monitoring must also be carried out mid-way through the project.

3.6.2.3 The results of medical monitoring must be reviewed with workers and appropriate follow-up action must be taken in accordance with OSH Standard 312.

### 3.7 Education and Training

3.7.1 All workers who work in locations where lead based products are present and whose work involves activities which could result in disturbance of those products must be given lead awareness education which covers the following topics (to arrange for presentation, contact your Occupational Safety and Health (OSH) Specialist):

- Lead hazards;
- Exposure avoidance; and
- Information and assistance resources

3.7.2 Before starting any lead abatement work, the workers involved must, in addition to the general awareness education outlined in clause 3.7.1, be given training which cover the following topics:

- Use and care of required personal protective clothing and equipment;
- Decontamination procedures and the importance of personal hygiene in reducing exposures;
- The purpose of medical monitoring and the interpretation of the results (where applicable); and
- Job specific lead work procedures and safety issues.

## 4. Roles and Responsibilities

### 4.1 Managers

4.1.1 Managers are responsible for ensuring that all lead abatement work is carried out in accordance with this standard. For assistance contact your OSH Specialist.

### 4.2 Workers

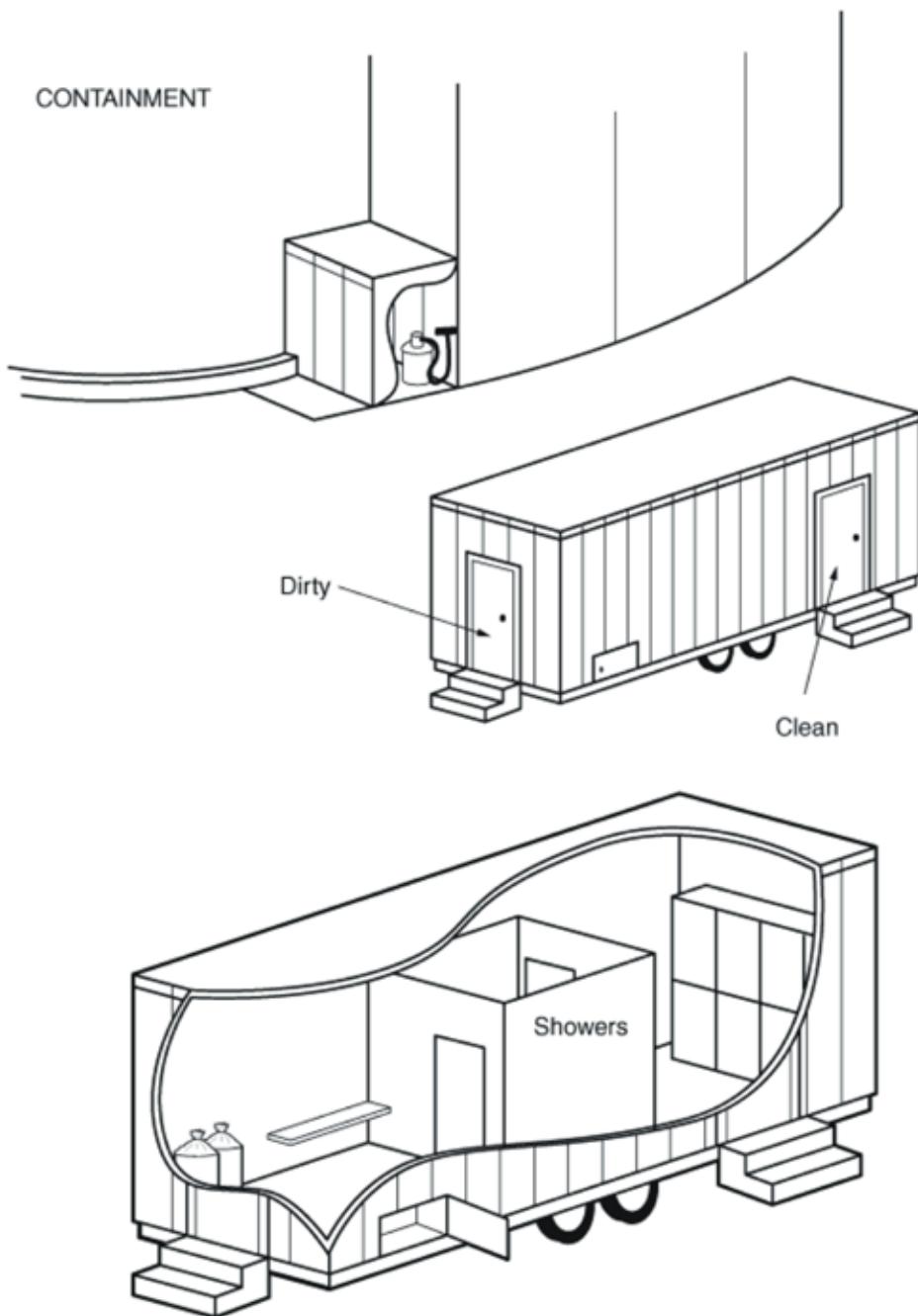
4.2.1 Workers involved in lead abatement work are responsible for ensuring that the work is done in accordance with the written work procedures and training provided.

## 5. References

- 5.1 WorkSafeBC, Occupational Health & Safety Regulation, Section 5.54, 5.82 to 5.84, 6.59 to 6.69 and 20.2
- 5.2 OSH Standards relating to Medical Monitoring and Respiratory Protection
- 5.3 WorkSafeBC Publication: Lead – Preventing Exposure at Work
- 5.5 BC Hydro Lead Workplace Label, Form GDS14-533

## Appendix 1

### Decontamination Facility Preferred Layout



### Table of Contents

# **OSH Standard 315**

## **Bloodborne Pathogens**

# OSH Standard 315

## Bloodborne Pathogens



### 1. Scope

1.1 This standard covers the health and safety aspects of bloodborne pathogens.

### 2. Purpose

2.1 This standard defines the requirements for addressing and minimizing exposures to bloodborne pathogens. It further outlines the criteria for when an employee should pursue a vaccination for protection against a very specific bloodborne pathogen: Hepatitis B virus. Additional information can be obtained from your Occupational Safety and Health (OSH) Specialist.

### 3. Standard

#### 3.1 General

3.1.1 The WorkSafeBC Occupational Health and Safety Regulation (OHSR) provides the following definitions:

**Biohazardous Material**—a pathogenic organism, including a bloodborne pathogen, which due to its known or reasonable believed ability to cause disease in humans, would be classified as Risk Group II, III or IV as defined by the Medical Research Council of Canada, or any material contaminated with such an organism.

**Harmful Contact**—situations where an injury penetrates through intact skin, or a mucous membrane or non-intact skin contact exposes a worker to blood or other potentially infectious material (OPIM).

**Occupational Exposure**—means reasonably anticipated, harmful contact with blood or other potentially biohazardous material that may result from the performance of a worker's duties.

3.1.2 In the WorkSafeBC OHSR Occupational Exposure is defined as regular and expected exposure to bloodborne pathogens during the course of an employee's regular duties. According to the WCB, this definition is more explicitly related to the health care profession and first responders, where regular or daily exposure to blood and body fluids occurs as part of their normal work duties (e.g. Nurses, Physicians, Firefighters and Paramedics). For more information, please contact your OSH Specialist.

3.1.3 Bloodborne pathogens fall into the category of biohazardous materials (see definition above). This standard will address the following:

- WorkSafeBC requirements
- Bloodborne Pathogens
- Vaccine Information
- Risk Identification
- Risk Criteria
- Methods of Controlling Exposure
- Minimizing Exposure
- Universal Precautions

- Availability of Vaccination
- Post Exposure Protocol and Evaluation

**3.2 WorkSafeBC Requirements**—The WorkSafeBC OHSR (section 5.54 and 6.34) requires that an Exposure Control Plan be in place where an employee has, or may have occupational exposure to a bloodborne pathogen. This standard serves as the basis for an Exposure Control Plan.

**3.3 Bloodborne Pathogens**—Basically, they are infectious viruses of bacteria which can be present in blood or body fluids. The bloodborne pathogens of most usual concern are:

- the hepatitis B virus (HBV), affects the liver
- the hepatitis C virus (HCV), affects the liver
- the human Immuno-Deficiency virus (HIV)

The hepatitis B and C viruses and HIV can all be spread by infected blood. They can also be spread by certain infected body fluids. In order for infection to occur in a susceptible individual, viruses from the infected blood and body fluids from an already afflicted person must enter another person's body. It is then a function of an individual's own immune system (ability to fight infection) that will determine whether an infection will ultimately occur.

Some employees within BC Hydro have the potential to encounter a number of different work situations which may increase their overall risk of exposure to bloodborne pathogens. This standard deals with the requirements of potential exposure to these bloodborne pathogens.

**3.4 Vaccine Information**—Of all of the bloodborne pathogens that are known to exist, the only vaccination currently available for protection against any of them is the vaccine for the hepatitis B virus. There is no vaccine currently available for protection against the hepatitis C virus or HIV (see Appendix 2).

This standard does not include exposures to faeces, urine, nasal secretions, sputum, tears and vomit, unless they are visibly contaminated with blood.

**3.5 Risk Identification**—Section 6.35 of the WorkSafeBC OHSR requires that BC Hydro maintain a list of all job classifications and identify all tasks and procedures in which there is a potential for occupational exposure to bloodborne pathogens or biohazardous material specified by the WorkSafeBC. This assessment determines the potential for exposure as well as the risk of exposure.

### 3.6 Risk Criteria

Most BC Hydro workers while at work, will never contact blood and/or certain body fluids that can spread HIV and the hepatitis B and C viruses. However, BC Hydro staff must be aware of some basic precautions. This is important since it is possible to become infected from a single exposure incident, following harmful contact with infected blood or body fluids.

Hepatitis B vaccine is the only vaccination currently specified in the WorkSafeBC OHSR (section 6.39) for hepatitis B virus. The following individuals (see below) in BC Hydro are considered to be occupationally exposed to hepatitis B and are eligible to receive the hepatitis B vaccine with cost being covered by BC Hydro:

a) All designated First Aid Attendants (Level II and higher); although individuals offering first aid in a typical office environment are at much lower risk of exposure than those individuals providing first aid at an electrical facility where there is a greater probability of significant injuries (e.g. major cuts causing bleeding).

or

- b) Individuals who work in a locale where intravenous drug paraphernalia can be readily found in the area, and the nature of the work being performed requires handling, climbing surfaces and moving infected material, thus increasing the probability of being injured, by inadvertently breaking the skin, by needle puncture, or otherwise coming into contact with infected blood products (e.g. Metermen, Meter Reader or Power Line Technician working in Vancouver Downtown East Side).

### 3.7 Methods of Controlling Exposures

To minimize any risk of possible exposure, the following controls must be considered and instituted when warranted by the risk:

- 3.7.1 Engineering controls—Minimize the hazard by guarding against potential exposures (e.g. isolate and secure electrical equipment from public access).
- 3.7.2 Administrative Controls/Safe Work Practices—Although most workers do not expect to be in contact with blood and body fluids, they should use basic safe work practices to address those rare incidents that may occur. Some examples of administrative controls include:
- universal precautions (see also section 3.9)
  - visually inspect all equipment before climbing or accessing
  - safely decontaminate or dispose of contaminated materials or objects
  - get first aid assistance
  - seek medical attention
  - safely clean up blood and body fluids after spills
  - report exposure incidents
- 3.7.3 Personal Protective Equipment—After instituting engineering and administrative controls, don protective equipment when working in areas contaminated with blood (e.g. use nitrile gloves when there is contact with contaminated surfaces).
- 3.7.4 Training—Must be provided to an employee when there is a potential for occupational exposure. The training will also include: the contents of the exposure control plan, identification of potential areas of high risk, review of bloodborne pathogens, common means of prevention and control as well as the post exposure protocol. Contact your OSH Specialist for training and an information video on Bloodborne Pathogens.
- 3.7.5 Instruction and Supervision of Workers—Ensure workers are given adequate instruction and supervision in any work procedures potentially contaminated with bloodborne pathogens.
- 3.8 Minimizing Exposure—The principle focus on the above controls is the Prevention of exposure. This is the preferred approach since immunization currently available for the treatment of some bloodborne pathogens (e.g. hepatitis B), does not confer immunity against any other bloodborne pathogens (e.g. HIV), or other potentially infectious materials (OPIM's). Once the above control measures are in place, there would be a low probability of occupational exposure to bloodborne pathogens. Individuals should discuss their concerns with their manager or their OSH Specialist if they think that they are occupationally exposed.

**3.9 Universal Precautions**—Under normal working conditions contact with blood or other biohazardous materials is not anticipated. However, as bloodborne pathogens are communicable, any surface or object covered with blood or body fluids must be treated as if it is infectious. Every effort must be made to avoid direct contact with such surfaces or objects and appropriate personal protective equipment must be worn (e.g. Nitrile gloves) if contact is possible. Needles must always be handled using tongs or forceps; never by hand. Hands and other soiled or contaminated surfaces must be washed thoroughly with soap and water. Contaminated surfaces such as tables, counter tops must also be wiped with a disinfecting solution (e.g. 9 parts water to 1 part household bleach by volume).

**3.10 Availability of Vaccination**—Section 6.39 of the WorkSafeBC OHSR requires that vaccination against hepatitis B virus must be made available upon request to all workers who are exposed or potentially exposed to this virus (see clause 3.5 of this standard). However, if engineering, administrative and PPE controls are effectively instituted, the probability that an employee could come in contact with either the hepatitis B virus or any other bloodborne pathogen is extremely low. Engineering, administrative and personal protective equipment controls must be put in place. If vaccination is still considered necessary by either the worker or manager, the necessary arrangements should be made.

- 3.10.1** The employee is responsible for making the necessary arrangements for the hepatitis B vaccine and providing management with the appropriate documentation. Records of vaccination will be kept by the manager.
- 3.10.2** Those individuals identified above may choose not to receive the hepatitis B vaccine, however they must indicate to their manager in writing their decision to forego the vaccination.

**3.11 Post Exposure Protocol and Evaluation**—If an individual has been exposed to a bloodborne pathogen, a post exposure protocol must be implemented. Post exposure to a potential bloodborne pathogen becomes a medical issue. In situations where workers may have been exposed to a hepatitis B virus or another bloodborne pathogen, immediate medical evaluation and treatment is required (WorkSafeBC OHSR, Section 6.4O). Obtain immediate medical assistance from the closest Hospital Emergency Department. They will be able to:

- Provide 24 hours assistance
- Draw blood from the injured person as well as from the person involved
- Administer HIV preventative post exposure drugs (e.g. anti retro virus)
- Provide follow-up information to a worker's family physician.

If possible, obtain a sample of the infected material or object in question, safely package it and forward it to the hospital. This may be helpful in determining whether the material or object was infectious. For further assistance, contact BC Hydro, Health and Recovery Services.

The following post exposure information is to be recorded by the manager:

- a) Document
  - route of exposure; and
  - circumstances related to the incident
- b) Determine infectivity of blood
  - assume blood is infective if answer is unknown
  - obtain sample of infectious material if possible
  - blood test is required (HIV/HBV serological status)

- c) Obtain Post-Exposure prophylaxis (prevention treatment) in consultation with BC Hydro medical consultant
- d) Records must be kept on every individual that may have been exposed
- e) First Aid log must reflect exposure incidents

#### 4. References

- 4.1 WorkSafeBC Occupational Health and Safety Regulation (Section 6.33 to 6.41)
- 4.2 Draft WorkSafeBC Operating Instructions (Part B6 pages 1 to 19), "Substance Specific Requirements" (April 1998)
- 4.3 SmithKline Beecham Information Pamphlets – Hepatitis B Are You at Risk? (1997) and "Hepatitis in the Workplace" (1995)
- 4.4 Information from the B.C. Ministry of Health, Victoria, B.C. (<http://www.bchealthguide.org/healthfiles/>)
- 4.5 Information from the Centre for Disease Control, Atlanta, Georgia, U.S.A. (<http://www.cdc.gov>)
- 4.6 HIV/AIDS, and Hepatitis B and C Preventing Exposure at Work. WorkSafeBC Publication (1998). ISBN O-7726-3601-X

## Appendix 1

### Hepatitis B Questions & Answers

#### Question #1—What is Hepatitis B?

##### Answer:

Hepatitis B is a viral liver disease caused by the hepatitis B virus (HBV). The acute form of hepatitis B can cause many severe symptoms—weakness, fatigue, fever, diarrhoea, vomiting as well as yellowing of the skin and the whites of the eyes (jaundice). Although it is seldom fatal, victims of the acute form of the disease frequently require hospitalization, weeks or months of rest and recuperation before they can return to normal life and work. Once an individual has been diagnosed as having hepatitis B, he/she may be hospitalized or otherwise prevented from spreading the disease to others. However, the incubation period before symptoms appear may be several weeks or months. During this period, a person can be highly infectious and therefore, a danger to everyone that has come into contact with that person.

The chronic form of hepatitis B presents a very different and much more dangerous situation. With chronic hepatitis B, the symptoms may be hidden and go unnoticed for years. Individuals will feel nothing and probably won't even know they have the disease, although the hepatitis B virus will be in their body and may be slowly destroying their liver. Chronic hepatitis B can lead to death through cirrhosis or cancer of the liver. Once the process has started, it cannot be stopped. There is no known reliable cure.

#### Question #2—How do you catch hepatitis B?

##### Answer:

Hepatitis B is an infectious disease that is passed from one person to another almost exclusively through direct contact with blood or body fluids. Hepatitis B is not spread through food or water or by casual contact. The virus can be transmitted by infected blood getting into the body through extremely small, breaks in the skin. Contact with infectious blood is the most common method of catching the disease. Blood is not the only means of infection. Hepatitis B virus can be carried in all body fluids. Therefore, Universal Precautions should always be followed.

#### Question #3—How do vaccines protect against hepatitis B?

##### Answer:

Vaccines cause your body's natural immune system to produce defensive substances called "Antibodies". The HBV vaccine will stimulate the production of specific antibodies which have the ability to neutralize hepatitis B viruses. It is important to note that this vaccine does not cure the disease.

## Appendix 2

### Pros and Cons of HBV Vaccination and Information of HIV/AIDS, and Hepatitis C

#### Pros and Cons of Vaccination

Currently there is no known cure for hepatitis B. The vaccine will only prevent the disease. Vaccination requires an initial course of three primary injections over six months which will provide five years of immunity. A single booster will be required every five years.

The most common reaction to the vaccine is minor, usually redness, warmth and pain or swelling at the injection site. Tiredness or slight fever may last 1 to 2 days.

Over 90 per cent of all people vaccinated develop immunity to hepatitis B virus (HBV).

The hepatitis B vaccine is effective only against HBV and does not immunize against other forms of infectious hepatitis. There is currently no vaccine for hepatitis C or HIV.

#### Information of HIV/AIDS, and Hepatitis C

**HIV/AIDS:** The human immunodeficiency virus (HIV) causes acquired immune deficiency syndrome (AIDS). Once introduced into the body, the virus infects the body's natural immune system and eventually compromises the body's ability to resist illnesses and infections. This results in serious illness and eventually death. There is currently no cure for HIV. Special drugs known as anti-retrovirals attack HIV's ability to reproduce itself. There are drugs that may be given after a person has been exposed to blood and certain body fluids to lower the risk of HIV infection.

**Hepatitis C:** The hepatitis C virus (HCV) can cause symptoms similar to those of hepatitis B (see Appendix 1). The hepatitis C virus can also cause acute and chronic liver disease and liver cancer. It is more likely to cause chronic hepatitis, liver scarring and cancer of the liver than hepatitis B. Most people infected with the hepatitis C virus do not report any symptoms when they first get the disease. About 90 percent become chronically infected and remain infectious to others. There is no cure for hepatitis C. There is medication that may be used for treating chronic hepatitis caused by HCV, but the medication only works in some cases.

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# **OSH Standard 316**

## **Field Ergonomics**

# OSH Standard 316

## Field Ergonomics

### 1. Scope

- 1.1 This standard describes the requirements and responsibilities for developing an Ergonomics Program pursuant to Sections 4.46 to 4.53 of the Occupational Health and Safety Regulation (OHSR).
- 1.2 For office ergonomics requirements, refer to OSH Standard 308 – VDT Workstations Ergonomics.

### 2. Purpose

- 2.1 To eliminate or, if that is not practicable, to minimize the risk of **musculoskeletal injury (MSI)** to workers and to assist managers with identifying, assessing and controlling factors in the workplace that may expose workers to a risk of MSI. The flowchart in **Appendix 1** summarizes the required **Steps in the MSI Prevention Process**. For assistance, managers should contact their Occupational Safety and Health (OSH) Specialist.

### 3. Standard

Requirements:

#### 3.1 Identify Economic Risk Factors

- 3.1.1 MSI risk factors in the workplace must be identified and used as the starting point for the MSI prevention process. There are a number of indicators that MSI risk factors may be present in the workplace and/or in a specific job or work activity:
  - Risk factors are observed (see Section 3.1.2);
  - Workers reporting signs and symptoms;
  - MSI(s) reported to First Aid;
  - Workers off work with MSI; or
  - Injury/claims statistics showing increased MSI incidences in certain jobs.
- 3.1.2 Risk factors that may cause or contribute to MSI in the workplace include:
  - The physical demands of work activities, including force required, repetition, duration, work postures, and local mechanical contact stress;
  - Aspects of the layout and condition of the workplace or workstation, including working reaches and heights, seating, and floor surfaces;
  - The characteristics of objects handled, including size/shape, load condition and weight distribution, and container/tool/equipment handles;
  - The environmental conditions, including temperature extremes; and
  - Characteristics of the organization of work, including work-recovery (rest) cycles, task variability, and work rate.

### 3.2 Assess Ergonomic Risk Factors

- 3.2.1 Identified risk factors must be assessed to determine their severity and likelihood of contributing to MSIs. A variety of risk assessment tools/methods are available, including WorkSafeBC's MSI Risk Factor Identification and Assessment Worksheets. The Worksheets are designed to assist with determining if an identified risk presents a low, moderate or high risk of MSI, and to help set priorities for risk control, if required (Section 3.3).
- 3.2.2 Risk assessments must be carried out by a person who is familiar with the work process/activity being assessed, has a good understanding of ergonomic risk factors, and has been instructed in the applicable assessment tool/method (contact OSH Specialist for assistance).
- 3.2.3 Risk assessments must include consultation with workers who are experiencing signs and symptoms of MSI, if applicable, and a representative sample of the workers who are required to carry out the work being assessed.

### 3.3 Control Ergonomic Risk Factors

- 3.3.1 If a risk assessment (Section 3.2) indicates that a work activity or tool presents a moderate or high risk of MSI, then controls must be implemented to eliminate or, if that is not practicable, minimize the risk.
- 3.3.2 Possible risk control options vary depending on the risk factor(s) present, but will typically involve changes to workstations, equipment or tools (Engineering Controls) or changes in the way work is done (Administrative Controls). Personal protective equipment may only be used as a substitute for engineering or administrative controls where those controls are not practicable. Appendix 2 – Summary of MSI Risk Factors and Control Options—provides examples of possible risk control options.
- 3.3.3 If permanent control measures will be delayed, interim controls must be implemented without delay (e.g. minimize the use of a problem tool pending selection and purchase of an ergonomically designed tool).
- 3.3.4 Implemented controls must be monitored to ensure that they are effective and must be reviewed at least annually. If deficiencies are identified, corrective action must be taken without undue delay.

### 3.4 Educate and Train Workers

- 3.4.1 Workers who may be exposed to a risk of MSI must be educated in the identification of the risks associated with their work, including the recognition of early signs and symptoms of MSIs, the potential health effects of MSIs and how physical condition impact the risk of MSI. To arrange for the delivery of ergonomic education, contact your OSH Specialist.
- 3.4.2 Workers who perform work that requires specific controls to minimize the risk of MSI (e.g. work procedures, mechanical aids, personal protective equipment, etc.) must be trained in the use of the applicable controls.

## 4. Responsibilities

### 4.1 Managers, in consultation with the local Safety Committee and/or Key Safety Representative(s) are responsible for implementing the requirements outlined in this standard.

### 4.2 Workers are responsible for:

- Assisting with the identification of ergonomic risk factors in the workplace by reporting any signs or symptoms of MSI to their manager and/or Safety committee/representative; and
- Using any risk control measures that are implemented in their workplace in accordance with the training or instruction provided.

**4.3** Safety committees/representatives are responsible for monitoring the ergonomics program and providing input on activities relating to:

- Risk identification, assessment and control;
- The content and provision of worker education and training; and
- The evaluation of compliance measures taken.

## **5. Records and Documentation**

**5.1** Records must be kept of activities relating to the Ergonomics Program including:

- MSI risks identification and assessment;
- Controls implementation and review; and
- Worker education and training.

## **6. References**

**6.1** WorkSafeBC Occupational Health & Safety Regulation, Sections 4.46 to 4.53

**6.2** OSH Standard 3O8 – VDT Workstations Ergonomics

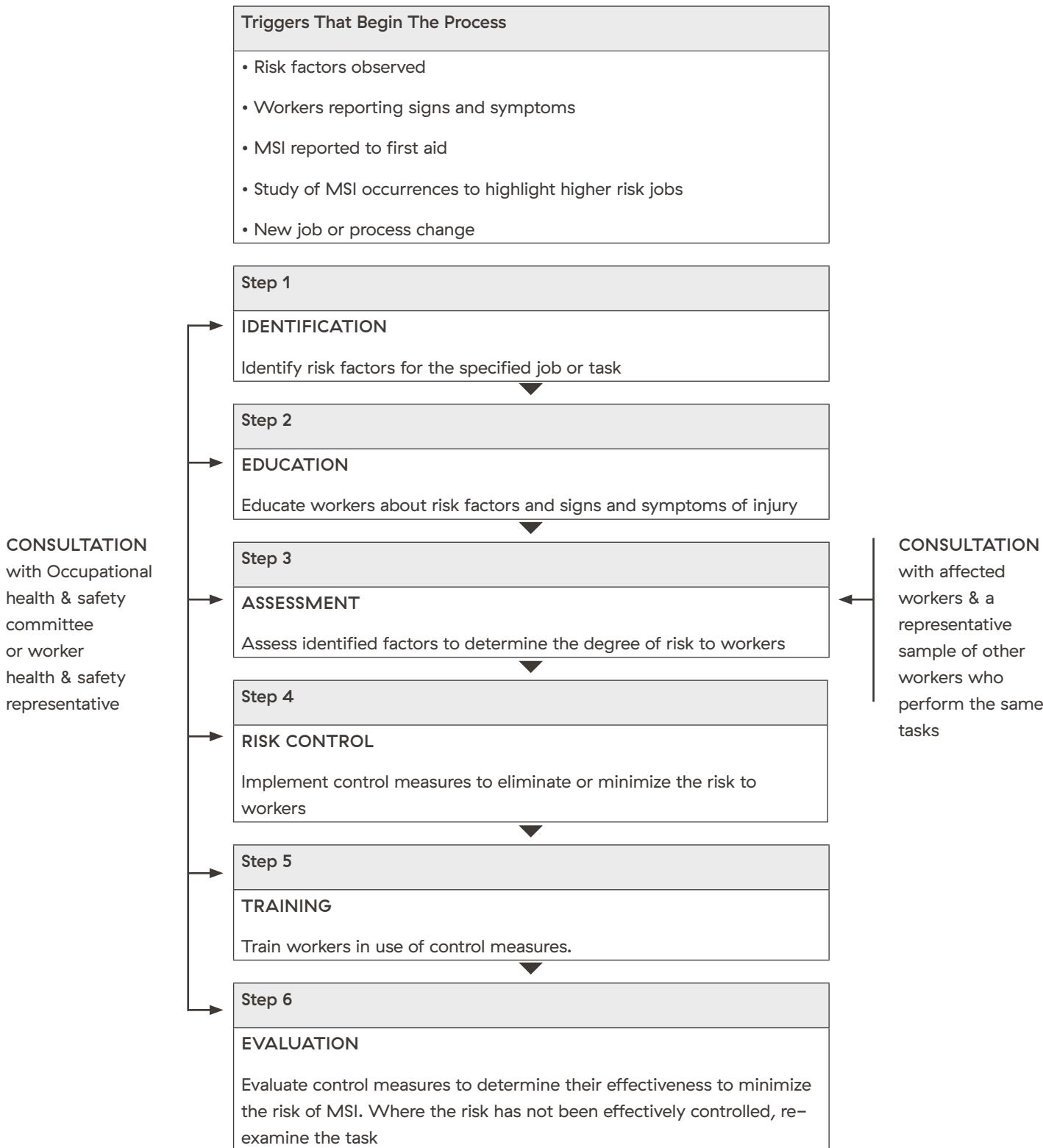
**6.3** WorkSafeBC Booklet: Preventing Musculoskeletal Injury (MSI): A Guide for Employers and Joint Committees (BK77)

**6.4** WorkSafeBC Booklet: Understanding the Risk of Musculoskeletal Injury (MSI): An Educational Guide for Workers on Sprains, Strains, and Other MSIs (BK78)

## **7. Glossary**

**7.1** Ergonomics—An applied science that seeks to fit the job to the worker by taking the worker's capabilities and limitation into account when assessing and designing jobs, workstations and tools. The goal of ergonomics is to prevent adverse health effects by creating an optimal match between the worker's capabilities and limitations and the demands of the job.

**7.2** Musculoskeletal Injury (MSI)—An injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels or related soft tissue including a sprain, strain and inflammation, that may be caused or aggravated by work.



## Appendix 2

### Summary of MSI Risk Factors & Control Options

Risk Factor	Definition	Possible Risk Control Options
Awkward Postures	<ul style="list-style-type: none"> <li>Those outside the “neutral” range defined for each joint as optimal for applying force or minimizing injury</li> </ul>	<ul style="list-style-type: none"> <li>Change height, reach or orientation of work or workstation/equipment/tools, or worker</li> <li>Use adjustable stands</li> <li>Use turntables or conveyors to bring items closer</li> <li>Ensure adequate vision</li> <li>Use tilted work surfaces and spring-loaded surfaces</li> <li>Design hand tools for neutral wrist and thumb posture</li> </ul>
High Repetitions	<ul style="list-style-type: none"> <li>Task or series of motions that are performed over and over again by the same muscle groups with little variation</li> </ul>	<ul style="list-style-type: none"> <li>Combine or eliminate some parts of task</li> <li>Ensure worker has some flexibility over pace and breaks, take frequent micropauses</li> <li>Give people time to break into repetitive tasks</li> <li>Train in good techniques</li> </ul>
Forceful Exertions	<ul style="list-style-type: none"> <li>Forces are generated by muscles of the hands and arms to cause movement (e.g. turning a board, gripping an item)</li> </ul>	<ul style="list-style-type: none"> <li>Reduce weight of objects held, or use devices to hold</li> <li>Reduce gripping or improve grip on tool</li> <li>Replace muscles with motors or mechanization</li> <li>Use larger stronger muscles (e.g. power grip vs. pinch)</li> <li>Ensure gloves are well-fitting and improve friction</li> <li>Reduce hand tool vibration and minimize cold</li> </ul>
Static Load	<ul style="list-style-type: none"> <li>Muscular contraction maintained with no movement (gripping tool, leaning over)</li> </ul>	<ul style="list-style-type: none"> <li>Use fixtures and clamps to hold materials, suspend tools</li> <li>Provide armrests where arms are elevated</li> <li>Job rotation, micro-pauses, rest breaks</li> </ul>
Local Mechanical Stresses	<ul style="list-style-type: none"> <li>Parts of the body in contact with objects (e.g. resting palm-side of wrist on sharp surface)</li> </ul>	<ul style="list-style-type: none"> <li>Distribute pressure over as wide an area as possible</li> <li>Use tools with long enough handles, round surfaces</li> <li>Pad surfaces with softer material</li> </ul>
Manual Materials Handling	<ul style="list-style-type: none"> <li>Lifting of objects (including people)</li> </ul>	<ul style="list-style-type: none"> <li>Minimize material movement through good design</li> <li>Use mechanical assists (lift trucks, platforms, hoists)</li> <li>Reduce weight of object, assign more people</li> <li>Provide better grip with handles</li> <li>Reduce horizontal distance with good access</li> <li>Limit stacking heights, heavy objects at waist height</li> <li>Change layout to reduce twisting, use good techniques</li> </ul>
Pushing, Pulling and Carrying	<ul style="list-style-type: none"> <li>Pushing, pulling or carrying of objects, carts, people, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce force with good wheels and handles</li> <li>Minimize distances</li> </ul>
Working Heights	<ul style="list-style-type: none"> <li>Vertical work level – affects posture</li> </ul>	<ul style="list-style-type: none"> <li>Spring-bottom bins, lift tables, alleviators, extend arms of tools, adjustable work surfaces, stools ladders</li> </ul>
Working Reaches	<ul style="list-style-type: none"> <li>Distance to objects handled</li> </ul>	<ul style="list-style-type: none"> <li>Redesign to bring items closer, use tilting mechanism, electronic eyes, rollers, etc.</li> <li>Reorient product, remove obstructions</li> </ul>
Sitting	<ul style="list-style-type: none"> <li>Prolonged periods in chair or sit-stand stool</li> </ul>	<ul style="list-style-type: none"> <li>For multiple users, make adjustable</li> <li>Provide seating instructions and training</li> <li>Allow sufficient leg room, and micro-pauses</li> </ul>
Standing	<ul style="list-style-type: none"> <li>Prolonged period stationary in one place</li> </ul>	<ul style="list-style-type: none"> <li>Alternate with sitting, sit/stand and walking tasks</li> <li>Use anti-fatigue matting and a low foot-rail</li> </ul>

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# **OSH Standard 317**

## **Battery Safety**

# OSH Standard 317

## Battery Safety



### 1. Scope

1.1 This standard covers the safety requirements for battery work.

### 2. Purpose

2.1 The purpose of this standard is to establish safety requirements for working on batteries to ensure that workers involved in such work are protected from the risks associated with battery chemical and explosion hazards, and to ensure regulatory compliance. With the exception of tools (section 3.5 of this Standard), electrical safety requirements are addressed under Power System Safety Protection (PSSP), the Safety Practices Regulation (SPR), Work Protection Procedures (WPP) and the applicable BC Hydro Engineering and Maintenance Standards.

### 3. Standard

#### 3.1 General

3.1.1 There are three main hazards associated with battery work:

- Electrical Contact – A considerable amount of stored energy is present in battery banks and, if the required work practices and procedures are not followed, flash burns due to shorting out or electrocution can occur (potential currents up to 10,000 amps);
- Chemical (Electrolyte) Exposure – The electrolyte in batteries is sufficiently acidic (Lead Antimony, Lead Acid and Lead Calcium batteries) or caustic/alkaline (Nickel Cadmium, Potash) to cause permanent damage to eyes or burns to skin if the electrolyte comes in contact with those areas; and
- Explosion (Hydrogen Gas) – Hydrogen gas is produced during equalizing and recharging electrolysis and, if the gas is allowed to accumulate due to inadequate ventilation, an explosive atmosphere can result. Hydrogen gas is colorless, odorless, tasteless and lighter than air.

3.1.2 With the exceptions described in clauses 3.1.3 through 3.1.5, this Standard applies to all Stations, communications, and emergency (UPS) batteries.

3.1.3 A lower level of personal protective equipment/clothing and emergency washing may be used when working on sealed, gelled-electrolyte (e.g. Valve-Regulated Lead-Acid – VRLA) and small, sealed radio control batteries (less than five, automotive-type batteries). See clause 3.3.3 for minimum personal protective equipment/clothing and washing facilities requirements during work on these batteries.

3.1.4 The emergency eye and skin washing requirements (clause 3.3.1) do not apply to unheated Radio Repeater sites that have liquid electrolyte batteries and are accessible only by helicopter. See clause 3.3.4 for minimum emergency washing requirements and precautions for these sites.

3.1.5 The emergency skin washing requirements for Non-Routine or Major Maintenance (clause 3.3.1) do not apply to Microwave sites if/when:

- There is no plumbed water supply at the site;
- The site is only accessible via helicopter or snowmobile/snowmachine due to winter conditions; and
- Work (i.e. emergency cell replacement) can't be delayed until the weather/road conditions improve.

See clause 3.3.5 for minimum skin washing requirement and precautions for Microwave sites that meet the above conditions.

### 3.2 Pre-Work Checklist and Precautions

#### 3.2.1 Before starting work on a battery bank the worker(s) must:

- Ensure required eye/skin washing facilities are available and operational (see section 3.3);
- Put on required personal protective equipment/clothing (see section 3.3);
- Ensure that spill kit and spill response plan/procedures are on site, if applicable (see section 3.4 and Appendix 1);
- Ensure that required tools are available and in good condition (see section 3.5);
- Ensure that battery room/area ventilation is adequate (see section 3.6);
- Remove any large metal adornments (e.g. wrist watch, bracelet); and
- Discharge body static by touching ground.

### 3.3 Personal Protective Equipment/Clothing & Emergency Washing Facilities

Note:

In addition to the hazard specific requirements outlined below, the general requirements for flame resistant clothing from OSH Standard 6O1 Personal Protective Equipment also apply.

#### 3.3.1 The required PPE/clothing and emergency washing facilities depend on the planned work activity, as per the following Table.

Work Activity	Face/Eye Protection	Hand Protection	Body/Foot Protection	Emergency Washing Facilities
Routine Maintenance <b>(See Note<sup>1</sup>)</b>	Face-Shield	Neoprene Rubber Gloves	Neoprene Rubber Apron	Plumbed or Portable Eye-Wash Station <b>(See Note<sup>4</sup>)</b>
Routine Corrective Maintenance <b>(See Note<sup>2</sup>)</b>	Face-Shield  Add Chemical Goggles if two or more workers are working side-by-side removing inter-cell connectors	Neoprene Rubber Gloves	Neoprene Rubber Apron	Plumbed or Portable (self-contained) Eye-Wash Station <b>(See Note<sup>4</sup>)</b>
Non-Routine or Major Maintenance <b>(See Note<sup>3</sup>)</b>	Face-Shield  Add Chemical Goggles when carrying charged battery cells	Neoprene Rubber Gloves	Neoprene Rubber Apron  Steel-toed Rubber Boots when carrying charged battery cells	Plumbed or Portable (self-contained) Eye-Wash Station <b>(See Note<sup>4</sup>)</b> ; and  Drench Hose (plumbed source) or Portable (self-contained) water supply for washing skin <b>(See Note<sup>5</sup>)</b>

Note1: Routine Maintenance includes visual inspections, voltage readings, specific gravity checks and topping up of batteries with distilled water.

Note2: Routine Corrective Maintenance includes removing/cleaning inter-cell connectors, cleaning battery terminals, bypassing cells, carrying out load testing and replacing less than 3 cells in a battery bank.

Note3: Non-Routine or Major Maintenance includes changing battery cells (3 or more) and installing or replacing battery banks. If new cells require filling with electrolyte after installation additional precautions, including respiratory protection may be required. Contact your OSH Specialist for assistance with carrying out a risk assessment.

Note4: Eyewash station must provide continuous flow, with a minimum duration of 15 minutes, and must be located within 5 seconds walking distance of the hazard area, but not further than 6 meters (20 feet). The flushing agent (potable water or saline solution) in the eye wash station must be maintained at 15–30 degrees centigrade (60–85 F), and the eyewash station must be tested and maintained in accordance with the instructions provided in Appendix 2 of OSH Standard 604 – Emergency Showers and Eyewash Stations.

Note5: Skin washing facilities must be located within 10 seconds walking distance of the hazard area but no further than 30 meters (100 feet). At sites without a plumbed water supply, portable skin washing equipment must be provided during the work – e.g. Encon's 37-gallon ABS dual-stream self-contained eyewash with drench hose on cart (Model O11O6OO1), or equivalent. Encon's 37-gallon tank supplies 30 gallons of useable water, providing 6 minutes of continuous skin rinsing. Encon products can be purchased from Acklands-Grainger or Fleck Brothers. If a plumbed shower is provided, it must be tested and maintained in accordance with Appendix 2 of OSH Standard 604.

3.3.2 PPE must be stored in an area away from the battery bank and must be put on at that location, before approaching and starting work on battery. If battery bank is located in a separate room, PPE must be stored outside the battery room. If battery bank is not located in a separate room (e.g. is located in control room), then PPE must be stored at least 6 meters (20 feet) from the battery bank.

3.3.3 The risk of electrolyte contact with eyes and skin is significantly reduced, but not eliminated, during work on sealed batteries with gelled electrolyte (e.g. VRLA batteries) and small, sealed radio control batteries (less than five, automotive-type batteries). To minimize risk during work on these batteries the following requirements must be met.

3.3.3.1 PPE and Clothing – Workers must wear neoprene rubber gloves, and a face-shield. Add a neoprene rubber apron when moving/carrying batteries/cells.

#### 3.3.3.2 Emergency Eye/Skin Washing Facilities

- During Routine/Corrective Maintenance at locations where there is no permanent eyewash station on site (as per Note4, clause 3.3.1), provide 2 one-litre personal wash bottles with isotonic saline solution.  
If an eyewash station is on site, ensure that it is operational before starting work.
- During Non-Routine or Major Maintenance at locations where there is no water supply (drench hose, as per Note5, clause 3.3.1), provide 2 one-litre wash bottles with isotonic saline solution for skin (and eye) washing.

3.3.4 The following emergency eye and skin washing requirements apply to unheated Radio Repeater sites that have liquid electrolyte batteries and are accessible only by helicopter.

- For all battery-related work, transport in a Fend-All “Flash Flood” (or equivalent) portable eyewash station and two one-gallon saline solution cartridges (Note: Sealed cartridges have a two-year shelf life – maximum 6 months after seal is broken).

- Place the eyewash station on a flat surface with the back of the unit supported, within 3 meters of the area where the battery work is carried out (See Note below).
- Place the cartridges next to the station ready for mounting, if required.
- For Non-Routine or Major Maintenance use solution in the cartridge(s) to wash affected skin in the event of skin contact with electrolyte.
- Proper use of personal protective equipment/clothing to minimize the risk of injury is particularly important at remote sites and must be stressed at all times.

Note:

When cartridge is mounted the eyewash station is top-heavy and may need to be supported to keep it upright – e.g. put the back of the unit up against an equipment case and/or have the second worker on site support the station during flushing.

- 3.3.5 At Microwave sites that meet the conditions outlined in clause 3.1.5, transport in a minimum of 2 one-litre personal washing bottles filled with water or saline solution for skin washing (in addition to the required, on-site permanent eyewash station). Proper use of personal protective equipment/clothing to minimize the risk of injury is particularly important at remote sites and must be stressed at all times.

#### 3.4 Spill Clean Up – Selection and Safe Use of Battery Spill Kits

- 3.4.1 As per the requirements of the OHSR (WHMIS) and OSH Standard 3O2 (Safety During Spill Response) a plan, including procedures and worker training, must be in place to address an emergency involving a controlled product.
- 3.4.2 Appendix 1 of this Standard is provided to assist managers with selecting a battery spill kit and developing their local response plan and clean up procedure in the event of a liquid electrolyte spill. The local procedure must include site-specific information and instructions – i.e. it is not acceptable to simply copy the generic procedure provided in Appendix 1.

#### 3.5 Electrical Hazards Controls – Tools

- 3.5.1 All work on, or near, a battery bank must be carried out with insulated tools to minimize the risk of worker injury in the event of inadvertent tool contact with adjacent cells. There are tools manufactured for this purpose – e.g. steel tools insulated entirely except for the contact point. Insulated tools are available through various suppliers.

Note:

Most battery manufacturers provide some wrenches in fixed sizes when a new battery bank is delivered. These tools should be retained for use after installation as they are the required size for inter-cell connectors, and are either plastic or 100% insulated.

### 3.6 Explosion Hazard Control – Ventilation

- 3.6.1 Battery rooms/areas must be ventilated (mechanically or naturally) to prevent the accumulation of hydrogen (H<sub>2</sub>) gas during equalizing and recharging electrolysis.
- 3.6.2 To minimize the risk of an explosion and comply with WorkSafeBC requirements, ventilation must maintain the H<sub>2</sub> concentration in the room/area at less than 20% of the Lower Explosive Limit (LEL). The LEL for H<sub>2</sub> is 4% by volume; therefore, the ventilation must be sufficient to maintain the H<sub>2</sub> concentration below 0.8% by volume.
- 3.6.3 For information about the requirements that apply to new installations, refer to the applicable Hydro Engineering Standards and the battery manufacturer's specifications. For assistance with carrying out ventilation assessments, contact your Occupational Safety and Health (OSH) Specialist.

### 3.7 Signage

- 3.7.1 A peel-and-stick, 4" x 4" (Form #8O524) and 8.5" x 11" (Form #8O524-1) label is available from BC Hydro Stationery and must be posted near each entry to the battery room/area, in a location where it is easily visible to anyone approaching the battery bank.



### 3.8 Chemical Storage

- 3.8.1 Chemical (electrolyte) storage at sites with batteries must not exceed quantities required for routine maintenance (maximum 1 litre).
- 3.8.2 Larger volumes of electrolyte may be required and stored at the site during battery bank installation or replacement, in cases where new cells arrive dry and have to be filled after installation. After completion of filling, surplus electrolyte must be removed from the site.

## 4. References

- 4.1 WorkSafeBC, Occupational Health and Safety Regulation, Part 5 – Chemical and Biological Substances
- 4.2 BC Hydro OSH Standards pertaining to Spill Response and Work Environment.
- 4.3 BC Hydro Battery Engineering and Maintenance Standards

4.4 BC Hydro Power System Safety Protection (PSSP)

4.5 BC Hydro Safety Practices Regulations

4.6 BC Hydro Batteries Workplace Label, Form 8O524 and 8O524-1

**Revision Rationale:**

OSH Standard 317 RO August 2006 (RO-1 Updated April 16, 2014): Notation added to Section 3.3 to provide clear connection between OSH Standard 317 Battery Work Safety Requirements and OSH Standard 6O1 Personal Protection Equipment to ensure the requirement for flame resistant clothing is identified. Section 3.7.1 edited to include image of Form #8O524 and previous wording from Section 3.7.2.

OSH Standard 317 RO August 2006 (RO-2 Updated August 1, 2014): Section 3.7.1 edited with new image of Form #8O524 and 4" x 4" size.

OSH Standard 317 RO August 2006 (RO-3 Updated June 18, 2015): Minor edit to section 3.7.1 to include the availability of 8.5" x 11" label (Form #8O524-1).

## Appendix 1

### Spill Clean-Up – Selection and Safe Use of Battery Spill Kits

#### A. Battery Type Determination

BC Hydro uses a variety of wet cell batteries that usually contain metal plates (e.g. lead, mercury or cadmium) surrounded by a corrosive liquid/gelled alkaline or acid electrolyte at varying concentrations. There are several different types of spill kits for battery electrolytes and it is important to determine the type of electrolyte that is being used before purchasing a kit (refer to electrolyte Material Safety Data Sheet). For example, the most common type of electrolyte used in lead antimony and lead calcium batteries is sulphuric acid with concentrations typically ranging from 30 to 60 percent by weight.

#### B. Spill Kit Selection

##### 1. Available Battery Spill Kits

There are basically two types of battery spill kits available on the market: Neutralizing Kits and Hazardous Liquids Kits with General Sorbents (Detailed information on both kits is provided below). Whenever possible, the spill kits with general sorbents should be used for the following reasons:

- **Reduced exposure hazard for responders** (neutralization requires increased handling and can create an exothermic – heat generating – reaction); and
- From a disposal standpoint there is **no advantage to “neutralizing”** the spilled liquid because the waste material generated is still considered a special waste due to the presence of heavy metals (e.g. lead) which leach into the fluid portion on the battery during normal use.

###### (a) Neutralizing Kits

Some spill kits come with a neutralizing agent which reacts with the electrolyte fluid to minimize the spill hazard. These neutralizing agents can come in the form of an acid (e.g. muriatic) or alkaline (soda ash). It is important that you determine whether the battery contains an acid or alkali electrolyte so that the appropriate neutralizing agent is selected. Caution must be taken when attempting to apply a neutralizer to the spilled liquid as **excessive heat and gas can be generated**.

Neutralizing agents are available in liquid, dry and powdered formulations. In order to overcome the problem of adding too much neutralizer, some manufacturers also add a color indicator to the neutralizer to help identify the neutralization point.

###### (b) Hazardous Liquids Spill Kit with General Sorbents

Some industrial suppliers provide spill kits for hazardous liquids. These kits often contain general sorbent materials for aggressive and hazardous fluids. Typical hazardous and aggressive liquids spill kits contain a treated polypropylene (synthetic) sorbent material, which is less likely to react with the spilled liquid.

Note:

Never place an organic sorbent – e.g. sawdust – on a strong acid or base, as the mixture may spontaneously combust.

Some manufacturers also provide a powdered sorbent (e.g. alumina silicate), which will react with any liquid to form a semi solid.

Note:

Please note that this solidified material is still corrosive.

Although these powders may be harder to clean-up they are more effective at sorbing up the spill liquid and less likely to leave any corrosive residue behind. These kits may be supplemented with a neutralizing agent that should not be used.

## 2. Spill Kit Size Selection

There is a wide range of spill kit sizes for battery spills. Some kits can handle only 1 litre of spilled liquid while others are designed to deal with several hundred litres at once. It is very unlikely that an entire battery bank would be damaged at one time, thus when choosing a spill kit, ensure the kit is able to handle at least 125%, and preferably 200%, of the largest battery volume. For maximum/ideal protection select a spill kit with the capacity to handle 125% of the largest battery plus 10% of the facility's total battery volume.

## C. Safe Use of Battery Spill Kits – Spill Clean Up

Care must be taken during clean up of battery spills. A local, site-specific hazard assessment must be carried out and an emergency/spill response plan must be in place. The plan must include written work procedures and worker training in those procedures. For assistance refer to OSH Standard 3O2 – Safety During Spill Response (Use the Spill Response Hazard Assessment form provided in Appendix 1 of OSH Standard 3O2 and the applicable electrolyte Material Safety Data Sheet).

The following generic clean up procedure is provided to assist with drafting of the local procedure. **The local procedure must include site-specific information and instructions – i.e. it is not acceptable to simply copy the following generic procedure.** For assistance, contact your Occupational Safety and Health (OSH) Specialist.

### Generic Clean-Up Procedure For Battery Spills/Leaks

#### Scope

The following generic procedure is for clean up of electrolyte spills/leaks only and is based on workers using a general sorbent – i.e. there is no attempt to neutralize the electrolyte. The procedure is not adequate for dealing with situations requiring entry during/after a fire or immediately after an explosion.

#### Procedure

##### 1. Ensure Safety

- a) Turn on mechanical ventilation system if in place, or maximize natural ventilation by opening door(s), and allow area/room to air out for 15–20 minutes.

###### Note:

This assumes that ventilation system can be turned on without entering spill area. If this is not the case, let area/room air out for 15–20 minutes and put on PPE before entering to turn on ventilation system.

- b) Put on Personal Protective Equipment (PPE), including face-shield and rubber gloves, boots and apron/

###### Note:

Wear chemical goggles beneath the face-shield if there exists a risk of electrolyte splashing during spill control or clean up.

- c) Do not enter spill area if it cannot be ventilated.

##### 2. Stop the Flow

- a) If required, enter the spill area and stop the flow.

### 3. Secure the Area

- a) Limit access to properly equipped/protected workers.

### 4. Contain the Spill

- a) Use battery spill response kit contents to contain the spill. Review spill kit instructions prior to taking action!
- b) Use sorbent socks to contain any free liquid.
- c) Place sorbent material over spill area, minimizing splashing.

### 5. Report

If the spill volume exceeds 1 litre (Class 9.2) and enters the environment (e.g. via floor drain or storm sewer system) the Provincial Emergency Program (PEP) must be contacted. PEP telephone number is 1 800 663 3456.

### 6. Clean Up

- a) Clean up contaminated sorbent in accordance with kit instructions and carefully place contaminated sorbent and materials into a leak proof container or 5 Mil. poly bag.

#### Note:

Used sorbent material is corrosive. Seal and label waste container (refer to section C of this Appendix). Place waste container in the special waste storage area. Call Store 12 Special Waste Coordinator for transportation and disposal assistance.

- b) Outside the spill area remove PPE avoiding contact with contaminated areas. Clean contaminated PPE and reusable equipment with soap and water and rinse thoroughly with water. Any damaged PPE that cannot be repaired must be placed into the waste container for disposal.
- c) Ensure any spill kit materials used during the cleanup and damaged PPE are promptly replaced.

### D. Waste Storage and Disposal

All waste generated from the clean-up of a battery spill is considered a **special waste** and must be disposed of in accordance with the Provincial Special Waste Regulations. Even if the electrolyte has been neutralized, the waste material will still be a special waste because, due to the nature of wet cell batteries, heavy metals leach into the electrolyte generating a leachable hazardous waste.

All contaminated materials and sorbents generated during clean up must be placed into a leak proof plastic (5 Mil polyethylene) or corrosive resistant container. A polyethylene lined metal drum may be used as long as there is not direct contact with the metal surfaces.

Apply a WHMIS workplace label to the waste container. Label must include product identification, handling precautions and reference to Material Safety Data Sheet. Also indicate date and contact person/phone on label. Store container in a designated special waste storage area and contact the Store 12 Special Waste Coordinator for transportation and disposal assistance.

For further information, contact your Environmental Coordinator.

### Table of Contents

# **OSH Standard 318**

## **Crystalline Silica**

# OSH Standard 318

## Crystalline Silica



### 1. Scope

- 1.1 This standard establishes the requirements for minimizing exposure to airborne crystalline silica dust and particulate (mainly originating from concrete demolition/work). These requirements do not apply to work involving exposure to amorphous silica (e.g. silica gel) which is not a known carcinogen.
- 1.2 Throughout this standard the term 'silica' shall refer to respirable crystalline or airborne silica dust that may contain respirable crystalline silica.
- 1.3 For more information on WorkSafeBC requirements see the appendices regarding the information and details on an exposure control plan.

### 2. Purpose

The purpose of this standard is:

- 2.1 To establish the requirement to develop and implement a silica exposure control plan where a risk of worker exposure to airborne crystalline silica exists.
- 2.2 To minimize the risk of exposure to silica by reducing exposures to As Low As Reasonably Achievable (ALARA) below the occupational exposure limit.

### 3. Standard

- 3.1 The rationalization for this standard is that legislation requires an exposure control plan when worker exposures are greater than 50% of the exposure limit. The current OHSR 8-hour time weighted average exposure limit for crystalline silica (alpha quartz and cristobalite, respirable) is 0.025 milligrams per cubic metre (mg/m<sup>3</sup>). Prolonged exposure to respirable silica can lead to illness (e.g. silicosis).

- 3.2 BC Hydro's silica exposure control plan shall consist of the following:

- (a) Statement of purpose and responsibilities
- (b) Risk identification, assessment and control
- (c) Education and training
- (d) Written work procedures
- (e) Hygiene facilities and decontamination procedures, as required
- (f) Health monitoring, as required
- (g) Documentation, as required

The BC Hydro silica exposure control plan shall be reviewed annually.

### 3.3 Hazard Identification and Risk Assessment – Sampling/Monitoring and Identification

- 3.3.1 BC Hydro has developed and defined group risk levels for silica-related work activities based on personal sampling and literature studies. Risk levels for silica-related work activities were defined as low, moderate or high.

Low risk activities include: formwork, pouring concrete, mixing, placing concrete/grout, clean-up of low hazard activities and wet coring.

Moderate risk activities include: grinding, drilling, chipping, cutting, demolition & clean-up of moderate hazard activities.

**Note:**

To date no specific activities currently conducted by BC Hydro are designated to be a high risk. Potential high risk conditions can occur for work activities where there is a potential for exposure and no known controls are in place.

- 3.3.2 If the work does not fall within the identified silica-related work activities and required controls identified within the silica exposure control plan, a **qualified person will carry out a risk assessment** of work involving silica related work. The risk assessment will be documented and will note the potential exposure to workers. Where required, the risk assessment will include a requirement for silica in air monitoring to confirm the anticipated level of risk and to support the choice of control methods used.

### 3.4 Training

- 3.4.1 In addition to General Instruction, all workers who are required to carry out work involving silica (Section 3.5) must be given training in both applicable written work procedures and the correct use of the required personal protective equipment and controls. The applicable work procedures must be reviewed as part of pre-job tailboards.
- 3.4.2 Training must be delivered by a qualified person in the applicable work activity risk level (i.e. low, moderate or high). Efforts must be made to ensure that workers are competent in doing the work in accordance with the applicable procedures.
- 3.4.3 If workers find or conduct work where there is a potential for crystalline silica to become airborne in a work area they must secure the area to prevent disturbance of the silica and immediately report the condition/circumstances to their crewleader/workleader or manager.
- 3.4.4 If work activities involve potential release of respirable silica all work in the affected area will be stopped until the risk has been eliminated. If this is not practicable, written work procedures will be developed and implemented to minimize the potential for exposure until the hazard can be eliminated. Work procedures will be prepared by a qualified person.

### 3.5 General Instruction

- 3.5.1 All workers who access or carry out work at locations where airborne silica is present will be given instruction in the hazards of respirable silica. For assistance, contact your Occupational Safety and Health (OSH) Specialist.
- 3.5.2 Contractors who carry out work in areas where respirable silica is present will be informed of the location of the work and controls in place to prevent exposure.

### 3.6 Reporting Incidents Involving Exposure

- 3.6.1 If there is suspected/accidental worker exposure to respirable silica during routine work, a near miss or incident shall be completed on the BC Hydro Incident Management System (IMS). To document this worker exposure, each worker must complete a minor injury report and forward copies to their manager and to BC Hydro Safety. BC Hydro Safety currently administers and maintains safety records.

## 4. Roles and Responsibilities

- 4.1 Managers are responsible for minimizing the risk of exposure to silica by implementing a silica management plan, ensuring workers have an acceptable level of competency, ensuring that workers / contractors comply with the requirements of the plan, and by investigating incidents involving failure of the controls.
- 4.2 Workers who carry out work at locations where air borne silica is present are responsible for participating in the instruction/training provided, complying with the requirements for managing respirable silica and reporting any problems or concerns to their work/crew leader or manager.

## 5. Records and Documentation

- 5.1 Records must be kept of the activities pursuant to the silica exposure control plan. Except where indicated otherwise, the records will be retained on file permanently. The records must include:
- Risk assessments
  - Inspections where activities / work have the potential to release respirable crystalline silica
  - Silica-in-air monitoring and sampling results
  - Instruction and training (minimum of 3 years)
  - Written work procedures (if applicable), and
  - Investigations of incidents involving failure of controls described in the plan (Incident Reports and Corrective Actions)

## 6. References

### 6.1 WorkSafeBC Occupational Health and Safety (OHSR) Regulation

- Part 5 – Subsections 5.82(2) (Employer's Responsibility), 12.100 (Substitution), 12.101 (Reuse prohibition)
- Part 5 – Subsection 5.54 (Exposure Control Plan), when workers may be exposed to airborne silica dust in excess of 50% of the exposure limit

### 6.2 WSBC Guidelines Part 6 – Crystalline – respirable alpha quartz and cristobalite notation A2, 1 – Crystalline silica is also classified as a human carcinogen, and exposures must be kept as low as reasonably achievable.

### 6.3 NIOSH Silica Analytical Methods:

- Method # 7601\* – Visible Absorption Spectrophotometry, Respirable silica
  - Method # 7501\* – X-Ray Powder Diffraction (XRD), Amorphous silica
  - Method # 7602\* – Infrared absorption Spectrophotometry, Free crystalline silica
  - Method # 7500\* – X-ray Powder Diffraction (XRD), Crystalline silica
- \* Each analytical method has limitation(s)

6.4 WorkSafeBC publication The Dangers of Breathing Silica Dust <http://www2.worksafebc.com/publications/posters.asp?reportID=35498>.

6.5 OSH Standard 312 Medical Monitoring

6.6 WorkSafeBC Injury Prevention Resources for Construction – Hazardous Materials (Silica) <http://www2.worksafebc.com/Portals/Construction/HazardousMaterials.asp?ReportID=34096>

6.7 BC Hydro Silica Exposure Control Plan

6.8 BC Hydro Silica Work Procedures

**Revision Rationale:**

OSH Standard 318 RO August 2009: This standard is a new standard to reflect WorkSafeBC Occupational Health & Safety Regulation requirements. This standard establishes the requirements and expectations for respirable crystalline silica management.

OSH Standard 318 VO-1 August 2009: Minor edit made June 17, 2013 – Removed outdated reference to BCTC (BC Transmission Corporation), EARG (Engineering, Aboriginal Relations and Generation) and FO (Field Operations) in Appendix 1 – Definitions and Requirements and web links updated in Section 6.7, 6.8 and Appendix 4.

## Appendix 1

### Definitions and Requirements

1. The WorkSafeBC (WSBC)—related requirements are covered in Parts 5.54 of the Occupational Health and Safety Regulation (OHSR) – (requirement to develop an exposure control plan (ECP) when workers are or may be exposed to airborne silica dust in excess of 50% of the exposure limit. Because is a confirmed human carcinogen, WSBC considers respirable crystalline silica to be a “designated substance” under section 5.57 of the OHSR and requires that materials containing respirable silica in workplaces must be effectively managed to ensure that exposures are kept “As Low As Reasonably Achievable” (ALARA).
2. Silica is the second most common mineral on earth and makes up nearly all of what we call “sand” and “rock.” Silica exists in many forms—one of these, “crystalline” silica (including quartz), is the most abundant and poses the greatest concern for human health.
3. **Qualified Person:** An occupational health and safety professional with experience in the practice of occupational hygiene as it relates to management. For the purposes of this Plan this includes Operational Safety Field Support personnel who have the required knowledge and experience.

## Appendix 2

### Exposure Control Plan

The silica exposure control plan provides information for general silica-related work activities performed throughout BC Hydro and serves as a tool for determining which control measure (substitution, engineering, administration and personal protective equipment (PPE)) to use depending on the work activity to be carried out, the duration of the activity, and the working environment.

If the activities, equipment or controls that exist at BC Hydro worksites are different from those presented within this ECP, a “Site-specific Exposure Control Work Plan” must be developed and documented for that work project. Where these changes occur for airborne silica generating work activities, personal air sampling must be conducted to assess worker exposures and to determine the hazard risk level for that activity, and the “Site-specific Exposure Control Work Plan (ECWP)” must be developed and implemented.

BC Hydro will ensure that the regulatory requirements and silica work procedures noted in the silica ECP are followed at our worksites. The silica work procedures for activities known to generate silica dust are meant to protect not only BC Hydro workers, but all workers on our worksites (including subcontractors who are required to have their own safe work procedures for activities being conducted).

#### Typical Elements of a Silica Exposure Control Plan

- An exposure control plan is required pursuant to WorkSafeBC OHSR Section 5.54.

The complexity of the exposure control plan depends on factors such as the results of the risk assessment, the options available for abatement and control, whether these options are utilized, and the likelihood of activities creating respirable silica. BC Hydro has silica working procedures to address typical low and moderate risk work.

- Sources of Respirable Silica and Identification

Respirable silica can originate from work involving:

- Rock and sand
- Topsoil and fill
- Concrete, cement, and mortar
- Masonry, brick, and tile
- Granite, sandstone, and slate
- Asphalt (containing rock and stone)
- Fibrous-cement board containing silica

BC Hydro must ensure information related to work involving respiratory silica be maintained and kept current.

- Coordination of workers and subcontractors

Owners and managers need to ensure that all workers are aware of the requirements for managing crystalline respirable silica producing activities.

- Identification and hazard assessment

BC Hydro must ensure a risk assessment is conducted by a qualified person on work where there is the potential to create airborne respirable silica. This assessment and review of the work activities must be conducted before any work is conducted involving respirable silica.

- Education and training

BC Hydro must ensure anyone at risk of exposure to respirable crystalline silica is adequately instructed and trained in the hazards of its hazards, procedures, means of identification, work procedures and operational controls.

- **Written procedures**

BC Hydro must ensure that procedures for handling, control, prevention or minimizing exposure are in place. These procedures include task specific work direction that addresses the hazards identified.

- **Workplace monitoring**

BC Hydro must conduct workplace monitoring where silica related work is being conducted to confirm effectiveness of controls.

- **Review of program**

An exposure control plan shall be reviewed at least annually and updated as necessary by BC Hydro, in consultation with the health and safety committee or work representatives.

## Appendix 3

### Silica Reference Information

#### Facts about Silica

Silica is the second most common mineral on earth, found in the common form as ‘rock or sand’. Some common materials that contain silica include:

- Rock, sand, topsoil and fill
- Granite, sandstone, and slate
- Concrete, concrete block, cement, mortar and asphalt (containing rock and stone)
- Masonry, brick, refractory brick and tile
- Composite products such as fibrous-cement board

Silica is the compound formed from the elements silicon (Si) and oxygen (O) and has a molecular formula of SiO<sub>2</sub>. The three main forms or ‘polymorphs’ of silica (there are seven in total with four of the seven being extremely rare) are alpha quartz, cristobalite and tridymite. The polymorph most abundant and most hazardous to human health is alpha quartz and is commonly referred to as crystalline silica. If crystalline silica becomes airborne through industrial activities (e.g., demolition of concrete), exposures to crystalline silica (specifically exposure to the size fraction that is considered to be respirable) can lead to silicosis (a fatal lung disease) and has been linked to other diseases such as tuberculosis and lung cancer.

The Occupational Health and Safety Regulation (OHSR) has established seven different occupational exposure limits for silica (February 2009); six of these are for “total” and “respirable” amorphous silica (diatomaceous earth, fume and precipitated and gel forms), and one is for “respirable” crystalline silica (alpha quartz and cristobalite). The silica form most likely to cause serious problems to workers health is respirable crystalline silica (alpha quartz and cristobalite).

#### Health Hazards

The most common route of exposure to crystalline silica is via inhalation (skin exposure, eye contact and ingestion present minimal exposure risk) and can cause a disabling, sometimes fatal disease called silicosis. The fine particles are deposited in the lungs, causing thickening and scarring of the lung tissue. The scar tissue restricts the lungs’ ability to extract oxygen from the air. This damage is permanent, but symptoms of the disease may not appear for many years.

A worker may develop any of three types of silicosis, depending on the concentrations of silica dust and the duration of exposure:

- Acute silicosis – develops within a few weeks, or 4 to 5 years, after exposure to very high concentrations of crystalline silica.
- Accelerated silicosis – develops 5 to 10 years after initial exposure to crystalline silica at high concentrations.
- Chronic silicosis – develops after 10 or more years of exposure to crystalline silica at relatively low concentrations.

Initially, workers with silicosis may have no symptoms; however, as the disease progresses, a worker may experience a shortness of breath, severe cough and weakness. These symptoms can worsen over time and lead to death. Exposure to silica has also been linked to other diseases, including bronchitis, tuberculosis, and lung cancer.

The American Conference of Governmental Industrial Hygienists (ACGIH) designates silica as a substance that is a suspected human carcinogens (notation of ‘A2’). The International Agency for Research on Cancer (IARC) designates silica as a substance that is carcinogenic to humans based on sufficient evidence of carcinogenicity in humans (notation of ‘Group 1’).

## Appendix 4

### Silica Work Procedures with Potential for Respirable Crystalline Silica

	Title	Date
1	Low Hazard Risk Activity Procedures	August 2009
2	Coring Procedures	August 2009
3	Grinding Procedures	August 2009
4	Drilling Procedures	August 2009
5	Chipping Procedures	August 2009
6	Cutting Procedures	August 2009
7	Demolition Procedures	August 2009
8	Moderate Hazard Risk Cleaning Activity Procedure	August 2009
9	Silica Work Procedure – HEPA Filter Bag Replacement	August 2009

Link: [Work Methods Webpage](#)

### Summary of Work Activities and Applicable Hazard Risk Level

Low Hazard Risk Activities	Moderate Hazard Risk Activities
Formwork	Grinding
Pouring concrete	Drilling
Mixing	Chipping
Placing concrete/grout	Cutting
Clean-up of low hazard activities	Demolition
Wet coring	Clean-up of moderate hazard activities

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# **OSH Standard 401**

## **Motor Vehicle Safety**

# OSH Standard 401

## Motor Vehicle Safety



### 1. Purpose

- 1.1 To establish the requirements and responsibilities of managers and employees for the safe operation of motorized vehicles used on BC Hydro business.

### 2. Scope

- 2.1 This standard applies to operation of road-licensed motorized vehicles on BC Hydro business.

### 3. Requirements

- 3.1 BC Hydro shall comply with all applicable government regulations as they pertain to the operation of motor vehicles and their operators.
- 3.2 BC Hydro shall judge driving behaviour by the same principles and standards as all unsafe workplace behaviour, as outlined in the Corporate Policy for Safety and associated procedures.
- 3.3 Employees shall display courteous driving practices while driving on BC Hydro business or at any time they are using a BC Hydro vehicle.
- 3.4 Managers, drivers and passengers shall seek to minimize risks associated with driving.
- 3.5 BC Hydro shall maintain a Motor Vehicle Safety Program within BC Hydro Safety to oversee management of risks related to vehicle safety across the organization.
- 3.6 The Motor Vehicle Safety Program shall include procedures for:
  - 3.6.1 Journey planning to take into account driver competency, driving environment, and vehicle safety.
  - 3.6.2 Driver assessment and training.
  - 3.6.3 Monitoring and evaluating compliance with program requirements across BC Hydro. The Program manager shall annually report compliance and performance to the Senior Vice-President of Safety, Security and Emergency Preparedness, who will oversee periodic audits.

### 4. Roles and Responsibilities

#### 4.1 Managers and supervisors are responsible for:

- 4.1.1 Incorporating the Motor Vehicle Safety Program requirements into the operational work procedures used in their groups.
- 4.1.2 Ensuring that workers and contractors comply with this standard.
- 4.1.3 Reporting and investigating incidents.
- 4.1.4 Reviewing Fleet Bulletins relevant to the operation of vehicles used in their groups.

#### 4.2 Workers are responsible for:

- 4.2.1 Maintaining their drivers' licenses current if required to drive.
- 4.2.2 Participating in instruction and training as required.

4.2.3 Following approved work procedures.

4.2.4 Reporting any problems or concerns to their work/crew leader or manager.

4.3 The Vehicle Safety Program Manager is responsible for:

4.3.1 Developing and maintaining documented requirements, processes, practices and procedures of the Vehicle Safety Program.

4.3.2 Coordinating annual management review of Vehicle Safety Program and BC Hydro performance.

## 5. Regulations and Related Documents

5.1 WorkSafeBC OHS Regulation, Section 16, 17 and 18.

5.2 Employment Standards Act, Section 39

5.3 Workers Compensation Act, Sections 115 and 117

5.4 Motor Vehicle Act Regulations – Division 35 and 37

5.5 National Safety Code, as implemented in British Columbia

### Revision Rationale:

- OSH Standard 4O1 R1 August 2OO6: Standard completely revised September 29, 2011.
- OSH Standard 4O1 V1–1 September 29, 2011: Minor edit made February 7, 2012 – Motor Vehicle Safety Program is managed by Operational Safety in Section 3.5.
- OSH Standard 4O1 V1–2 September 29, 2011: Minor edit made July 4, 2014 – Clarification of Manager and Supervisor responsibilities in Section 4.1.4 to include expectation to review relevant safety related Fleet Bulletins regarding vehicles used by their workers.

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# **OSH Standard 405**

## **Aerial Lifting Devices**

# OSH Standard 405

## Aerial Lifting Devices

### 1. Scope

1.1 This standard covers the requirements for the operation, regular maintenance and field inspections of insulated and uninsulated aerial lifts.

### 2. Purpose

2.1 The purpose of this document is to communicate the requirements for the use and maintenance of aerial lifting devices including those used in Barehand and Live Line applications.

### 3. Standard

#### 3.1 General

3.1.1 WorkSafeBC Regulations, Policies and Guidelines Part 16 (Mobile Equipment) and Part 19 (Electrical Safety), Part 13, (Temporary Work Platforms) and along with Safety Practice Regulations (SPR) should be reviewed in combination with this standard.

3.1.2 During the course of live line work, the live line tool (e.g. a hot stick) provides primary protection to the worker and the aerial lift provides back-up insulation. In the case of barehand work, the aerial lift is the primary insulation for the worker. Back-up and primary insulation will be dielectrically maintained.

#### 3.2 Operating Limitations

3.2.1 Insulated aerial lifting devices that elevate workers are classified as follows:

- Group I—Those that are designed and manufactured for work in which the boom is considered primary insulation (barehand work). These machines are dielectrically tested to permit workers to work on lines having phase-to-phase voltages of up to 500 kV. They may also be used as Group II devices, providing they have received the appropriate dielectric test certification.
- Group II—Those that are designed and manufactured for work in which the boom is considered back-up insulation. These machines are of the articulated type. They are dielectrically tested to allow workers to work from up to, but no closer than, Column 1 Limits of Approach on lines having phase-to-phase voltages up to one of the following levels: 69 kV, 230 kV, or 500 kV.
- Group III—Telescoping – Those that are designed and manufactured for work in which the boom is considered back-up insulation. These machines are dielectrically tested to allow workers to work up to, but no closer than, Column 1 Limits of Approach on lines having phase-to-phase voltages of up to 46 kV. These aerial devices are of the telescoping type and their manufacturer's rated platform height is no more than 12.5 m.

3.2.2 The location of the upper boom's clear insulating material must be clearly delineated. Group I, II and III machines shall have the insulating section of their upper booms finished in orange gel coat. BC Hydro Field Operations Type C—Telescoping machines shall have their upper boom insulated sections constructed of orange fiberglass, or finished in orange Gel-coat. The chassis insulation (i.e. the lower boom insert) on Type C—Telescoping machines shall be orange.

### 3.2.3 Articulating Booms (Group I and Group II machines) with Insulated Sections

- Articulating-boom bucket trucks are only acceptable for bringing workers close to energized equipment if the length of clear insulation is at least 1.5 m and never less than the Column 2 Limits of Approach for the voltage being worked on.
- Lower steel booms and knuckles must maintain a distance from live conductors greater than Column 3 Limits of Approach.

Note:

The section of the telescoping boom's insulation that extends beyond the supporting roller or wear pad, measured with the boom fully retracted, represents the length of insulation that is not prone to being scratched by contact with the roller or pad (referred to as the insulation's protrusion). The sum of the lengths of the insulation's protrusion and the chassis insulation must be equal to or greater than the Absolute Limits of Approach for the voltage being worked on (2 ft. for 46 kV).

### 3.2.4 Telescoping Booms (group III—Telescoping machines) with Insulated Sections

- Telescoping-boom bucket trucks are acceptable for bringing workers close to energized equipment only if the extended length of clear insulation is equal to or greater than the Column 2 Limits of Approach. The insulation must be effective for all boom positions.
- The sum of the lengths of the insulation's protrusion (see Glossary) and the chassis insulation must be equal to or greater than the Column 1 Limits of Approach for the voltage being worked on (e.g. 2 ft. for 46 kV).

### 3.2.5 Insulated Lower Boom Insert

- Conductive components must not bridge the lower boom insert or chassis insulation, thereby negating the dielectric rating, unless specifically required by safe work procedures.

### 3.2.6 Live Line Jibs

- A live line jib on an insulated aerial lift must have a length of clear insulation that is at least equal to the Column 1 Limits of Approach for the voltage being worked on.
- The minimum length of clear insulation for live line jibs that are placed on the end of a boom truck must be equal to the Column 2 Limits of Approach.

### 3.2.7 Bucket Liners

- Dielectrically tested bucket liners are required for high voltage rubber glove work.
- Plastic bucket liners are to be installed prior to the installation of the metal liners that are used in barehand work. These plastic liners provide mechanical protection to the bucket. They do not need to be dielectrically tested for this application, but require inspection for damage prior to use.

### 3.2.8 Any aerial lift that has failed its electrical test, including the electrical test of the lower boom insert, must be treated as uninsulated and clearly marked as such.

- 3.2.9 Aerial lifts that are overdue an electrical or mechanical inspection, shall with cause, be given a two month grace period during which they can continue to operate. Beyond this period such machines shall be deemed to be and treated as uninsulated.
- 3.2.10 Attachments or modifications to the equipment are not permitted unless the manufacturer or equivalent authority has certified that they will not adversely affect the safety of the equipment.
- 3.2.11 Storage and travel boom covers must not be used when an insulated aerial lift vehicle is working around live lines or equipment.

### 3.3 Limits of Approach for Workers in Buckets

- 3.3.1 The boom and bucket of an insulated aerial lift may be brought to a position that places the worker no closer than the Column 2 limits of Approach. When the boom and bucket are stationary, the worker may extend his reach no closer than Column 1 Limits of Approach. For the sole purpose of moving an occupied bucket between the neutral and phase conductors (flying through the neutral), the worker can get up to but no closer than Column 2 Limits of Approach. When flying through the neutral, contact between the bucket or boom and the neutral is to be avoided.
- 3.3.2 When work circumstances cause the boom's back-up insulation to be lost, then the bucket must be kept at a distance equal to or greater than column 3 Limits of Approach.  
  
As an example, when work is done on a grounded circuit above live under-build, then Column 3 limits must be kept between the bottom of the bucket and the live line – or adequate cover-up must be used.
- 3.3.3 The back-up insulation provided by an aerial lift must not be considered as primary insulation for the purpose of determining Limits of Approach.
- 3.3.4 Buckets have no insulation value and must not in any way be relied on as back-up protection.
- 3.3.5 Qualified workers must maintain at least Column 3 Limits of Approach from energized (ungrounded) conductors when moving the boom of an uninsulated aerial device, and may extend their reach no closer than Column 2 Limits of Approach only when the boom and bucket are stationary. All parts of an Aerial Lift having a boom that is not insulated must stay outside Column 3 Limits of Approach.

### 3.4 Workers on the ground must maintain at least Column 2 Limits of Approach from an aerial lift when work is being performed on energized equipment, until each of the following conditions prevail:

- The person aloft or in the vehicle has determined that the conductors and equipment are stable and has given verbal permission for the ground workers to contact the vehicle.
- No task is being performed that creates a risk of the vehicle becoming energized.
- Work aloft on the conductors or equipment must not resume until the ground workers have moved away from the vehicle, beyond Column 2 Limits of Approach, and have verbally indicated their intention to remain clear of the vehicle.

### 3.5 Uninsulated Aerial Lifting Devices

- Uninsulated aerial lifting devices typically used in BC Hydro stations and powerhouses are Genie lifts, scissor lifts, articulating aerial lifts, and bucket vans.
- 3.5.1 The equipment must be collapsed or retracted when relocating the vehicle
  - 3.5.2 Grounding of vehicles in substation will be done in accordance with applicable OSH standards, work procedures and SPRs.

- 3.5.3 No part of the aerial device can come closer than Column 3 to energized or ungrounded conductors. A qualified worker may extend their reach no closer than Column 2 when the equipment is stationary.
- 3.5.4 Equipment movements must be planned when working around energized stations or plants.
- 3.5.5 All workers who use aerial lifting devices must practice rescue at least twice per year as per SPR.
- 3.5.6 An effective means to control workers from working directly under an elevated worker in a lifting device will be put in place. E.g. safety-watch, barriers.
- 3.5.7 A pre-job inspection to ensure the equipment is safe to use must be done. e.g. controls and limits switches, leaks, mechanical inspection.
- 3.5.8 When suspending loads from boom-mounted fork lifts (Telehandlers), the manufacturers approved lift hook attachments must be used as per manufacturer's instructions.
- 3.5.9 When using crane supported work platforms, WCB Standard WPL 2-2004 must be followed.

### 3.6 Limits of Approach for Vehicles that Do Not Elevate Workers

- 3.6.1 A material handling vehicle or digger derrick that is to be used for work near energized lines or equipment must have an insulated section in the boom.
  - The length of the clear insulation should preferably be 1.5 m or greater, but never less than 0.9 m.
- 3.6.2 Insulated telescoping booms may be used up to the Column 2 Limits of Approach for the lifting of materials.
- 3.6.3 Fibreglass boom extensions may be used up to the Column 1 Limits of Approach for lifting materials under the following conditions:
  - They must be maintained in a clean condition and stored in a protected area when not in use.
  - They must be tested electrically each year.

### 3.7 Aerial Lift Motion at the Job Site

3.7.1 The operator must have full and continuous view of any outrigger being deployed. The operator shall, prior to moving an outrigger, inform all persons near the aerial lift that the outriggers are about to be moved. All persons must stay clear of outrigger movements.

- 3.7.2 Once set up on the site, the vehicle must not be moved until after the boom or ladder is cradled and tied down, the outriggers are retracted, and the power take off is disengaged.

**Note:**

The only exception is for short moves, when an Aerial Lift may be moved with workers in the bucket providing the boom is in the cradled position. Such movement must be under the direction of a worker in the elevated position who must be in full view of the driver.

- 3.7.3 Where the vehicle cannot be leveled, it must be parked facing either uphill or downhill, without exceeding the maximum pitch angle (refer to manufacturer's operating instructions). Work must be done with the boom located uphill beyond the centre of the vehicle.
- 3.7.4 Vehicles equipped with torsion bars are not to be inclined sideways beyond the manufacturers' allowable limit – generally about 5 degrees.

### 3.8 Positioning a Bucket for Work

- 3.8.1 The boom, including its elbow, is to be kept clear of hazardous contact, including vehicle traffic and sources of ground (e.g. telephone lines or stays).
- 3.8.2 The elbow of the boom must stay outside Column 3 Limits of Approach.
- 3.8.3 The worker operating the motion controls must face in the direction of travel of the bucket.

### 3.9 Work in Buckets

- 3.9.1 When two workers are in the bucket(s) of one aerial device, only one worker is permitted to signal ground workers.
- 3.9.2 Climbing spurs must not be worn while working in bucket trucks.

Note:

The lone exception is when a worker is preparing to transfer from the bucket to a pole.

### 3.10 Tools in Buckets

- 3.10.1 All tools not in use must be properly secured or removed from the bucket.
- 3.10.2 When a hydraulic power tool is not in use, it must be disengaged from its source of power (i.e. the tool's hydraulic power lever must be placed in the off position).
- 3.10.3 Electrically operated power tools will not be used from the bucket of an aerial lift that is close to energized primary conductors or equipment, unless the tool has a self contained power source (e.g. a battery pack).

### 3.11 Use of Metal Wire Holders in Buckets

- 3.11.1 Metal wire holders must be taken into account when determining Limits of Approach for live line work.
- 3.11.2 Metal wire holders must be kept well clear of energized conductors when they are not being used during live line work.

### 3.12 Use of Live Line Jibs in Buckets

- 3.12.1 Jibs must be wiped before live line applications. Their surfaces are to be inspected and waxed frequently.
- 3.12.2 Jibs must be handled and stored with care to maintain their dielectrical integrity.
- 3.12.3 Jibs must be stored in appropriate bags, bins or receptacles that protect their surfaces from abrasion and contamination when not required for use.
- 3.12.4 Jibs may be secured in their holders at the job site when not in actual use, but only for short periods of time.
- 3.12.5 Any jib holder that allows the jib to slide within it must be equipped with adequate inner protection to prevent abrasion of the jib surfaces.
- 3.12.6 The sliding of the jibs within their holders must be kept to a minimum.

### 3.13 Dielectric Testing and Inspections

- 3.13.1 Only the safety service shops listed in the Approved Safety Service Shops are authorized to perform dielectric testing and inspections.

- 3.13.2 Equipment that is suspected of being damaged or malfunctioning must be examined, and a determination made by a qualified person as to whether it constitutes a safety hazard. Unsafe items must be replaced or repaired prior to use.
- A written record of the unsafe item and its repair must be kept on file.
- 3.13.3 Group I aerial devices (barehand machines) must pass the AC qualification test (outlined in Table 1 of CSA C225-OO) before going into service.
- 3.13.4 Group I aerial devices must pass the AC periodic electrical test (outlined in Table 2 of CSA C225-OO) after every overhaul and major repair. They must also pass this test at an interval of no less than once every three years.
- 3.13.5 Group I machines must pass the DC periodic electrical test (Testing and Maintenance Instructions for Safety Service Shops) in every year in which they are not subject to an AC test. No more than 1 year is to elapse between the AC or DC testing of these machines.
- 3.13.6 Annual electrical inspections and tests are required for Group II and Group III aerial devices. Details of these tests are contained in the “Testing and Maintenance for Safety Service Shops” manual.
- 3.13.7 Mechanical inspections and tests are required annually. They are carried out in the field by the Non-Destructive Testing section of Powertech Labs. Defects will be brought to the attention of line management and Fleet Services Department.

#### 3.14 Maintenance

- 3.14.1 Only approved cleaners and waxes listed in the “List of Approved Products for Servicing Live Line Tools and Equipment” are to be used to maintain booms and jibs.

**Note:**

Some cleaners and waxes can promote conductivity. Powdered detergents must not be used, as they tend to scratch fibreglass.

- 3.14.2 All scratches must be sealed as soon as possible to prevent contamination by dirt and moisture.

**Note:**

Small scratches may be temporarily addressed using a surface sealant such as a two-part epoxy or Terrepair. It should be noted that this is only a temporary repair and proper repairs (by Fleet Services) should be made as soon as possible.

- 3.14.3 The internal surfaces of aerial lift booms and extensions require special equipment for cleaning and their maintenance must be performed under the directions of an Approved Safety Service Shop or Fleet Services.

- 3.14.4 Group I aerial lifting devices used in Barehand applications are to have their hydraulic oil dried annually prior to the commencement of barehand season. Dielectric testing of the hydraulic oil will be done at the conclusion of the oil drying procedure and quarterly thereafter. Pass/fail is 25kV as per ASTM standard D1816.

**Note:**

The frequency with which the hydraulic oil is dried and tested will be periodically reviewed by Field Operations Safety and if appropriate, altered.

## 4. Roles and Responsibilities

### 4.1 Managers

- 4.1.1 Designate specific workers that will be responsible for field inspections and regular maintenance of aerial lifting devices and reporting malfunctioning or damaged equipment.
- 4.1.2 Establish the frequency by which booms and jibs will be cleaned and waxed.

### 4.2 Workers

- 4.2.1 Follow applicable safe work practices and procedures.
- 4.2.2 Conduct daily and monthly inspections prior to first use and preferably at the beginning of each shift.
- 4.2.3 Perform routine cleaning and waxing of the external surfaces of all insulated booms, jibs, and lower boom inserts, and the inner surfaces of open-ended hollow jibs.

**Note:**

Waxing should be conducted if water shows a tendency to form sheets rather than beads. The interval between waxing is not to exceed 3 months. Completely clean and wax surfaces, examining carefully for damage. Perform this procedure shortly before the required annual dielectric test.

## 5. Records and Documentation

- 5.1 Decals that clearly identify the maximum voltage for which an aerial device is rated will be placed in conspicuous locations (i.e. clearly visible by both ground workers and vehicle operators) on all insulated aerial lifts.
- 5.2 A written record of all unsafe equipment and its repair will be kept on file.
- 5.3 A yellow coloured Caution decal shall be attached to a fibreglass boom that has failed the annual electrical test. This decal must remain in place and the boom considered uninsulated until the problem is corrected and the boom passes the electrical test.
- 5.4 A fibreglass boom that passes the annual electrical test must be fitted with a Test Due decal identifying the date of the next annual inspection. The colour of these decals will change from year to year.
- 5.5 Mechanical Test Due decals identifying the date of the next annual inspection must be placed on the vehicle.

## 6. References

- 6.1 BC Hydro Testing and Maintenance Instructions for Safety Services Shops
- 6.2 CSA Standard C225 Vehicle Mounted Aerial Devices
- 6.3 WorkSafeBC Occupational Health & Safety Regulation, Part 16, Mobile Equipment and Part 19, Electrical Safety, Part 13 Ladders, Scaffolds and Temporary Work Platforms
- 6.4 BC Hydro Safety Practice Regulation – Definitions for General Rules for Workers Engaged in Work Adjacent to, or on, Energized Lines or Electrical and/or Mechanical Apparatus), Appendix VIII (Work in EHV Areas)
- 6.5 OSH Standard 401 Motor Vehicle Safety
- 6.6 OSH Standard 602 Insulated Tools and Equipment
- 6.7 OSH Standard 608 Fall Protection

## 7. Glossary

- 7.1 **Aerial Lift**—A vehicle-mounted lifting device that is used to position workers or equipment. The lifting boom may be telescoping, articulating or both.
- 7.2 **Back-Up Insulation**—A section of a piece of equipment or tool that will, when properly maintained, prevent dangerous current flow through a worker, in the event that primary insulation is accidentally defeated.
- 7.3 **Clear Insulation**—the portion of the boom that is constructed of insulating fibreglass and is free of metal components on the boom's external and internal surfaces for all boom positions. The clear insulated length is typically marked by the manufacturer and cannot be arbitrarily altered. It is dielectrically tested and maintained to provide worker protection.
- 7.4 **Digger Derrick**—A vehicle-mounted lifting device having a telescoping boom that is normally insulated. Some Digger Derricks have fibreglass 3rd extensions. Digger Derricks are designed and maintained for hoisting material, and usually not workers, near energized lines or apparatus.
- 7.5 **Fibreglass Boom Extensions**—Insulated, non-telescoping devices that are mechanically attached to booms for extending their reach. They are designed and maintained for work near energized lines or apparatus.
- 7.6 **Live Line Jibs**—Insulated, non-telescoping boom extensions that are attached to aerial lifts. They are used to make direct contact with live lines and are therefore maintained as live line tools.
- 7.7 **Over-Ride**—The transfer of controls from the bucket to the lower station of an Aerial Lift so that all movements can be controlled from the deck of the vehicle.
- 7.8 **Platform Height**—The vertical distance between the ground and the base of the platform (the bucket).
- 7.9 **Primary Insulation**—Tools and equipment that, when properly maintained, are highly resistant to current flow. When used, they are intentionally placed directly in contact with live equipment such that in that they may be electrically stressed to system voltage. Examples are hotsticks, live line jibs, and three-phase lifts.
- 7.10 **Protruding Insulation**—The section of the telescoping boom's insulation that extends beyond the supporting roller or wear pad, measured with the boom fully retracted. This is the length of insulation that is not prone to being scratched by contact with the roller or pad (referred to as the insulation's protrusion).
- 7.11 **System Voltage**—The voltage of the part of the power system under consideration, measured phase to phase.
- 7.12 **Three Phase Lift**—A set of insulated poles used with an insulated boom to support a distribution line which may be energized.

**Revision Rationale:** Sections 3.13.1, 3.13.5, 3.13.6 and 3.14.1 revised to align with new updated Testing and Maintenance Instructions for Safety Shops Manual announced through Safety Directive Series 2012 No. 4 ‘Revisions to OSH 6O2 Insulated Tools and Equipment’. Section 3.3.1 revised as per Safety Directive Series 2010 No. 3 ‘Flying Through the Neutral’, Section 3.5.8 added as per Safety Alert Series 2012 No. 10 ‘Manufacturer Required Use of Lift Hooks for Suspending Loads From Telehandlers’ and Section 3.5.9 added as per Safety FYI Series 2011 No. 5 ‘Crane Supported Work Platforms’.

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## Table of Contents

# **OSH Standard 407**

## **Helicopter and Fixed-Wing Aircraft Safety**

# OSH Standard 407

## Helicopter And Fixed-Wing Aircraft Safety

### 1. Purpose

1.1 To establish the requirements for management of helicopter and fixed-wing aircraft safety.

### 2. Scope

2.1 This standard applies to use of all chartered helicopters and fixed-wing aircraft for all BC Hydro employees, BC Hydro contractors and their sub-contractors when working under contract with BC Hydro, and all other passengers.

2.2 This standard does not apply to commercially scheduled fixed-wing, helicopter flights (e.g. Helijet between Vancouver and Victoria) or Medevac operations.

### 3. Requirements

3.1 As a principle, aircraft shall be used only when no other form of transportation is reasonable and when planning of the work includes an approved risk assessment process that shows that the aircraft-related safety risks to workers and the public are acceptable to BC Hydro.

3.2 As a principle, only people who are essential to the operational activity shall be on board the aircraft.

3.3 BC Hydro shall maintain an Aircraft Operations Department (AOD) that will maintain an Aircraft Operations Program (herein called the “Program”) to direct and oversee management of aircraft-related risks across the company.

3.4 The Program shall include procedures for monitoring and evaluating compliance with Program requirements across BC Hydro and its Contractors. The AOD Manager shall annually report compliance and performance to the Senior Vice-President of Safety, Security and Emergency Preparedness, who will oversee periodic audits of Program effectiveness.

3.5 The Program shall include a risk assessment process for identifying mission specific aircraft types which ensures current Canadian Aviation Regulations are met, applies the BC Hydro hierarchy of controls, and considers Federal Aviation Regulations (U.S.), Joint Aviation Requirements (Europe), International Civil Aviation Organization and Utility Industry best practices. Selection of aircraft for specific missions must be of the identified type and ensure pilot proficiency. The Program shall also include procedures for establishing and maintaining the following:

3.5.1 Approved Aircraft Service Provider List

3.5.2 Approved Aircraft List

3.5.3 Approved Pilot List

3.5.4 Flight Approval Process covering flight booking, flight coordination, flight hazard assessment and flight approval.

3.6 Contractors shall either use aircraft service providers, aircraft and pilots from BC Hydro's approved lists (see section 3.5 above), or for contract-specific work they may use alternative suppliers of these services, in which case the selected aircraft service providers, aircraft and pilots must meet or exceed the criteria used in the BC Hydro approval process, as demonstrated through successful completion of an independent third party audit in which both the auditor and audit criteria have been formally accepted by BC Hydro.

3.7 Contractors shall either use AOD's Flight Approval Process (see section 3.5 above), or they shall follow a flight approval process that has been formally accepted by BC Hydro.

#### 4. Roles and Responsibilities

4.1 The Aircraft Operations Department Manager is responsible for:

4.1.1 Managing the Program

4.2 Managers are responsible for:

4.2.1 Incorporating the requirements of the Program into their operations in the facility or group they manage

4.2.2 Ensuring that Workers and Contractors are qualified and comply with the Program requirements

4.2.3 Completing the training required by the Program

4.2.4 Reporting Program non-compliance to AOD

4.3 Workers are responsible for:

4.3.1 Complying with the Program requirements

4.3.2 Completing the training required by the Program

4.3.3 Reporting any problems or concerns to their Work/Crew Leader or Manager

#### 5. Regulations and Related Documents

5.1 Transport Canada Canadian Aviation Regulations

5.2 WorkSafeBC Occupational Health & Safety Regulation

#### Revision Rationale:

Complete revision to simplify OSH standard and state performance objectives for maintaining and establishing an effective Aircraft Operation Program. Some of the detail formerly located in BC Hydro's Aircraft Policy and OSH Standard 407 has been removed and incorporated into documentation of the Aircraft Operation Program.

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# **OSH Standard 408**

## **Operation of Boats**

# OSH Standard 408

## Operation Of Boats

### 1. Purpose

1.1 To establish the safety requirements for operation of boats at, to, and from BC Hydro worksites.

### 2. Scope

2.1 This standard shall apply to all BC Hydro work, either conducted and supervised by BC Hydro employees or assigned to contractors.

2.2 Where boats are owned and operated by other parties in circumstances other than BC Hydro business (e.g. ferry companies, water taxis, etc.), BC Hydro workers must comply with passenger and load regulations required of those companies.

2.3 This standard does not cover non-boating work around water or diving safety requirements.

### 3. Requirements

#### 3.1 Regulatory Compliance

- 3.1.1 BC Hydro boat owners and operators, and contractors must ensure compliance with current regulatory requirements applicable to each individual boat as it is constructed, used, and located. Regulatory requirements pertinent to boat operation include but are not limited to the applicable sections of:
- WorkSafeBC Occupational Health & Safety Regulation (OHSR) Parts 4, 7, 8, 17 and 24;
  - Canada Shipping Act and its regulations (Transport Canada); and
  - Transportation Safety Board Regulations.

Note: See Appendix 1 for further guidance on Transport Canada regulatory requirements broken down into vessel categories.

#### 3.2 Boat Registration

- 3.2.1 Registration for small non-pleasure human-powered boats (i.e. canoes, kayaks) and small power-driven boats with propulsion motors less than 10 horsepower (hp) is not required by Transport Canada (Ship Safety Bulletin No.: O5/2012). Transport Canada's Small Vessel Register has a simplified registration process in place for owners of these vessels that still wish to participate in registration. See link in Appendix 1 for instructions.
- 3.2.2 Power-driven (greater than 10hp) boats operated by BC Hydro and their contractors must be registered with Transport Canada as commercial vessels as per the Canada Shipping Act. The registration number for BC Hydro and contractor boats must incorporate the letter "C" (e.g. COOOOBC) for Commercial vessels. See links in Appendix 1 for registration guidance.

Note: Registration status can be checked in Transport Canada's Vessel Registration Query System

- 3.2.3 In addition to registration, power-driven vessels greater than 15 gross tonnage must be inspected by Transport Canada prior to entering service, and be inspected periodically afterwards on an annual or quadrennial basis. See links in Appendix 1 for inspection guidance.

3.2.4 The vessel owner must ensure vessel construction and modifications to small vessels are done in accordance with applicable Transport Canada regulations, including Small Vessel Regulation requirements identified through resources in Appendix 1, and Transport Canada's Construction Standards for Small Vessels – TP1332.

3.2.5 Major vessel modifications must be reported to Transport Canada by updating the vessel registration details as per Small Vessel Regulations 71O.

Note: Major modifications are defined as a modification or repair or a series of modifications or repairs that substantially change the capacity or size (length or gross tonnage) of a vessel or the nature of a system on board that affects its watertight integrity or its stability or that substantially increases its service life. An example of modifications impacting stability includes installation of welded arms which could alter the vessel's centre of gravity.

### 3.3 Risk Assessment and Procedures

3.3.1 A risk assessment must be conducted via Job Planning and Tailboard prior to a boat trip or ongoing series of similar boat use/work tasks and documented to determine the level of potential risk, exposure and likelihood of a vessel emergency including consideration of, but not limited to:

- Weather (wind, air temperature, precipitation) (including cold stress as per OHSR section 7.34);
- Water Temperature (cold stress as per OHSR section 7.34);
- Potential wave height;
- Distance from shoreline;
- Docking and boarding facilities available;
- Use of ancillary equipment (e.g. remote operating vehicles off side of boat);
- Crew complement available (working alone or in isolation as per OHSR section 4.20.2); and
- Potential rescue situations and available rescue resources as per OHSR section 4.13.

3.3.2 The Canada Shipping Act and Small Vessel Regulations require suitable safety procedures to be established and documented, based on local conditions, industry best practices and hazards identified. The following procedures must be developed where applicable:

- Safe vessel operation;
- Emergency situations (i.e. Person in water, fast flowing water, vessel breakdown as per OHSR section 4.13/4.14);
- Cold-water shock and hyperthermia prevention (where water temperature is less than 15 degrees Celsius) (and cold exposure control plan as per OHSR section 7.34);
- Operation of mechanical blowers in all gasoline spaces (including signs);
- Closing of ventilation dampers or openings before firefighting; and
- Safe refuelling and prevention of any leakage of fuel.

3.3.3 Procedures must address the requirements of this standard, and include supplementary procedural information outlined in Appendix 2: Supplementary Requirements for Procedures.

- 3.3.4 Crews conducting work tasks on a boat must perform and document a person in water (overboard) rescue practice specific to the vessel used and conditions of the work as per WorkSafeBC OHSR section 32.2.
  - 3.3.4.1 The rescue practice must be representative of a real working scenario, address all applicable hazards to the job, and include a realistic representation of a body (e.g. rescue dummy or other human-like figure).
  - 3.3.4.2 Rescue procedures must be practiced at minimum once per year to ensure awareness and effectiveness, and a record of the drills must be kept as per WorkSafeBC OHSR section 4.14(3).

### 3.4 Operating Limitations

- 3.4.1 Workers must not work alone in a boat unless the risk assessment and prescribed controls deem it safe to do so as per OSH Standard 8O1 and OHSR section 4.20.2.
- 3.4.2 If boat operations can be impacted by Dam operations, Generation Operating Order 1G-05 (Procedures for working in or adjacent to water near generation facilities) and applicable Local Operating Orders must be followed. Work in or adjacent to water includes:
  - Working immediately downstream from a Facility; and
  - Working immediately upstream from a Facility;
  - Working either upstream or downstream of a public safety boom;
  - Areas that are remote from the Facility but still under the material influence of flow and reservoir changes.
- 3.4.3 With the exception of emergencies, canoes less than 5m long or 1m wide and rafts must not be used unless the risk assessment and prescribed controls deem it safe to do so, and area manager approval is provided.

### 3.5 Instruction and Training

- 3.5.1 All small powered vessel (O-15GT) operators and crew members must at minimum possess the qualifications required by the Marine Personnel Regulations sections 212 (operators), and 205 (crew members).

See Section 4 of the Small Vessel Compliance Program Detailed Compliance Guidance Notes for a table of Transport Canada mandatory qualifications.

Note: Where the Marine Personnel Regulations require only a Pleasure Craft Operator Card (PCOC) for training requirements, the job specific risk assessment must determine if this is adequate for the hazards of the work. Where the PCOC is found to be insufficient, Small Vessel Operator Proficiency (SVOP) Training and MED A3 (Marine Emergency Duties) Certificates must be obtained.

- 3.5.2 At least one crew member must hold either a marine basic first aid certificate or any occupational first aid training course of two days minimum (as per Marine Personnel Regulations 205(9) and as clarified by Transport Canada Ship Safety Bulletin O3/2009).

Note: BC Hydro boating safety courses, including those required by Transport Canada, are listed on the BC Hydro Safety Course Catalogue (see Boats and Swift Water). All Transport Canada courses are a one-time requirement.

- 3.5.3 Any passengers (who are not performing any work related duties) on a boat do not have to obtain any Transport Canada training, but must obtain instruction and orientation from the Boat Operator and/or the Crewmember specifying safety requirements (including emergency procedures and lifejacket/PFD use).

Note: BC Hydro Safety Training offers SAFE-12O: Boats Passenger Awareness for general passenger training, however situation and boat specific instruction must still be provided by the operator.

### 3.6 Safety Equipment and Lights

- 3.6.1 All vessels must be equipped with safety equipment required by Transport Canada and the Small Vessel Regulations relevant to the size and type of vessel. This includes, but is not limited to, the requirements outlined in Appendix 3.

### 3.7 Wharves, Docks and Boarding

- 3.7.1 BC Hydro boat owners and facility managers must ensure that adequate docking facilities are provided as per WorkSafeBC OHSR section 17.9 and G17.9. Additionally, any BC Hydro owned wharves or docks used in conjunction with the operation of boats must be in compliance with WorkSafeBC OHSR sections 24.2–24.6, which outlines requirements related to:

- Walkway slip-reducing surface finishing;
- Foundation or buoyancy for intended loads;
- Ladder installation on docks;
- Lifesaving equipment that must be available;
- Curbs, bullrails, guardrails and barriers;
- Markings for curbs, bullrails, guardrails and barriers; and
- Rescue boat.

Note: The OHSR 24.6 requirement for a rescue boat may not apply in certain work situations where work is close to the shoreline, with no expected high speed boat operations or potential exposure to vessel stability, sinking or drowning hazards (see WorkSafeBC IR201616O85OO4A). The risk assessment must evaluate the need for a rescue boat.

- 3.7.2 Where wharves or docks are not available, and boarding/disembarking must occur, the operator must find a safe and stable shore location.
- 3.7.3 A worker must not board or leave a boat while it is in motion, except in case of emergency as per WorkSafeBC OHSR section 17.9(1).

### 3.8 Incident Reporting

- 3.8.1 In addition to reporting an incident through BC Hydro's Incident Management System, boating related incidents must be reported to the Transportation Safety Board as required by the Transportation Safety Board Regulations.
- 3.8.1.1 An initial report must be called in as soon as possible after an incident.
- 3.8.1.2 A full report must be submitted within 30 days of the incident.

Note: See the Transportation Safety Board's Report a Marine Occurrence webpage for guidance on reporting, including what should be reported.

#### 4. Roles and Responsibilities

##### 4.1 Managers

- 4.1.1 Ensure boats under his/her ownership are in compliance with applicable Transport Canada commercial vessel requirements.
- 4.1.2 Ensure work involving boats is in compliance with the provisions of this standard.

##### 4.2 Workers

- 4.2.1 Comply with the requirements of this standard and applicable procedures.

#### 5. References

- 5.1 Canada Shipping Act and its regulations
- 5.2 Transport Canada Marine Safety webpage (resources within)
- 5.3 WorkSafeBC Occupational Health & Safety Regulation Parts 4, 7, 8, 17, 24 and 32.
- 5.4 BC Hydro Safety Practice Regulations
- 5.5 BC Hydro Safety Course Catalogue

#### 6. Information Controls

##### 6.1 Revision History

Date	Version	Comments
August 3, 2016	V3-O	This update to OSH Standard 4O8 has completely revised the content to align to Transport Canada and WorkSafeBC regulatory compliance requirements and address IMS Incident #285O1 corrective actions.

## Appendix 1

### Transport Canada Compliance Categories Relevant to BC Hydro

The following Small Non-Pleasure Vessel categories should be applied when identifying applicable Transport Canada requirements:

Category	Application	Examples	Resource (links)
Human-Powered Vessels	Vessel not propelled by an engine and is not fitted with an engine on-board to propel it.	Canoes, kayaks, oar-boats	<ol style="list-style-type: none"> <li>1. <a href="#">Transport Canada's Small Vessel Register (Commercial), Vessel Registration Office</a> (voluntary registration)</li> <li>2. <a href="#">Transport Canada's Compliance Guide for Human-Powered Non-Pleasure Vessels (TP152O4E)</a> (compliance checklist)</li> <li>3. <a href="#">Small Vessel Regulations Part 3: Human Powered Vessels other than Pleasure Craft</a></li> </ol>
Small (Powered) Vessels O-15GT	<ul style="list-style-type: none"> <li>• Vessel measures O-15 gross tonnage*</li> <li>• Carry between O-12 passengers</li> <li>• Not human propelled</li> </ul>	Tug (steel), jet boat, river boat	<ol style="list-style-type: none"> <li>4. <a href="#">Transport Canada's Small Vessel Register (Commercial), Vessel Registration Office</a> (mandatory registration)</li> <li>5. <a href="#">Transport Canada's Small Vessel Compliance Program</a> (voluntary compliance program)</li> <li>6. <a href="#">Small Vessel Compliance Program Detailed Compliance Report and Guidance Notes (TP15111E)</a> (compliance guide)</li> </ol>
Small (Powered) Vessels 15-150GT	<ul style="list-style-type: none"> <li>• All vessels measuring over 15 – 150 gross tonnage*</li> <li>• All vessels carrying more than 12 passengers</li> <li>• Does not include unmanned barges.</li> <li>• Any vessels requiring a marine mortgage</li> </ul>	Barge	<ol style="list-style-type: none"> <li>7. <a href="#">Canadian Register of Vessels, Vessel Registration Office</a> (mandatory registration)</li> <li>8. <a href="#">Transport Canada Initial Inspection</a> (mandatory prior to entering service)</li> <li>9. <a href="#">Transport Canada Periodic Inspection</a> (mandatory every 1–4 years)</li> <li>10. <a href="#">Transport Canada's Vessels of 15–150GT</a> (outline of compliance requirements)</li> </ol>

\*Note: **Gross tonnage** is the measure of the overall size of a vessel as determined by a tonnage measurer or standard calculation.

## Appendix 2

### Supplementary Requirements for Procedures

The following requirements must be incorporated into the procedures required by Section 3.3 of this Standard:

#### Spill Response

- Refer to the Canada Shipping Act for information requiring arrangements with a spill response organization related to the total quantity of fuel or cargo being carried.
- Fuelling procedures are to be in place for fuelling the boat, and spill response equipment must be available.
- Materials or substances brought on board for the purpose of work must be incorporated into the risk assessment in order to evaluate spill response requirements.

#### Pre-trip Inspection

- Prior to each trip, an inspection must be completed to check load, bilges, fuel, oil, emergency equipment and boat general condition.
- Any deficiencies observed in the inspection must be reported immediately to the boat owner, and remedied prior to boat use if safe operation is affected.
- Automatically inflatable life jackets must be inspected as per the original equipment manufacturer's requirements.

#### Communication

- All boats carrying passengers must have a dependable two-way communication device capable of contacting persons that can effect emergency operations if required.
- When transporting passengers, the operator must notify the contact person at a frequency determined by the risk assessment.

#### Adverse Weather

- The boat must be appropriate to the type of operation and water conditions to which it will be exposed.

## Guides to General Boating Safety

- Unlace boots worn in canoes, rowboats or small motor boats to allow ease of removal in the event of a craft capsiz.
- Carry proper equipment and know how to use it.
- Maintain the boat and equipment in good condition, keep bilges clean.
- Know and obey the Rules of the Sea/Water.
- Operate with care, courtesy and common sense.
- Always keep the boat under complete control.
- Watch posted speeds, slow-down in anchorages.
- Never overload the boat.
- Ensure that life-saving equipment is accessible.
- Check local weather reports before departure.
- Guard against leakage of engine fuel and cooking fuel.
- Have fire extinguishers ready.

## Resources:

- For more information on developing procedures, templates for these procedures, as well as other example checklists and forms, visit Transport Canada's Templates for Small Commercial Vessel Procedures and Records webpage.
- For more information on Cold Water Immersion, see WorkSafe Bulletin: Cold Water Immersion.

## Appendix 3

### Safety Equipment for Boats

All vessels must be equipped with safety equipment required by Transport Canada and the Small Vessel Regulations relevant to the size and type of vessel. This includes, but is not limited to, the following:

- The Small Vessel Regulations specify minimum requirements of portable safety equipment, according to the length of the boat. See relevant resource links in Appendix 1 for guidance.
- Boats must be equipped with the proper lighting as specified by the regulations under the Canadian Shipping Act and WorkSafeBC OHSR section 17.26. See relevant resource links in Appendix 1 for guidance.
- Every person on board a human-powered vessel must wear a Transport Canada and WorkSafeBC (OHSR sections 8.26–8.30) approved personal flotation device (PFD) or lifejacket of an appropriate size for each person on board as per Small Vessel Regulations 31O.
- Powered vessels must carry on board a Transport Canada and WorkSafeBC (OHSR sections 8.26–8.30) approved life jacket of an appropriate size for each person on board as per Small Vessel Regulations sections 4O9/5O6.

Note: OHSR section 8.26 requires that workers at risk of drowning must wear a lifejacket or personal flotation device (PFD). This must be determined in the risk assessment.

- Transport Canada approved personal PFDs may be used as the sole flotation device in lieu of lifejackets only if the conditions outlined in Ship Safety Bulletin No. O6/2012 (Wearing and Using Flotation Devices) are satisfied, including but not limited to:
  - PFDs must be worn at all times when in an open boat, or when on deck on a vessel of closed construction, and underway;
  - Passenger vessel length 8.5m or less or workboats length 12m or less;
  - Operating on Sheltered Waters or within 2 nautical miles from shore on a lake or river;
  - Be a highly visible colour (yellow, orange or red); and
  - Fitted with retro-reflective tape and a whistle.
- Vessels carrying PFDs that do not meet the conditions of the above referenced Transport Canada policy must also carry Lifejackets for everyone on board.

Note: See Ship Safety Bulletin No. O6/2012 (Wearing and Using Flotation Devices) for more information on floatation device selection and specification.

- Each boat operated on BC Hydro business must be equipped with a first aid kit suitable for the number of persons on board.

# **OSH Standard 501**

## **Fire and Safety**

## **Plans for Buildings**

# OSH Standard 501

## Fire and Safety Plans for Buildings

### 1. Scope

1.1 This standard describes the requirements for fire and safety plans for BC Hydro facilities including:

- Every building required by the BC Fire Code to have a fire alarm system.
- Every building that has a fire alarm and/or fire suppression system.
- Indoor and outdoor storage facilities.
- Areas where flammable or combustible liquids are handled or stored.
- Areas where hazardous processes or operations occur.
- Demolition and construction sites.

### 2. Purpose

2.1 To ensure that all BC Hydro workers, contractors and visitors are provided with a plan to facilitate a safe means of evacuation in response to emergencies.

### 3. Standard

#### 3.1 General Requirements

- 3.1.1 BC Hydro will develop and implement fire and safety plans for all facilities to minimize danger to life from the effects of fire, earthquake, explosion, bomb threats or other emergency situations.
- 3.1.2 The content and complexity of the fire and safety plans for facilities will depend upon the building classification as identified in the British Columbia Fire Code, the occupant load, type of occupancy and the type of construction including size and height. Plans for facilities located in Seismic Zones 3, 4, 5, and 6 (as identified in Appendix 1) must address the hazards associated with earthquakes.
- 3.1.3 Facilities that do not require a comprehensive fire and safety plan as detailed in clause 3.1.2 must have written evacuation procedures in place including emergency contact information.
- 3.1.4 Emergency Response Teams (ERTs) must be organized and trained to meet the requirements for response as detailed in the building/facility Fire and Safety Plan.
- 3.1.5 All workers must be given adequate instruction in the fire prevention and emergency evacuation procedures applicable to their workplace.
- 3.1.6 Emergency evacuation drills must be held at least annually to ensure awareness and effectiveness of emergency exit routes and procedures.

#### 3.2 Generic Plan Content

The Fire and Life Safety Plans for buildings/facilities described in clause 3.1.2 shall be prepared in co-operation with the local fire department and other applicable regulatory authorities and emergency response agencies and shall include:

- 3.2.1 The objectives of the Fire and Safety Plan for the administration of preventative measures and the implementation of emergency procedures.
- 3.2.2 The emergency procedures to be used in case of fire including:
  - 3.2.2.1 Sounding the fire alarm
  - 3.2.2.2 Notifying the fire department
  - 3.2.2.3 Instructing the occupants on procedures to be followed when the fire alarm sounds.
  - 3.2.2.4 Evacuating occupants, including special provisions for persons requiring assistance.
  - 3.2.2.5 Confining, controlling and extinguishing the fire.
- 3.2.3 The emergency procedures to be used in the event of an earthquake if required (Seismic Zones 3, 4, 5 and 6).
- 3.2.4 The emergency procedures to be used in the event of a bomb threat.
- 3.2.5 The appointment and organization of designated workers to carry out fire safety and emergency response duties.
- 3.2.6 The training of the designated workers and other building occupants in their responsibilities for fire safety and emergency response.
- 3.2.7 Documents, including diagrams showing the type, location and operation of building fire and safety emergency systems.
- 3.2.8 Conducting fire drills and building evacuations.
- 3.2.9 The control of fire hazards in the building or facility.
- 3.2.10 The control of non-structural safety hazards in the workplace (Seismic Zones 3, 4, 5 and 6).
- 3.2.11 The inspection and maintenance of building facilities and supplies provided for the safety of occupants.
- 3.2.12 A copy of the records of inspections, maintenance procedures or tests conducted over the past 2 years.

### 3.3 High Buildings

For buildings in excess of 6 stories in height within the scope of clause 3.2.6 of the British Columbia Building Code 1998, the Fire and Safety Plan shall, in addition to the requirements of sub-section 3.2 of this standard, include:

- 3.3.1 The training of designated workers in the use of the voice communication system.
- 3.3.2 The procedures for the use of elevators.
- 3.3.3 The action to be taken by designated workers in initiating any smoke control or other fire emergency systems installed in a building in the event of fire until the fire department arrives.
- 3.3.4 Instructions to the designated workers and fire department for the operation of the systems referred to in clause 3.3.3.
- 3.3.5 The procedures established to facilitate fire department access to the building and fire location within the building.

### 3.4 Indoor Storage

The fire safety and plan shall, in addition, to the requirements of sub-section 3.2, include:

- 3.4.1 The product classifications, as described in the BC Fire Code Sentence 3.2.1.1(1), for each part of the building where products of different classification are stored.
- 3.4.2 The method of storage, including aisle widths for rack storage.
- 3.4.3 The maximum permitted height of storage for the building or part of the building, if different.
- 3.4.4 The maximum permitted size of individual storage areas.
- 3.4.5 In sprinkler-equipped buildings, the sprinkler system design criteria, inside and outside hose allowances, and results of the benchmark sprinkler system main drain and water flow tests.
- 3.4.6 The procedures for fire fighting and spill response.
- 3.4.7 The storage method and maximum height of storage as described in clauses 3.4.2 and 3.4.3 shall be posted in the storage area.
- 3.4.8 Signs required in clause 3.4.6 shall have:
  - A minimum dimension of 200 mm.
  - Letters not less than 25 mm high.

### 3.5 Outdoor Storage

The fire safety and plan shall, in addition to the requirements of sub-section 3.2, include:

- 3.5.1 The location and classification of the products currently stored, as described in BC Fire Code Sentence 3.3.1.1(1).
- 3.5.2 The method of storage, including the clear spaces required and the maximum permitted size of individual storage areas.
- 3.5.3 The location of fire alarm systems and fire fighting equipment.
- 3.5.4 The control of fire hazards in and around the outdoor storage area.
- 3.5.5 The procedures for fire fighting and spill response.
- 3.5.6 At least one copy of the fire emergency procedures shall be prominently posted at the outdoor storage site.

### 3.6 Flammable/Combustible Liquids

Emergency planning measures conforming to sub-section 3.2 shall be provided for all buildings, parts of buildings, structures and open areas where flammable/combustible liquids are stored or transferred. The fire safety and evacuation plan shall, in addition to sub-section 3.2, include:

- 3.6.1 The location, classification and quantities of product currently stored
- 3.6.2 The location of fire alarm pull stations and fire fighting equipment.
- 3.6.3 The control of fire hazards and ignition sources in and around the storage/transfer area.
- 3.6.4 The procedures for fire fighting and spill response.

### 3.7 Hazardous Processes and Operations

This part applies to processes and operations that involve a risk from explosion, high flammability or related conditions which create a hazard to life safety.

- 3.7.1 A fire safety plan conforming to sub-section 3.2 shall be prepared for areas where processes and operations described in sub-section 3.7 take place. In addition to the information required in sub-section 3.2, the fire safety plan shall include:
- 3.7.1.1 The location and identification of storage and use areas for specific products.
  - 3.7.1.2 The procedures for the safe shutdown of operations under emergency conditions.
  - 3.7.1.3 The procedures for fire fighting and or spill response.
  - 3.7.1.4 The names, addresses and telephone numbers of persons to be contacted in case of fire during non-operating hours.

### 3.8 Construction and Demolition Sites

This section applies to buildings or parts of buildings undergoing construction or demolition operations and includes renovations. The degree of application of this section to each construction project and each demolition project shall be determined as part of the fire safety plan prior to the commencement of operations.

- 3.8.1 Prior to the commencement of construction or demolition operations, a fire safety plan conforming to sub-section 3.2 shall be prepared for the site.
- 3.8.2 The fire safety plan shall include:
- 3.8.2.1 The designation and organization of site workers to carry out fire safety duties, including fire watch service if applicable. The emergency procedures to be used in the case of fire, including:
    - Sounding the fire alarm
    - Notifying the fire department
    - Instructing site personnel on procedures to be followed when the alarm sounds, and
    - Fire fighting procedures
  - 3.8.2.2 The control of fire hazards in and around the building.
  - 3.8.2.3 The procedures for fire fighting and spill response.
  - 3.8.2.4 Maintenance of fire fighting facilities.

### 3.9 Risk Analysis

Elements to be addressed in the development and implementation of fire and safety plans will be based on the specific emergencies that could be anticipated in a building or facility. A detailed risk analysis must be conducted in all buildings to evaluate the need for emergency response for the following:

- Fire and explosions
- Bomb threats
- Earthquakes (Seismic Zones 3, 4, 5 and 6)
- Spills involving hazardous materials

- Power outages
- Confined space entry and rescue
- High angle rescue
- First aid
- Post earthquake building safety rapid evaluations

### 3.1O Specific Requirements

The specific requirements of the Fire and Safety Plan for a building or facility will be governed by the risk analysis. Plans will include the following specific components:

- 3.1O.1 The objectives of the Fire and Safety Plan for the administration of preventative measures and implementation of emergency procedures.
- 3.1O.2 The appointment and organization of designated workers to carry out the fire and life safety duties of the plan as members of the ERT.
- 3.1O.3 General instructions to all occupants for all emergencies as identified in the risk analysis.
- 3.1O.4 The definitions of the titles assigned to the ERT members referred to in the plan which may include some or all of the following, according to the requirements of the plan:

#### FSD (Fire and Safety Director)

- Responsible for the administration and maintenance of the Fire and Safety Plan and assumes command during an emergency.

#### DFSD (Deputy Fire Safety Director)

- Assumes the duties of the Fire Safety Director during an absence and assists the Fire Safety Director during emergencies.

#### CCO (Communications Control Officer)

- Operates Public Address and Fire Fighters' telephone systems.

#### ECO (Evacuation Control Officer)

- Takes charge of personnel outside of the building, directing them to the muster areas.

#### FW (Floor Warden)

- Facilitates evacuation, search and rescue as required of designated floor areas. Performs daily Fire and Safety Inspections.

#### Searcher

- Assists FW in evacuation, search and rescue activities as required.

#### OFAA (Occupational First Aid Attendant)

- Provides effective injury management until the patient becomes the responsibility of qualified pre-hospital emergency medical personnel or hospital staff.

**Building Safety Rapid Evaluator**

- Conducts a rapid evaluation of the building/facility as assigned in the event of an earthquake and reports their findings to the Fire and Safety Director.

3.10.5 The duties and responsibilities of the ERT members in the administration and implementation of the plan:

- On a day to day basis
- In the event of an emergency
- Training programs or drills

3.10.6 The duties of the site building services personnel, security staff and first aid attendants, if applicable.

3.10.7 A general description and operational features and instructions of the safety features and communications systems of the building or facility, including the following features:

- Building size, location, type of construction etc.
- Exit systems
- Fire alarm and detection system or means of notifying occupants of an emergency
- Voice communication system if applicable
- Fire fighters' telephones
- Fire equipment including sprinklers and standpipe systems
- Special fire extinguishing systems, e.g. CO<sub>2</sub>, Halon, dry chemical etc.
- Emergency power supply
- Elevators
- Smoke control systems
- Utilities including electrical, natural gas and water
- Earthquake emergency supply cabinets and equipment
- Provisions for hazardous spill containment and cleanup

3.10.8 A list of all physically disabled persons in the building, the nature of their disability and work location. This includes those with short term as well as permanent disabilities.

3.10.9 Copies of reference drawings for the site and floor areas identifying the location of access for emergency response agencies, evacuation exits and the location of emergency equipment.

3.10.10 A complete list of emergency telephone and fax numbers for off-site internal and external emergency response agencies.

**3.11 Procedure**

3.11.1 The Fire and Safety Plan shall be kept on site in a pre-determined location for reference by the fire department, ERT members, the safety committee and workers.

3.11.2 All workers must be given adequate instructions in the fire prevention and emergency evacuation procedures applicable to their place of work.

- 3.11.3 All workers must carry out the evacuation procedures under the direction of the ERT members in the event of an emergency or practice drill.
- 3.11.4 The emergency procedures and other duties for ERT members, as detailed in the plan shall be given to all team members.
- 3.11.5 The emergency procedures and floor plans for the building shall be posted at all exits and elevator lobby areas, if applicable.
- 3.11.6 All ERT members must be fully trained to perform their specific duties and responsibilities as detailed in the plan.
- 3.11.7 All workers must familiarize themselves with the location of the fire alarm pull stations, posted evacuation routes and exit facilities in the workplace.
- 3.11.8 Evacuation drills shall be conducted at least annually at all buildings/ facilities to evaluate the effectiveness of the plan and maintain acceptable levels of preparedness for building occupants and the members of the ERT. Records of drills must be kept.
- 3.11.9 ERT members shall conduct additional drills at intervals not greater than 2 months in high buildings (greater than 36 meters in height). Records of drills must be kept.
- 3.11.10 The content of fire and safety plan must be reviewed or revised on an ongoing basis:
  - 3.11.10.1 As required by changes in designated ERT members.
  - 3.11.10.2 As the result of a change in occupancy or operating procedure.
  - 3.11.10.3 When changes or additions to building fire alarm or life safety systems are made.
  - 3.11.10.4 As required by revision to the BC Fire Code or OHSR.

#### 4. Roles and Responsibilities

##### 4.1 Managers

- 4.1.1 Ensure that fire and safety plans are developed and implemented in the workplace.
- 4.1.2 Ensure that all workers are conversant with their workplace emergency procedures.
- 4.1.3 Ensure that training is provided to all workers with emergency response duties.
- 4.1.4 Ensure that evacuation drills are conducted on a periodic basis (per annum at minimum).

##### 4.2 Workers

- 4.2.1 Ensure that they are conversant with the emergency procedures in the workplace.
- 4.2.2 In the event of an emergency, carry out the emergency procedures in accordance with the workplace emergency plan.

#### 5. Records and Documentation

- 5.1 The Fire and Safety Plan shall be kept on site in a pre-determined location for reference by the fire department, ERT members, the safety committee and workers.
- 5.2 The Fire and Safety Plan will include a copy of the records of inspections, maintenance procedures, tests, and evacuation drills conducted over the past 2 years.

## 6. References

- 6.1 BC Fire Code Section 2.8 – Emergency Planning
- 6.2 BC Fire Code Section 2.16 – Construction Sites Fire Safety Plan
- 6.3 BC Fire Code Section 3.2 – Indoor Storage
- 6.4 BC Fire Code Section 3.3 – Outdoor Storage
- 6.5 BC Fire Code Part 4 – Flammable and Combustible Liquid
- 6.6 BC Fire Code Section 5.15 – Hazardous Processes and Operation
- 6.7 WorkSafeBC Occupational Health & Safety Regulation 4.13 – Risk Assessment
- 6.8 WorkSafeBC Occupational Health & Safety Regulation 4.14 – Emergency Procedures
- 6.9 WorkSafeBC Occupational Health & Safety Regulation 4.16 – Training
- 6.10 WorkSafeBC OHS Regulation 4.17 – Notification of Fire Departments
- 6.11 CAN/CSA-Z731-M91 – Emergency Planning for Industry
- 6.12 ER-VWM-O3 Environmental Resource –Spill Response Standard
- 6.13 OSH 505 Fire Protection Program
- 6.14CPS – Safety Policy

## Appendix 1

### Seismic Zones – Selected Locations in British Columbia

Location	Seismic Zone
100 Mile House	1
Abbotsford	4
Agassiz	3
Alberni	5
Ashcroft	2
Burns Lake	3
Cache Creek	2
Campbell River	6
Castlegar	1
Chetwynd	1
Chilliwack	4
Comox	6
Courtenay	6
Cranbrook	1
Crescent Valley	1
Crofton	5
Dawson Creek	1
Duncan	5
Elko	1
Fernie	1
Fort Nelson	1
Fort St. John	1
Golden	1
Grand Forks	1
Greenwood	1
Hope	3
Hudson Hope	1
Kamloops	1

Location	Seismic Zone
Kaslo	1
Kelowna	1
Kimberley	1
Kitimat	4
Lillooet	2
Lytton	2
Mackenzie	2
Masset	6
McBride	1
McLeod Lake	2
Merritt	2
Mission City	4
Montrose	1
Nakusp	1
Nanaimo	4
Nelson	1
Ocean Falls	4
Osoyoos	1
Penticton	1
Port Alberni	5
Port Hardy	6
Port McNeill	6
Powell River	5
Prince George	2
Prince Rupert	5
Princeton	2
Qualicum Beach	4
Quesnel	2

Location	Seismic Zone
Revelstoke	1
Salmon Arm	1
Sandspit	6
Sechelt	5
Sidney	5
Smithers	3
Squamish	3
Stewart	4
Taylor	1
Terrace	4
Tofino	5
Trail	1
Ucluelet	5
Vancouver & Region	4
Burnaby	4
Cloverdale	4

Location	Seismic Zone
Coquitlam	4
Delta	4
Ladner	4
Langley	4
New Westminster	4
North Vancouver	4
Richmond	4
Surrey	4
Vancouver	4
West Vancouver	4
Vernon	1
Victoria & Region	5
Williams Lake	2
Youbou	4

# **OSH Standard 503**

## **Earthquakes—Evaluation of Non-Structural Hazards in the Workplace**

# OSH Standard 503

## Earthquakes—Evaluation of Non-Structural Hazards in the Workplace

### 1. Scope

- 1.1 This standard describes the process to manage non-structural earthquake hazards in the workplace. This standard applies to all BC Hydro facilities located in seismic risk zones 3, 4, 5 and 6 (OSH 501—Fire and Safety Plans for Buildings).

### 2. Purpose

- 2.1 This standard outlines the process to identify and mitigate non-structural earthquake hazards. This standard serves as a guide for BC Hydro personnel that have responsibility for the buildings and facilities where BCH employees conduct work. The intention is to identify potential non-structural hazards and mitigate them, using local resources.

### 3. Standard

#### 3.1 General

- 3.1.1 Injuries, loss of life, property damage and business interruption can be reduced and recovery accelerated by mitigating non-structural hazards in the workplace.
- 3.1.2 Non-structural elements are those parts of a building that do not support its structural integrity, including items such as suspended ceilings, lights, windows, office furnishings, computer equipment, work shop equipment, mechanical systems, etc.
- 3.1.3 Non-structural hazards can be effectively managed through a process of detailed evaluations and regular inspections. Appendix 1 – Non-Structural Hazard Checklist – provides a comprehensive checklist for evaluations and monthly inspections. Appendix 2 – Guide for Non-Structural Hazard Mitigation – provides information for corrective action.

#### 3.2 Non-structural hazard evaluations

- 3.2.1 Documented non-structural hazard evaluations must be conducted at all risk facilities on an annual basis.
- 3.2.2 Additional evaluations shall be conducted on the installation of new equipment or changes in the work place.
- 3.2.3 Immediate corrective action must be taken to mitigate non-structural hazards identified in evaluations.

#### 3.3 Inspections

- 3.3.1 Documented non-structural hazards inspections must be conducted on a monthly basis. This process may be included in the scheduled site safety inspection process. Note: Building Safety Rapid Evaluators should be utilized in the completion of ongoing non-structural hazard inspections in their regular place of work.
- 3.3.2 Immediate corrective action must be taken to mitigate non-structural hazards identified on inspections.

### 4. Roles and Responsibilities

#### 4.1 Managers

- 4.1.1 Ensure that non-structural hazard evaluations are conducted on an annual basis.
- 4.1.2 Ensure that monthly inspections include the site specific non-structural hazards identified in the annual evaluation.

4.1.3 Ensure that corrective action is taken to mitigate non-structural hazards identified in evaluations and inspections.

#### 4.2 Workers

4.2.1 Identify potential non-structural earthquake hazards and notify manager of unsafe conditions.

### 5. References

5.1 WorkSafeBC OHS Regulation Part 4

5.2 Guidebook for Developing a School Earthquake Safety Program, Federal Emergency Management Agency, 1990.

5.3 School Earthquake Safety Guidebook, B.C. Ministry of Education, 1987

5.4 Comprehensive Earthquake Preparedness Planning Guidelines: Corporate, Federal Emergency Management Agency, 1985

5.5 Reducing the Risks of Non-structural Earthquake Damage: A Practical Guide, Bayrepp.

## Appendix 1

### Non-structural Hazard Checklist

Date of check: \_\_\_\_\_

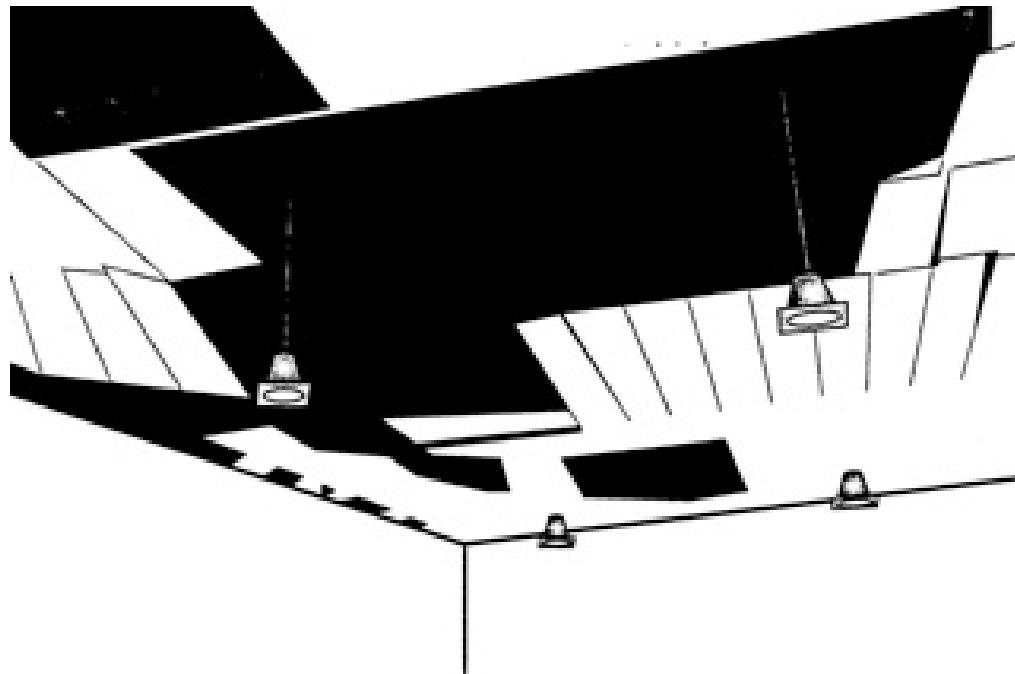
Name of checker: \_\_\_\_\_

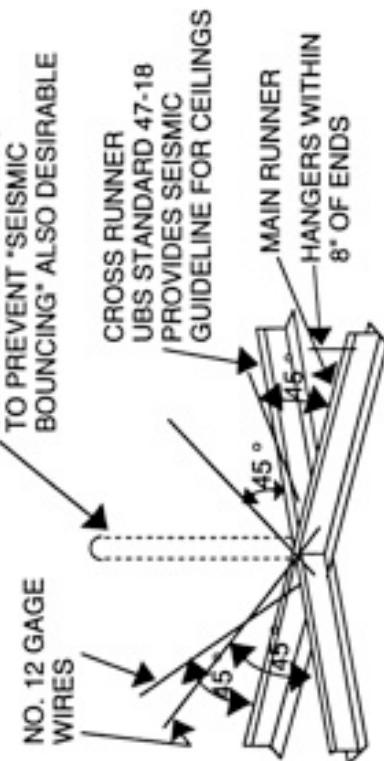
Item	Description	Yes	No	Who will fix it	Date set for completion
1. Ceilings  Appendix 2 pages 2,3,4,5	a) Are T-bars, ceiling tiles, grills, vents, overhead light fixtures, fluorescent tubes, air handling units and space heaters secured so they will not break free during intense shaking?  b) Have other hazards above work areas been made secure?  Specify _____				
2. Cabinets  Appendix 2 pages 6,7	a) Are stationery cabinets, filing cabinets, bookcases, cupboards and storage racks anchored to the wall?  b) Are groups of filing cabinets bolted to each other to “enlarge the footprint”?				
3. Shelves  Appendix 2 page 8	a) Are heavier objects stored on lower shelves, lighter objects on higher shelves?  b) Are sills, restraining bars or chains in place to prevent things from being pitched off?  c) Are fragile items (especially people) protected from flying objects?				
4. Drawers and Door	a) Are desk drawers, file drawers and cabinet doors fitted with secure latches and kept closed when not being accessed?  b) Do all other spaces, such as closets, have secure doors?  Specify _____				
5. Electronic Equipment  Appendix 2 page 9	a) Are personal computers, display terminals, photocopiers, fax machines, printers, telephones and other potential projectiles secured with Velcro strips or non-skid pads?  b) Are there plastic covers nearby to protect the equipment from fire sprinklers, debris or dust?				
6. Partitions and Screens  Appendix 2 page 10	a) Are interior partitioning walls securely anchored to the floor and to adjoining walls, with their tops adequately braced to the overhead structure?  b) Are portable screen walls placed where they will cause no harm if they move or fall?				

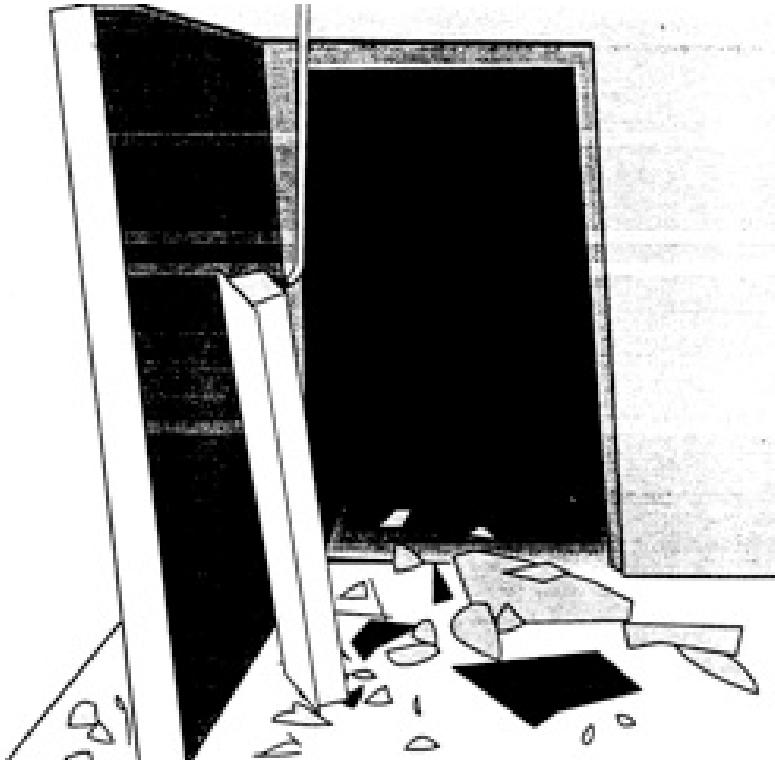
Item	Description	Yes	No	Who will fix it	Date set for completion
7. Windows and Mirrors	a) Are panes of glass that might shatter and injure people, inside or outside the building, protected from doing so?				
8. Heavy Equipment Appendix 2 pages 5,11,12,13	a) Have appliances, heating and air-conditioning units, generators, pumps and machine tools been anchored or otherwise restrained?  b) Have all other items of heavy equipment, which may cause damage by breaking loose, been made secure?  Specify _____				
9. Hot Water Tanks Appendix 2 page 14	a) Are separate hot water tanks strapped to a structural wall or equivalent to prevent movement and reduce the possibility of gas leaks, water leaks and fire?				
10. Toxic substances	a) Are all hazardous materials safely stored? Paint? Janitorial fluids? Photocopier toner? Gasoline? Other:  Specify _____				
11. Asbestos	a) Has all asbestos, that could spill fibres into the heating or cooling system, been removed?				
12. Outside Facilities Appendix 2 page 15	a) Are all sheds, awnings, canopies, car-ports braced to withstand shaking?  b) Are other outside facilities, where people or valuable equipment may be, made secure?  Specify _____				
13. Access routes	a) Are all access routes clear?  b) Are all bookshelves, storage racks and other sources of debris secure so they will not impede the movement of people?  c) Do all desks and tables have clear spaces beneath for persons to crouch?  d) Do all desks and tables have clear spaces beneath for persons to crouch?				

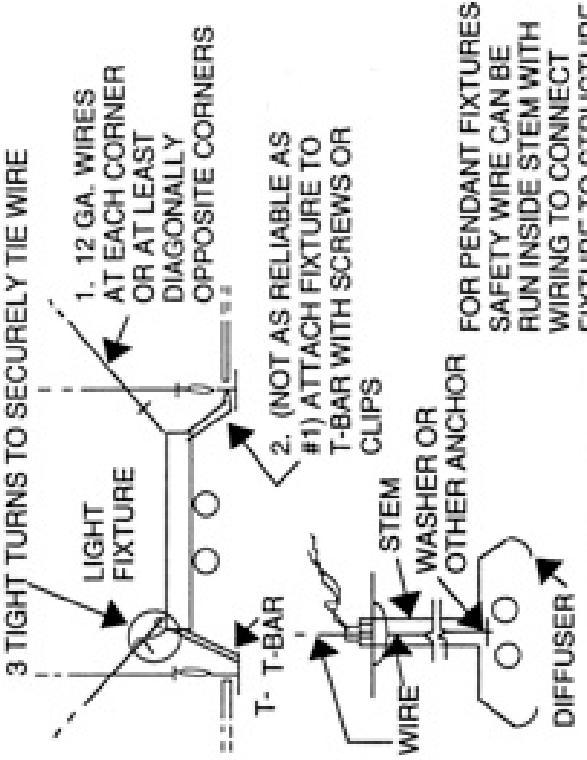
## Appendix 2

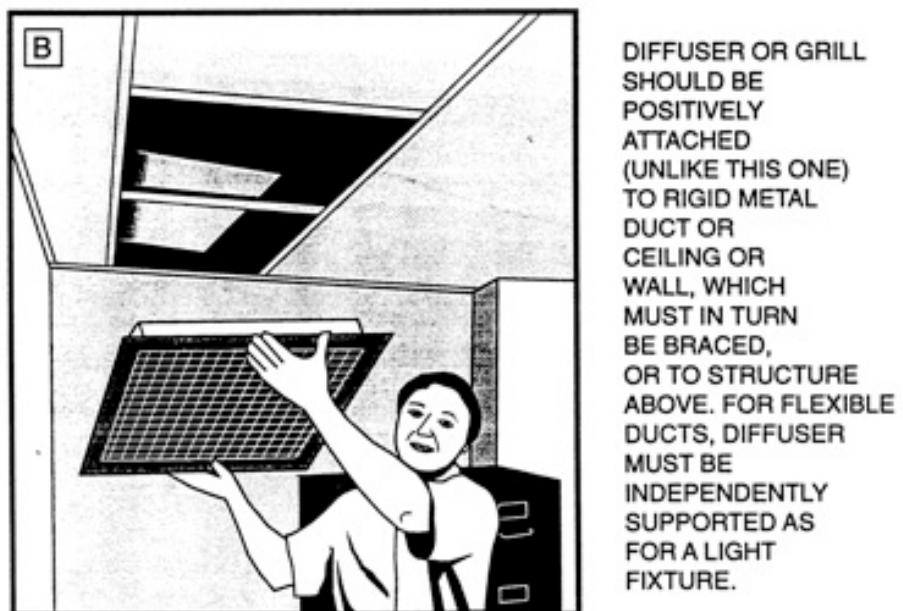
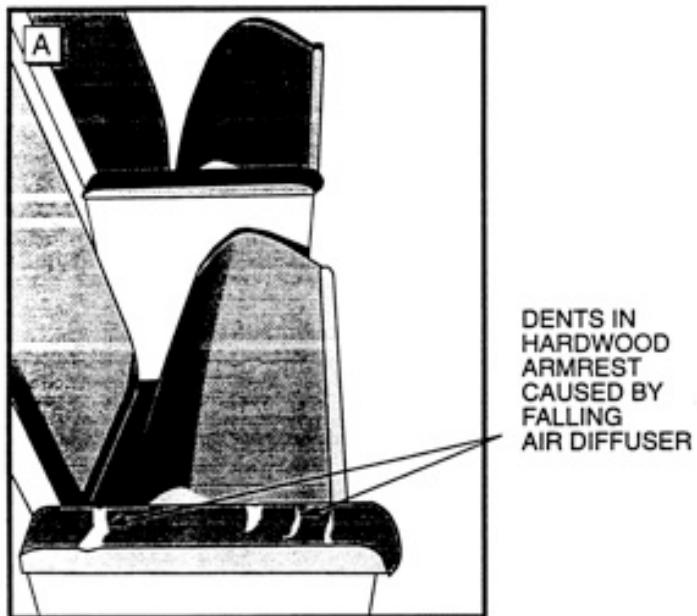
### Guide for Non-Structural Hazard Mitigation



SUSPENDED CEILINGS		PROTECTIVE COUNTERMEASURE	
DAMAGE EXAMPLE			
		 <p>NO. 12 GAGE WIRES</p> <p>CROSS RUNNER UBS STANDARD 47-18 PROVIDES SEISMIC GUIDELINE FOR CEILINGS</p> <p>MAIN RUNNER HANGERS WITHIN 8" OF ENDS</p> <p>45°</p> <p>45°</p> <p>45°</p> <p>45°</p> <p>4-WAY DIAGONAL BRACING EVERY 12 FT ON MAIN RUNNERS, AND WITHIN 4 FT OF WALLS SEE "LIGHT FIXTURES" FOR CEILING - MOUNTED LIGHTS</p>	
	<b>Drawing on Previous Page</b>		
earthquake: 1972 Nicaragua	credit: John F. Meehan	APPROXIMATE COST: \$20.00 PER SQ. FT.	
EXISTING VULNERABILITY		UPGRADED VULNERABILITY	
SHAKING INTENSITY	EFFECTS	+	\$
LIGHT	only occasional dislodged tile	low	0-5% low
MODERATE	talling of some of ceiling, especially at perimeter and in large rooms	mod	5-20% mod
SEVERE	talling of most or all of ceiling tiles, as well as some ceiling mounted equipment and ceiling frame	mod	20-100% mod
<b>+</b> LIFE SAFETY HAZARD		\$ % OF REPLACEMENT VALUE DAMAGED	
		POST-EARTHQUAKE OUTAGE	



LIGHT FIXTURES										
DAMAGE EXAMPLE	PROTECTIVE COUNTERMEASURE									
	 <p><b>Drawing on Previous Page</b></p>									
	<p>APPROXIMATE COST: \$30</p>									
EXISTING VULNERABILITY	UPGRADED VULNERABILITY									
SHAKING INTENSITY	EFFECTS	\$	SHAKING INTENSITY	EFFECTS	\$					
LIGHT	occasional falling of fixture diffusers	+	low	0-5%	low	LIGHT	no damage	low	0%	low
MODERATE	falling of some fixtures	mod	5-20%	mod	mod	MODERATE	no damage	mod	0%	low
SEVERE	falling of some fixtures	high	20-80%	mod	mod	SEVERE	slight chance of occasional falling of fixture diffusers	mod	0-10%	low
<b>+</b> LIFE SAFETY HAZARD		<b>\$</b> % OF REPLACEMENT VALUE DAMAGED	<b>+</b> POST-EARTHQUAKE OUTAGE							



## HEATING-VENTILATING-AIR CONDITIONING DISTRIBUTION

### DAMAGE EXAMPLE

### PROTECTIVE COUNTERMEASURE

Drawing on Previous Page

Drawing on Previous Page

Earthquake: 1971 San Fernando  
credits: a) J. Ayres b) William T. Holmes

APPROXIMATE COST: \$30 per diffuser

### EXISTING VULNERABILITY

### UPGRADED VULNERABILITY

SHAKING INTENSITY	EFFECTS	+	\$	SHAKING INTENSITY	EFFECTS	+	\$	Hazard
LIGHT	occasional falling of diffuser	low	0-5%	low	LIGHT		no damage	low
MODERATE	swinging of ducts; occasional falling of diffusers, grills	mod	5-20%	mod	MODERATE		no damage	low
SEVERE	talling of ducts, mixing boxes, as well as diffusers	mod	20-80%	high	SEVERE		chance of localized damage but no falling of ducts	low

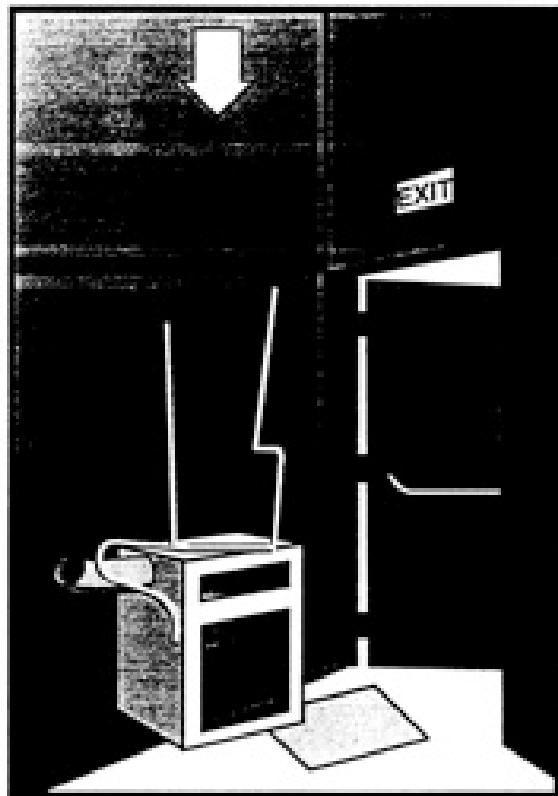
+

\$

% OF REPLACEMENT VALUE DAMAGED



POST-EARTHQUAKE OUTAGE

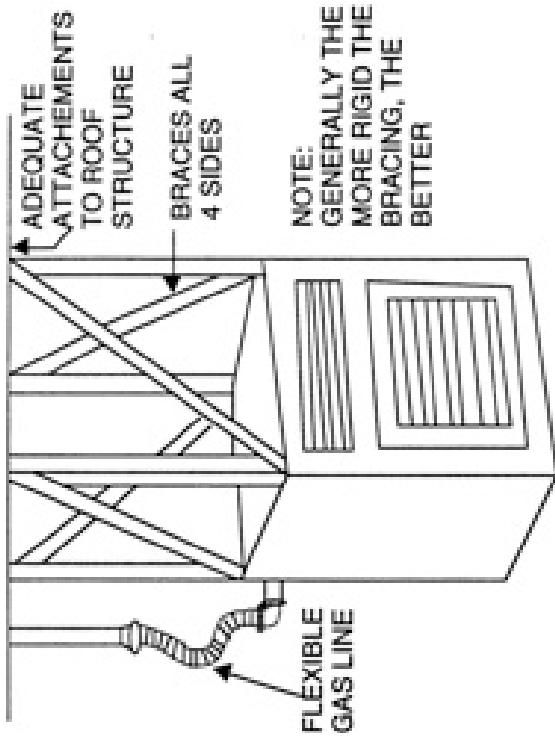


**GAS SPACE HEATER  
FELL FROM CEILING  
ABOVE.**

## HANGING SPACE HEATERS

### DAMAGE EXAMPLE

### PROTECTIVE COUNTERMEASURE



Drawing on Previous Page

earthquake: 1971 San Fernando  
credits: C. Wilton, Scientific Service, Inc.

APPROXIMATE COST: \$100 per heater

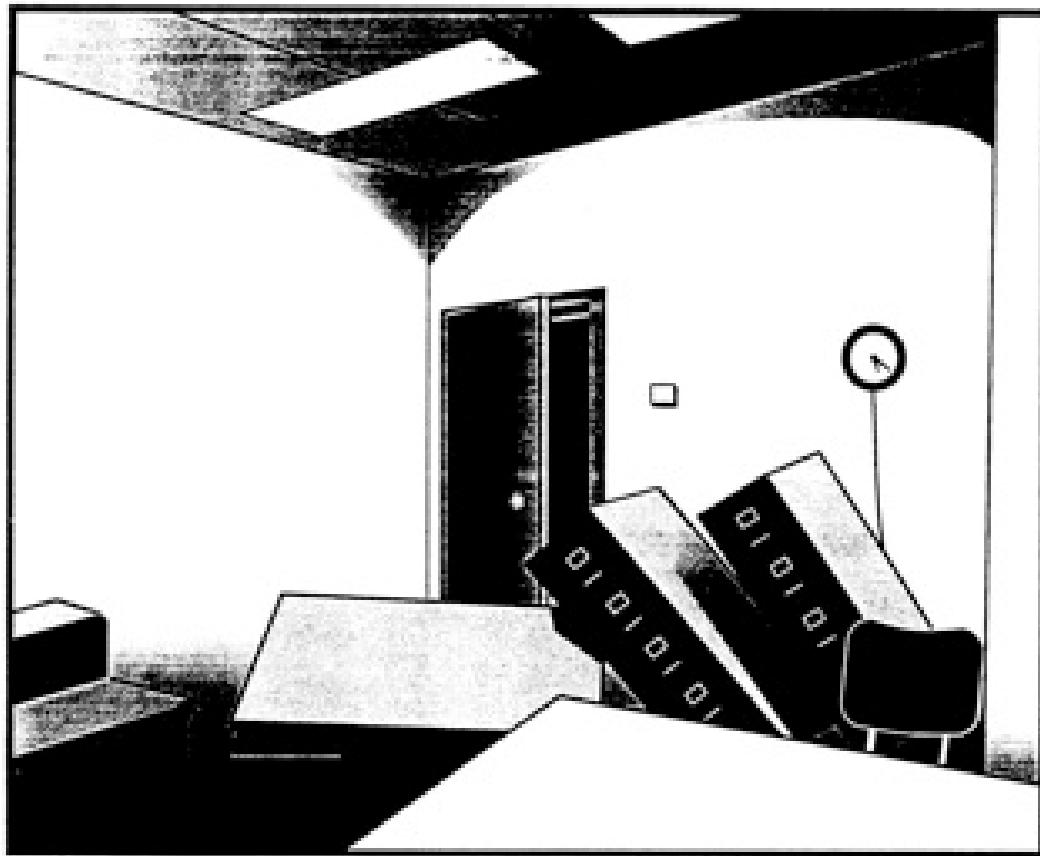
### EXISTING VULNERABILITY

SHAKING INTENSITY	EFFECTS	+	\$	UPGRADED VULNERABILITY	
				SHAKING INTENSITY	EFFECTS
LIGHT	slight chance of enough swaying to cause gas leaking	mod	0-20%	low	LIGHT
MODERATE	likely that swaying will cause damage or gas leak; also fire damage	mod	20-50%	mod	MODERATE
SEVERE	severe damage; falling unless connections of hangers are unusually strong; also fire damage	high	50-100%	mod	SEVERE

+

LIFE SAFETY HAZARD      \$ % OF REPLACEMENT VALUE DAMAGED

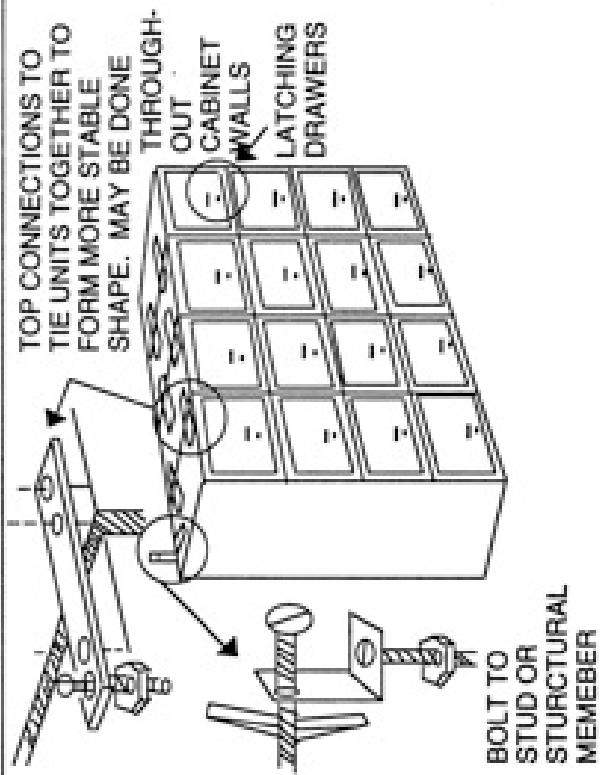
POST-EARTHQUAKE OUTAGE



## TALL FILE CABINETS

### DAMAGE EXAMPLE

### PROTECTIVE COUNTERMEASURE



**Drawing on Previous Page**

earthquake: 1979 Imperial Valley, California  
credit: BSD, Inc.

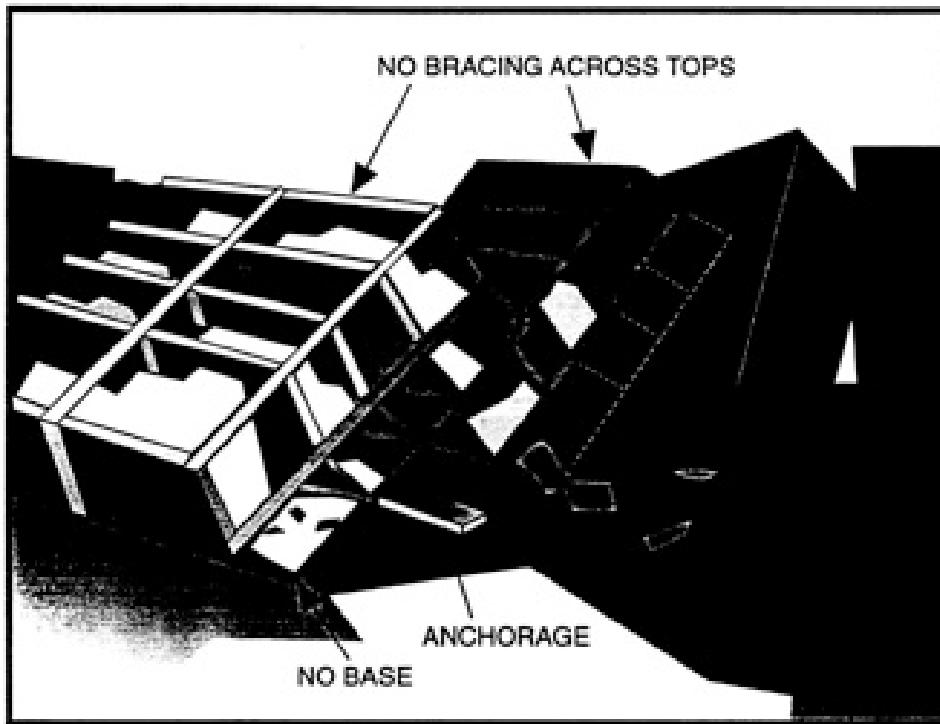
### EXISTING VULNERABILITY

APPROXIMATE COST: models standard  
\$5 per pair of cabinets; latching

### UPGRADED VULNERABILITY

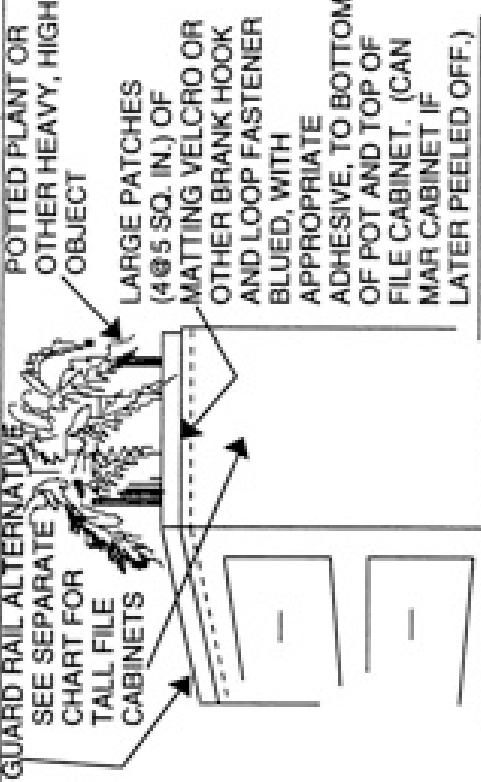
SHAKING INTENSITY	EFFECTS	+	\$	SHAKING INTENSITY	EFFECTS	+	\$
LIGHT	no damage	low	0-5%	LOW	no damage	low	0%
MODERATE	occasional tipover if drawers unlatched and if top heavy	mod	5-20%	MODERATE	no damage	low	0%
SEVERE	tipover of most tall cabinets	mod	20-100%	SEVERE	damage limited to spillage of occasional individual unlatched drawer	low	0-10%

**+** LIFE SAFETY HAZARD    **\$** % OF REPLACEMENT VALUE DAMAGED    **+** POST-EARTHQUAKE OUTAGE



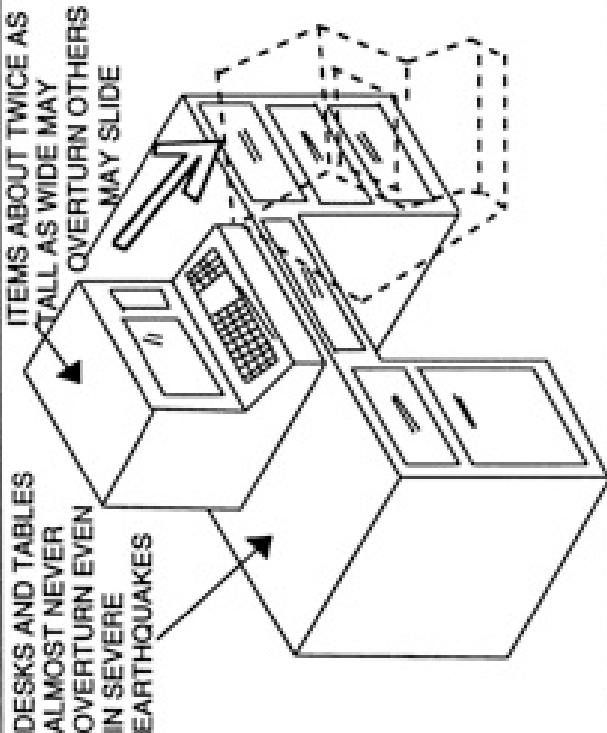
DAMAGE EXAMPLE		PROTECTIVE COUNTERMEASURE		UPGRADED VULNERABILITY		POST-EARTHQUAKE OUTAGE																																					
<b>TALL SHELVING</b>				APPROXIMATE COST: \$5 per linear foot of shelving																																							
<b>DAMAGE EXAMPLE</b>  <b>Drawing on Previous Page</b>		<b>EXISTING VULNERABILITY</b>		<b>UPGRADED VULNERABILITY</b>																																							
		<table border="1"> <thead> <tr> <th>SHAKING INTENSITY</th> <th>EFFECTS</th> <th>+</th> <th>\$</th> <th>SHAKING INTENSITY</th> <th>EFFECTS</th> <th>+</th> <th>\$</th> </tr> </thead> <tbody> <tr> <td>LIGHT</td> <td>occasional tall heavy shelf tips from distant earthquake</td> <td>low</td> <td>0-5%</td> <td>low</td> <td>LIGHT</td> <td>none</td> <td>low</td> <td>0%</td> <td>low</td> </tr> <tr> <td>MODERATE</td> <td>overturning of some of heaviest shelving</td> <td>mod</td> <td>5-20%</td> <td>mod</td> <td>MODERATE</td> <td>some of unrestrained contents fall out</td> <td>mod</td> <td>0-10%</td> <td>low</td> </tr> <tr> <td>SEVERE</td> <td>overturning of most shelving</td> <td>high</td> <td>20-80%</td> <td>high</td> <td>SEVERE</td> <td>unlikely shelving will be damaged; half of unrestrained contents fall out; almost none of restrained contents</td> <td>mod</td> <td>10-50%</td> <td>mod</td> </tr> </tbody> </table>		SHAKING INTENSITY	EFFECTS	+	\$	SHAKING INTENSITY	EFFECTS	+	\$	LIGHT	occasional tall heavy shelf tips from distant earthquake	low	0-5%	low	LIGHT	none	low	0%	low	MODERATE	overturning of some of heaviest shelving	mod	5-20%	mod	MODERATE	some of unrestrained contents fall out	mod	0-10%	low	SEVERE	overturning of most shelving	high	20-80%	high	SEVERE	unlikely shelving will be damaged; half of unrestrained contents fall out; almost none of restrained contents	mod	10-50%	mod		
SHAKING INTENSITY	EFFECTS	+	\$	SHAKING INTENSITY	EFFECTS	+	\$																																				
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<b>+ LIFE SAFETY HAZARD</b>		<b>\$ % OF REPLACEMENT VALUE DAMAGED</b>																																									



MISCELLANEOUS OFFICE FURNISHINGS																																																	
DAMAGE EXAMPLE	PROTECTIVE COUNTERMEASURE																																																
 <p><b>GUARD RAIL ALTERNATIVE</b> SEE SEPARATE CHART FOR TALL FILE CABINETS</p> <p><b>LARGE PATCHES</b> (4@5 SQ. IN.) OF MATTING VELCRO OR OTHER BRAK HOOK AND LOOP FASTENER BLUED, WITH APPROPRIATE ADHESIVE, TO BOTTOM OF POT AND TOP OF FILE CABINET. (CAN MAR CABINET IF LATER PEELED OFF.)</p> <p><b>Drawing on Previous Page</b></p>	<p>POTTED PLANT OR OTHER HEAVY, HIGH OBJECT</p> <p>CHAIRS, DESKS AND TABLES HAVE ONLY VERY RARELY OVERTURNED IN EARTHQUAKES; COUNTERS AND CASWORK SHOULD BE ANCHORED, HOWEVER.</p> <p>APPROXIMATE COST: \$150 materials plus 15 minutes labour</p>																																																
<p>earthquake: 1979 Santa Barbara credit: Larry Parsons/Health and Safety, UCSB</p> <p><b>EXISTING VULNERABILITY</b></p>	<p><b>UPGRADED VULNERABILITY</b></p> <table border="1"> <thead> <tr> <th>SHAKING INTENSITY</th> <th>EFFECTS</th> <th>+</th> <th>\$</th> <th>SHAKING INTENSITY</th> <th>EFFECTS</th> <th>+</th> <th>\$</th> </tr> </thead> <tbody> <tr> <td>LIGHT</td> <td>no damage</td> <td>low</td> <td>0-5%</td> <td>low</td> <td>LIGHT</td> <td>no damage</td> <td>low</td> <td>0%</td> <td>low</td> </tr> <tr> <td>MODERATE</td> <td>no damage</td> <td>low</td> <td>5-20%</td> <td>low</td> <td>MODERATE</td> <td>no damage</td> <td>low</td> <td>0%</td> <td>low</td> </tr> <tr> <td>SEVERE</td> <td>tipover or shifting of a few top-heavy and narrow items</td> <td>mod</td> <td>20-50%</td> <td>mod</td> <td>SEVERE</td> <td>occasional tipover of small items; furniture slides up to a few inches</td> <td>low</td> <td>0-10%</td> <td>low</td> </tr> <tr> <td><b>+</b> LIFE SAFETY HAZARD</td> <td><b>\$</b> % OF REPLACEMENT VALUE DAMAGED</td> <td><b>+</b></td> <td><b>\$</b> POST-EARTHQUAKE OUTAGE</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	SHAKING INTENSITY	EFFECTS	+	\$	SHAKING INTENSITY	EFFECTS	+	\$	LIGHT	no damage	low	0-5%	low	LIGHT	no damage	low	0%	low	MODERATE	no damage	low	5-20%	low	MODERATE	no damage	low	0%	low	SEVERE	tipover or shifting of a few top-heavy and narrow items	mod	20-50%	mod	SEVERE	occasional tipover of small items; furniture slides up to a few inches	low	0-10%	low	<b>+</b> LIFE SAFETY HAZARD	<b>\$</b> % OF REPLACEMENT VALUE DAMAGED	<b>+</b>	<b>\$</b> POST-EARTHQUAKE OUTAGE						
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## DESK TOP COMPUTERS AND OFFICE EQUIPMENT

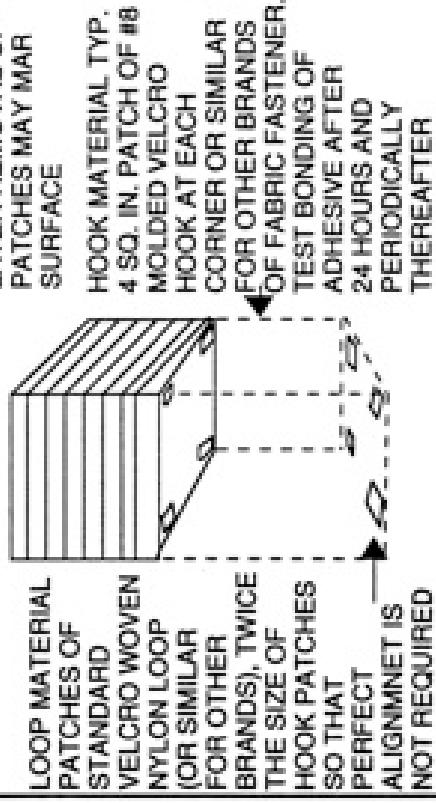
### DAMAGE EXAMPLE



ITEMS ABOUT TWICE AS TALL AS WIDE MAY OVERTURN EVEN IN SEVERE EARTHQUAKES

### PROTECTIVE COUNTERMEASURE

DESKS AND TABLES ALMOST NEVER OVERTURN EVEN IN SEVERE EARTHQUAKES



SAMLL LIPS OR PARAPETS AT EDGE OF COUNTER OR TABLE, OR DETACHABLE "LEASH" AT REAR, ARE ADEQUATE TO PREVENT SLIDING AND FALLING

V-45 ADHESIVE TYP.  
LATER REMOVAL OF PATCHES MAY MAR SURFACE

### EXISTING VULNERABILITY

SHAKING INTENSITY	EFFECTS	+	\$	SHAKING INTENSITY	EFFECTS	+	\$
LIGHT	no damage	low	0-10%	LOW	LIGHT	no damage	low
MODERATE	shifting of equipment	mod	10-20%	MODERATE	no damage	low	0%
SEVERE	some equipment falls to floor	mod	20-80%	HIGH	SEVERE	downtime more likely to be due to electrical outage or building damage than equipment damage	low

**+** LIFE SAFETY HAZARD      **\$** % OF REPLACEMENT VALUE DAMAGED

POST-EARTHQUAKE OUTAGE

### Table of Contents

# **OSH Standard 504**

## **Post-Earthquake**

## **Building Safety Rapid**

## **Evaluation Program**

# OSH Standard 504

## Post-Earthquake Building Safety

### Rapid Evaluation Program

#### 1. Scope

1.1 This standard describes the post-earthquake building safety rapid evaluation program.

#### 2. Purpose

2.1 This standard outlines a three-stage program to evaluate building safety following seismic activity.

#### 3. Standard

##### 3.1 General

3.1.1 BC Hydro has adopted a Building Safety Rapid Evaluation program based on the ATC 20 methodology developed by the Applied Technology Council of California to carry out post-earthquake safety evaluations of buildings.

There are three different post-earthquake building safety evaluation procedures:

- Rapid Evaluation. The simplest procedure is “Rapid Evaluation”. This is normally the first level of evaluation and is designed to quickly designate the apparently safe and the obviously unsafe structures. This Rapid Evaluation can take from 10-30 minutes. This type of evaluation can be carried out by trained Building Safety Rapid Evaluators. Doubtful structures identified in the “RESTRICTED USE” or “UNSAFE” category must be scheduled for a more detailed visual examination, designated a Detailed Evaluation.
- Detailed Evaluation. The Detailed Evaluation is the second level of examination. It consists of a thorough visual examination of a structure, inside and out, and is designed to result in the rating of all structures as either safe for use, potentially dangerous (i.e., restricted use), or unsafe. It is normally performed by structural engineers. This procedure can take from 1-4 hours.
- Engineering Evaluation. After the Detailed Evaluation, any further evaluations would ordinarily be done by a structural engineer/consultant. This is designated the Engineering Evaluation and is the third and most thorough evaluation technique. This procedure can take from 1 to 7 days or more, depending on the type of structure and damage involved.

3.1.2 BC Hydro will include the provision for Post-Earthquake Building Safety Rapid Evaluation of all facilities located in seismic Zones 3, 4, 5, and 6 (see Appendix 5, for selected locations) as an integral part of its Emergency Response Plans.

3.1.3 The majority of stations and reporting locations within seismic zones 3, 4, 5, and 6 have been evaluated for seismic withstand capabilities

3.1.4 BC Hydro has provided training to a number of Building Safety Rapid Evaluators on the methodology of conducting basic building structure damage assessment using ATC 20, ATC-20-1 and ATC-20-2 to the Rapid Evaluation level.

- 3.2 Emergency response plans in seismic Zones 3, 4, 5 and 6 shall include the duties, responsibilities and report locations of the post-earthquake Building Safety Rapid Evaluators.
- 3.3 BC Hydro line management shall ensure that the names, work locations, and home contact information of workers assigned to conduct Rapid, Detailed and Engineering Evaluations be maintained as part of the emergency response plan.
- 3.4 All workers assigned duties to conduct post-earthquake Rapid Evaluations of buildings must be trained in the use of the ATC 2O and ATC 2O 2. (See Appendix 1). Training must include field visits to facilities that such Building Safety Rapid Evaluators will be called upon to evaluate.
- 3.5 Facilities plans and information on hazardous materials and/or operations must be readily available on site to assist in the rapid evaluation process.
- 3.6 The building Fire & Safety Director will arrange for safety evaluations of the building following an earthquake if any damage is immediately obvious or if, in his or her opinion, the shaking caused by the earthquake was strong enough or long enough to warrant an evaluation to confirm building safety. The evaluation process is described in Appendix 4 "Evaluation Flow Chart". The Rapid Evaluation will be conducted by trained Building Safety Rapid Evaluators.
- 3.7 Building Safety Rapid Evaluators shall conduct rapid evaluations of BC Hydro facilities as assigned and report their findings to the Fire Safety Director/ Building Manager/Emergency Centre Manager as per emergency plans.
- 3.8 Buildings evaluated shall be posted as "INSPECTED", "RESTRICTED USE" or "UNSAFE" on completion of the Rapid Evaluation. A special posting category, "AREA UNSAFE", is used to designate unsafe areas either inside or outside the building. For instance, if a badly cracked parapet is observed, the area on the ground outside the building and within potential striking distance must be roped off or otherwise barricaded to prevent entry.
  - 3.8.1 Buildings posted as "INSPECTED" (green placard) indicates no apparent hazard found, although repairs may be required. Original lateral load capacity is not significantly decreased. No restriction on use or occupancy.
  - 3.8.2 Buildings posted "RESTRICTED USE" (yellow placards) indicates that a structure has suffered damage such that the risk of partial collapse, local falling hazard, or other hazard necessitates some entry or occupancy restrictions. The following are typical observed conditions for which a building should be posted "RESTRICTED USE", accompanied by appropriate sample restriction statements.
    - The structural elements associated with certain areas of the building have been so badly damaged that partial collapse could occur in those areas. The "RESTRICTED USE" placard would state "Do not enter the following areas (...) without written authorization from jurisdiction" or similar wording. Barricade tape at the affected area would further bar entry. This restriction is the first of the restriction statements on the placard in Appendix 2.
    - The overall condition of the building is too degraded to allow continuous occupancy, but brief occupancy by tenants or workers to remove belongings or goods is appropriate. An example would be a wood frame structure with collapsed cripple walls in which the floor is safe but uneven, the entrances are usable, further falling or collapse hazards are absent, the gas and electric utilities are secured, and the plumbing is broken but not hazardous. The "RESTRICTED USE" placard would note "no general public entry into building" or state that "brief entry is allowed for removing belongings or goods." This restriction is the second pre-printed restriction statement on the placard in Appendix 2.

- Where there are falling hazards at certain entrances to the building. If safe entrances (exits) are still available, the “RESTRICTED USE” placard would state “Do not enter or exit from the following doorways (...).” Barricade tape at the affected entries would further bar their use.
- The structural condition of a stairway is adequate for use by individuals but is questionable for emergency exiting or the removal of heavy building contents. The “RESTRICTED USE” placard would place restrictions on the occupancy of elevated floors.
- The building has been damaged such that no immediate hazard exists, but the quality of health or living conditions for long-term occupancy in the building is significantly diminished. Examples of such damage include extensive interior finish cracking, noticeable plumbing leakage, or damage allowing weather intrusion. No occupancy or use restrictions would be stated, but the placard would note that the Manager must correct the deficiencies prior to workers returning to work in the building.

3.8.3 Access to buildings posted as “UNSAFE” (red placard) indicates an extreme hazard, may collapse, or imminent danger of collapse from an aftershock.

**Unsafe for occupancy or entry, except by authorities.**

3.8.4 Access to the area adjacent to a building/structure or inside of a building posted as “AREA UNSAFE” indicates an extreme hazard or imminent danger of collapse from an aftershock.

**Area must not be entered except by authorities.**

3.9 Building Safety Rapid Evaluators should be utilized in the completion of ongoing non-structural hazard inspections in their regular place of work.

3.10 The Fire and Safety Director shall request a Detailed Evaluation of the building if the Rapid Evaluation results in a posting of “Restricted Use” or “Unsafe”. The Fire & Safety Director may request a Detailed Evaluation of the building if the Rapid Evaluation results in a posting of “Inspected”, with some concerns identified, or if the building is a complex building such as the Edmonds or Dunsmuir office. Detailed and/or Engineering Evaluations that are required as a result of the posting of a facility as “RESTRICTED USE”, “UNSAFE” or “AREA UNSAFE” must be conducted by a qualified structural engineer.

3.11 “RESTRICTED USE”, “UNSAFE” and “AREA UNSAFE” placards shall remain posted until problems are fixed and an “INSPECTED” placard is posted. “INSPECTED” placards shall remain in place for at least 5 days following this posting.

3.12 There may be a need to change the posting of a building. This can result from several situations including: A Detailed Inspection of a structure posted RESTRICTED USE after a Rapid Evaluation; an Engineering Evaluation; re-evaluation to correct a mistake; re-evaluation due to new found damage or an aftershock; or re-evaluation after temporary repairs. Any change in posting category (i.e., re-posting) must be done only by qualified structural engineers trained in the detailed evaluator process.

3.13 Building Safety Rapid Evaluators are to look for readily observable gross kinds of structural distress and geotechnical conditions that threaten building safety. The procedure for conducting a Rapid Evaluation is summarised in the following:

- 3.13.1 Examine the ground in the general area of the structure for fissures, bulged ground, or signs of slope movement.
- 3.13.2 Examine the entire outside of the structure.
- 3.13.3 Evaluate the structure using the six Rapid Evaluation criteria and complete the BC Hydro Post-Earthquake Building Rapid Evaluation Form (Appendix 2). Buildings posted as RESTRICTED USE, UNSAFE or AREAS UNSAFE must be scheduled for a Detailed Evaluation.

## Rapid Evaluation Criteria

Condition	Posting
1. Building has collapsed, partially collapsed, or moved off its foundation.	UNSAFE
2. Building or any story is significantly out of plumb.	UNSAFE
3. Obvious severe damage to primary structural members, severe racking of walls or other signs of severe distress are present.	UNSAFE
4. Obvious damage to ceiling tiles, wall partitions, door frames, canopies, awnings, overhead bus work, station equipment or other falling hazard present.	AREA UNSAFE
5. Large fissures in ground, massive ground movement, or slope displacement present.	AREA UNSAFE
6. Other hazard is present (e.g., toxic spill, asbestos contamination, broken gas line, fallen power line).	UNSAFE or AREA UNSAFE

3.13.4 Ordinarily enter a building only if the structure cannot be viewed sufficiently from the outside or when there is a suspected, or reported, problem such as gross non-structural distress (e.g. fallen ceiling or badly damaged partitions visible from the outside).

**Do not enter obviously unsafe structures.**

3.13.5 Post the structure according to the results of the evaluation. Use one of the four placards (INSPECTED, RESTRICTED USE, UNSAFE or AREA UNSAFE). On the INSPECTED placard, indicate whether only the "exterior" or the "exterior" and "interior" was inspected by checking the appropriate box. Post every entrance to a building classified RESTRICTED USE or UNSAFE. (Appendix 3 – Examples of Posting and Barricading).

3.13.6 Explain the significance of UNSAFE or RESTRICTED USE postings to building occupants, and advise them to leave immediately. Areas designated AREA UNSAFE must also be evacuated.

3.13.7 Significant aftershocks ordinarily require re-inspection of buildings posted INSPECTED or RESTRICTED USE. Whenever a building is re-evaluated, a new placard should be posted to indicate the date, time of re-evaluation, and the evaluator's name, even if the posting classification is unchanged.

3.13.8 The yellow copy of the completed Post-Earthquake Rapid Evaluation form is to be retained by the evaluator, with the white and green copies given to the Fire & Safety Director. The Fire & Safety Director shall take any immediate steps necessary to ensure the safety of the occupants, including evacuation if warranted. The Fire & Safety Director shall advise the building manager of the evaluation results, and forward to the building manager the white and green copies of the evaluation form. The building manager shall forward the green copy of the evaluation form to the municipal or provincial building authority for the local area.

3.14 Protective clothing including steel toe shoes/boots, hard hat, goggles, dust masks, coveralls and heavy gloves must be worn by inspectors while carrying out their duties.

3.15 Post-Earthquake Inspection Kits shall be made available to Building Safety Rapid Evaluators by those responsible for the building(s) to which they are assigned including:

- A copy of ATC 20 1 Field Manual for Post-Earthquake Safety Evaluation of Buildings.
- Copies of BC Hydro Post-Earthquake Rapid Evaluation forms are available through BC Hydro Stationery. The Form number is: 11911.

- A supply of placards for posting buildings available by ordering through BC Hydro Stationery. The stationery order numbers are:

INSPECTED      BCH 1OO8O

RESTRICTED USE      BCH 1OO81

UNSAFE      BCH 1OO82

AREA UNSAFE      BCH 1OO83

- Rolls of yellow “Do Not Cross Line” tape to designate unsafe areas not to be entered.
- Other miscellaneous items such as flashlight, clip board, writing pad, etc.

#### 4. References

- 4.1 WorkSafeBC Occupational Health & Safety Regulation 4.1 (Safe Premises) and 4.2 (Safe Buildings and Structures)
- 4.2 User’s Guide – National Building Code of Canada (NBCC) – 1995 – Structural Commentary (Part 4)
- 4.3 ATC 2O Procedures for Post-Earthquake Safety Evaluations of Buildings
- 4.4 ATC 2O 1 Field Manual: Post-Earthquake Safety Evaluation of Buildings
- 4.5 ATC 2O 2 Addendum to the ATC-2O Post-Earthquake Building Safety Evaluation Procedures
- 4.6 BC Hydro Safety Policy
- 4.7 OSH Standard 5O1 Fire and Safety Plans for Buildings
- 4.8 OSH Standard 5O3 Earthquakes – Evaluation of Non-Structural Hazards in the Workplace

## Appendix 1

### Training Requirements—Post-Earthquake Rapid Evaluation Building Inspectors

<b>Objective</b>	To provide technical background for designated workers to use the ATC 20, ATC-20-1 and 2 methodology developed by the Applied Technology Council, California, to carry out post-earthquake Rapid Evaluations of Hydro's buildings and post them as "INSPECTED", "RESTRICTED USE", "UNSAFE", or "AREA UNSAFE".
<b>Format</b>	One-day seminar on Building Safety Rapid Evaluation with 1/2 day in the classroom, 1/2 day field evaluation of buildings to be assessed.
<b>Outline</b>	Evaluation of buildings for non-structural hazards. Examination of outside of building. Examination of inside of building. Examination of ground in the general area of the building. Six-point Rapid Evaluation criteria. Determining the specific restrictions on use. Posting of the building. Explaining the "RESTRICTED USE", "UNSAFE" and "AREA UNSAFE" posting to building occupants. Arranging for detailed evaluation of building posted "RESTRICTED USE" or "UNSAFE".
<b>Participants</b>	This training would be of value to all Hydro's workers assigned duties to conduct post-earthquake safety evaluations of buildings.
<b>Prerequisites</b>	Preferably individuals with general building design, construction or inspection experience.
<b>Delivery</b>	Training can be arranged through the CDPPT Building Withstand Team.
<b>Updates</b>	Two to four hour program at two-year intervals.

## Appendix 2

### Samples of Safety Assessment Form/Placards

Serial numbered  
2001

**BC hydro** 

### Post-Earthquake Building Rapid Evaluation Form

Evaluator:	Date & time:			
Area evaluated:	Exterior only:      Exterior & interior:			
<b>BUILDING DESCRIPTION</b>				
Building Name:	Type of Construction			
Address:	<input type="checkbox"/> Wood frame <input type="checkbox"/> Reinforced masonry <input type="checkbox"/> Steel frame <input type="checkbox"/> Unreinforced masonry <input type="checkbox"/> Tilt-up concrete <input type="checkbox"/> Unknown <input type="checkbox"/> Concrete frame <input type="checkbox"/> Other: <input type="checkbox"/> Concrete shear wall			
Building Manager:	Primary Occupancy			
Number of stories above ground:	<input type="checkbox"/> Dwelling <input type="checkbox"/> Warehouse <input type="checkbox"/> Office <input type="checkbox"/> Substation: _____ kV <input type="checkbox"/> Lineroom <input type="checkbox"/> Other <input type="checkbox"/> Powerplant			
Number of stories below ground:				
<b>EVALUATION</b>				
Investigate the building for the conditions below and check (✓) the appropriate box.				
Observed Conditions:	Minor/none	Moderate	Severe	Est'd Structural damage
Collapse, Partial collapse or building off foundation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None
Building or story leaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0 - 25%
Racking damage to walls, other structural damage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25 - 50%
Chimney, parapet, or other failing hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50 - 75%
Loose or fallen ceiling fixtures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	75 - 100%
Ground slope movement or cracking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Electrical Hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fire Hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Chemical Hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Broken Plumbing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Comments:				
<b>POSTING</b>				
Choose a posting based on the evaluation and team judgement. Severe conditions endangering the overall building and occupants are grounds for an Unsafe posting. Localized Severe and overall Moderate conditions may allow a Restricted Use posting. Post INSPECTED placard at main entrance. Post RESTRICTED USE and UNSAFE placards at all entrances. Post AREA UNSAFE where required.				
<input type="checkbox"/> INSPECTED (Green Placard)	<input type="checkbox"/> RESTRICTED USE (Yellow Placard)	<input type="checkbox"/> UNSAFE (Red Placard)	<input type="checkbox"/> AREA UNSAFE (Red Placard)	
Record any use & entry restrictions exactly as written on placard: _____				
Further Actions (i.e. Barricades needed in the following areas: _____)				
Detailed Evaluation recommended:	Structural <input type="checkbox"/>	Geotechnical <input type="checkbox"/>	Other _____	
Other recommendations & comments: _____				
Received by (Building Manager): _____				

White copy: Building Manager or Delegate

Yellow copy: Evaluator

Green copy: Municipal Authority

# INSPECTED

## LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

- Inspected Exterior Only
  - Inspected Exterior and Interior
- Report any unsafe condition to local authorities; reinspection may be required.

Date: \_\_\_\_\_  
Time: \_\_\_\_\_

**(Caution: Aftershocks since inspection may increase damage and risk)**

This facility was inspected under emergency conditions for:

Inspector Comments:

(Jurisdiction)

Inspector ID/Agency: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Facility Name and Address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Do not REMOVE, ALTER or COVER this placard until authorized by governing authority**

# RESTRICTED USE

**Caution:** This structure has been inspected and found to be damaged as described below:

Date: \_\_\_\_\_  
Time: \_\_\_\_\_

**Entry, occupancy, and lawful use are restricted as indicated below:**

Do not enter the following areas: \_\_\_\_\_

Brief entry allowed for access to contents: \_\_\_\_\_

Other restrictions: \_\_\_\_\_

Facility Name and Address: \_\_\_\_\_

(Caution: Aftershocks since inspection may increase damage and risk)

This facility was inspected under emergency conditions for:

(Jurisdiction)

Inspector ID/Agency: \_\_\_\_\_

**Do not REMOVE, ALTER or COVER this placard until authorized by governing authority**

# UNSAFE

## DO NOT ENTER OR OCCUPY (THIS PLACARD IS NOT A DEMOLITION ORDER)

This structure has been inspected found  
to be seriously damaged and is unsafe  
to occupy, as described below:

Date: \_\_\_\_\_  
Time: \_\_\_\_\_

**(Caution: Aftershocks since inspection  
may increase damage and risk)**

This facility was inspected under  
emergency conditions for:

**Do not enter, except as specifically  
authorized in writing by jurisdiction.  
Entry may result in death or injury.**

Facility Name and Address:

Inspector ID/Agency:  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**Do not REMOVE, ALTER or COVER this placard  
until authorized by governing authority**

# AREA UNSAFE

## DO NOT ENTER OR OCCUPY THIS AREA

### (THIS PLACARD IS NOT A DEMOLITION ORDER)

This structure has been inspected found  
to be seriously damaged and is unsafe  
to occupy, as described below:

Date: \_\_\_\_\_

Time: \_\_\_\_\_

**(Caution: Aftershocks since inspection  
may increase damage and risk)**

This facility was inspected under  
emergency conditions for:  
\_\_\_\_\_ (Jurisdiction)

**Do not enter, except as specifically  
authorized in writing by jurisdiction.  
Entry may result in death or injury.**

Facility Name and Address:  
\_\_\_\_\_

Inspector ID/Agency:  
\_\_\_\_\_

**Do not REMOVE, ALTER or COVER this placard  
until authorized by governing authority**

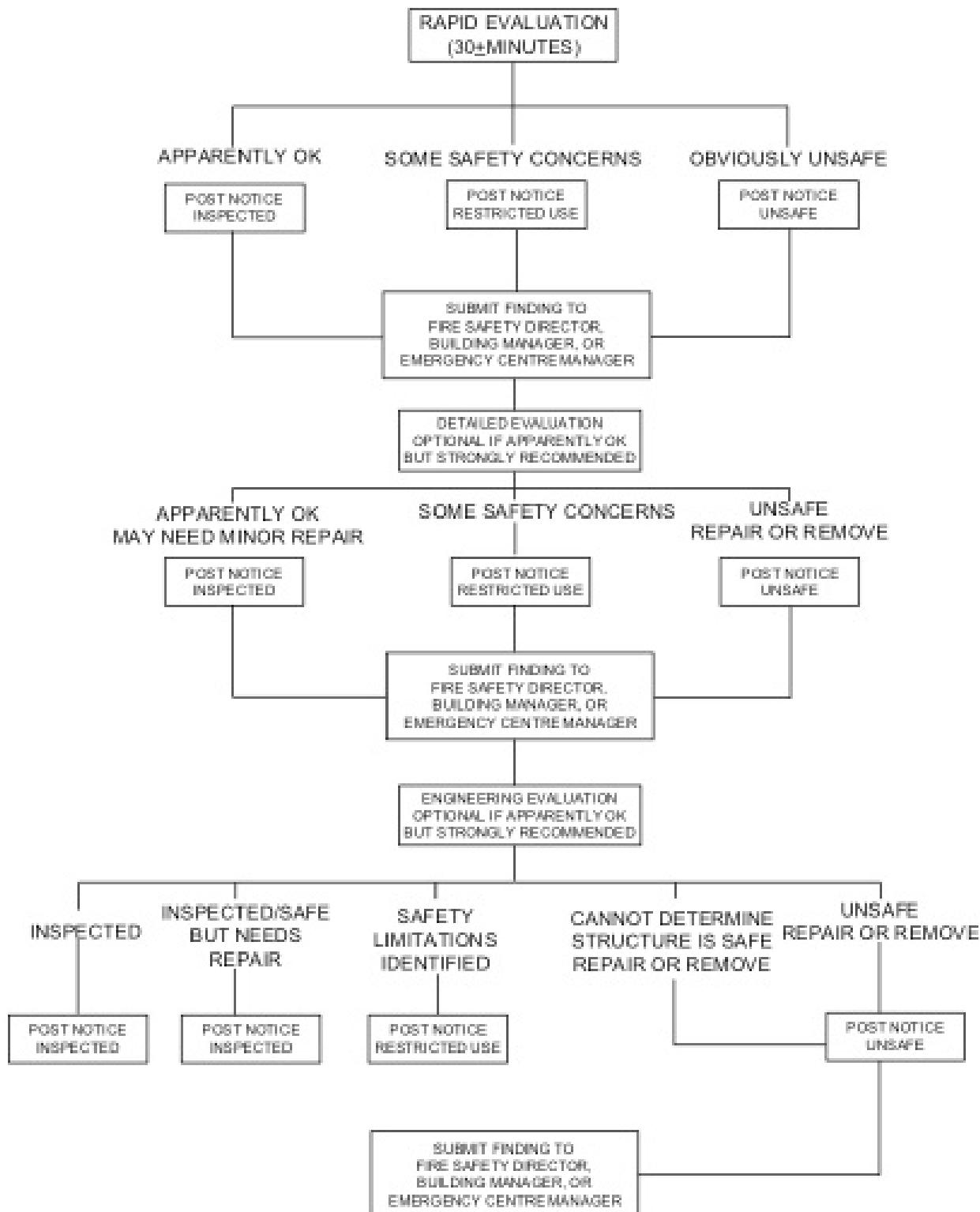
## Appendix 3

### Examples of Posting and Barricading

Condition Present	Action
<b>Buildings</b>	
Building has no apparent safety-related damage or other hazard present.	Post building:INSPECTED
Building appears to be of doubtful safety; further evaluation required.	Post building:RESTRICTED USE
Building in danger of collapse.	Post building:UNSAFE
Building in danger from geotechnical hazard (e.g., slope failure).	Post building:UNSAFE
Building structurally safe, but its use prevented by other hazard (e.g., ruptured gas line, toxic chemical spill).	Post building:UNSAFE
<b>Equipment</b>	
Elevator machinery has been damaged.	Post elevator doors and switches:UNSAFE
<b>Falling or other hazards</b>	
Building has falling hazard present (e.g., damaged parapet, cracked window).	Barricade danger zone and/or post:AREA UNSAFEThe UNSAFE placard may be placed on a perimeter barricade for this purpose.
Ruptured gas line, toxic chemical spill.	Post:AREA UNSAFEIf practical, and report situation to local authorities.
Building within inundation zone of unsafe dam, reservoir, or tank.	Post:AREA UNSAFEIf practical, and report situation to local authorities.

## Appendix 4

### Evaluation flowchart



## Appendix 5

### Seismic Zones—Selected Locations in British Columbia

Location	Seismic Zone
100 Mile House	1
Abbotsford	4
Agassiz	3
Alberni	5
Ashcroft	2
Burns Lake	3
Cache Creek	2
Campbell River	6
Castlegar	1
Chetwynd	1
Chilliwack	4
Comox	6
Courtenay	6
Cranbrook	1
Crescent Valley	1
Crofton	5
Dawson Creek	1
Duncan	5
Elko	1
Fernie	1
Fort Nelson	1
Fort St. John	1
Golden	1
Grand Forks	1
Greenwood	1
Hope	3
Hudson Hope	1
Kamloops	1
Kaslo	1
Kelowna	1
Kimberley	1
Kitimat	4
Lillooet	2
Lytton	2
Mackenzie	2
Masset	6

Location	Seismic Zone
McBride	1
McLeod Lake	2
Merritt	2
Mission City	4
Montrose	1
Nakusp	1
Nanaimo	4
Nelson	1
Ocean Falls	4
Osoyoos	1
Penticton	1
Port Alberni	5
Port Hardy	6
Port McNeill	6
Powell River	5
Prince George	2
Prince Rupert	5
Princeton	2
Qualicum Beach	4
Quesnel	2
Revelstoke	1
Salmon Arm	1
Sandspit	6
Sechelt	5
Sidney	5
Smithers	3
Squamish	3
Stewart	4
Taylor	1
Terrace	4
Tofino	5
Trail	1
Ucluelet	5
Vancouver & Region	4
Burnaby	4
Cloverdale	4

Location	Seismic Zone
Coquitlam	4
Delta	4
Ladner	4
Langley	4
New Westminster	4
North Vancouver	4
Richmond	4
Surrey	4

Location	Seismic Zone
Vancouver	4
West Vancouver	4
Vernon	1
Victoria & Region	5
Williams Lake	2
Youbou	4

# **OSH Standard 505**

## **Fire Protection Program**

# OSH Standard 505

## Fire Protection Program

### 1. Scope

1.1 This standard covers the BC Hydro fire protection program.

### 2. Purpose

2.1 This standard specifies fire safety measures to protect workers, contractors, visitors and the workplace from the consequences of fire and/or explosion.

### 3. Standard

3.1 Measures must be taken to ensure that BC Hydro workers, contractors and visitors, plant and equipment are protected from the risks of fire and/or explosion by the most effective, prudent and technically feasible means.

3.2 The BC Hydro Fire Protection program shall be in conformance with the following Acts, Codes, Standards and Regulations:

- BC Building Code
- BC Fire Code
- National Fire Protection Association (NFPA) Codes, Standards and Recommended Practices
- Fire Services Act of BC
- Forest Fire Prevention and Suppression Regulation (BC Reg. 169/95)
- Open Burning Smoke Control Regulation (BC Reg. 145/93)
- Workers Compensation Board Act and WorkSafeBC Occupational Health & Safety Regulation
- Canadian Standards Association (CSA)
- Underwriters' Laboratories of Canada (ULC)
- Underwriters' Laboratories (UL)
- BC Hydro Safety Practice Regulations
- BC Hydro Design Standards

3.3 The BC Hydro Fire Protection program will be based on the prevention of injuries/loss of life, damage to property and the environment through the implementation of the following elements:

- 3.3.1 The completion of site specific fire hazard assessments and risk analysis for facilities, equipment and work procedures.
- 3.3.2 The immediate elimination of fire hazards.
- 3.3.3 Ongoing fire inspections/fire protection audits of plant and equipment.
- 3.3.4 Scheduled servicing, maintenance and testing programs including records of work completed for fire protection equipment/suppression systems in conformance with current codes and standards.

- 3.3.5 Documented design review of fire, safety and protection systems for new facilities and/or extensions to existing facilities.
- 3.3.6 The development/implementation of fire emergency plans.
- 3.3.7 The provision of information to local fire departments on hazardous materials including hazardous wastes at BC Hydro facilities which may endanger firefighters including storage locations and safe handling procedures.
- 3.3.8 The provision of information to fire departments and the forest service on the hazards associated with the BC Hydro plant and the electrical system as a component of the pre-fire emergency planning process.
- 3.3.9 The training of all workers in the fire prevention and the emergency evacuation procedures applicable to their place of work.
- 3.3.10 The selection and training of workers assigned to fire fighting duties including but not limited to fire suppression methods, fire prevention, emergency procedures, the Incident Command System (ICS), firefighter team safety and communications applicable to the workplace.
- 3.3.11 The provision and maintenance of approved fire fighting equipment, personal protective clothing and respiratory equipment for workers assigned fire fighting duties.
- 3.3.12 Maintaining compliance with the Waste Management Act – Open Burning Smoke Control Regulation BC Reg. 145/93 in the management and disposal of debris (vegetative matter) or demolition waste.
- 3.3.13 Conducting work in areas classified as wildland in compliance with the Forest Fire Prevention and Suppression Regulation BC Reg. 169/95.
- 3.3.14 The prompt reporting and investigation of fires and/or explosions.
- 3.3.15 Maintaining records of reports and investigations of incidents involving fire and/or explosions and the release of hazardous materials.

#### 4. Roles and Responsibilities

The implementation of Fire Protection Program requires the cooperation and coordination of all employees as follows:

##### 4.1 Managers

- 4.1.1 Ensure that a fire hazard assessment is conducted for all buildings, operating equipment and work procedures in their area of responsibility.
- 4.1.2 Establish site specific guidelines for the prevention of fires in the workplace for workers and contractors.
- 4.1.3 Ensure that monthly inspections are carried out at each BC Hydro building or operation to identify and correct fire hazards.
- 4.1.4 Arrange for testing, maintenance and servicing of fire equipment, fire alarm and fire suppression systems in compliance with the BC Fire Code and NFPA Standards.

- 4.1.5 Ensure that formalized fire emergency plans for all facilities within their jurisdiction are developed, implemented and maintained.
- 4.1.6 Ensure that local emergency agencies such as fire departments are familiar with fire and emergency plans including site specific hazards.
- 4.1.7 Ensure that all workers are trained in fire prevention, emergency evacuation, and fire fighting procedures applicable to their place of work.
- 4.1.8 Ensure that all workers assigned to fire fighting duties are provided with the appropriate approved fire fighting equipment, respiratory equipment and personal protective clothing.
- 4.1.9 Ensure that annual fire emergency drills are conducted to confirm and evaluate the level of understanding of all workers with the procedures in the site emergency plans. Records of drills and exercises must be kept.
- 4.1.10 Ensure that information on proposed renovations or changes in usage of existing facilities including drawings is submitted to BC Hydro Engineering for code compliance review at the planning stage.
- 4.1.11 Ensure that within 24 hours all fires are reported to the Treasury Manager and your Occupational Safety and Health (OSH) Specialist. "Fire and Explosion Report" Form #8O311 is available on the Intranet.

#### 4.2 Supervisors/Crew Leaders

- 4.2.1 Conduct fire hazard assessments in their work area and correct hazards as identified.
- 4.2.2 Conduct or designate workers to carry out monthly fire inspections of the work area. Maintain records of inspections.
- 4.2.3 Ensure that workers are familiar with the fire prevention regulations and emergency procedures for the work place.
- 4.2.4 Complete a fire report within 24 hours of the incident on a "Fire and Explosion" Report Form #8O311 available on the Intranet. Forward one copy to the Treasury Manager and one copy to your Occupational Safety and Health (OSH) Specialist.
- 4.2.5 Ensure that fire equipment is recharged and returned to service immediately after usage.
- 4.2.6 Ensure that fire emergency response equipment and fire protection systems are properly maintained.
- 4.2.7 Ensure that operations involving the disposal of debris (vegetative matter) or demolition waste are carried out in compliance with the Waste Management Act BC Reg. 149/93.
- 4.2.8 Ensure that all industrial work activities conducted under their direction in areas designated as wildland or forest are carried out in compliance with the Forest Fire Prevention and Suppression Regulation BC Reg. 169/95.

#### 4.3 Workers

- 4.3.1 Report all fire hazards or hazardous conditions to their work leader, supervisor or manager.
- 4.3.2 Report all incidents involving fires and/or explosions to their supervisor or manager.
- 4.3.3 Conduct all work practices in compliance with WorkSafeBC Occupational Health and Safety Regulations and site specific fire regulations.
- 4.3.4 In the event of a fire, carry out emergency procedures in accordance with their site or local Fire Emergency Response Plan.

#### 4.4 BC Hydro Engineering

- 4.4.1 Specify the type, location and general requirements of fire protection for all BC Hydro facilities.
- 4.4.2 Assist in the design and development of specifications, for fire protection and life safety systems.
- 4.4.3 Conduct reviews of all building plans (including substations, hydro and thermal, stationary or mobile) from a Fire Prevention and Fire Safety viewpoint, prior to calling tenders.
- 4.4.4 Provide consulting services on the operation of and maintenance requirements for fire protection systems.
- 4.4.5 Conduct periodic inspection and fire protection audits of corporate facilities.
- 4.4.6 Ensure that acceptance testing and verification of new or modified fire protection systems are conducted.
- 4.4.7 Provide consulting services in the interpretation of fire/life safety codes and standards.

### 5. References

- 5.1 BC Building Code
- 5.2 BC Fire Code
- 5.3 National Fire Protection Association (NFPA) Codes, Standards and Recommended Practices
- 5.4 Fire Services Act of BC
- 5.5 Forest Fire Prevention and Suppression Regulation (BC Reg. 169/95)
- 5.6 Open Burning Smoke Control Regulation (BC Reg. 145/93)
- 5.7 Workers Compensation Board Act and WorkSafeBC Occupational Health & Safety Regulation
- 5.8 Canadian Standards Association (CSA)
- 5.9 Underwriters' Laboratories of Canada (ULC)
- 5.10 Underwriters' Laboratories (UL)
- 5.11 BC Hydro Safety Practice Regulations (SPR)
- 5.12 BC Hydro Design Standards
- 5.13 BC Hydro SES – Fire Protection
- 5.14 BC Hydro SES – Emergency Preparedness

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### Table of Contents

# **OSH Standard 508**

## **Emergency Kits &**

## **Winter Survival**

# OSH Standard 508

## Emergency Kits & Winter Survival

### 1. Scope

1.1 This standard covers emergency preparedness kits, cabinets and winter survival.

### 2. Purpose

2.1 This standard provides information on Emergency Preparedness Supply Cabinets and Kits including their contents, inspection and maintenance procedures, and winter survival kits and training.

### 3. Standard

#### 3.1 General

- 3.1.1 Facilities located in seismic risk zones 3, 4, 5 and 6 (see OSH Standard 501 – Fire and Safety Plans for Buildings) that serve as headquarters and/or are staffed for significant periods of the day shall be equipped with Emergency Preparedness Supply Cabinets and Kits as detailed in this standard.
- 3.1.2 Emergency kits should be stored in easily accessible locations. Post-earthquake accessibility of the kit is an important consideration for high-risk seismic zones.
- 3.1.3 Workers that will be subjected to extreme weather conditions during their work activities must be provided with training and an appropriate winter survival kit.

#### 3.2 Emergency Preparedness Supply Cabinets

- 3.2.1 A single Emergency Preparedness supply cabinet can house sufficient emergency supplies for up to 50 persons. The cabinet (2 doors, 3 shelves) is a crush-resistant steel storage unit measuring 1350mm (53") height, 1060mm (41") width, 580mm (23") depth. An instructional video entitled "Emergency Preparedness Cabinets" available through BC Hydro Strategic Emergency Management provides information on using the contents of the cabinets.
- 3.2.2 Post-earthquake accessibility of emergency supplies is an important consideration for high-risk seismic zones. Therefore Emergency Preparedness Supply Cabinets should be stored in easily accessible locations. For proper placement of the Cabinets within a building, employ the following guidelines to optimize post-earthquake accessibility:
  - Situate cabinets in an area of structural strength near the vicinity of a building exit.
  - Avoid concentrating multiple cabinets at a single location. Instead, distribute the cabinets throughout different areas of the building to maximize accessibility.
- 3.2.3 The emergency preparedness supply cabinet is fitted with a lock and a 'break-glass' key box. Appendix 7 describes the modification procedure(s) to upgrade the key box. The seal-ties required for the key box upgrade are available from BC Hydro Strategic Emergency Management (provide your mailing address and the number of key boxes slated for upgrade).

#### 3.3 Emergency Preparedness Kits

- 3.3.1 Emergency Preparedness Kits are designed to provide essential rescue, first aid, and survival support

requirements for a period of 72 hours. These kits, stored inside emergency preparedness supply cabinets, are organized in modular format and are available from Store 1. Appendix 2 lists the contents of emergency preparedness kit modules.

- 3.3.2 Emergency Preparedness kits must be inspected and maintained in accordance with the schedule provided in Appendix 5. Written records shall be kept for all monthly checks, annual inspections and periodic maintenance performed. A maintenance record form is provided in Appendix 6.
- 3.3.3 Update packs are available to upgrade Emergency Preparedness Kits where contents are damaged or are beyond their expiry date. See Appendix 3.

#### 3.4 Winter Survival

- 3.4.1 Some BC Hydro work is carried out in remote areas under harsh winter conditions. Workers that will be subjected to extreme weather conditions must be provided with:
  - Winter survival kits, and
  - Training in winter survival techniques.
- 3.4.2 Training in winter survival is available in all regions. It can vary from a one-day course focusing mainly on the winter survival kit and the use of its contents, to a week-long wilderness experience. Details may be obtained from your Occupational Safety and Health (OSH) Specialist.
- 3.4.3 Winter survival kits are available from suppliers as listed. See Appendix 4 for winter survival kits, their contents and suppliers.
- 3.4.4 The contents of winter survival kits should be inspected before use. Contents that are dated, punctured or leaking should be replaced.

### 4. Roles and Responsibilities

#### 4.1 Managers

- 4.1.1 Ensure that Emergency Cabinets and Kits are stored in readily accessible locations and have sufficient contents for the occupants of the location.
- 4.1.2 Ensure that the emergency preparedness cabinets are inspected and maintained in accordance with the specified schedule. It is recommended that a worker be designated for this task.
- 4.1.3 Ensure that employees subject to extreme weather conditions have the appropriate training and emergency survival equipment.

#### 4.2 Workers

- 4.2.1 Designated workers are to conduct inspection and maintenance of Emergency Preparedness Cabinets and Kits in accordance with the specified schedule, and to document all inspections and maintenance activities.

## 5. Records and Documentation

5.1 Document and maintain records of checks, inspections, and maintenance of Emergency Preparedness Cabinets and Kits.

## 6. Reference

6.1 WorkSafeBC OSH Regulations, Part 3, Division 3

6.2 Wilderness Survival Manual, Form #1OO11

## Appendix 1

### Emergency Preparedness Kit Descriptions

The following provides a description of the various Emergency Preparedness Kit Modules. See Appendix 2 for kit contents. All kit modules are available from Store 1 by Stores Requisition.

#### **Rescue First-Aid Kit – Stock #151-O5O1**

This is a portable tote bag with rescue equipment suitable to for up to 50 persons, and first aid for up to 25 persons. For 26 to 50 persons, an additional first aid kit is required.

#### **Food Water Survival Support Kit – Stock #151-O5O2**

This kit contains supplies for the survival of 5 people for 3 days. Up to ten kits may be stored in one cabinet.

#### **First-Aid Kit – Stock #151-O5O3**

This is an expansion module for 26 to 50 persons as described above.

#### **Emergency Backpack – Stock #151-O5O4**

This is a mobile kit that contains first aid and survival equipment, food and water to help 1 person survive for 3 days. It may be expanded for up to 5 persons by adding an emergency kit for each additional person. The kit is suitable for vehicle use, and in some circumstances suitable for work sites.

#### **Emergency Kit – Stock #151-O5O5**

This kit contains survival equipment, food and water to support 1 person for 3 days. Although it is intended as an expansion module for the emergency backpack, it may also be used as a bare minimum stand-alone kit.

## Appendix 2

### Emergency Preparedness Kit Contents

Description	151–O5O1	151–O5O2	151–O5O3	151–O5O4	151–O5O5
Hard Hat	2				
Leather Palmed Gloves	2				
Safety Goggles	2				
Disposable Emergency Blanket	3				
Duct Tape 48mm x 50m	1				
<hr/>					
Polyprop Rope 1/4" x 100ft	1				
Polyprop Rope 3/8" x 100ft	1				
Waterproof/Windproof Matches	2				
Multi-Blade Campers' Knife	1			1	
Crowbar 24"	1				
<hr/>					
Long Handled Sledge Hammer 4lb	1				
Vise Grip	1				
Radio AM/FM	1			1	
Alkaline Batteries for Radio	2			2	
Flashlight	2			1	
<hr/>					
Alkaline Batteries for Flashlight	4			2	
Whistle	1			1	1
Bag for First Aid Kit	1				
packets of Drinking Water 4oz		45		9	9
Emergency Food Bars 360ocal		5		1	1
<hr/>					
Water Bag 2 US gal		1		1	
Pack of Water Purification Tablets		1		1	
Light Stick 12 hour		1		1	2
Long Burning Candle		1			
Dust and Filter Mask		5		1	1

Description	151- O5O1	151- O5O2	151- O5O3	151- O5O4	151- O5O5
Foil Emergency Blanket	1	5	1	1	1
Garbage Bag 30" x 48"		5		1	
Personal Tissue 140 Sheets		10		2	2
Survival Bag 3ml		3			
Benzalkonium Chloride Towelette		10		5	3
Benzalkonium Chloride Towelette		10		5	3
Bag for Food-Water-Survival		1			
Triangular Bandage + 2 Pins	2		2	2	
Pressure Dressing 5" x 7"	1		1	1	
Pressure Dressing 4" x 4"	4		4		
Sanitary Pad	12		12	2	2
<hr/>					
Adhesive Dressing 3/4" x 3"	10		10	10	
Finger Tip Dressing	5		5	3	
Anchor Dressing	5		5	3	
Butterfly Closure	5		5	3	
Burn Dressing 2" x 6"	1		1	1	
<hr/>					
Abdominal Pad 10" x 12"	1		1	1	
Abdominal Pad 12" x 16"	1				
Gauze Sponges 4" x 4"	2		1		
Gauze Sponges 3" x 3"	2		2	2	
Eye Pad	2		2		
<hr/>					
Ophthalmic Irrigating Solution	1		1	1	
Telfa Pad 3" x 4"	1		1	1	
Cotton Tip Applicator ②	2		2	2	
Tongue Depressor				1	
Roller Gauze 2" x 5yd	2		2	1	

Description	151- O5O1	151- O5O2	151- O5O3	151- O5O4	151- O5O5
Hospital Tape 1" x 10yd	1		1	1	
Antiseptic Bacterial Pad	5		5	5	
Antibiotic Ointment 15g	1		1		
Chemical Cold Pack	1		1		
Mini Heat Pad 7hr	1		1		
Universal Scissors	1		1		
Surgical Scissors				1	
Splinter Forceps	1		1		
Disposal Penlight	1		1		
Metallic Splint 3" x 24"	1		1	1	
Latex Gloves 2pr	1		1	1	
Energy Tablets 47g	1		1		
Antacid Tablets	1		1		
First Aid Manual	1		1	1	
Bag for First Aid Kit	1		1		
Pouch for Survival Support				1	
Pouch for First Aid Kit				1	
Pouch for Food and Water				1	
Emergency Backpack				1	
Pouch for Emergency Kit					1

### Appendix 3

#### Emergency Preparedness Kit Upgrade Pack Contents

Description	Handling Unit	151-O511 Rescue Kit	151-O512 Food Water Survival Support	151-O513 First-Aid Kit	151-O514 Emergency Backpack	151-O515 Emergency Kit
Cells, Alkaline, AA	Each	2			2	
Cells, Alkaline, D	Each	4			2	
Tape, Duct, 48mm x 50m	Each	1				
Ophthalmic Irrigating Solution, 120ml – Eyestream or Equivalent	Each			1	1	
Tape, adhesive, 1" x 10yd	Each			1	1	
Antiseptic/Antibacterial Pad – Betadine Swab Aids or Equivalent	Each			5	5	
Penlight, disposable – Dorcy or Equivalent	Each			1		
Antacid Tablets, in Roll – Rolaids or Equivalent	Each			1		
Light Stick, 12 hour – Coughlan or Equivalent	Each		5		1	2
Moist Towelettes – Benzalkonium Chloride	Each		10		5	3
Moist Towelettes – Benzalkonium Chloride	Each		10		5	3
Adhesive Dressing, Sterile, Plastic ¾" x 3", Individually Wrapped Band-Aid or Equivalent	Each			10	10	
Adhesive Dressing, Fingertip, Sterile 75mm x 44 mm, Individually Wrapped	Each			5	3	
Adhesive Dressing, Anchor, Sterile 75 mm x 38 mm, Individually Wrapped	Each			5	3	
Closure, Butterfly, Sterile, medium size. Individually Wrapped. Smith & Nephew or Equivalent	Each			5	3	
Gloves, Surgical, Disposable. Size Large	Pairs			10	2	

## Appendix 4

### Winter Survival Kits

#### Fanny Pack

This kit contains survival equipment, and food to support 1 person for 3 days. The kit includes:

Pack, Shelter & Bedding	Food	Cooking
1 fanny pack 1 tube tent 1 alpine over-bag	2 Knorr soup mixes 4 tea bags 1 ration pack (compressed food) 4 hot chocolate 2 Wonders bars	1 Trangia survival stove 1 Sigg fuel bottle 1 litre methyl hydrate 2 large Sierra cups 2 sets knife, fork, spoon
Signal	Fire	Miscellaneous
1 flashlight 1 Huntsman compass 1 survival whistle 1 wilderness signal kit 2 "AA" batteries	2 candles (Pink Lady) 1 pkg waterproof matches 1 Bic lighter	1 package pocket tissue 1 50 foot cord 1 sheath knife 1 folding saw 1 first aid kit (soft pack) 1 lip balm 1 sun screen 1 insect repellent 1 garbage bag

#### Vehicle Survival Kit

This kit contains survival equipment, food and first aid supplies to support 1 to 2 people overnight. It is intended for employees whose work always involves vehicle use and whose worst case survival scenario would be a disabled vehicle in extreme weather conditions. The vehicle survival kit includes:

Cooking	Food	Fire
1 large metal cup 1 36 hour candle	1 emergency food rations 6 emergency water rations 3 hot chocolate 3 tea bags	1 pkg waterproof matches
First Aid	Miscellaneous	
1 triangular bandage 4 adhesive strips 1 fingertip bandage 1 dressing 2" x 3", fabric 6 BZK (antiseptic towelette) 6 gauze, 3" x 3", sterile 14" x 6" sterile pressure dressing	1 survival whistle 1 flashlight 2 "AA" batteries 2 12-hour lightsticks 1 emergency space blanket 1 hand and pocket warmer 2 toilet tissue, personal	1 multi-blade knife 1 garbage bag 5 zip-lock bags (miscellaneous sizes) 1 emergency shelter 1 content card 1 poly-zip bag 11" x 14" (sealed)

## Winter Survival Kit

This kit contains survival equipment, food, and first aid supplies to support 2 to 3 people for 4 days. The winter survival kit includes:

Pack, Shelter & Bedding	Food	Cooking
1 travel back pack	6 Knorr soup mixes	1 Trangia survival store
1 tent "Stretch Dome" (with fly)	12 tea bags	1 Sigg fuel bottle
1 tube tent	1 ration pack (compressed food)	1 litre methyl hydrate
1 ground sheet	6 hot chocolate	1 1.3 litre pot with lid
1 bivy sack (North Face)	6 rice (boil in bag)	1 2 litre pot with lid
1 compression stuff sack (custom)	2 Wonders bars	2 large Sierra cups
1 sleeping bag (Bigfoot)		2 sets knife, fork, spoon
Signal	Fire	Miscellaneous
1 flashlight	6 candles (Pink Lady)	2 packages pocket tissue
2 "D" batteries	1 Esbitt stove (with fuel tablets)	1 75 foot cord
1 reflector mirror	1 package large fuel tablets	1 sheath knife
6 Skyblazer flares	1 pkg waterproof matches	1 folding saw
1 Huntsman compass	1 fire lighter flint	1 mini heater
1 survival whistle	1 Bic lighter	1 book "Survival Sense"
2 Cyalume lightsticks		
1 ML-15 signal flash		
2 "AA" batteries		

### Suppliers:

The BC Hydro Winter survival kit and fanny pack may be purchased from:

Carleton Rescue Equipment Ltd.

3201 Kingsway

Vancouver, B.C.

V3R 5K3

Vehicle Survival Kit EKIT 1815 may be purchased from:

FAST Limited First Aid & Survival Technologies Ltd.

8850 River Road

Delta, B.C.

V4G 1B5

## Appendix 5

### Emergency Preparedness Cabinet and Kit Inspection and Maintenance Schedule

Emergency Preparedness Cabinets and Kits must be inspected and maintained in accordance with the schedule outlined below. Written records shall be kept for all monthly checks, annual inspections and periodic maintenance performed. A maintenance record form is provided in Appendix 6. If the cabinet key box requires upgrading, see Appendix 7.

#### Before Use

Before using a kit, check its contents for evidence of damage or wear.

#### Monthly Check

Conduct a quick check to ensure that the cabinet is accessible and the contents are undamaged. Replace punctured or leaking contents.

#### Annual Inspection

Perform a visual inspection of key kit components:

- Check Kit bags for general condition of all contents and for evidence of damage or wear. Replace punctured or leaking contents.
- Check batteries located in the end pouch of the Rescue First-Aid Kit for damage or leakage.
- Check Food or Water pouches contained in a box within the Food Water Survival Support kits for damage. Package integrity is critical to the performance of these items. Replace time dated contents that are beyond their expiry date.

#### 5 year Periodic Maintenance

Every five years, key and expired components shall be replaced. Update packs are available from Store 1. See Appendix 3 for contents of update packs.

#### Update Packs Available

The contents of the Upgrade pack are listed in Appendix 3.

- Rescue First-Aid kit – Stock #151-O511 (Note: The first-aid component is handled separately below)
- Food Water Survival Support kit – Stock #151-O512
- First-Aid kit – Stock #151-O513
- Emergency backpack – Stock #151-O514
- Emergency kit – Stock #151-O515

## Appendix 6

### Emergency Preparedness Kit Maintenance Record Form

RECORD OF 5 YEAR PERIODIC UPDATE	
Updated on:	Next Update Required on:

RECORD OF ANNUAL INSPECTION	
Year: Checked by:	Year: Checked by:
Year: Checked by:	Year: Checked by:

RECORD OF ANNUAL INSPECTION												
For Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

## Appendix 7

### Emergency Preparedness Supply Cabinet – Key Box Upgrade

#### Procedure for Key Box Upgrade

At present, the key has simply been placed on the bottom of the key box. Due to safety concerns related to retrieval of the key from the broken glass, a modification has been designed to suspend the key within the key box.

The following modification must be completed on all Emergency Preparedness Supply Cabinets where the cabinet is locked and the key is stored within the key box.

Two different models of key boxes are deployed on the emergency preparedness supply cabinets. From the pictures below, identify the model of the key box slated for upgrade. Then employ the respective modification procedure to upgrade the key box. Before completing this procedure, have a duplicate key made by a locksmith.



For Globe model – Use Procedure One

For Ross model – Use Procedure Two

## Key Box Upgrade – Procedure One for Globe Model

- Step 1** Using a screwdriver, loosen the lower screw on the key box face.
- Step 2** Loosen and remove the upper screw on the key box face.
- Step 3** Rotate the key box face on the lower screw to gain access to the key. Use caution as the glass plate behind the face is loose and must be retained during this operation.
- Step 4** Remove the key from the box and have a copy made.



- Step 5** As illustrated above, place seal-tie through the keyhole and pull free end all the way through. Do not over-tighten as the seal will break!



- Step 6** Place key into key box, behind the glass, with seal-tie as close to the centre as possible and the key positioned so that it will be suspended after the next step.



**Step 7** Replace the key box face and tighten the screws with the seal-tie trapped between the body and face of the key box.



**Step 8** Cut the seal-tie flush with the top of the key box using a sharp knife.

## Key Box Upgrade – Procedure Two for Ross Model

**Step 1** This procedure requires a second cabinet key. A locksmith will be able to provide you with a copy.

**Step 2** The key can be accessed by removing the screws from the front of the key box and moving the glass away. After gaining access to the cabinet, unscrew the lock box from the cabinet and re-assemble the breakglass components.



**Step 3** As illustrated above, place seal-tie through the keyhole and pull free end all the way through. Do not over-tighten as the seal will break!



**Step 4** Loosen the screws holding the key box to the cabinet (not the glass retaining screws on the front of the box) enough so that the key can be inserted between the cabinet and the back of the lock box as shown above.

**Step 5** Retighten the screws while holding the seal-tie so that the key is suspended in the lock box.



**Step 6** Cut the seal-tie flush with the top of the key box using a sharp knife.

## Table of Contents

# **OSH Standard 509**

## **Fire Extinguisher Maintenance**

# OSH Standard 509

## Fire Extinguisher Maintenance

### 1. Scope

1.1 This standard covers the maintenance of fire extinguishers.

### 2. Purpose

2.1 This standard specifies the procedures and requirements for fire extinguisher maintenance.

### 3. Standard

#### 3.1 General

- 3.1.1 Hand-portable and wheeled fire extinguishers are installed throughout the BC Hydro infrastructure. This equipment is the first line of defense against fires, and its reliability is dependent upon a maintenance schedule of inspections, servicing and testing (refer to Appendix 1 – Maintenance Schedule for Hand-Portable Fire Extinguishers).
- 3.1.2 The specific regulatory requirements are listed in the BC Fire Code Section 6.2 Portable Fire Extinguishers, NFPA 10 – The Standard for Portable Fire Extinguishers and according to WorkSafeBC OHS Regulation 4.3.

#### 3.2 Inspection

- 3.2.1 Fire extinguishers must be inspected on a monthly basis by trained BC Hydro workers.
- 3.2.2 Inspections of fire extinguishers must include checks, of at least the following items:
- Located in designated place.
  - No obstruction(s) to access or visibility.
  - Operating instructions or nameplate legible and facing outward.
  - Seals and tamper indicators not broken or missing.
  - Determine fullness by weighing or hefting.
  - Examine for obvious physical damage, corrosion, leakage or clogged nozzle.
  - Pressure gauge reading or indicator in the operable range or position.
  - Hydrostatic test date is not overdue.
  - Last annual service date on the record tag.
  - Ensure that the WHMIS label is legible.

Immediate corrective action must be taken to rectify any deficiencies revealed by the inspections.

#### 3.3 Servicing

- 3.3.1 Fire extinguishers must be serviced on an annual basis, and as required whenever deficiencies are found. Service work is to be conducted by qualified BC Hydro workers or approved fire extinguisher service contractors with ASTT Certification.

3.3.2 The servicing of a fire extinguisher requires a full service check, including:

- All applicable items in clause 3.2.2.
- Disassembly, thorough examination, and cleaning of the mechanical parts.
- Replacement of any defective parts.
- Examination of the condition of the extinguishing agent and expellant.

Note:

The specific requirements for the fire extinguisher servicing are detailed in the BC Hydro Fire Extinguisher Manuals.

3.4 Fire extinguishers must be hydrostatically tested at regular intervals as prescribed in Appendix 1. Hydrostatic tests are to be conducted by qualified, properly equipped, approved agencies. Contact BC Hydro Fire Marshal or Fire Prevention Equipment Servicer/Trainer for further information.

3.5 Fire extinguishers must be recharged immediately after use. Recharging is to be conducted by qualified BC Hydro workers or approved fire equipment service contractors technicians with ASTT Certification.

3.6 Fire extinguishers removed from their designated locations while undergoing maintenance, hydrostatic testing, or recharging must have temporary replacement fire extinguishers (of similar type and rating) serving in their stead.

### 3.7 Training

- 3.7.1 All workers who are assigned fire extinguisher maintenance duties (e.g. inspection, servicing, recharging) must be given the appropriate training.
- 3.7.2 Fire Prevention Equipment Servicer/Trainer, Construction Services is available to provide training and a full range of inspection, maintenance and recertification of fire fighting equipment.

### 3.8 Fire Prevention Services

- 3.8.1 The Construction Services, Fire Prevention Equipment Servicer/Trainer (or Fire Marshal) can supply additional information on maintenance manuals and worker training on request.
- 3.8.2 Fire Prevention Equipment Servicer/Trainer (or Fire Marshal) can provide full service recharge and hydrostatic test services to BC Hydro Business Units on request.

## 4. Roles and Responsibilities

### 4.1 Managers

- 4.1.1 Ensure that hand portable and wheeled fire extinguishers are inspected, maintained, recharged and tested in accordance with the requirements of this standard.
- 4.1.2 Ensure that all workers assigned fire extinguisher maintenance duties have been provided with adequate instruction and training.

4.1.3 Ensure that records for fire equipment maintenance are kept on site for review and reference purposes.

#### 4.2 Workers

4.2.1 Trained workers are to conduct monthly inspections of fire extinguishers in accordance with the provisions of this standard.

4.2.2 Workers shall report any damaged, discharged equipment or equipment overdue for maintenance or test to their manager.

### 5. Records and Documentation

5.1 Each extinguisher must have a tag securely attached that denotes the month and year the maintenance was conducted and identifies the person performing the service. The Fire Extinguisher Service Record tag, Form 8O312, should be used.

5.2 Monthly inspections must be recorded and kept on file.

5.3 Service records must be maintained. The record information should include the size and type of extinguishers, serial number, last hydrostatic test date, the type of work conducted and any deficiencies found. A sample may be seen in Appendix 2.

### 6. References

6.1 NFPA 1O Standard for Portable Fire Extinguishers

6.2 BC Fire Code Section 6.2 Portable Fire Extinguishers

6.3 WorkSafeBC OHS Regulation 4.3.

6.4 BC Hydro Fire Extinguisher Manual (available through Fire Marshal or Fire Prevention Equipment Servicer/Trainer)

## Appendix 1

### Maintenance Schedule for Hand-Portable Fire Extinguishers

#### Types of Maintenance:

**Inspection:** A quick check at regular intervals to provide reasonable assurance an extinguisher is available and operable.

**Servicing:** A thorough check (full service) at regular intervals to provide maximum assurance an extinguisher will operate effectively and safely.

**6 year Maintenance:** Procedure required to be performed on stored pressure extinguishers with a 12 year HST frequency.

**Hydrostatic Testing (HST):** A pressure test on the extinguisher shell, cylinders, some cartridges and some hose assemblies.

Extinguisher	Inspection Frequency	Servicing Frequency	6 year Maintenance	Hydrostatic Testing Frequency
Ansul 5 lb, 10 lb, 20 lb, 30 lb, ABC cartridge operated dry chemical	Monthly	Annually	Not Required	12 Years
5 lb, 15 lb, & 20 lb Carbon Dioxide	Monthly	Annually	Not Required	5 Years
Dry Chemical Stored Pressure	Monthly	Annually	Required	12 Years
FE-36/CLEAN GUARD Stored Pressure	Monthly	Annually	Required	12 Years
2.5 gallon Water Mist	Monthly	Annually	Not Required	5 Years
2.5 gallon Water Pressure	Monthly	Annually	Not Required	5 Years
150 lb & 350 lb ABC Dry Chemical Wheeled Unit	Monthly	Annually	Not Required	12 Years
Nitrogen Cylinder for Wheeled Unit	Monthly	Annually	Not Required	10 Years
50 lb, 75 lb, 100 lb Carbon Dioxide Wheeled Unit	Monthly	Annually	Not Required	5 Years

## Appendix 2

### A Typical Example

#### FIRE AND EMERGENCY SERVICES RECORD AND INVENTORY

DATE: February 2001

PAGE 1 of 4

SITE NAME: Cathedral Square Substation

FILE: 4O6A

SPECIAL REMARKS: Contact Boundary Operations Centre

SERVICER: RVH & DP

Location	Type	HST	Serial	Make	S*	R*	H*	Deficiencies
Room 1O2	FE-36	2000	BF4996	Ansul	x			
Room 1O2	FE-36	2000	BF1231	Ansul	x			
Room 1O3	3O DC	88	DK494169	Ansul			x	
Room 1O3	3O DC	93	CP336961	Ansul	x			
Room 1O6	3O DC	89	D859691	Ansul			x	
Room 1O7	3O DC	89	DK494174	Ansul			x	
Room 1O8	3O DC	89	DK494176	Ansul			x	
Room 11O	FE-36	2000	BF4369	Ansul	x			
Room 1O5	FE-36	2000	BF4414	Ansul	x			
Room 114	2O DC	83	CWF543O95	Ansul	x			
Room 117	FE-36	20004	BF3674	Ansul	x			

\*S – Serviced      32 & 6 hoses

Total Number of Hours      5.5

H – HST

4

R – Recharged

\_\_\_\_\_

Local Component

Yes

#### Table of Contents

# **OSH Standard 601**

## **Personal Protective Equipment**

# OSH Standard 601

## Personal Protective Equipment

### 1. Purpose

1.1 This standard describes the application of Personal Protective Equipment (PPE) for:

- All persons at BC Hydro workplaces; and
- All BC Hydro employees entering other industrial workplaces.

1.2 This standard describes the accountability of the Business Group's Senior Leadership to:

- Establish PPE zones in the workplace; and
- Define basic PPE requirements for all PPE zones.

### 2. Scope

2.1 This standard covers the use of PPE mandated by WorkSafeBC and required by BC Hydro Safety Practice Regulations

2.2 When it has not been practicable to eliminate the hazards of a workplace, PPE shall be used. PPE represents the workers' last line of protection for the body (see OSH Standard 110 – Hazard Identification & Risk Assessment).

### 3. Standard

#### 3.1 Definitions

3.1.1 PPE (Personal Protective Equipment) is defined as safety clothing/equipment that is worn by an individual as a last line of defense to protect against hazards.

3.1.2 PPE Zone is defined as a work area that requires usage of basic PPE.

#### 3.2 Identification of PPE Zones

3.2.1 To ensure compliance with Section 8.4 of the WorkSafeBC Occupational Health and Safety (OHS) Regulation, which requires an evaluation of workplace conditions to be conducted where required in order to determine appropriate PPE, Business Groups, with support from BC Hydro Safety are responsible for defining PPE zones for their worksites. See Appendices 1 and 2 for direction on identification of PPE Zones.

- PPE zones shall be clearly established and communicated through signage and/or controlled access.
- Modifications to PPE zone must be approved by Senior Management.
- Basic PPE requirements shall be defined for PPE zones.

#### 3.3 Basic PPE

3.3.1 Basic PPE is protection for head, foot, eyes, hearing and hands, plus high visibility clothing. Basic PPE must be worn or readily accessible in workplaces where hazard exists. These have been defined in:

Appendix 3 for T&D workplaces

Appendix 4 for Generation workplaces

3.3.2 Specific requirements for each type of Basic PPE must be followed as defined in:

Appendix 5 – Head Protection – General Requirements, plus Off-Road Vehicle Requirements

Appendix 6 – Foot Protection

Appendix 7 – High Visibility Clothing

Appendix 8 – Eye Protection

Appendix 9 – Hearing Protection

Appendix 10 – Hand and Forearm Protection (Gloves and Sleeves)

3.3.3 Occupations or persons not covered by the requirements of Section 3.3 shall be governed by WorkSafeBC requirements, and Sections 3.4 through 3.6 of this Standard.

#### 3.4 Hazard Specific-PPE (HS-PPE)

3.4.1 Additional PPE (HS-PPE) is required for task-specific hazards where basic PPE does not provide sufficient protection (e.g., respiratory protection, handling of hazardous materials, fall protection, etc.).

3.4.2 HS-PPE is used in conjunction with basic PPE, and can supersede basic PPE (e.g. for chemical spill clean-up, the use of rubber boots overrides the use of leather boots)

3.4.3 HS-PPE requirements can be determined by the following:

- Consulting HS-PPE table in Appendix 11, which will give direction to other hazard specific OSH Standards; or by
- Consulting BC Hydro documentation (SPRs, Work Procedures, Local Instructions); or by
- Conducting a risk assessment for unique task-specific hazards. Contact your Occupational Safety and Health (OSH) Specialist for assistance.

#### 3.5 PPE – General Requirements

3.5.1 All PPE shall meet the requirements of WorkSafeBC regulation and specifications.

3.5.2 BC Hydro will supply PPE as required.

- Exceptions to this include safety footwear and prescription safety eyewear which shall be purchased by employees for reimbursement (reimbursement policy detailed in Appendices or collective agreement).

3.5.3 BC Hydro employees shall use only PPE supplied by BC Hydro or meet the requirements of this and other applicable Standards.

- If unavailable through stores, exceptions can be evaluated through a Professional Engineer or OSH Specialist and approved by the Business Group.

3.5.4 PPE requires proper inspection, maintenance, cleaning, and storage.

3.5.5 PPE must not be modified.

3.5.6 PPE is available for employees to use at home. See Appendix 12.

### 3.6 Application of Flame Resistant (FR) Clothing\*

3.6.1 Task-Specific Requirements – when working on or around energized equipment, a base layer of FR clothing (i.e., shirt and pants with full coverage of arms, torso and legs) that provides an arc thermal performance value (ATPV) of at least 8 cal/cm<sup>2</sup> will be worn for the following:

3.6.1.1 Performing certain electrical switching activities (see **Arc Flash FAQs**).

3.6.1.2 Applying and removing worker protection grounds

3.6.1.3 Select work on DC systems involving battery banks (see **Arc Flash FAQs**).

3.6.1.4 Working on 750 VAC down to 50 VAC electrical equipment

3.6.1.5 When inside column #4 Limits of Approach (specific distances defined in Safety Practice Regulation Table 4O1)

3.6.1.6 Working in and/or walking within energized Substations and Switchyards (“Gate to gate”)

Exception to Section 3.6.1.6 – FR clothing is not required:

- when driving directly to and entering an office or control building (or equivalent) within the yard,
- on defined safe access routes through the substation or switchyard to those buildings, and
- Within those buildings, as long as all requirements of Section 3.6.1.1 through 3.6.1.5 are met.

As long as all requirements of Section 3.6.1.1 through 3.6.1.5 are met.

Flammable undergarments (e.g., polyester) are prohibited. FR clothing performs best when it is the layer closest to the skin. It may be worn over top of a first layer of clothes made of non-melting natural fibre (e.g., cotton, silk, wool, rayon), including undergarments and socks.

See Appendix 13 for further elaboration on the use of FR clothing.

*NOTE: Some switchgear have specific operating instructions including NO RACKING OUT OF CIRCUIT BREAKERS UNLESS DE-ENERGIZED. Refer to BC Hydro Safety Alert Series 2009 No.1 Metalclad Switchgear Risk of Internal Arc Failure and 2009-4-A Arc Flash Risk of Low Voltage Metalclad Switchgear and Generator Bus.*

3.6.2 When workers are required to wear FR clothing and fall protection equipment, the fall protection equipment is highly recommended to also be arc flash rated. See OSH Standard 6O8 (Fall Protection) for more information.

*NOTE: HS-PPE requirements are normally contained in dedicated OSH standards listed in Appendix 11. A dedicated OSH standard has not yet been written for FR clothing and other HS-PPE protection against arc flash. In the interim, FR requirements are outlined above*

3.6.3 Work Activities also requiring a face shield (8 cal/cm<sup>2</sup>), in addition to the FR requirements above:

3.6.3.1 Removal/Installation of revenue meters on any voltage.

3.6.3.2 Work on\* exposed energized low voltage (secondary) > 250V. This includes DC excitation system which have a ceiling voltage >250V.

\*Note 1: “Work on” includes opening unhinged covers containing energized equipment, connecting and removing conductors while energized, and testing for voltage using contact methods

Note 2: For circuits/busses where incident energy has been assessed as less than 4 cal/cm<sup>2</sup>, face shields are not required

## 4. Roles and Responsibilities

### 4.1 Workers

- 4.1.1 Must use basic PPE in PPE zones
- 4.1.2 Must use approved PPE appropriate to the situation
- 4.1.3 Alert crew leader/manager to work conditions where PPE is required but not worn
- 4.1.4 Regularly inspect PPE to ensure it is in good working condition. Ensure PPE is properly maintained and stored.

### 4.2 Crew Leader/Work Leader

- 4.2.1 Ensure PPE Zones are defined and clearly marked
- 4.2.2 Ensure PPE requirements are clearly communicated
- 4.2.3 Ensure crews are provided with properly maintained PPE
- 4.2.4 Ensure workers are wearing PPE

### 4.3 Managers

- 4.3.1 Ensure PPE Zones are defined and clearly marked
- 4.3.2 Ensure PPE requirements are clearly identified
- 4.3.3 Ensure PPE requirements are current
- 4.3.4 Ensure employees are trained in correct application of PPE
- 4.3.5 Ensure all required PPE is worn
- 4.3.6 Provide resources and funding for PPE programs
- 4.3.7 Monitor PPE programs for effectiveness

## 5. References

- 5.1 WorkSafeBC Occupational Health & Safety (OHSR) Regulation
- 5.2 Safety Practice Regulations – Rule 300

**Revision Rationale:**

**November 28, 2016 V7-1O:**

**Appendix 5 – Head Protection – Utility Terrain Vehicles (UTVs) and Snowcats:**

Helmet use is no longer required for the operation of snowcats. The decision to remove the requirement was based on a risk analysis that concluded the following:

- Helmet use is not required by regulation or by snowcat manufacturers;
- Helmet use is not a practice used or encouraged by industry, including the heaviest users of snowcats – ski resorts;
- The history of snowcat incidents does not support the use of helmets; and lastly,
- The use of helmets in snowcats could impede vision and communication.

All other helmet use requirements outlined in OSH 6O1 remains in place and must be complied with (e.g. ATVs, UTVs, snowmobiles).

**October 18, 2016 V7-9:**

Section 3.6 Application of Flame Resistant (FR) Clothing: Minor changes to align with Safety Directive 2016-5-D Arc Flash Protection – Metering, Low Voltage (Secondary) Work and Interim Measures.

Appendix 1O: Completely revised to reflect ANSI and EN minimum ratings for gloves and sleeves when working with knives or other sharp objects. Developed and communicated with the F16/17 Knife Injury Reduction Project.

## Appendix Listing

**Table of Appendix Numbers and Titles**

Appendix Number	Title
1	Example – Implementing PPE Zones for Conforming Areas
2	Example – Implementing PPE Zones for Non-conforming Areas
3	T&D Operations Workplace PPE Zones and Requirements
4	Generation Workplace PPE Zones and Requirements
5	Head Protection – General Workplace Requirements, plus requirements for ATVs, UTVs, snowmobiles, and Sno-Cats
6	Foot Protection
7	High Visibility Clothing
8	Eye Protection
9	Hearing Protection
10	Hand Protection (general purpose work gloves)
11	HS-PPE Table
12	PPE for Home Use
13	Flame Resistant Clothing

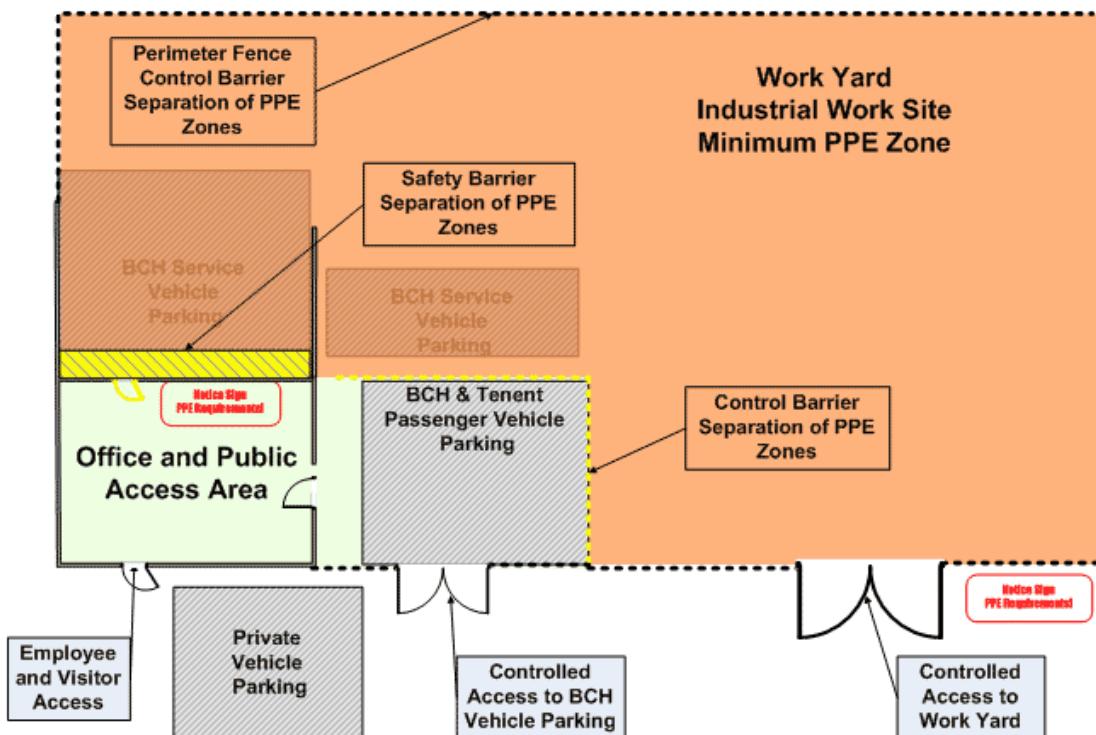
## Appendix 1

### Example – Implementing PPE Zones for Conforming Areas

Conforming area = A space that is being utilized as per design.

A facility with conforming areas has its office and work spaces properly situated in suitable environments. Some examples: office areas are located in proper office environments; or industrial work yards permit only service vehicles.

It is a straightforward method to establish PPE zones for conforming areas. The example diagram below demonstrates how to establish PPE zones for such areas.



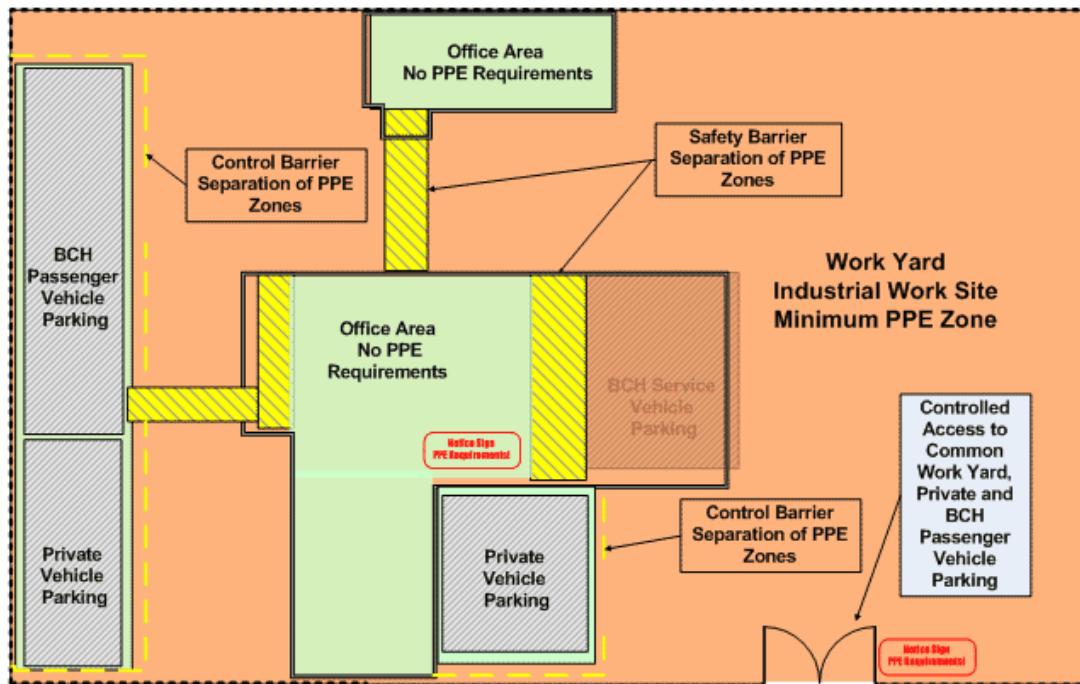
## Appendix 2

### Example – Implementing PPE Zones for Non-conforming Areas

Non-conforming area = a space that is not being utilized as per design

A facility with non-conforming areas has office and/or work areas that are improperly situated or areas that serve multiple/mixed purposes. Some examples: improvised office spaces occupy a corner of the warehouse floor; or a work yard is utilized for mixed use – industrial use plus warehouse loading plus employee parking plus public parking.

Establishing PPE zones for non-conforming areas can be problematic and may pose a challenge for some sites. The example diagram below demonstrates how to establish PPE zones for such areas.



## Appendix 3

### T&D Workplace PPE Zones and Requirements

#### Scope

- Per OSH Standard 6O1 section 3.2 this appendix establishes workplace PPE Zones and their associated Personal Protective Equipment (PPE) requirements for Transmission and Distribution (T&D).
- T&D leadership or BC Hydro Safety shall be consulted for circumstances or applications not described in the table below.
- T&D Workplace PPE Zone requirements apply consistently to all employees from start of shift to end of shift.

Workplace PPE Zone	PPE to be worn at all times	PPE Required to be readily accessible and worn in the presence of hazards
<b>Office Facilities</b>  (includes small work benches where hand tools or test instruments are used)	<ul style="list-style-type: none"> <li>None required</li> </ul>	<ul style="list-style-type: none"> <li>Task appropriate PPE</li> </ul>
<b>Work Yards</b>  (including adjacent warehouses and loading bays, does not include category C work)	<ul style="list-style-type: none"> <li>Safety boots</li> <li>Hi Vis attire</li> <li>Hard Hat</li> </ul>	<ul style="list-style-type: none"> <li>Ear Protection</li> <li>Eye Protection</li> <li>Gloves appropriate for the task</li> </ul>
<b>Worksites</b>  (e.g., line work, stations, etc.)	<ul style="list-style-type: none"> <li>Safety boots</li> <li>Hardhat</li> <li>Helmets, when operating ATVs, snowmobiles or motorcycles</li> <li>FR Clothing*</li> </ul>	<ul style="list-style-type: none"> <li>Ear Protection</li> <li>Eye Protection</li> <li>Gloves appropriate for the task</li> <li>Hi Vis attire (required when moving vehicles or equipment operating)</li> </ul>
<b>Work Shops</b>  (work shop defined as facilities with large equipment such as lathes, drill presses, pneumatic tools, welding machines)	<ul style="list-style-type: none"> <li>Safety boots</li> </ul>	<ul style="list-style-type: none"> <li>Ear Protection</li> <li>Eye Protection</li> <li>Gloves appropriate for the task</li> <li>Hi Vis attire (required when moving vehicles or equipment operating)</li> <li>Hard Hat</li> </ul> <p><b>Note:</b> Some large shops have hazards present on an ongoing basis, so this PPE would be required at all times. If evaluation is required, discuss with your OSH Specialist.</p>

\* FR Clothing Refer to Appendix 13 “BCH Flame Resistant (FR) Clothing Guideline”

## Appendix 4

### Generation Workplace PPE Zones and Requirements

There are two PPE zones in Generation Plants and they are as follows:

1. **Plant PPE Zone** (plant, excluding offices, and shops which are separated from the generation area. Small stations in which the shop is in the main hall would only have one zone)

- Head Protection
- Foot Protection
- Eye Protection

Hearing protection, hand protection and high visibility clothing is worn as required and must be readily accessible.

2. **Shops PPE Zone**

- Foot Protection

Head protection, eye protection, hearing protection, hand protection and high visibility clothing is worn as required and must be readily accessible.

In addition, helmets must be used for the operation of all-terrain vehicles, snowmobiles, or motorcycles as identified in Appendix 5.

## Appendix 5

### Head Protection

#### General Workplace Requirements

##### Specification

- Safety headgear shall conform to WorkSafeBC OHS Regulation, Part 8.11 General Requirements, as applicable. At minimum, safety hard hats must be Class E and approved by CSA or ANSI.
  - Type 2 is also required where the results of a risk assessment warrant the need for side impact protection
- Protective headgear is typically orange, white, green, or blue in colour and has slots for ear muffs and face shields.

#### Application

- Apprentices are issued green hard-hats, and trades trainees/pre-apps/youth hires are issued blue hard-hats.
- Traffic control workers must wear hard hats with reflective material, such as lime green Reflexite Hot Dots or equivalent. Conductive tape shall not be used.
- The sweat bands and crown straps of hard hats must be adjusted to give at least 3 cm clearance between the shell and the wearer's head.
- Chinstraps (either 2 or 4 point) must be used to secure the hard hat if it is likely to be dislodged or when climbing or working from a height exceeding 3 metres. The CSA standard advises that chinstraps used with Class E hardhats not be drawn over the brim or peak because the strap, in case of contact with a live electrical conductor, may allow the current to flow from the conductor to the end user.
- Hard hats may be worn with winter liners provided the entire assembly has no metallic fasteners.

#### Maintenance and Storage

- Proper storage and care of safety hard hats will extend service life.
  - Store hard hats in a clean dry area away from sunlight, contaminants and temperature extremes. Do not store safety hats in the rear window of vehicles – the sun's UV rays damage the shell.
  - Hard hats are to be kept clean. Use mild soap and warm water, and let air dry.

#### Inspection and Testing

- Hard hats are to be frequently inspected. Examine the components (shell, suspension, chin strap) for signs of damage, wear and degradation. Safety hats failing visual inspection must be discarded and replaced.

#### Replacement

- Hard hats that sustain a forcible impact must be discarded and replaced.
- Manufacturers' replacement guidelines for hard hats in typical usage are as follows:
  - Suspension replacement every year
  - Shell replacement every 2 – 5 years

- The service life of a hard hat will depend on the use, care and storage. Safety hats subjected to heavy use, aggressive conditions and/or poor storage must be frequently replaced. The service life of hard hats that are properly stored and seldom used will exceed 5 years; but need ongoing inspection and replacement if any damage becomes evident. If older than 10 years, check with your OSH Specialist or the specification section of this Appendix to determine whether any change in regulation has made the hard hat obsolete and in need of replacement.

#### General

- BC Hydro Stores stocks Class E hard hats.

#### Requirements for All Terrain Vehicles (ATVs), Snowmobiles, Utility Terrain Vehicles (UTVs) and Sno-Cats

- Must be operated in compliance with WorkSafeBC OSH Regulation, Part 16 Mobile Equipment

#### ATVs and Snowmobiles

- ATVs and snowmobiles are characterized by straddle seating and handlebar steering.
- Operators and passengers on ATVs and snowmobiles must wear a helmet meeting the requirements of WorkSafeBC OHS Regulation, Part 8.12 Use with All Terrain Vehicles, Snowmobiles, Motorcycles, as applicable. At a minimum, the helmet must be approved by CSA or Snell, as outlined in the regulation.
  - The design of the helmet can be either open-faced (no chin/jaw protection) or full-faced (integrated chin/jaw protection).
- Eye protection must be worn by operators and passengers and can be in the form of an approved face shield from the manufacturer of the specific helmet or through the use of approved safety eyewear. Note: Full-faced helmets come with face shield built in.
- EXCEPTION – as per WSBC 8.12, when an ATV is operated within a specific location (e.g., yard) with no significant hazard of rollover or loss of control AND at a speed not exceeding 20 km/h, a CSA or Snell approved bike helmet with chinstrap or an approved hard hat with chinstrap may be used in place of an ATV helmet.

## Utility Terrain Vehicles (UTVs) and Sno-Cats

- UTVs and Sno-Cats are characterized by side-by-side seating and steering wheel.
- Helmet use is not required for Snowcats.
- Similarly for ATVs and Snowmobiles, BC Hydro **does not require** helmet use if all of the following parameters can be met when operating the UTV:
  - 20 kph or lower speed
  - Equipped with roll-over protection, and seatbelts are used
  - Equipped with windshield or safety glasses are used.
  - Operated in a specific location frequently used by mobile equipment, with good terrain and no significant hazard of rollover. This means a Yard, or access roads on a right-of way. Grades cannot exceed 10%, and there cannot be adjacent ditches or slopes.
- If these conditions cannot be met, or if the UTV or Sno-Cat is to be used off-road (areas other than those described in the fourth sub-bullet above), a helmet as described for ATVs will be required.

## Sizing

- For a helmet to be effective, it must feel comfortable on your head – it should fit snugly, but not painfully tight.
- Fit:
  - If you can pull the helmet on without having to spread the helmet, it is too big.
  - A properly fitted helmet might seem tight as you pull it on, because the foam components that seal out the wind noise are made to conform to your head. If a helmet pulls on too easily without resistance of such padding, it will be noisy and uncomfortable.
  - The helmet needs to fit snugly so that it is stable when you shake your head side-to-side, front-to-back or up and down. A full-face helmet should grip your cheeks and jaw as well as the top and sides of your head.
  - Grab the helmet with both hands and try to move the helmet forward and backward and from side to side. The helmet fits right if your skin moves with the liner of the helmet.
  - Try to remove the helmet from your head without undoing the retention system closures. If the helmet comes off or shifts freely over your eyes, then re-adjust and try again.
  - If you can grab the rear lip of the helmet and roll it forward off your head (even with slight pressure), you need a different helmet; it should not come off.
  - There should be very little “play” in the way the helmet sits on your head. In fact, the helmet should not be able to move around on your head without it tugging on your skin a bit.

## Maintenance and Storage

- Proper storage and care of safety helmets will extend service life.
  - Store helmets in a clean dry area away from sunlight, contaminants and temperature extremes. Do not use chinstrap to hang helmets off of handlebars or hooks.
  - Helmets are to be kept clean. Use mild soap and warm water, and let air dry. Removable interior padding can be laundered by hand or machine wash gentle.

### Inspection and Testing

- Helmets are to be inspected prior to each use. Follow manufacturer's instructions. Examine the components (shell, padding, chin strap, visor, face shield) for signs of damage, wear and degradation. Helmets failing showing excessive wear, loose components, cracks/gouges on shell, or face shield damage that would impede vision, must be discarded and replaced.

### Replacement

- The service life of a helmet is dependent on the intensity and frequency of its use. Follow any manufacturer's instructions for service life. Discard and replace helmet if:
  - The helmet was subjected to an impact.
  - The comfort padding or the retention system has become loose due to heavy use or display signs of deterioration.
  - The synthetic foam padding displays signs of heavy use and the helmet feels too loose. Test: with the retention system fastened, the helmet turns to the side when you gently shake your head.

### General

- Helmets are purchased through the local tools budget.

## Appendix 6

### Foot Protection

#### Specification

- Safety footwear (boots or shoes) must meet CSA Standards as required by WorkSafeBC and SPR Rule 3O2.2. WorkSafeBC OSH Regulation Part 8.22 also accepts safety footwear that is ANSI-rated. The ANSI Standard for footwear has been withdrawn and replaced by ASTM Standards. ASTM-rated footwear will only be accepted if an equivalent level of safety to CSA-rated footwear can be verified with an OSH Specialist, and all other required safety features described below are met.
- BC Hydro has determined that trade/job functions in categories F and G are exempt from the above rule. Footwear for categories F and G must be of sturdy construction and satisfy the table requirements listed below.
- Categories of safety footwear are listed in the table below. If work activity straddles various work environments with different safety requirements, select safety footwear that offers the highest level of protection.

Category	Typical Trade or Function
A	Workers who climb poles or work on high voltage lines.
B	Workers who work in substations, switchyards, or Generation plants (includes powerhouse and shops).
C	Workers who work in right-of-ways or in the bush.
D	Workers who work in heavy industrial shops or garages.
E	Workers who work in stores or warehouses.
F	Workers who work in laboratories or light non-industrial shops such as telecommunications, protection and control.  (Note: Category F footwear does not require CSA approval)
G	Workers who read meters, traverse uneven, difficult terrain, or walk long distances.  (Note: category G footwear does not require CSA approval)

- Required safety features for each category of safety footwear:

Required Safety Features	Category						
	A	B	C	D	E	F	G
Sturdy construction for foot protection	✓	✓	✓	✓	✓	✓	✓
Sturdy soles with good traction	✓	✓	✓	✓	✓	✓	✓
Soles with insteps and distinct heels for ladder work	✓	✓	✓	✓	✓	✓	✓
Sole puncture protection plus grade 1 toe protection (CSA symbol = green triangle, AST <sup>TM</sup> identification will specify "PR", "I/75" and "C75")	✓	✓	✓	✓	✓		
Sole resistance to electric shock (CSA symbol = white rectangle with $\Omega$ , AST <sup>TM</sup> identification will specify "EH"))	✓	✓					
Minimum Height of 20 cm (8 inches)	✓						
Minimum Height of 15 cm (6 inches)				✓			
Minimum Height above ankle	✓			✓		✓	
No minimum height (below ankle or higher)					✓	✓	

- Safety boot remarks for electrical workers:
- Safety boots with electrically resistive soles display a CSA symbol = ‘white rectangle with Ω sign’, or ASTM identification that specifies “EH”. BC Hydro has mandated that these boots be worn by electrical workers.
  - Safety boots with electrically resistive soles are not permitted to be re-built or re-soled. When worn out, they must be replaced.
- Safety boots with electrically conductive soles display a CSA symbol = ‘red rectangle with letter C and grounding symbol’, or ASTM identification that specifies “Cd”. BC Hydro Stores carry these boots (stock series 154–1900). These boots are required by BC Hydro to be used to maintain equipotential for specifically barehand work or work on energized steel structures.

#### Maintenance and Storage

- Proper storage and care will extend service life.

#### Inspection and Testing

- Visually inspect before use.

#### Replacement

- Units failing visual inspection must be discarded and replaced.

#### Reimbursement

- Employees who are required to wear CSA-approved safety boots or shoes at work are expected to purchase them. Union members shall refer to their collective agreement – MoveUP (formerly COPE 378) – Article 16.O4, IBEW 258 – Article 28, and M&P members shall refer to BC Hydro’s Management and Accounting Policies and Procedures (MAPP 5.6.1B.1), with respect to safety footwear coverage.

## Appendix 7

### High Visibility Clothing

#### Specification

- High Visibility (HV) Clothing shall conform to WorkSafeBC OHS Regulation, Part 8.24 or to CSA Standard Z96–O9.
- If high visibility components are to be integrated with Flame Resistant clothing, or if a high visibility vest is to be worn over Flame Resistant clothing, the high visibility components must also be flame resistant.

#### Application

- Employees must wear HV clothing:
  - If they are exposed to the hazards of moving vehicles/equipment; or
  - If it enhances their safety (e.g. visibility in forest).
- If the worker must wear both HV clothing and FR clothing at the same time, refer to Appendix 13 for additional direction

#### Maintenance and Storage

- Proper storage and care will extend service life.

#### Inspection and Testing

- Visually inspect before use.

#### Replacement

- Units failing visual inspection must be discarded and replaced.

#### General

- BC Hydro Stores stocks High Visibility Clothing.

## Appendix 8

### Eye Protection

#### Specification

- Protective eyewear shall conform to WorkSafeBC OHS Regulation, Parts 8.14 through 8.18.
  - This regulation includes the requirement that protective eyewear meet CSA Standard Z94.3–92 Industrial Eye and Face Protectors, or ANSI Standard Z87.1–1989 Practice for Occupational and Educational Eye and Face Protection.
  - Note that prescription protective eyewear must meet the specific requirements of WorkSafeBC OSH Regulation 8.15. Requirements include use of plastic or polycarbonate lenses unless there is no danger of impact, in which case treated safety glass lenses can be used. If there is a danger of impact, glass lenses may not be used unless they are worn behind impact rated goggles.
- Protective eyewear must have side shields or wrap-around protection.

#### Application

- When working on or testing electrical equipment energized at a potential greater than 30 Volts, polycarbonate lenses with > 99.9% ultra violet light absorption must be worn.

Note: When workers are exposed to bright light conditions in addition to the working conditions described above, it is recommended that workers wear CSA approved frames with lenses that provide >90% blue and >80% infrared light absorption.

- Recommended lenses for work indoors or in low light conditions when working on or testing electrical equipment at a potential greater than 30V:
  - Uvex SCT Low IR lenses
- Workers wearing contact lenses should alert site supervisor and first-aid attendant.

#### Maintenance and Storage

- Proper storage and care will extend service life.

#### Inspection and Testing

- Inspect lenses and frame for damage.

#### Replacement

- Replace if eyewear is defective or in poor condition.

## Reimbursement

- Reimbursement for prescription safety eyewear will be made available when:
  - Workers have personal prescription eyewear, and
  - Their duties require eye protection.
- Reimbursement for replacement prescription safety eyewear will be provided when personal lenses are replaced due to prescription change, or every 2 years, whichever comes first.
- Prescription safety eyewear damaged on the job is usually replaced by WorkSafeBC.
- When purchasing prescription safety eyewear, ensure personal prescription requirements are met as well as the requirements of WorkSafeBC OHS Regulation 8.15.
- There are two (2) options for purchase and reimbursement. A comparison table and the steps for carrying out both options are shown below:

	Advantages	Disadvantages
Option 1	BCAO's Occupational Vision Plan allows employees to purchase safety glasses at wholesale prices, employees do not have to pay out of pocket. The full cost will be reimbursed.	Not all optometrists within B.C. subscribe to this program (although most communities have an optometrist who does subscribe to the program).
Option 2	Employee may choose any optometrist to visit.	Depending on the total cost of the safety eyewear, the full cost may not be reimbursed.

- **OPTION 1 – Purchase Safety Glasses through BC Association of Optometrists (BCAO)**

1. Obtain a BCAO "OVP Authorization Form" (not available online) from BC Hydro Safety at Safety@bchydro.com. You may also request a BC Hydro insert form which specifies what safety glasses features are allowable.
2. Have your work leader/manager (must have required spending authority) authorize your requirement for these safety glasses by completing the authorization form. Ensure BCO 9O533, Release OOOO is specified in the top left hand corner of the form.
3. To find a local list of providers go to the Occupational Vision Plan website <http://www.ovp.bc.ca> and choose "Find an OVP Optometrist" under the "Your OVP Optometrist" drop-down menu.
4. Book an appointment with an optometrist on the BCAO plan, and take your approved authorization form and current prescription (from a registered Optometrist or an Ophthalmologist within the last two years) with you.
5. Pay for your eyewear with your corporate credit card. Keep the credit card receipt and accompanying invoice. If you don't have a corporate credit card, use a personal credit card (cheques are not accepted).
6. Process the expense in accordance with the appropriate process (BC Hydro credit card expense or out-of-pocket expense). Include the credit card receipt and accompanying invoice as supporting documentation.

- **OPTION 2 – Purchase Safety Glasses through employee's choice of Optometrists**
  1. Obtain a BC Hydro [Industrial Safety and VDT Prescription Eyewear Reimbursement Form](#) from the BC Hydro Safety Website and have your manager approve it.
  2. Book an appointment with the optometrist of your choice.
  3. Present the approved form at your appointment and have the optometrist complete the form.
  4. Choose a pair of safety frames, pay the optometrist and keep the receipt for reimbursement.
  5. Submit an expense claim to BC Hydro for partial reimbursement in accordance with the following table:

Lens Type*	Reimbursement Maximum
Single Vision	\$300
Bi-focal	\$350
Tri-focal or Progressive	\$450

\* Lens type must be equivalent to personal use eyewear.

## Appendix 9

### Hearing Protection

#### Specification

- For detailed information on hearing protection, refer to OSH Standard 309 (Hearing Conservation).
- Ear plugs (Types: Custom, Disposable, Reusable).
- Ear muffs (Hardhat mounted, typical standalone).
- Ear caps (hearing protection that fits over ear canal).

#### Application

- Hearing protection must be used if noise levels exceed 85 dBA.
- Training – learn how to correctly apply hearing protection.

#### Maintenance and Storage

- Ear muffs must be maintained in accordance with manufacturer's instructions.
- Maintain good personal hygiene and cleanliness of hearing protection.
- Proper storage and care will extend service life.

#### Inspection and Testing

- Visually inspect before use.

#### Replacement

- Units that are damaged or fail to provide adequate hearing protection must be discarded and replaced.

#### General

- Contact OSH Specialist for more information and/or assistance.
- Other Considerations on selection and use of Hearing Protection:
  - Daily exposure
  - Worker ability to hear
  - Communication with other worker
  - Use of other equipment and/or PPE
  - Physical constraints of worker activity
  - Temperature, climate & environment
  - Comfort

WorkSafe Reference (Hearing Loss Prevention): <http://www2.worksafebc.com/Topics/HearingLossPrevention/Home.asp>

## Appendix 10

### Hand and Forearm Protection (Gloves and Sleeves)

#### Specification

Gloves and sleeves must:

- Properly fit the user's hand and forearm.
- Provide appropriate dexterity and grip for the work task.
- Meet required protection ratings specified below when working with knives or other sharp objects.

Hazard to hand/forearm	Required Minimum Protection Rating	
Cut	ANSI:A4	EN:5
Puncture	ANSI:4	EN:3

Note: High Voltage Class 3 Rubber Glove Work Methods and Class 1 rubber glove use in proximity to broadcast antennas are exempt from the requirement for Cut and Puncture protection ratings.

ANSI / ISEA 105-2016 standard provides protection ratings for gloves and sleeves. ANSI Cut Protection ratings use a nine-level scale. Level A1 provides the least amount of cut protection and level A9 provides the most cut protection. For more information on ANSI and EN protection ratings, visit the [Gloves webpage](#).

#### Application

- Work gloves that meet the BC Hydro minimum Cut and Puncture protection ratings must be worn when work tasks involve the use of knives and other sharp objects.
- Protective sleeves that meet the BC Hydro minimum Cut and Puncture protection ratings are recommended when work tasks present cut or puncture risk to the forearms.

#### Maintenance and Storage

- Proper storage in a cool, dry, well ventilated space away from direct sunlight will extend service life.

#### Inspection and Testing

- Visually inspect the glove or sleeve material for foreign objects, wear and tear, before use.

#### Replacement

- Gloves or sleeves failing visual inspection must be discarded and replaced.

#### Purchasing

- Recommended gloves and sleeves that meet the minimum requirements of this standard are listed on the Gloves webpage.
- If you are unable to determine the protection ratings for gloves or sleeves that are not on BC Hydro's recommended list, contact the manufacturer directly or contact Safety Engineering for further support.

*Note: Hazard-specific applications (chemical work, welding, painting, etc.) require the appropriate HS-PPE gloves. Contact an OSH Specialist for information on HS-PPE gloves.*

## Appendix 11

### HS-PPE Table

OSH Standard #	OSH Document Title	Mandatory Usage of Basic PPE and HS-PPE
OSH 2O3	Welding, Cutting and Hot Tapping	<ul style="list-style-type: none"> <li>• FR clothing</li> <li>• Hardhat</li> <li>• Eye protection</li> <li>• Respiratory protection</li> </ul>
OSH 2O8	Chainsaws and Portable Power Tools	<ul style="list-style-type: none"> <li>• Chainsaw pants 36OO rpm rating</li> <li>• Appropriate PPE</li> </ul>
OSH 212	Safe Handling of Oil, Liquids & Compressed Gases	<ul style="list-style-type: none"> <li>• Loose fitting, well insulated gloves</li> <li>• Eye protection</li> </ul>
OSH 3O2	Safety During Spill Response	<ul style="list-style-type: none"> <li>• Written procedure will describe PPE</li> <li>• Respiratory protection</li> <li>• Gloves</li> <li>• Eye protection</li> <li>• Body protection</li> <li>• Protective footwear</li> </ul>
OSH 3O3	Confined Spaces	<ul style="list-style-type: none"> <li>• Procedures describe PPE</li> <li>• Retrieval harness</li> </ul>
OSH 3O4	Polychlorinated Biphenyls (PCBs)	<ul style="list-style-type: none"> <li>• Goggles</li> <li>• Aprons</li> <li>• Nitrile gloves</li> <li>• Coveralls</li> <li>• Jackets</li> <li>• Boot covers</li> <li>• Respiratory protection</li> </ul>
OSH 3O5	Sulphur Hexafluoride (SF6)	<ul style="list-style-type: none"> <li>• Protective eyewear</li> <li>• Nitrile gloves</li> <li>• Neoprene gloves</li> <li>• Half-face piece respirator with combination P1OO (HEPA)</li> <li>• Acid gas or organic vapour cartridges</li> <li>• Safety goggles</li> <li>• SCBA</li> <li>• Rubber boots</li> <li>• Disposable coveralls</li> </ul>

OSH Standard #	OSH Document Title	Mandatory Usage of Basic PPE and HS-PPE
OSH 31O	Selection and Use of Solvents	<ul style="list-style-type: none"> <li>• Impervious gloves</li> <li>• Chemical goggles</li> <li>• Face-shield</li> <li>• Chemical resistant apron</li> <li>• Disposable coveralls</li> <li>• Rubber boots</li> <li>• Foot covers</li> </ul>
OSH 313	Respiratory Protection	<ul style="list-style-type: none"> <li>• Face seal dependent air purifying respirator</li> <li>• SCBA (self contained breathing apparatus)</li> <li>• Supplied air respirators</li> </ul>
OSH 314	Lead Abatement	<ul style="list-style-type: none"> <li>• Respiratory protection</li> <li>• Disposable coveralls with hood</li> <li>• Steel toe rubber boots</li> <li>• Eye protection</li> <li>• Face protection</li> <li>• Head protection</li> <li>• Hearing protection</li> <li>• Specialized protection for abrasive blasting and high pressure washing</li> </ul>
OSH 315	Bloodborne Pathogens	<ul style="list-style-type: none"> <li>• Nitrile gloves</li> </ul>
OSH 317	Battery Work Safety Requirements	<ul style="list-style-type: none"> <li>• Face shield</li> <li>• Chemical goggles</li> <li>• Neoprene rubber gloves</li> <li>• Neoprene rubber apron</li> <li>• Steel toe rubber boots</li> </ul>
OSH 4O8	Operation of Boats	<ul style="list-style-type: none"> <li>• Personal flotation device</li> </ul>
OSH 5O5	Fire Protection Program	<ul style="list-style-type: none"> <li>• PPE</li> <li>• Respiratory equipment</li> </ul>
OSH 6O1	Personal Protective Equipment	<ul style="list-style-type: none"> <li>• FR clothing information</li> </ul>
OSH 6O2	Insulated Tools and Equipment	<ul style="list-style-type: none"> <li>• Rubber gloves</li> </ul>
OSH 6O8	Fall Protection	<ul style="list-style-type: none"> <li>• Fall arrest</li> </ul>
OSH 6O9	Ladders	<ul style="list-style-type: none"> <li>• Fall arrest</li> </ul>

## Appendix 12

### PPE for Home Use

- Employees are permitted to use BC Hydro equipment for home use. The equipment is to be returned by the time specified. See the table below.
- Guidelines for PPE for Home Use:
  - The borrowed equipment is for the home use of employees only and must not be used while performing work for third parties (cannot be for pay; can be for volunteer work but only if known and approved by Manager) or used by third parties.
  - Employees must be qualified and trained in the effective use of the equipment.
  - No items may be borrowed from equipment or supplies required for emergency response or system restoration.
  - Any consumables associated with PPE are either provided at Manager's discretion or the employee must purchase on their own.
  - Equipment must be returned in good condition in a timely manner as indicated in the table or the employee will be required to replace at Stores inventory or replacement cost.
  - If equipment is damaged or destroyed in performing the intended function (i.e. it prevented an injury) then BC Hydro will absorb the cost.
  - Obtain Manager approval to borrow items not listed in the table.

PPE	Code
Protective Headgear: Hard Hats	A
Eye Protection:	
• Safety glasses	C
• Face shield or Goggles	B
Hearing Protection:	
• Ear plugs	C
• Ear muffs	A
Gloves: Leather/Rubber/Nitrile	C
Safety Footwear	D
Body Protection:	
• Aprons	B
• High Vis Vest	A
• Chainsaw pants	B
Flame Resistant Clothing	E
Fall Protection	A

#### Code Key:

**A = PPE issued to Employee – must be returned by employee's next working day**

**B = PPE for general use – must be returned by the next working day**

**C = Manager will provide item to employee for home use at reasonable intervals**

**D = Employee owned PPE – reimbursement as per Collective agreement**

**E = Not for loan as no known use at home**

**Notes:**

- Respiratory protection is excluded from this program.
- Use **PPE Outside of Work Sign-Out Sheet**

## Appendix 13

### BC Hydro Flame Resistant (FR) Clothing Requirements

#### Overview:

BC Hydro OSH Standard sets out the requirement for FR clothing. FR clothing is in the category of Hazard Specific PPE (specialized clothing to protect against hazards involved in specific job tasks).

Per WorkSafeBC regulations, workers must wear FR clothing appropriate to the risk when working near electrical energy, high temperatures, flames, molten metal or sparks. The type of electrical work where this hazard exists, and therefore requires FR clothing per regulation, is listed in OSH Standard 6O1 section 3.6. The minimum level of protection provided by FR clothing in BC Hydro is an arc thermal performance value (ATPV) of 8 cal/cm<sup>2</sup>.

**Qualified electrical workers** including respective apprentices will be issued FR clothing. (Qualified electrical workers are defined in OSH Standard 2O1 section 4.1)

**Other workers** identified via facility, site or trade through a risk assessment that show them continuously working in areas that pose a hazard to electrical energy, high temperatures, flames, molten metal or sparks will also be issued FR clothing.

#### Hazard and Barrier Assessment:

- An assessment has determined that FR clothing with an arc thermal performance value (ATPV) of 8 cal/cm<sup>2</sup> is appropriate for general use.
- There are some tasks performed by BC Hydro workers that need FR clothing with an ATPV rating well in excess of 8 cal/cm<sup>2</sup> (e.g. switching in an enclosed space or metal clad switchgear). CSA Standard Z462 and [BC Hydro Safety Alert Series 2O09 No. 4 Arc Flash Risk Low Voltage Metalclad and Generator Bus](#) provide guidance in the selection of appropriate arc flash PPE for such circumstances.

#### Note:

While it is known that electrical utilities are exempt from the [CSA Z462](#) (Workplace Electrical Safety) standard, BC Hydro presently recognizes that this standard is a valuable reference (Specifically Chapter 4, Tables 4 & 5) for determining FR Clothing requirements appropriate for the risk, based on the work activity.

If workers are exposed to the hazards of moving vehicles or equipment then High Visibility apparel is required. If the worker is at the same time also required to wear FR clothing:

- A flame resistant high-vis vest may be worn over top of the FR clothing, or
- FR clothing with integrated high-vis components may be used. For integrated FR / high-vis clothing, the high visibility components must also be flame resistant.
- See OSH Standard 6O1 Appendix 7 for more information on high visibility clothing. If there are any concerns consult a Safety Engineer to assist with the hazard or risk assessment.

#### Why FR Clothing is Required?:

When working on or around energized electrical equipment, there is a potential Arc Flash Hazard and workers must wear FR clothing because:

- Arc flash can cause serious burns even when workers are up to 10 feet or more from the location of the arc
- 50% of deaths from electrical contact are associated with arc flash burns
- Majority of hospital admissions for electrical contact are burn injuries, not shock injuries
- BCH has a history of arc flash incidents and near misses.
- FR clothing helps protect you from the arc flash hazard.

### When FR Clothing is Required (per OSH Standard 6O1):

FR clothing performs best when it is the layer closest to the skin. It may be worn over top of a first layer of clothes made of non-melting natural fibre (e.g., cotton, silk, wool, rayon), including undergarments and socks. Flammable undergarments (e.g. polyester) are prohibited. In addition, if the FR clothing is to provide the intended protection to the worker in an arc flash event, the clothing must be worn as follows when working in proximity to an arc flash hazard:

- Collars of FR clothing must be buttoned closed, and with sleeves and cuffs worn down and secured.
- Protective neck, head, hand and foot coverings must be worn if the occupational hazard warrants their use. Requirement will be documented in work procedures.
- Non-flame resistant clothing must not be worn over flame-resistant garment.

**Electrical Task-Specific Requirements** – when working on or around energized equipment, a base layer of FR clothing (i.e., shirt and pants with full coverage of arms, torso and legs) that provides an arc thermal performance value (ATPV) of at least 8 cal/cm<sup>2</sup> will be worn for the following:

- Performing Electrical Switching
- Applying and Removing Worker Protection Grounds
- Working on DC systems involving battery banks
- Working on 750 VAC down to 50 VAC electrical equipment
- When inside column #4 limits of approach (specific distances defined in Safety Practice Regulation Table 4O1)
- Working in and/or walking within energized Substations and Switchyards (“Gate to gate”)

The “gate to gate” requirement in substations and switchyards has been established because these areas can have exposed high voltage conductor and equipment in confined areas that can be constrained in size. Switching is often done manually, but can also be done remotely and can occur without local awareness. The potential therefor to be in an area subject to arc flash is high. It is recognized, however, that there is some access to substations and switchyards that is limited and not subject to this same exposure, so the following exceptions to the gate to gate FR requirement have been provided. FR is not required in substations and switchyards:

- When driving directly to and entering an office or control building (or equivalent) within the yard,
- On defined safe access routes through the substation or switchyard to those buildings, and
- Within those buildings.

As long as all the other requirements under Electrical Task-Specific Requirements are met.

#### Note:

When switching energized LV or HV Metalclad switchgear workers must wear face shields and gloves with an ATPV of at least 8 cal/cm<sup>2</sup> to protect their face and hands from the potential arc flash hazard. Class 1 rubber gloves with the leather protectors are considered to have an ATPV rating of at least 8 cal/cm<sup>2</sup>.

- NOTE 1: This requirement for face shields and gloves does NOT apply to switching panel-boards or switchboards rated 240 VAC and below with moulded-case or insulated-case circuit breakers.
- NOTE 2: Some switchgear in substations have specific operating instructions including NO RACKING OUT OF CIRCUIT BREAKERS UNLESS DE-ENERGIZED. Refer to BC Hydro Safety Alert Series 2OO9 No.1 Metalclad Switchgear Risk of Internal Arc Failure

**Non Electrical Task-Specific Requirements** – Refer SPR Rule 3O2 that describes required clothing and footwear workers must wear to protect themselves from the hazards associated with their type of work. There may be site specific requirements due to equipment condition or vintage.

### Ordering FR Clothing

If you need FR Clothing, there is an order form and instructions on the Safety Clothing Program webpage.

# **OSH Standard 602**

## **Insulated Tools, Equipment and Rubber Gloves**

# OSH Standard 6O2

## Insulated Tools, Equipment and Rubber Gloves

### 1. Scope

- 1.1 This standard covers the use, maintenance and testing requirements of insulated tools and equipment.
- 1.2 The categories of insulated tools and equipment include live line tools, live line guards, plastic barriers and cover-up, proximity and custom barriers, hydraulic hose, rubber gloves and other insulating rubber equipment.

### 2. Purpose

- 2.1 The purpose of this standard is to communicate acceptable practices for the safe use and care of insulated tools and equipment.

### 3. Standard

#### 3.1 General

- 3.1.1 Insulated tools and equipment are used for work in energized high and low voltage environments. Preserving the dielectric integrity of these devices maximizes protection for workers.
- 3.1.2 Requirements for each category of insulated tools and equipment are specified in the Appendices and must be followed to ensure worker safety.
- 3.3.3 Only approved Field Testers and approved Safety Service Shops may perform tests, repairs and alterations to live line tools and equipment. See the approved lists on the Safety Service Shops.

### 4. Roles and Responsibilities

#### 4.1 Workers

- 4.1.1 Workers are responsible for following applicable safe work practices and procedures for energized high and low voltage work.
- 4.1.2 Perform day to day visual inspection, cleaning and minor maintenance of insulated tools and equipment.
- 4.1.3 Ensure that line tools and equipment have valid test decals affixed prior to using them.

#### 4.2 Managers

- 4.2.1 Ensure employees are trained in the correct application and care of insulated tools and equipment.
- 4.2.2 Monitor programs for maintaining and testing of insulated equipment (e.g. washing rubber gloves, line hose, insulator covers and blankets).

## 5. Records and Documentation

### 5.1 Documents

- 5.1.1 An inspection log is to be kept to verify that adequate maintenance of covers and barriers is taking place.
- 5.1.2 Line Rooms will retain Class 3 glove numbers so that the same gloves (or a replacement if a failure occurs), will be returned to the same user after testing.

## 6. References

- 6.1 WorkSafeBC Occupational Health & Safety Regulation Part 19
- 6.2 IEEE 978 Guide for In-Service Maintenance and Electrical Testing of Live Line Tools
- 6.3 CSA Standard C225 – Vehicle Mounted Aerial Devices
- 6.4 CAN/ULC (IEC Adopted Standards)
- 6.5 ASTM Standards

**Revision Rationale:**

Content Change – Requirements for when to use low voltage gloves has been removed from OSH Standard 6O2 V5–8 and placed in SPR 418 – Rubber Glove Work. Only the specification, maintenance and usage directions remain in OSH Standard 6O2; see Appendix 3.

Format Change – Entire OSH Standard has been restructured and renamed to meet current formatting expectations. Content remains the same as the previous OSH Standard, but some material has been moved in appendices. See the new Appendix 1 through 5 for specific categories of insulated tools and equipment.

## Appendix 1

### Insulated Live Line Tools and Equipment Requirements

- 1) Live line tools are insulated tools that are designed for use on voltages greater than 750 V, including fibreglass reinforced plastic (FRP) tools (e.g. hotsticks, grip-all, universal poles).
- 2) FRP tools must meet or exceed the requirements of ASTM F711 or equivalent.
- 3) 1.2 m (4 ft.) universal poles are:
  - a. Only to be used as means of holding hand tools and other devices.
  - b. Only to be used when appropriate Limits of Approach can be maintained.
  - c. Never to be used for tying or untying tie-wires.
- 4) Lever type tools (e.g. MD6, Lever Jumper Holding Tool) of 1.2 m (4 ft) length are not to be used.
- 5) Only the top foamed filled section of a telescopic (extendable) live line tool (e.g. a switch stick) is to be considered insulating; the extendable hollow sections are not to be considered as insulation for determining the maximum voltage rating for this style of tool.
- 6) The maximum voltage rating of live line tools is determined by the clear insulation distance (includes fibreglass and plastic sections, excludes any metallic sections internally or externally). The clear insulation distance must be equal to or greater than the Column 2 LOA distance corresponding to the voltage that the tool will be used. Specific tools that do not meet this requirement may be still be approved for use, provided they are approved by a Professional Engineer and recorded on the BC Hydro Approved Tools List.
- 7) Live line tools and equipment must be marked with a valid TEST DUE date or decal from an approved Safety Service Shop or Field Tester in accordance with the “Testing and Maintenance Instructions for Safety Service Shops and Field Testers”
  - a. The first test on all new live line tools must be from an approved Safety Service Shop.
  - b. If the test interval is one year or greater, the tool may be used for a period of no more than two months beyond the TEST DUE date.
  - c. If the interval is less than one year the tool may not be used beyond the TEST DUE date.
  - d. Test intervals are set out in Table 1.
- 8) Damaged live line tools or equipment must be withdrawn from service and sent to an approved Safety Service Shop for repair.
- 9) Live line tools that do not have Column 2 of clear insulation as required by section 7 above must be approved by a Professional Engineer. The recommended criteria for this approval is that the clear insulation distance meets the requirements of the OSHA Live Line Work Minimum Approach Distances for the voltage range the tool is to be used on. Note that most major manufacturers design their tools according to these criteria.

## Appendix 2

### Guards and Barriers Requirements

Live line guards and barriers fall into three categories:

- Plastic Cover-up
- Rubber Cover-up
- Un-tested construction awareness barriers

The effect of cover-up in relation to Worker Limits of Approach is detailed in Table 2.

#### 1) Plastic Cover-up

- i. Plastic cover-up (e.g. line guards, pole guards, arm guards, custom Lexan sheets) consists of single layer or spiral form plastic material and must be dielectrically tested.
- ii. Commercially purchased plastic cover-up must meet ASTM F968, and only approved material may be used in the construction of custom covers and barriers. The manager of BC Hydro Work Methods, or a professional engineer, will provide design assistance to fit each individual requirement.
  - a) The design for Lexan sheets, linear polyethylene sheets and fabricated shapes must take the following into account:
    - Holes for tie down purposes are to be drilled in each corner with 2.5 cm of material between the hole and sheet edges.
    - The perimeter of clear barrier sheets must be marked with a 2.5 cm border of non-conductive paint.
    - Use 1 cm polypropylene or nylon tie down ropes of adequate length for restraining the sheets and barriers from movement.
    - For polyethylene sheets and fabricated shapes, use a medium density polyethylene material that is international orange in colour.
- iii. Inspection and electrical testing of plastic cover-up must be carried out in accordance with the schedule in Table 1 by an Approved Safety Service Shop listed on the Safety Website.
- iv. Plastic Cover-up must have a regular maintenance schedule for inspection and cleaning. It must be stored in a clean and dry location and treated as a live line tool.

#### 2) Rubber Cover-up Requirements

Rubber Cover-up e.g. (Line hose, insulator covers, and rubber blankets) provides protection to workers and equipment from accidental contact with energized high and low voltage electrical apparatus.

- i. Rubber cover-up is manufactured and tested in accordance with ASTM D1048, ASTM D1049, or ASTM D1050.
- ii. Inspection and electrical testing of rubber cover-up must be carried out in accordance with the schedule in Table 1 by an Approved Safety Service Shop.
- iii. High voltage rubber protective equipment that is left in service on energized lines or apparatus for extended periods of time, (e.g. overnight), must be removed, cleaned and visually inspected before re-use, and if suspect, submitted for electrical testing.
- iv. Rubber goods that are damaged or show signs of leakage, must be immediately withdrawn from service.
- v. Line hose is to be raised and lowered in hose bags. Blankets and covers are to be raised and lowered in a controlled manner, i.e. in a bag or with a hand-line hook inserted in a corner eyelet.

- vi. Plastic or adhesive tape must never be used to hold rolled blankets since adhesive tape residue collects contaminants, which compromises the dielectric properties of the blanket.
  - vii. Bucket clamp pins (or suitable hooks) are to be used to secure the blanket to the edge of the bucket during rubber glove work when moving the bucket from one location to another or when stripping the line.
- 3) Untested Construction Awareness Barriers Requirements
- i. Construction Awareness barriers (e.g. Instant Insulation) are used to increase the visibility of energized equipment during third party construction projects. They shall be of a high visibility orange or yellow material.
  - ii. They do not provide any dielectric protection, and therefore workers must observe Limits of Approach even with these barriers in place.
  - iii. These barriers are to be used only on voltages of 35kV (phase to phase) or less.
  - iv. Awareness barriers must be cleaned and inspected after removal and before returning to service if they have been in service for a total of 90 days or more. Any cover that has suspected damage must be removed from service. Damaged ends may be cut off if this is practical.

## Appendix 3

### Insulating Rubber Gloves Requirements

- 1) Rubber gloves must meet or exceed the requirements of ASTM Specification D12O or equivalent. Per ASTM D12O, the rated Class of the glove shall be marked by the manufacturer on a tag on the glove.
- 2) All high voltage (Class 1 and above) insulating rubber gloves must be constructed of two contrasting colours in order to facilitate detection of cuts and tears during inspection.
- 3) All watches, rings and other jewellery must be removed before putting on gloves. The use of wool or cotton liners worn inside the gloves is recommended.
- 4) The rubber glove cuff must extend past the protector cuff by at least one inch multiplied by the Class number, and at least  $\frac{1}{2}$ " for Class O. This section must not be regarded as insulation.
- 5) Visual inspection and air testing of gloves must be performed before use and when damage is suspected.
- 6) Rubber gloves must not be worn inside out or without appropriate leather covers. Under no circumstances may the rubber gloves or the leather covers be used for any purpose other than rubber glove work.
- 7) Low Voltage Glove Requirements:
  - i. Definitions:
    - Hazardous Low Voltage (HLV) – 31VAC – 750VAC or 150VDC – 750VDC
  - ii. For Hazardous Low Voltage glove requirements, please refer to SPR 418 – Rubber Glove Work.

## Appendix 4

### Live Insulator Washing Hose

Live insulator washing hose is electrically insulated hose used for washing energized electrical equipment.

- 1) Live insulator washing hose must have a minimum inside diameter of 2 cm (3/4") and minimum burst rating of 27,600 kPa (4000 psi). Minimum unspliced length must be 4.5 m (15 ft) for use on voltages of up to 150 kV and 7 m (23 ft) for voltages between 150 – 500 kV.

Note: For procedures and associated tools and equipment, see Insulator Washing Procedures in the Live Line Manual.

- 2) Live Insulator washing hose is subject to mechanical and dielectric testing at intervals set out in Table 1.
- 3) Live insulator washing hoses with cuts and/or kinks that penetrate deeper than the outer jacket or hoses that have rippled vinyl coating are to be tagged and immediately removed from service and/or sent to an approved Safety Service Shop.

## Appendix 5

### Hydraulic Hose

High-pressure Hydraulic Hose is hose that is rated for pressures greater than or equal to 34,500 kPa (5000 psi).

Low-pressure Hydraulic Hose is hose that is rated for pressures less than 34,500 kPa (5000 psi).

- 1) Insulated and non-insulated high-pressure hydraulic hose shall be subject to a mechanical test at intervals as set out in Table 1, and shall have a valid MECHANICAL TEST DUE decal affixed.
- 2) Insulated hydraulic hose that functions as primary insulation (e.g. hose used to actuate hydraulic tools during rubber glove procedures) requires dielectric testing at intervals as set out in Table 1. Only hydraulic hose that passes this test and that has a valid Test Due decal affixed may function as primary insulation. Hydraulic hose not used as primary insulated does not require dielectric testing.
- 3) Hydraulic hose must have a ratio of minimum bursting pressure to operating pressure of 3 to 1.
- 4) Hydraulic hose must be inspected in the field for defects and when required sent in for testing at an approved Safety Service Shop.
  - i. Hoses must be regularly inspected and maintained by the user in a manner consistent with other live line equipment maintenance.
  - ii. Hose must not be hung on pressure points (e.g. over a nail in a wall).
  - iii. Hose must be wiped clean before storing in a proper bag in a dry environment.
  - iv. Hose ends are to be joined together or sealed where possible to avoid contamination of the oil.
  - v. Hoses are not to be bent to a radius tighter than 14 times the hose diameter.
  - vi. Hoses with cuts and/or kinks that penetrate deeper than the outer jacket or hoses that have rippled vinyl coating are to be tagged and immediately removed from service and/or sent to an approved Safety Service Shop.

**Table 1**
**Test intervals for tools and equipment**

Item	Field Test	Safety & Service Shop Test
Live Line Tools	2 years – the test that follows a Field Test must be a Safety Service Shop test.	2 years – The test that follows a Safety Service Shop test may be either a Safety Service Shop or Field Test.
Tree Trimming Tools used by Certified Utility Arborists	—	1 year
Hydraulic Hose used as primary insulation (mechanical and electrical test – where applicable)	—	2 years
Insulator Washing Hose	—	1 year
Live Line Jumpers	—	1 year
Load Break Tools	—	2 years or 1500 operations (Whichever comes first – shop must be certified by manufacturer)
Plastic and Custom Cover-up (not construction cover-up for 3OM33)	—	2 years
Rubber Blankets, Line Hose, and Covers	—	1 year
Class O to 4		
Rubber Gloves	—	6 months
Class O, 1, and 3		
Live Line rope used above 60kV (green) and Barehand rope (orange)	—	1 year

Note: Test Intervals are based on applicable CAN/ULC and ASTM Standards

**Table 2**  
**Worker Limits of Approach (LOA) in Relation to Cover-up**

	A	B	C	D	E	F
	Tested Cover-up – Touching conductor	Untested barrier/Cover – Touching conductor	Tested barriers – Not touching conductor	Not tested – Grounded	Not tested – Not grounded – At Column 3	Not Tested – Not Grounded – At Column 2
Examples	Rubber Cover-up/ Blankets, Plastic cover-up	Construction cover-up	Lexan Sheet	Steel door or chain-link fence, doghouse enclosure – ES 44 –00051, 00052	Plywood or similar barrier mounted at Column 3 LOA	Plywood barrier mounted at Column 2.
Where and how they are to be mounted	Touching conductor – applied by Qualified Electrical Journeyperson	Touching conductor – applied by Qualified Electrical Journeyperson	Not Touching conductor – OSh 6O2 3.3.6 – Up to but not touching for 60kV and below with barrier tested to the voltage it is being applied to, no closer than Column 1 LOA for voltages greater than 60kV.  SPR 4O1.1 – see number of workers and qualifications to mount	Engineered secure mounting – solid barrier is desirable.  *If barrier is not solid (e.g., chain-link fence) precautions are needed (plywood, signs, training, supervision) to prevent barrier from being defeated (e.g., tools or equipment projecting through barrier)	Barrier mounted at LOA of workers which will be working around barrier. Must be securely mounted (must be able to withstand all foreseeable forces applied by worker and any equipment).  Assumption is that the barrier has been mounted securely such that it can withstand foreseeable forces from workers/equipment/tools.	Must be installed de-energized or by qualified worker using appropriate tools. Reasoning is that LOA table adds distance for inadvertent movement. A physical barrier is better at preventing contact than a ‘rule’ which provides for additional distance to the energized equipment. Principles is it safe, How secure is mounting? Must be approved by PEng.
1	Qualified Electrical Worker (Col 1 or 2)	Avoid contact	Worker LOA	Avoid contact (SPR 4O1.1)	Touch contact permitted*	Contact permitted
2	Qualified Specialty Trained (Col 3) – Supervised by Qualified Electrical Worker	Avoid contact	Worker LOA	Avoid contact	Touch contact permitted*	Contact permitted
3	Qualified Specialty Trained (Col 3) – Unsupervised	Maintain Col 3 LOA	Maintain Col 3 LOA	Maintain Col 3 LOA	Touch contact permitted*	Options: 1. Work up to barrier but avoid contact 2. Maintain Column 3 LOA
4	Unqualified (Col 4) – Supervised by Qualified Electrical Worker	Worker LOA	Worker LOA	Avoid contact	Touch contact permitted*	Work up to barrier but avoid contact
5	Unqualified (Col 4) – Unsupervised	Worker LOA	Worker LOA	Worker LOA	Touch contact permitted*	Work up to barrier but avoid contact *(provided secure enough to prevent access outside defined work area.)
6	Uninsulated Equipment Operated by Qualified Electrical Worker or unqualified who is supervised by Qualified electrical worker (Col 3)	Avoid contact	LOA	Avoid contact	Touch contact permitted*	Very dependent on level of barrier security compared to equipment being used around it. If barrier is mounted securely enough, the equipment could conceivably be permitted to operate up to but not in contact with the barrier.
7	Uninsulated Equipment Operated by Unqualified Worker, or Qualified Specialty trained, not supervised (Col 4)	Column 4	Column 4	Column 4	Touch contact permitted*	Column 4 LOA

## Table of Contents

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# **OSH Standard 603**

## **Work Area Barriers**

# OSH Standard 603

## Work Area Barriers

### 1. Scope

1.1 This standard describes the application and use of work area barriers.

### 2. Purpose

2.1 The purpose of this standard is to communicate the installation criteria and requirements for work area barriers, and to outline the procedures for barrier deployment.

### 3. Standard

#### 3.1 General

3.1.1 This standard describes methods by which work areas are to be clearly defined to help prevent workers from reaching hazards outside the work area and to make others aware of activity within the work area. This includes cordoning off the work area in order to establish its perimeter, and to control access to and from the work area. This procedure may be used to prevent pedestrian traffic from entering a work area (e.g. to cordon off a section of sidewalk when working overhead from a bucket truck). The use of work area barriers does not relieve workers of their responsibility to adhere to rules governing safe work practices.

3.1.2 This standard addresses the use of visual barriers to define work areas. The use of electrical proximity barriers may also be used to help define the work area. Use of electrical proximity barriers is described in OSH Standard 602 – Insulated Tools and Equipment.

#### 3.2 Installation Criteria for Barriers

3.2.1 The manager or their delegate (e.g. foreman, sub-foreman or crew leader) is responsible for determining whether or not a work area will be cordoned off. This decision is to be made and documented during a pre-job planning or tailboard discussion. Factors that shall be considered include, but are not limited to:

- The requirements of WorkSafeBC regulation 19.18②:  
“Barriers or distinctive identification must be used to differentiate high voltage electrical equipment which has been de-energized for safety reasons from similar energized equipment at the work location if lack of such identification would result in undue risk to workers.”
- Work area(s) within an isolated zone will need to be defined by the use of barriers unless documented otherwise.
- Equipment testing areas usually need to be defined by the use of barriers unless documented otherwise.
- Hazardous areas (e.g. hatch covers removed) need to be defined by the use of barriers.

#### 3.3 Barrier Requirements

3.3.1 Work area barriers at grade must be highly visible, non-conductive rope, chain or comparable material using standard yellow precautionary markings. Flags or tapes may be attached to the barriers to increase visibility. See Appendix 1 – Barrier Deployment Examples.

3.3.2 Barrier posts must be of sufficient height to allow the barrier to be securely strung above a grade at an elevation between 36 and 50 inches. Appendices 1 & 3 provide samples of suitable barrier posts.

### 3.4 Work Areas

- 3.4.1 Work area barriers will be used to establish the perimeter of a work area unless it has been predetermined in a documented pre-job plan or tailboard that barriers are not necessary.

Note: The person responsible for establishing the work area will take into account the similar appearance of substation equipment when planning work area boundaries.

- 3.4.2 Planned work is to be completed within the work area defined by the barriers. These areas are to be kept as small as practical.

- 3.4.3 The work area barriers will be placed under the direction of the work leader. Barriers must be in place before work commences, and may be disassembled only after all work inside the area is completed.

- 3.4.4 The perimeter of the work area will be established such that the contained work area is completely inside the isolated zone. Whenever possible, the vertical extension of the work area perimeter will also be inside the isolated zone.

- The perimeter of the work area will be such that workers inside the work area cannot reach all hazards that are outside the established work area and persons that are outside the work area cannot reach hazards that are inside the work area. (The extension of the workers reach provided by tools and equipment shall be considered and documented in the tailboard). When the hazard is energized electrical equipment or conductors, then the barrier is to be positioned no closer to the energized equipment or conductors than Column 2 Limits of Approach. If work conditions are such that this principle cannot be met, then the hazards adjacent to the work area will be identified in a documented tailboard (Note: proximity barriers may be necessary in the presence of such hazards).
- The established perimeter includes any hazards above the work area. Electrical hazards in proximity above or beside the work area are to be isolated and grounded if practicable, otherwise physical or visual barriers must be installed to differentiate these electrical hazards from the de-energized work area. Proximity is to be judged using the requirements of SPR 4O1, plus consideration of any area that could be reached through inadvertent or unintended movement or positioning. Some examples of overhead visual barriers are shown in Appendix 3. Workers should consult a Trades Training Instructor or Safety Advocate for assistance if required.
- All defined work area boundaries shall be identified by the use of work area barriers completed with signs. A typical barrier sign will be two sided. On the Work Area side, the lettering will be black on a yellow background (see Appendix 2 – Two-sided Barrier Sign). This would indicate that area beyond the barrier would be considered the work zone. The opposite side of the sign facing inside the work area would have Danger High Voltage in black on a red background. This would indicate that all equipment on the other side of the barrier is to be considered live. Barrier warning signs must be placed in appropriate position(s) so that they are visible to all workers. Work areas must include a point of access that will be as small as practical through which tools and materials can be moved. All barriers and barrier signs must be highly visible.

Note:

Work Area Barriers are to be attached to independent stanchions placed for the sole purpose of defining the work zone. Structural steel may be used provided that it is not part of an isolation point or its use creates an excessively large work zone.

- 3.4.5 If work is required outside the established boundaries, this will necessitate a change in the work plan and a new documented tailboard shall be initiated. The new tailboard will include any requirements for new or re-defined work area boundaries.

### 3.5 Hazardous Areas

- 3.5.1 Conditions where inadvertent access could expose workers to hazards (e.g. equipment required to be temporarily left operating without adequate guards, hatch covers temporarily removed, etc.) shall be addressed by the use of barriers. Other circumstances may also dictate that barriers shall be erected to warn workers of potential hazards.
- 3.5.2 When a hazard has been identified, barriers shall be erected to warn workers of the potential hazard. All barriers shall have appropriately labelled warning signs that are visible from all access points stating "Keep Out", as well as identifying the nature of the hazard.

### 3.6 Testing Areas

- 3.6.1 Safety barriers for testing under Work Protection Practices (WPP) or under Safety Protection Guarantees (SPG) must be used to identify areas in which hazardous energy sources are introduced for test purpose. These barriers must have a single pre-determined point of entry/exit.
- 3.6.2 Danger High Voltage Testing warning signs visible from all access points must be posted on barriers.
- 3.6.3 Signs identifying work area access will state "Entering Work Area" on one side and "Leaving Work Area" on the opposite side. See Appendix 3 – Barrier Signs and Stanchions.
- 3.6.4 Flashing warning light(s) will further identify test areas when appropriate.

## 4. Roles and Responsibilities

### 4.1 Workers

- 4.1.1 Comply with procedures for barrier implementation, and ensure that barriers and barrier signs are, and remain, properly deployed.
- 4.1.2 Notify crew leader, supervisor or manager if work activity encroaches on defined work area boundaries.

### 4.2 Managers

- 4.2.1 Provide necessary assistance and guidance in establishing or re-defining work area boundaries.

## 5. References

- 5.1 SPR Section 7OO Isolation and Lockout: WPP rules 7O1.1O, 713.6 and 722.6
- 5.2 WorkSafeBC Regulation, "Isolation and Lockout," 19.18②
- 5.3 Local Operating Orders
- 5.4 Brady Catalogue Phone # 1 800 263 6179 (Lynn Wilson Sales)
- 5.5 Hastings Catalogue ([www.hfgp.com](http://www.hfgp.com))
- 5.6 Sherine Industries Ltd, Tel. 1 800 665 O566

### Revision Rationale:

OSH Standard 6O3 RO August 2006 (RO-1 Updated March 10, 2015): OSH standard has been updated to reflect learnings from IMS Incident 218O1 – New Westminster Substation Electrical Contact Incident.

OSH Standard 6O3 RO August 2006 (RO-2 Updated April 15, 2015): Minor edits to include stock numbers (danger signs) on page 9 and image replaced on page 10 to clarify that the wrapping is not required for 1) traffic cone.

## Appendix 1

### Barrier Deployment Examples



Rope barrier using on-site fabricated steel stanchions



Plastic chain barrier using on-site fabricated steel stanchions

## Appendix 1

### Barrier Deployment Examples



Rope barrier using Bradylink stanchions stock # 92112.

Barrier bases weighted with sand or water.



Bradylink plastic chain and barrier stanchions.  
Barrier bases weighted with sand or water.

Catalogue # 92122 for posts  
Catalogue # 78234 for 1½" chain



Hastings Telescopic Barriers with Traffic Stanchions

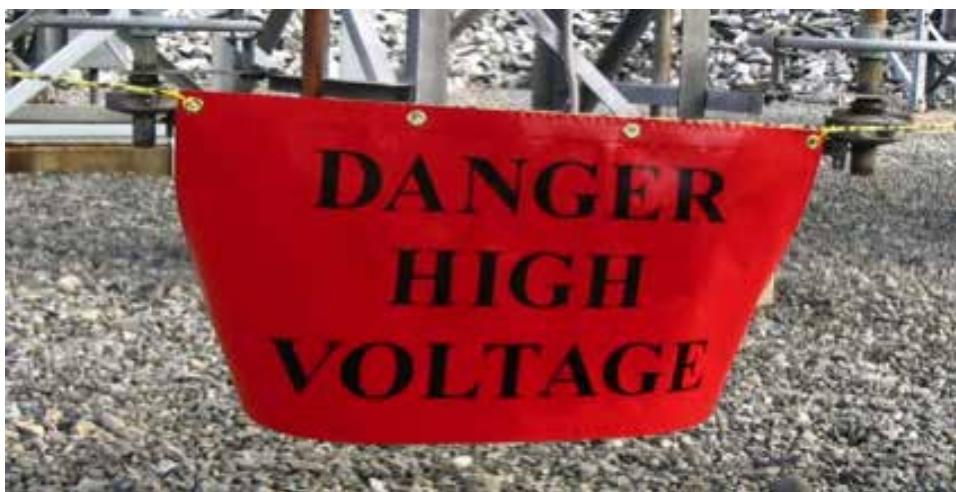


Hastings Telescopic Barrier Bar (51" to 85")  
Catalogue # 6850

**Appendix 2**  
**Two-Sided Barrier Sign**



Work Area display face – two-sided barrier sign BCH stock # 96OO35O4



Danger High Voltage display face – two-sided barrier sign BCH stock # 96OO35O4

Appendix 3  
Barrier Signs and Stanchions



18" X 30" two sided vinyl Barrier Sign with 2½" lettering – BCH stock # 96004025

Danger High Voltage or Energized Bus Above signs (45cm x 30cm) in 3 ml Sintra plastic – available through Sherine Industries Ltd. (1 800 665 0566)



7" X 10" two-sided yellow plastic sign with 2" lettering for "Caution" and 1"lettering for "Entering/Leaving work area"



Danger High Voltage (BCH stock #97000508) or Energized Bus Above (BCH stock #97000509) signs (45cm x 30cm) in 3 ml Sintra plastic



1) Traffic cone  
2) Bradylink stanchion –  
stock # 92116



3) Site-made steel base stanchion with plastic post  
4) Site-made all steel stanchion

## Table of Contents

# **OSH Standard 604**

## **Emergency Showers and Eyewash Stations**

# OSH Standard 604

## Emergency Showers And Eyewash Stations



### 1. Scope

1.1 This standard covers requirements and procedures for emergency showers and eyewash stations.

### 2. Purpose

2.1 Policies and procedures are outlined to ensure that BC Hydro facilities are appropriately equipped with emergency showers and eyewash stations.

### 3. Standard

#### 3.1 General

3.1.1 The work of some BC Hydro workers causes them to be exposed to substances that are toxic, corrosive or otherwise harmful to the skin or eyes. Where such exposures may occur, appropriate emergency washing equipment must be provided. This Standard establishes the policies and procedures for selecting, installing, using, testing and maintaining emergency washing equipment (showers and eyewash stations).

3.1.2 Emergency washing equipment is remedial only. Contamination of skin and eyes must be prevented by proper work procedures, training and the provision and use of personal protective equipment (refer to OSH Standard 601 – Personal Protective Equipment).

3.1.3 For information about emergency washing requirements for work involving batteries, refer to OSH Standard 317 – Battery Work Safety Requirements.

3.1.4 For assistance with implementing this standard, contact your Occupational Safety and Health (OSH) Specialist.

3.2 BC Hydro will provide emergency washing equipment at job sites where a worker's eyes or skin may be exposed to harmful or corrosive substances, or other substances, which may burn or irritate. To determine the degree of hazard that a work activity poses to skin/eyes and the applicable emergency shower and eyewash equipment requirements, refer to Appendix 1 of this Standard.

3.3 Emergency shower and eyewash equipment must be installed in accordance with the manufacturer's instructions and acceptable plumbing practices, and must be tested upon initial installation to ensure that the required pressures, volumes and flow rates are achieved. Regular testing and maintenance must be carried out in accordance with the manufacturer's instructions and Appendix 2 of this Standard.

3.4 The water supply provided for plumbed eyewash stations must be potable (i.e. safe for drinking). Portable (self-contained) eyewash stations must be filled with potable water or an isotonic saline flushing solution. For further information about drinking water standards, refer to OSH Standard 307 – Drinking Water.

3.5 The valves which activate emergency shower and eyewash equipment must be designed so that, once activated, the flow of water or flushing solution will continue without requiring the use of the operator's hands. Mixing valves used to temper (15–35°C) water, where required, must be designed with a fail-safe cold water supply.

**Note:** The requirements for tempered water in the Table in Appendix 1 do not apply if the advise of a medical professional indicates that tempered washing would increase risk of injury in a particular application.

- 3.6 Emergency shower and eyewash stations must be clearly identified by signs that indicate their location and provide directions for their use. The pathways from areas of potential injury to showers and eyewash stations must be unobstructed.
- 3.7 Emergency showers and eyewash stations and, where applicable, the water supply piping, must be protected from freezing.
- 3.8 Workers who are required to use emergency washing equipment must be trained in their location and proper use.
- 3.9 When showers or eyewash stations are used for treatment of injuries the regulations for the practice and recording of first aid will apply. The use of emergency washing facilities for first aid should always be followed by medical treatment.
- 3.10 Workers who wear contact lenses must notify the site first aid attendants to ensure that appropriate treatment is given in the event of eye injury.

#### 4. References

- 4.1 WorkSafeBC Occupational Health & Safety Regulation, Part 5, Section 5.85 to 5.96 Emergency Washing Facilities
- 4.2 BC Hydro Emergency Shower/Eyewash Maintenance Record, Stationery Form 8O423
- 4.3 OSH Standard 317 – Battery Work Safety Requirements
- 4.4 OSH Standard 3O7 – Drinking Water

## Appendix 1

### Hazard Assessment and Emergency Washing Equipment Requirements

In determining the degree of hazard a work activity poses to the skin and eyes three main factors must be taken into consideration:

- a) The nature of the hazardous material involved;
- b) The quantity of the material; and
- c) The potential for the material contacting the eyes and/or skin during the work.

This Appendix is meant to assist in determining emergency shower and eyewash station requirements. Note that emergency washing facilities supplement and do not replace safety eyewear and other personal protective equipment.

#### Nature of Hazardous Materials

Chemical products that pose a hazard of skin or eye contact may be divided into three groups. They are:

##### 1. High Hazard Materials

These products are WHMIS Class E corrosive materials or Class D1(a) materials meeting criteria for acute dermal toxicity. The MSDS and label will confirm this classification. Contact the supplier if clarification is necessary. Products in this category can produce serious irreversible damage to skin and eyes, or induce serious acute toxicity through skin exposure.

##### 2. Moderate Hazard Materials

These products are WHMIS Class D2b irritant materials. Products in this category produce reversible irritation to skin and eyes. While not as serious as the effects caused by the first category, the availability of emergency washing facilities is important in minimizing discomfort, and speeding recovery.

##### 3. Low Hazard Materials

Other materials pose eye and skin hazards due to their physical nature. Work with grinders, lathes and other equipment in a machine shop are examples. These will be considered of lower hazard potential from the standpoint of emergency eyewash and shower requirements. These hazards are addressed in this standard, although the availability and quality of first aid treatment is normally more important than the immediate availability of emergency flushing equipment

## Work Hazard Assessment

### 1. Examples of Situations Posing High Hazard

The selection of suitable shower and eyewash equipment must be based upon an assessment of the hazardous materials present in the workplace and the potential for those materials contacting the eyes and/or skin during the required work activities. Following are examples of situations posing high, moderate and low hazard to eyes/skin. At the back of this Appendix, decision charts have been provided to assist with categorizing eye/skin hazards for activities involving high or moderate hazard materials.

#### High Hazard to the Eyes

- a) A work activity where any volume of a high hazard material may be splashed into the eyes.

Examples include handling and pouring containers of battery acid, concentrated caustic or acid cleaning products, fibreglass catalysts etc. which may allow splashing.

#### High Hazard to the Skin

- a) A work activity where more than 100 ml of a high hazard material may be splashed above the waist; or
- b) A work activity where more than a litre of a moderate hazard material may be splashed onto the body with splashing possible above the waist.

Examples include installations where ammonia or chlorine gas is used.

### 2. Examples of Situations Posing Moderate Hazard

#### Moderate Hazard to the Eyes

- a) Work activities where any volume of a moderate hazard material may splash into the eyes.

Examples include handling irritant materials such that a splash hazard to the eyes is presented. Bulk open pouring of fuels (not using closed fittings), paint thinners and solvent work are examples of situations moderately hazardous to the eyes.

### 3. Examples of Situations Posing Low Hazard to the Skin and Eyes

Work operations such as grinding, welding rosin-cored soldering and machine shop work may result in irritation of the eyes that does require availability of emergency flushing equipment. The duration and immediate availability of flushing in these situations is not as critical as the availability of qualified first aid. When there is a possibility of contacting small quantities of materials (less than 100 ml of a high hazard material or less than 1 litre of a moderate hazard material) where splashing is limited to areas below the waist can be considered as situations posing low hazard to skin. The limited quantities of material involved allow for lower flushing volumes and durations. Routine maintenance in battery rooms not involving pouring electrolyte or carrying cells would be included in the category.

## Emergency Shower and Eyewash Equipment Requirements

Refer to the chart on the following page.

### Special Considerations for Remote and Transient Work-Sites

#### 1. Transient Work-Sites (Construction Sites etc.)

Where it is not practical to provide a permanent potable water supply at a transient work-site, portable, self-contained eyewash units may be used. Where there is a high or moderate hazard to the eyes or skin, emergency facilities must deliver at least 15 minutes flush duration. Dunk tanks and similar facilities may be substituted for showers.

#### 2. Remote Work-Sites

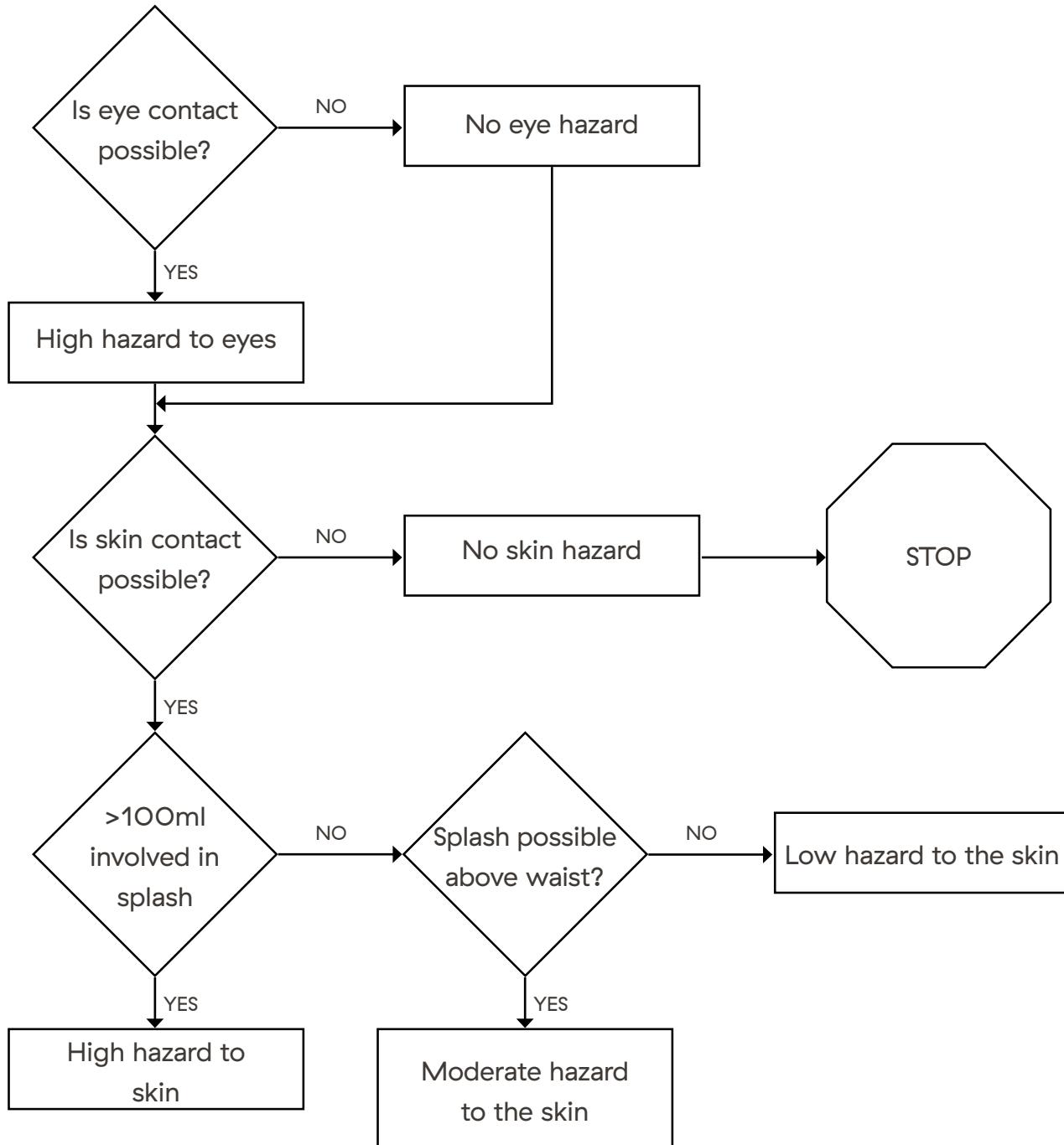
Where it is not practical to provide a portable, self-contained unit at a remote work-site, effective means to flush eyes and skin must be available at the work-site based on the hazard present. For details on requirements for **battery-related work at remote sites** (e.g. unheated Radio Repeater sites), refer to **OSH Standard 317**. Special emphasis must be placed on personal protective equipment and safe work practices to minimize the likelihood of accidental contact with materials hazardous to the skin and eyes.

**Emergency Shower and  
Eyewash Equipment Requirements**

Eye	High Hazard	Moderate Hazard	Low Hazard
<b>Requirement</b>	Tempered*, continuous flow eyewash facility with a minimum duration of 15 minutes (or more if required by the nature of the material).	Within 5 seconds walking distance of hazard area, but no further than 6 metres (20 ft).	Effective means to flush the eyes.
<b>Location</b>	Within 5 seconds walking distance of hazard area, but no further than 6 metres (20 ft).	Within 10 seconds walking distance of the hazard area, but no further than 30 metres (100 ft). May be located further than 30 metres, provided that: <ul style="list-style-type: none"> <li>a) A supplementary eyewash facility is located 20 seconds walking distance of the hazard area but no further than 30 metres (100 ft), and</li> <li>b) First aid services are maintained to start treatment of an affected worker within 5 minutes.</li> </ul>	Within 10 seconds walking distance of the hazard area but no further than 30 metres (100 ft).
Skin	High Hazard	Moderate Hazard	Low Hazard
<b>Requirement</b>	Tempered*, continuous flow emergency shower facility with a minimum duration of 15 minutes (or more if required by the nature of the material).	Tempered*, continuous flow emergency shower facility with a minimum duration of 15 minutes.	Emergency flushing equipment, such as a non-tempered drench hose.
<b>Location</b>	<p>New Installations: Within 5 seconds walking distance of the hazard area but no further than 6 metres (20 ft).</p> <p>Existing installations: May be located further than 6 metres provided that:</p> <ul style="list-style-type: none"> <li>a) A supplementary emergency shower facility such as a non-tempered drench hose is located within 5 seconds walking distance of the hazard area but no further than 6 metres, and</li> <li>b) Tempered shower facility is available within the building to start emergency washing within 5 minutes.</li> </ul>	<p>New Installations: Within 10 seconds walking distance of the hazard area but no further than 30 metres (100 ft).</p> <p>Existing installations: May be located further than 30 metres provided that:</p> <ul style="list-style-type: none"> <li>a) A supplementary emergency shower facility such as a non-tempered drench hose is located within 10 seconds walking distance of the hazard area but no further than 30 metres, and</li> <li>b) First aid services are maintained to start treatment of an affected worker within 5 minutes.</li> </ul>	Within 10 seconds walking distance of the hazard area but no further than 30 metres (100 ft).

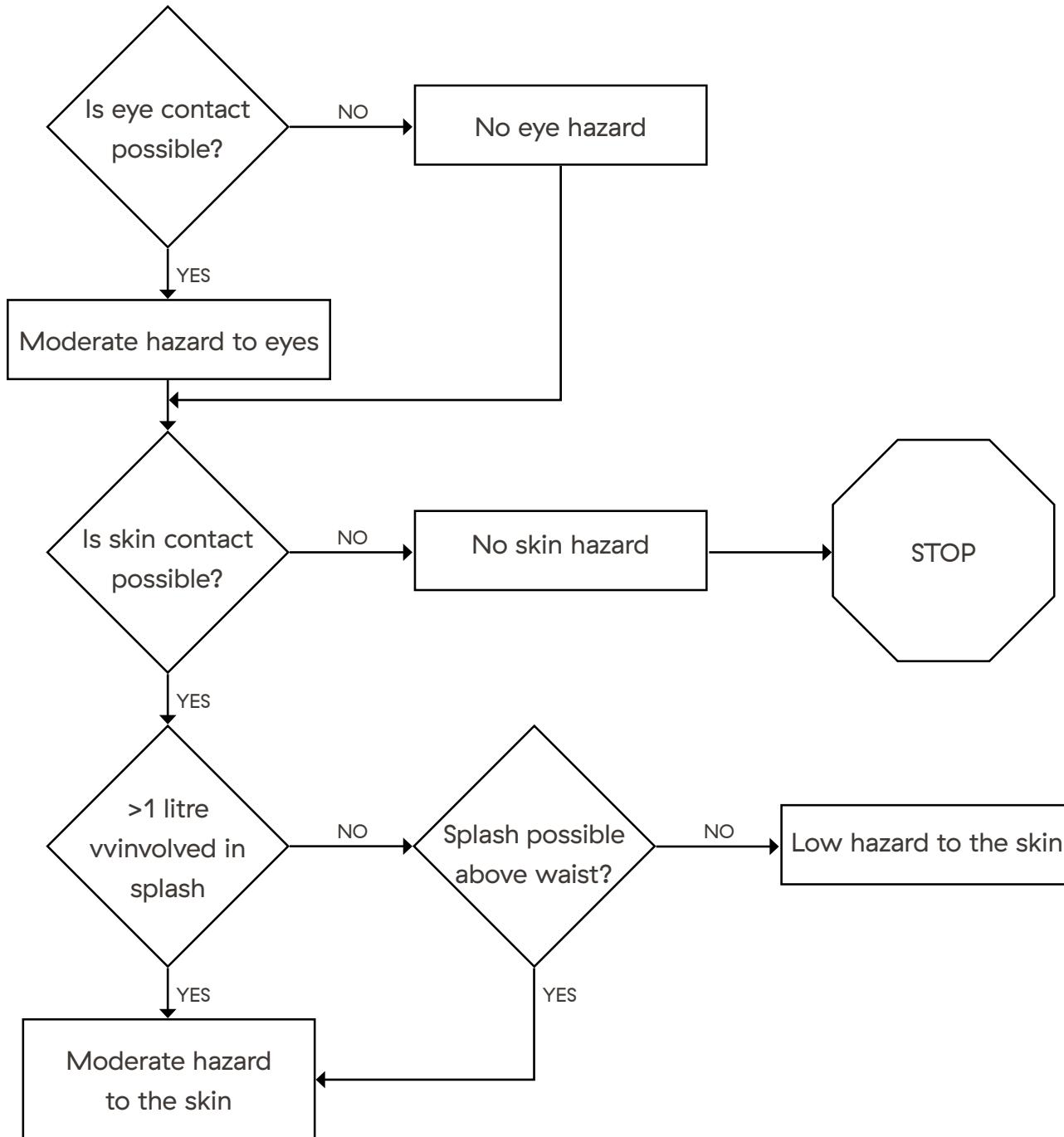
## Eye/Skin Hazard Categorization

### When Handling High Hazard Materials



## Eye/Skin Hazard Categorization

### When Handling Moderate Hazard Materials



## APPENDIX 2

### Testing and Maintenance of Emergency Showers and Eyewash Stations

Showers and eyewash stations, whether plumbed or self-contained, must be properly tested and maintained. Testing and maintenance must be recorded on a BC Hydro Emergency Shower/Eyewash Maintenance Record, Stationery Form 8O423 and attached to the unit.

#### Plumbed Showers and Eyewash Stations

1. Once per month fully activate the flow and run for a sufficient length of time to completely flush the branch of the water line supplying the unit and, where required, ensure that water is tempered (15–35°C).

#### Self-Contained Showers and Eyewash Stations

1. Self-contained Showers and Eyewash stations must be maintained in accordance with the manufacturer's instructions. At minimum, self-contained Eyewash station maintenance must include the requirements in sections 2 through 4 below.
2. Before a new self-contained Eyewash station is put into service it must be disinfected as follows:
  - Fill the unit with potable water;
  - Add 30 ml (1 fluid oz) of household bleach for every 20 litres (5.3 US gallons) of water, mix well and let stand for at least 20 minutes

**Note:** Volumes are based on using household bleach with 5–10% sodium hypochlorite – check MSDS to confirm concentration);

  - Drain the solution completely by allowing the disinfecting solution to flow through the nozzles and observe flow to confirm there are no blockages, then turn unit upside down to drain any remaining solution;
  - Rinse the unit thoroughly with potable water then refill (see section 3).
3. Only potable water or an isotonic saline solution may be used in self-contained Eyewash stations. If a saline flushing solution is used, then replacement frequency must be in accordance with the supplier's instructions. If potable water is used, then water replacement and treatment (disinfection) to prevent the growth of microbial contaminants must be carried out as follows.

**Note:** The effectiveness of these procedures in controlling microbial growth will depend on a number of factors, including handling of solution, local water quality, temperature ranges and environment. If there is evidence of microbial contamination when the eyewash solution is replaced, then fluid replacement must be carried out more frequently. A recommended alternative is to install a self-contained eyewash station that is equipped with factory sealed washing fluid cartridges (e.g. Fendall Pure Flow1000, or equivalent) that only require replacement at the cartridge expiry date – 24 months from date of manufacture.

- a) Every 6 months drain the unit completely and inspect nozzles to confirm that flow is unrestricted. If there is any evidence of microbial contamination (e.g. fluid odours/cloudiness or visible contamination/film on the inside of the unit) then unit must be disinfected, as per Section 2 above, and fluid replacement must be carried out more frequently.
- b) Refill unit with potable water, add 1 drop of household bleach (5–10% sodium hypochlorite) for every 2 litres of water (2 drops per gallon) and mix well (Note: This provides a chlorine residual of 1–2 ppm).

**Note:** Household bleach must be stored in properly labelled plastic containers in a cool, dry place away from sunlight. When properly stored, the shelf life of household bleach is about one year.

4. Monthly inspect the eyewash station to ensure that there is a proper (full) level of flushing fluid and the unit activating device is intact (Note: Keep station clean by wiping with a damp cloth, as required).

**Remote Worksites (e.g. Microwave Sites and unmanned Substations)**

1. At remote work sites where it isn't practicable to follow the testing and maintenance procedures outlined above, the following modified procedures may be used.
  - a) If monthly flow testing of **plumbed Showers** and **Eyewash** stations and/or monthly inspection of **self-contained Eyewash** stations isn't practicable, then the units must be tested/inspected immediately before work involving hazardous materials is carried out at the site. If the required emergency washing equipment is not operational, do not proceed with work.
  - b) If semi-annual replacement of self-contained **Eyewash** station solution is not practicable, then the replacement frequency may be extended to annual, if local conditions permit (see **bolded Note** in Section 3 above).

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# **OSH Standard 608**

## **Fall Protection**

# OSH Standard 608

## Fall Protection



### 1. Purpose

1.1 The purpose of this standard is to communicate acceptable and required fall protection practices.

### 2. Scope

2.1 This standard sets out the requirements associated with protecting workers from falling from elevated work positions. It does not address slip and fall or tripping hazards that involve no change in worker elevation.

### 3. Standard

#### 3.1 General

3.1.1 Fall protection is required when work is being performed in areas where a fall of greater than 3 m (10 ft) may occur or where an unusual risk of injury exists, regardless of fall distance (e.g. work above pits, protrusions, open tanks or moving machinery). For fall protection requirements with ladders, refer to OSH Standard 609.

3.1.2 This Standard and all Fall Protection plans and equipment must meet the expectations of Part 11 Fall Protection of the WorkSafeBC OH&S Regulation.

Note: Work activities that meet the definition of “Rope Access”, must comply with Part 34 of the WorkSafeBC OH&S Regulation. For additional resources on assessing work activities that may meet the definition of rope access work, refer to section 7.10, 7.11 and Appendix 2, Rope Access.

3.1.3 All workers whose work activities involve the risk of falling shall be provided with fall protection equipment and training in accordance with this standard.

- Workers that require personal fall protection equipment shall be provided with no less than a full body harness and a shock absorbing lanyard.
- All Fall Protection equipment shall meet or exceed the applicable CSA, ANSI, or European CE Standard, as is deemed acceptable by WorkSafeBC.
- Guidance on equipment selection is available from the BC Hydro fall protection equipment catalogue, or by referencing posted BC Hydro work procedures.
- In special circumstances where approved products do not meet the needs of a specific function or hazard, contact the Subject Matter Experts identified at the end of this Standard for assistance.

3.1.4 The total fall distance shall be calculated for all work.

- The available fall distance must be more than the fall distance required by the selected fall protection system.
- If working above or in proximity to energized equipment or conductors, the total fall distance shall be such that the worker cannot get closer than column 1 Limits of Approach to the energized conductor.
- The extended length of the shock absorber must be included in the calculation.
- Refer to section 3.5 of this Standard for additional information on shock absorbers.

3.1.5 After a fall has occurred, the complete fall protection system involved must be tagged and prohibited for further use unless inspected and recertified as safe for use by the manufacturers, their authorized agents, a Competent person, or by a Professional Engineer.

- 3.1.6 When using fall protection systems the job plan must consider rescue methods to be deployed in the event of an injury or a health issue and the tailboard must document the rescue procedure and personnel to be used (refer to OSH Standard 122 Job Planning, section 3.2.4).

### 3.2 Full Body Harnesses

- 3.2.1 When worn together the full body harness must be worn over the body belt.
- 3.2.2 Workers shall use a full body harness when working on metal towers such as transmission/communication towers and substation structures and aerial lifts, etc.

### 3.3 Fall Restrict Equipment for Wood Pole Climbing

- 3.3.1 A fall restrict device (pole strap) meeting the requirements of CSA Z259.14-O1 Type AB or ANSI equivalent shall be used when climbing or working from a wood pole. Refer to the Work Methods approved tools list for equipment that meets this criterion, and to the Fall Protection Plan for Climbing Wood Poles for procedural direction.

- 3.3.2 Workers who climb poles will be trained in the use of wood pole fall restrict devices.

### 3.4 Safety Belts and Safety Straps

- 3.4.1 Safety belts, waist belts and safety straps are for body positioning only – they are prohibited for use as fall arrest: only full body harnesses are permitted for fall arrest applications.

- 3.4.2 The preferred body holding device for wood pole fall protection is the full body harness. Waist belts are acceptable for use with wood pole fall restrict devices as described in section 3.3.1 (wood pole fall restrict devices are classified as fall restraint, not fall arrest).

- 3.4.2.1 When a waist belt is used without a full body harness, then the second belt must be an approved rope belt (e.g. the Petzl Grillon) – seat belt style retractors are not permitted for use with waist belts.

- 3.4.2.2 Approved rope belts may only be used for the purpose of climbing past obstacles: fall restrict pole straps are to be used as soon as the worker is past the obstacle on the pole, e.g., as soon as they are above the cross arm.

- 3.4.3 Seat belt style retractors may be used as a second belt for climbing past obstacles only when used in conjunction with a full body harness.

Note: If the retractor is to be choked around the pole when in use, then the retractor must be connected to the harnesses' dorsal D-ring. A Velcro strap can be used to secure the retractor in a conveniently accessible location when not in use.

- 3.4.4 Self-locking snap hooks shall be used to reduce the risk of roll-out of the snap hook when a double safety strap (two straps) is used (e.g. for pole climbing). See section 3.5 – Snap Hooks and Carabiners.

### 3.5 Lanyards and Shock Absorbers

- 3.5.1 Short lanyards shall be used wherever practicable to minimize fall distances.

- 3.5.2 Non-retracting lanyards shall have a self-locking snap-hook at each end. Exception – arc flash rated lanyards with soft loop ends.

- 3.5.3 The worker's weight, including tools and equipment, must be taken into account in the selection of shock absorbing lanyards.
- 6 ft fall rated CSA E4 shock absorbing lanyard for worker plus tools and equipment weight of 45 kg – 115 kg (100 lb – 254 lb).
  - 6 ft fall rated CSA E6 shock absorbing lanyard for worker plus tools and equipment weight of 90 kg – 175 kg (200 lb – 386 lb).
  - 6 ft and 12 ft fall rated ANSI shock absorbing lanyard for worker plus tools and equipment weight of 59 kg – 141 kg (130 lb – 310 lb).

Note: The ANSI shock absorbing lanyard is preferred for standardization purposes per the BCH Fall Protection training program, subject to it being suitable to the worker plus tool and equipment weight.

- 3.5.4 Per section 3.1.4 of this Standard, the increase in length of the shock absorbing lanyard must be taken into account when calculating total fall distance. Maximum increases in length must not exceed:

- CSA E4 shock absorbing lanyard – 1.2m (47 in)
- CSA E6 shock absorbing lanyard – 1.75m (69 in)
- ANSI 6 ft fall rated shock absorbing lanyard – 1.22m (48 in)
- ANSI 12 ft fall rated shock absorbing lanyard – 1.52m (60)

Note: 12 ft fall rated shock absorbing lanyard is not to be used unless shorter length fall protection options are proven to be non-viable by a competent person, and adequate available fall distance has been evaluated and assured.

- 3.5.5 The minimum force that must be applied to a shock absorbing lanyard before there is permanent elongation of more than 51 mm (2 in) must be 2 kN (450 lbs).

### 3.6 Snap Hooks and Carabiners

- 3.6.1 Snap hooks and carabiners shall be of the self-locking type.
- 3.6.2 Self-locking snap hooks are required at both ends of each strap when using two pole straps (e.g. when pole climbing).
- 3.6.3 Steel is the preferred material for carabiners and snap hooks and is to be used whenever possible. Aluminum components may be included in some approved systems if it is beneficial for a specific application or piece of equipment.

### 3.7 Vertical Lifelines and Rope Grabs

- 3.7.1 Vertical rope lifelines must be compatible with rope grabs and descent devices, and must be used in accordance with the manufacturer's instructions.

Note: The lifeline's diameter, material, construction and type must match that required by the rope grab. The preferred size for a synthetic rope lifeline is 16 mm (5/8 in) diameter.

- 3.7.2 Only lifelines and rope that are identified in the BC Hydro Fall Protection Manual equipment catalogue shall be used.

- 3.7.3 Only one worker shall be secured to one vertical lifeline at any time.
- 3.7.4 All rope grabs must be used with lanyards or connecting means of appropriate length for the system, and are to be as short as practicable.
  - To ensure that the maximum allowable free fall distance of 1.82 m (6 ft) is not exceeded, the maximum lanyard length measured from the rope grab to the snap hook must not exceed 0.9 m (3 ft).
  - Rope grabs with 0.6 m (2 ft) lanyards shall be used when possible
- 3.7.5 Once at the work location, the automatic rope grab used for fall arrest must be parked above the height of the dorsal D-ring on the person's full body harness.
- 3.7.6 Manual rope grabs used for work positioning or restraint must be in a position that will not allow any free fall.
  - Such manual rope grabs can be used as an anchor on a lifeline by a person who is attached to a separate suspension system, e.g., a window cleaner sitting on a Boson's chair with a separate lifeline.
  - Rope grabs that are used for fall restraint may have a lanyard longer than 3 ft provided the system is used for fall restraint in a way that will prevent the person from entering a fall arrest situation.

### 3.8 Horizontal Lifelines

- 3.8.1 Horizontal lifelines (temporary or permanent) must be certified by a Professional Engineer.
  - Engineered horizontal lifeline systems (including those that have been pre-approved by the manufacturers' Engineer) are acceptable for temporary use without an engineer's involvement provided they are installed and used in accordance with the manufacturers' instructions.
- 3.8.2 Horizontal lifelines can be sloping providing they are used with a suitable rope grab.
  - These systems must be certified by a Professional Engineer and require written fall protection plans outlining equipment requirements and rescue procedures.

### 3.9 Anchors

- 3.9.1 An anchor intended for fall protection (fall arrest or restraint) or rescue purposes must not be used for material handling, except with the approval of a Professional Engineer.
- 3.9.2 Any damage to an anchor must be reported to the supervisor.
- 3.9.3 Temporary and permanent anchors must be designed or confirmed to meet the requirements of Part 11 Fall Protection of the WorkSafeBC OH&S Regulation.
- 3.9.4 Direct anchorage to a fibreglass structure, such as an aerial bucket, is prohibited unless the anchor is certified by a Professional Engineer or by the manufacturer of the fibreglass structure.
- 3.9.5 Temporary anchor stanchions (posts) must be certified by a Professional Engineer.
- 3.9.6 Only self-locking snap hooks or carabiners shall be used to connect to an anchor..
  - The size of the snap hook or carabiner shall be compatible with that of the anchor.

Note: A self-locking snap hook can potentially dislodge from an anchor if its size differs considerably from that of the anchor, and the snap hook is pulled at an unfavourable angle with respect to the anchor.
- 3.9.7 Temporary anchor point installations are to be discussed and documented on the tailboard. Purpose of discussion is to evaluate and consider all surrounding workplace hazards to ensure the anchor is placed in an appropriate location that does not introduce additional risk from surrounding hazards.

3.10 Anchor Hooks (Shepherd Hooks)

- 3.10.1 Shepherd Hooks must be equipped with a latching mechanism across their gate opening, i.e., they must have a positive means of preventing the hook from becoming dislodged. Also refer to the Work on Metal Transmission Towers work procedure.

3.11 Safety Nets

- 3.11.1 A safety net, certified by a Professional Engineer, may be used when it is not practicable to use other forms of fall protection.

3.12 Transformer Fall Prevention Post

- 3.12.1 The maximum arrest force must be limited to 4 kN (900 lbs) per worker. The maximum free-fall distance must be limited to 1.83 m (6 ft).

- 3.12.2 For fall arrest, fixed length lanyards or self-retracting lanyards shall be connected to an anchor post (or extension as appropriate).

- Workers must connect to the extension when using a post located 0.6 m (2 ft) or closer to the edge of the transformer.
- In all other cases, worker may connect to the swivel rings on the post.

- 3.12.3 For fall restraint, fixed length lanyards must be connected to either an anchor post or a personal anchor point on a weld-on plate. An adjustable length lanyard, Y-lanyard or rope and rope grab may also be used.

- 3.12.4 A maximum of three people may be connected to a single Transformer Anchor Post.

- 3.12.5 A Transformer Anchor Post has three swivel connection rings. Each worker must connect their personal fall protection to a different swivel connection ring, i.e. two or more workers must not be attached to the same swivel connection ring.

Note: These posts, like all fall protection equipment, must be inspected prior to use. Particular attention should be directed to the inspection of the Circlips that secure the swivel connection rings to the post, as several of these clips have been found to have been broken in service.

3.13 Safety Inspection and Testing Requirements

- 3.13.1 Fall protection equipment that exhibits any damage, excessive wear, or is past the expected service life date must be immediately removed from service.

Note: Generation Operations are to take specific direction from Generation Maintenance Standard 1O.4O. MTCE.O1. T&D Operations are to refer to Appendix 1 of this Standard.

- 3.13.2 The frequency of inspection of fall protection equipment must not be less than that recommended by the manufacturer. For further information, refer to Appendix 1 – Safety Inspections.

## 4. Roles and Responsibilities

### 4.1 Workers

- 4.1.1 Perform a thorough visual inspection of their fall protection equipment prior to each use. In addition, documented, detailed annual inspections are required for all safety equipment owned by BC Hydro. Workers are to submit all of their fall protection equipment for annual inspection and non-destructive testing.
- 4.1.2 Understand the components of a fall protection system.
- 4.1.3 Wear approved fall protection equipment.
- 4.1.4 Follow the applicable work procedures and fall protection plans.
- 4.1.5 Achieve proper fitting of the full body harness.
- 4.1.6 Select appropriate lanyard or lifeline length.
- 4.1.7 Read the equipment manufacturer's instructions.

### 4.2 Managers

- 4.2.1 Ensure that workers are properly equipped and have received adequate training. Such training is available from Occupational Safety and Health (OSH) Specialists, Trades Training Instructors (TTI), or outside agencies.
- 4.2.2 Ensure that detailed inspections are being completed at the recommended frequencies.

## 5. Records and Documentation

- 5.1 Managers are to retain records of fall protection training for each worker.
- 5.2 Managers are to retain detailed fall protection equipment inspection records.

## 6. References

- 6.1 CSA Standard Z259.1, Safety Belts and Lanyards
- 6.2 CSA Standard Z259.2.1, Fall Arresters, Vertical Lifelines, and Rails
- 6.3 CSA Standard Z259.2.2, Self-Retracting Devices for Personal Fall-Arrest Systems
- 6.4 CSA Standard Z259.2.3, Descent Control Devices
- 6.5 CSA Standard Z259.3, Lineman's Body Belt and Lineman's Safety Strap
- 6.6 CSA Standard Z259.10, Full Body Harnesses
- 6.7 CSA Standard Z259.11, Shock Absorbers for Personal Fall Arrest Systems
- 6.8 CSA Standard Z259.14, Fall Restrict Equipment for Wood Pole Climbing
- 6.9 WorkSafeBC Occupational Safety & Health Regulation Part 11, Fall Protection
- 6.10 WorkSafeBC Occupational Safety & Health Regulation Part 20, Section 20.75, Roof Work
- 6.11 Generation Fall Protection Manual

6.12 T&D Fall Protection work procedures and approved equipment list

6.13 BC Hydro Fall Protection Equipment Catalogue

## 7. Glossary

- 7.1 **Fall Protection** – a generic term embracing any Fall Restraint or Fall Arrest systems, equipment, work plans and work procedures that are used to minimize the risk of falling, and reduce or eliminate any possible injury resulting from a fall.
- 7.2 **Fall Restraint** – a work positioning system that prevents a worker from falling from a work position, or a travel restriction system such as guardrails or a personal fall protection system that prevents a worker from reaching to an edge from which the worker could fall.
- 7.3 **Fall Arrest** – a system that will stop a worker's fall before the worker hits the surface below (e.g. a full body harness with a shock absorbing lanyard connected to an approved anchor).
- 7.4 **Fall Protection Plan (Work Plan)** – the written document that is required when working at heights of over 7.6 m (25 ft.) without guardrails. It covers the following four necessary elements of fall protection: 1) the fall hazards expected; 2) the fall protection system or systems to be used in the area; 3) the procedures to assemble, maintain, inspect, use and disassemble the fall protection system when applicable; and 4) the procedures for rescue.
- 7.5 **Qualified** – accepted as satisfactory with reference to experience, training, education, personal competency, physical fitness and familiarity with the rules, procedures, equipment and hazards involved in the job.
- 7.6 **Simple snap hook** – has one spring loaded catch. This catch needs to be moved to open the mouth of the hook.
- 7.7 **Self-locking snap hook** – has two catches; the second catch must be released before the first catch can be moved to open the mouth of the hook.
- 7.8 **Self-retracting lifeline** – consists of a reel of stainless steel cable or nylon webbing that locks when an abrupt force is applied to the exposed section of the line. It is used as a fall arrest device and attaches to the back (dorsal) D ring of a full body harness.
- 7.9 **Work Procedures** – the sequential steps to be performed to minimize the hazard when no physical form of fall protection is employed. Examples of Work Procedures include Control Zone and Safety Monitor.
- 7.10 **Rope Access** – means a technique in which a rope access system is used to provide a person with access to and from a workplace, commonly including suspension at the workplace, in such a way that a fall is prevented or arrested.
- 7.11 **Rope Access System** – means a system consisting of:
- a sit harness or full body harness;
  - rope, lanyards and other connecting equipment;
  - anchors; and
  - other components such as ascenders, descenders, belay devices, backup devices and fall arresters, that usually employs 2 separately secured subsystems, one as a means of access and the other as a safety, secondary, belay or backup system, but does not include a boatswain's chair, also known as a bosun's chair, or a zipline.

**Revision Rationale:**

V2–3 Updated November 29, 2016:

Section 3.5.3: Lanyards with soft loop ends shall only be attached to other soft loops requirement removed. WorkSafeBC regulations and the mandatory CSA standard do not expressly prohibit hard-to-soft connections. They do require connectors to be CSA or ANSI certified, and compatible as per the standards and manufacturer requirements.

Note that some manufacturer instructions do prohibit the connection of snap hooks with soft web loops (e.g. DBI SALA Exo Fit Harness instructions, section 2.10).

V2–2 Updated March 7, 2016:

Section 3.1.2: Included reference to rope access and points towards Appendix 2 Rope Access. Edit made based on WSBC's new Part 34 Rope Access.

Section 7.1O & 7.11: Included the definition of Rope Access and Rope Access System. Edit made based on WSBC's new Part 34 Rope Access.

Section Appendix 2 Rope Access: New Appendix to provide a method to assess working at height activities to determine if the activity meets the definition of rope access or not. Also includes an inventory of Rope Access assessments.

V2–1 Updated February 10, 2016:

Section 3.1.6: New section added to reflect rescue requirements when using Fall Protection. Edit made in response to WorkSafeBC order related to November 2014 electrical contact at the New Westminster substation.

Section 3.9.7: New section added to require discussion, evaluation and documentation of temporary anchor points. Edit made in response to WorkSafeBC order related to November 2014 electrical contact at the New Westminster substation. **Appendix 1 Safety Inspections**

Generation Operations are to take specific direction from Generation Maintenance Standard 1O.4O.MTCE.O1. T&D Operations are to refer to this Appendix.

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Safety inspection is divided into three categories as follows:

1. Equipment that is used frequently and is subject to deterioration from use (e.g. Power Line Technician body belts, lanyards, body harnesses and climbers).
  - Such equipment requires a thorough visual inspection to be performed by the user prior to each use.
  - The inspection shall be carried out according to the manufacturer's instructions.
  - In addition, equipment used by line crews requires annual non-destructive testing.
2. Equipment that is used frequently, but is not subject to excessive wear or damage.
  - The user of such equipment will perform a thorough visual inspection according to the manufacturer's instructions prior to each use.
  - This equipment does not require annual non-destructive testing.
3. Equipment that is used only occasionally.
  - The user will carry out a thorough visual inspection prior to each use, according to the manufacturer's instructions.
  - This equipment does not require non-destructive testing.

Assistance with visual inspections can be found in the [Personal Fall Protection Equipment Inspection Guide](#).

## Appendix 2

### Rope Access

#### Scope

This appendix sets out the requirements for assessing rope access work activities within BC Hydro, based on WorkSafeBC Part 34 (Rope Access) regulation. WorkSafeBC Part 34 is an extension of the WorkSafeBC Part 11 (Fall Protection) that became law in February 2015 with the intent to better regulate rope access work throughout the Province. Part 34 has much more stringent training requirements than Part 11 because of the higher technical requirements when using ropes, connectors and supporting equipment.

#### Purpose

The purpose of this Rope Access Appendix is to provide guidance to operations to help determine if their work activity falls under Part 11 (Fall Protection) or Part 34 (Rope Access).

#### Requirements

##### a. Rope Access Work Assessment Inventory

The rope access inventory identifies BC Hydro work activities that have been assessed to determine if Part 34 applies to the activity. The majority of work activities at BC Hydro, that include working at heights, will not fall under Part 34, however, more complicated rope work that requires suspension from a rope may need to be formally assessed. The inventory table below documents specific work activities that have been assessed against the regulation. There is no requirement for re-assessment unless the work activity changes.

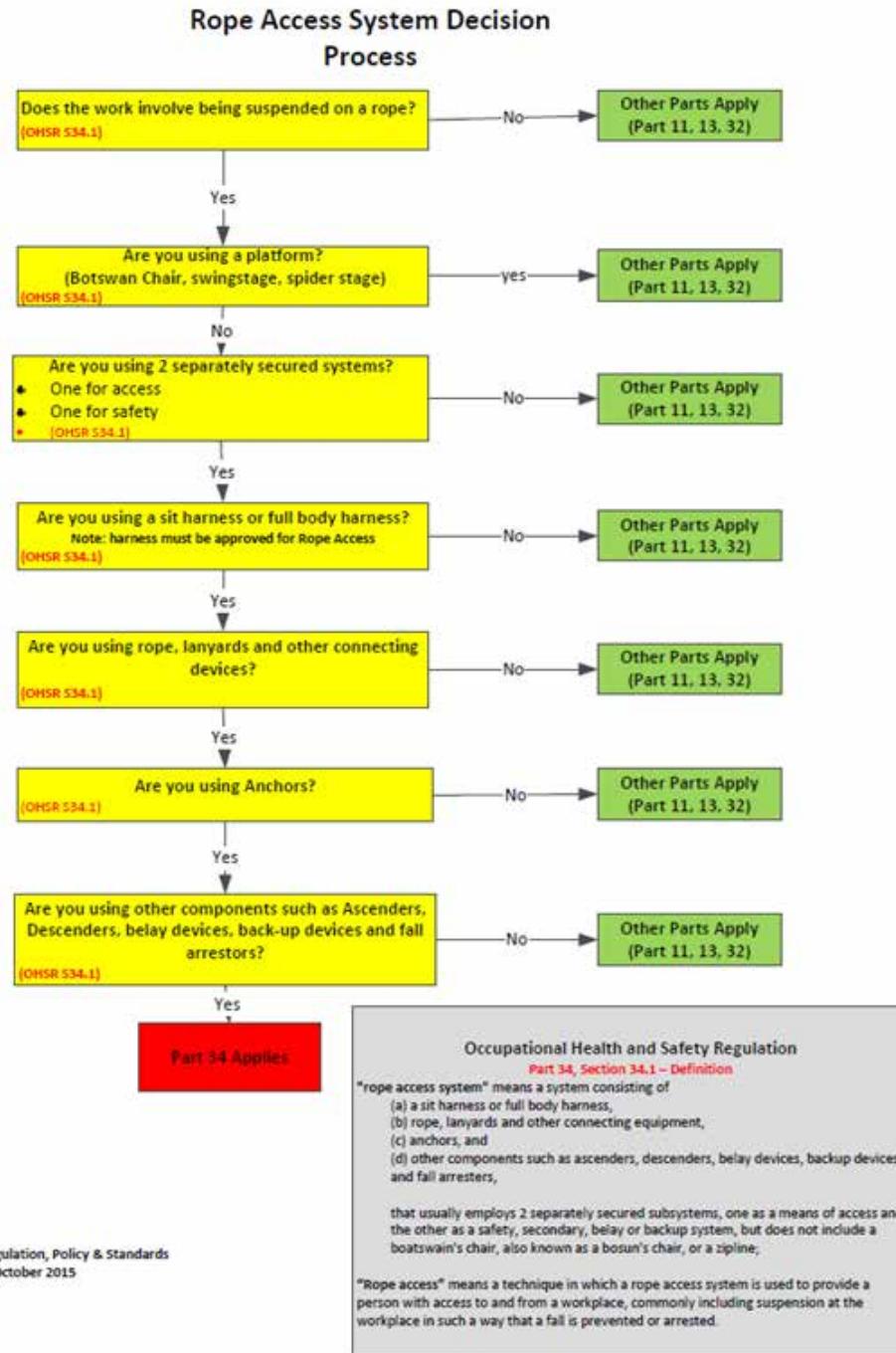
Work Activity	Assessment Date	Assessment Decision	Justification	Notes
Barehand Tower access	Sept. 3, 2016	Not Rope Access	Part 34 of the WorkSafeBC regulation does not apply to hoisting employees using the capstan hoist because the system does not include ascenders, descenders or belay devices used in a rope access system that would allow the employee lateral movement under their control. The employee being raised and lowered does not have control over their movement; this is controlled by the employee managing the capstan winch on the ground. The work activity incorporates a separate fall protection system in the event of a failure of the hoisting rope.	<ul style="list-style-type: none"> <li>Decision has also been noted in the Barehand work procedures.</li> <li>Ref Procedure: BH1: live line rope method</li> </ul>

Work Activity	Assessment Date	Assessment Decision	Justification	Notes
GMS Penstock Inspection	Oct. 16, 2015	Not Rope Access	The Penstock inspection falls out of the Part 34 requirements in two sections of the definition. 1) The employee is not under suspension during the descent in the Penstock. Although he does depend on the working rope to maintain his position because of the angle of the penstock. 2) The work activity does include one lower device (MPD) controlled by a worker at the top of the penstock and one Fall Arrest (DMM Buddy or Kong Backup).	<ul style="list-style-type: none"> <li>Decision has also been noted in the GMS Penstock and Intake Gates Procedures</li> </ul>
GMS Penstock Tower Access	Oct. 16, 2015	Not Rope Access	The tower access using the rated man basket and crane does not fall under Part 34 because the basket is used as a platform and therefore would need to meet Part 13 requirements.	<ul style="list-style-type: none"> <li>Decision has also been noted in the GMS Penstock and Intake Gates Procedures</li> </ul>

As new work activities that may require formal assessment are identified, they will be added to the inventory and assessed.

b. Work Activity Assessment Process

Differentiating between “Fall Protection Systems” and “Rope Access Systems” is not always clear because equipment used will often meet the requirements for both types of systems. The work activity assessment process is based on the definition of “Rope Access” and “Rope Access System” in WorkSafeBC Part 34 and can help determine the applicable regulations.



Prepared by Regulation, Policy & Standards  
October 2015

This assessment process was discussed and supported by WorkSafeBC following a meeting with WorkSafeBC Regulatory Practices Group and WorkSafeBC Rope Access Working Committee on November 24, 2016.

The decision tree can be used as a tool to help determine if a formal evaluation is necessary; a formal assessment will require additional support from Safety. The formal assessment process to evaluate the work activity requires a site visit to observe the work activity and document the types of equipment being used. This information is then evaluated against the criteria in the decision tree based on the WSBC definition of “Rope Access” and “Rope Access System” in OHSR s34.1–Definitions. To meet the definition of a rope access system, the system being used must meet ALL the criteria in the decision tree to fall under Part 34.

c. Records and Documentation

Formal Assessments of the work activities must be documented to provide justification on the decision and to assist with questions from WorkSafeBC inspections. The following table provides a list of documents for rope access assessments.

Record	Purpose	Document Storage Location	Notes
Assessment Inventory	Summary of BC Hydro Rope Access work activities	OSH Standard 6O8 – Fall Protection, Appendix 2	The inventory will include all formal assessments completed
Work Activity Assessment	Documents the decision process using the decision tree and the reason for the decision.	Local Facility	The activity document must be referenced in the relevant work procedure.

# **OSH Standard 609**

## **Ladders**

# OSH Standard 6O9

## Ladders



### 1. Scope

1.1 This standard applies only to the planned, or actual, use of fixed and portable ladders for BC Hydro work activity.

### 2. Purpose

2.1 The purpose of this standard is to provide corporate ladder use policy, principal safety requirements, and direction to other applicable standards, regulations or similar references to ensure ongoing safe work practice and regulatory compliance in ladder use.

### 3. Standard

#### 3.1 General

- 3.1.1 Ladders are available, necessary, and considered acceptable apparatus for a wide variety of applications and activities in electrical utility work. A ladder may be used for access (ascent or descent), or it may be used temporarily for work positioning and execution. Ladder use must conform to WorkSafeBC OHS Regulation Part 13.
- 3.1.2 Consideration must be made for the use of a work platform, scaffolding, or an aerial lift device as an alternative to ladders whenever practicable. If work cannot be performed from a ladder without undue hazard to a worker, a work platform must be provided. (WorkSafeBC Regulation 13.6).
- 3.1.3 Depending on the nature of the intended ladder work and its assessment of risk, using a ladder during work at heights can be considered high hazard work. If this is the case, the requirements of OSH Standard 122, Job Planning, must be followed including the use of the Hazard Barrier Reference form to assist in identifying and documenting appropriate barriers on the tailboard.
- 3.1.4 Ladders must be confirmed to be appropriate for the work application and inspected for overall condition and work readiness before use. Refer also to Safety Practice Regulation (SPR) rule 3O8.
- 3.1.5 See Appendix 1 for the safe application of ladder related fall protection systems and also refer to OSH Standard 6O8 – Fall Protection.

#### 3.2 Fixed Ladder Fall Protection

- 3.2.1 A fall arrest system will be used with ladders under the following conditions:
  - A fixed ladder over 7.6 m (25 ft) without an approved cage.
  - A fixed ladder with an approved cage over 15 m (50 ft).
- 3.2.2 A permanent fall protection system for fixed ladders shall be one of three types:
  - A rail or cable running the entire length of the flight. This system must meet the requirements of ANSI A14.3–1992 when used as fall restraint, or CSA Z259.2.1–98 when used as fall arrest.
  - A vertical synthetic rope lifeline rated as per ANSI A14.3 1992.
  - A self-retracting lifeline.

### 3.3 Portable Ladder Use and Fall Protection

- 3.3.1 When working from a portable ladder, the requirements of WorkSafeBC Regulation 13.5 and the related guidance provided in Appendix 1 on ladder positioning, securement and use must be followed.
- When ladders need to be secured for safe use, the worker may climb the unsecured ladder for the purpose of securing it prior to commencing work.
- 3.3.2 When working from a portable ladder above 3 m (10 feet) above grade (measured from the waist):
- The use of fall protection is not required when:
- Performing “light duty tasks” for sporadic, short-term work.
- The use of fall protection is required when:
- Work on a portable ladder is likely to exceed 15 minutes at one spot.
  - A hazard exists that is greater than the fall impact on a flat surface.
  - Working in proximity to high voltage equipment.
- 3.3.3 Per SPR 8O2.2 (a), for work from an unsecured ladder at a height of greater than 3 meters (10 feet) above grade there must be a second person present that is qualified and equipped to render or request emergency assistance.
- 3.3.4 Ladders made of wood, fibreglass, and aluminum are approved for general use. See SPR 3O8 and SPR 516.3 for rules using metal ladders.
- 3.3.5 All job-built ladders must conform to WorkSafeBC Standard LDR 1-2004.
- 3.3.6 Ladders in poor condition must be clearly labelled “Do Not Use” and removed from service for repair or destruction.

## 4. Roles and Responsibilities

### 4.1 Workers

- 4.1.1 Comply with the provisions of this standard and all referenced regulations as required.

### 4.2 Supervisors

- 4.2.1 Ensure available equipment is in good working order
- 4.2.2 Ensure fall protection provisions are established, understood, and in place
- 4.2.3 Confirm all elements of the safe work plan are in place before ladder work proceeds

## 5. Records and Documentation

None required.

## 6. References

- 6.1 ANSI Standard A14.3-1992, Safety Requirements for Fixed Ladders
- 6.2 CAN/CSA-Z259.2.1-98 (R2004)–Fall Arresters, Vertical Lifelines and Rails
- 6.3 OSH Standard 6O8 – Fall Protection
- 6.4 WorkSafeBC OHS Regulation Part 13, Ladders, Scaffolds and Temporary Work Platforms
- 6.5 WorkSafeBC OSH Guidelines Part 11 (G11.2(5)3, Fall Protection
- 6.6 WorkSafeBC Standard LDR 1-2004 (Job Built Ladders)
- 6.7 Safety Practice Regulations, Rules 3O8, 8O2.2 (a) and 516.3

## 7. Glossary

- 7.1 Fall Protection – A generic term embracing any Fall Restraint or Fall Arrest systems, equipment, work plans and work procedures that are used to minimize the risk of falling, and reduce or eliminate any possible injury resulting from a fall.
- 7.2 Fall Restraint – A work positioning system that prevents a worker from falling from a work position, or a travel restriction system such as guardrails or a personal fall protection system that prevents a worker from reaching to an edge from which the worker could fall.
- 7.3 Fall Arrest – A system that will stop a worker's fall before the worker hits the surface below (e.g. a full body harness with a shock absorbing lanyard connected to an approved anchor).
- 7.4 Self-retracting lifeline – Consists of a reel of stainless steel cable or nylon webbing that locks when an abrupt force is applied to the exposed section of the line. It is used as a fall arrest device and attaches to the back (dorsal) D ring of a full body harness.

### Revision Rationale:

OSH Standard 6O9 V3-1 (Updated March 31, 2016): Clarification of section 3.1.3 for considering working from a ladder as high risk.

OSH Standard 6O9 V3-O (Updated February 10, 2016): General rewrite of the standard to ensure alignment with and proper reflection of WSB regulations, plus BC Hydro requirements from the Safety Practice Regulations. Note: Additional minor edit made February 22, 2016 removing ‘measure from the waist’ from section 3.3.2. Work height is to be measured from level being stood upon, the same as for fall protection.

## Appendix 1

### Fixed and Portable Ladder Safety

#### Application of Permanent Fall Protection Systems for Fixed Ladders

1. Vertical synthetic rope lifelines shall be connected to a permanent anchor having a minimum load capacity of 22 kN (5,000 lbs).
2. When a rope lifeline is suspended along the side of a fixed ladder, the back (dorsal) D ring on a full body harness shall be used to connect to the lifeline via a 0.6 m (2 ft) lanyard that is integrally sewn with a rope grab.
3. The chest (sternal) D ring shall be used only with systems that are fixed to the centre of the rungs, and attached to the rail or cable of a fixed ladder via a 23 cm (9 in) connector.

#### Light Duty Work from Portable Ladders

This will apply when working off of any kind of portable ladder doing a “light duty task,” such as inspection or painting, where the ladder will be at any one spot for sporadic, short-term work. Portable ladders include step ladders as well as extension step ladders.

Examples of sporadic short-term work:

- Temporary service pole connections
  - Gaining access to roofs
  - Brief Communications Protection and Control (CPC) work on pole-mounted recloser controls
  - Inspection of exterior vents, gutters, and window seals;
  - Caulking;
  - Touch-up painting; and,
  - Maintenance-type work (such as changing light bulbs).
1. Portable ladders must:
    - Be placed on a firm and level base to achieve a secure footing, or they must be lashed or held in position and,
    - Be positioned so that the horizontal distance from the base to vertical plane of support is approximately 1/4 of the ladder length
    - Be positioned far enough away from an edge or floor opening to decrease the potential fall distance.
  2. Where positioning of ladders stated above is not possible due to physical site limitations such as fences, sloping ground, obstructions, etc. the following criteria shall be used, in the order shown:
    - A second person will be present and the ladder will be suitably secured, or
    - A scaffold will be erected, by a competent person, to reach to the work location.
  3. Workers will keep their centre of gravity (i.e. waist) between the side rails of the ladder, and, will have one hand available to hold on to the ladder or other support to maintain three points of contact.

4. Ladders used to gain access to a roof or other areas must extend at least 0.91 m (3 ft) above the support.
5. Ladders must not be modified.
6. Ladders must not be lashed together to make them longer.
7. Not more than one person may be on any ladder at one time.
8. At least one hand will be in contact with a ladder rung when climbing up or down the ladder. While climbing or descending, heavy or bulky objects shall not be carried, nor any other objects which may make ascent or descent unsafe.

There are CSA-approved products on the market, such as Laddermaster, Stabilad and Safe Set Ladder Base, which can be used to adapt regular ladders to uneven surfaces.

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# **OSH Standard 801**

## **Employees Working Alone**

# OSH Standard 8O1

## Employees Working Alone

### 1. Scope

1.1 This standard covers the safety requirements and procedures for all employees working alone and worker checks. This standard does not address telecommuting from home which will be dealt with by the manager on a case by case basis as per 4.1.4.

### 2. Purpose

2.1 This standard establishes the WorkSafeBC requirements and procedures for employees working alone.

### 3. Standard

3.1 WorkSafeBC OHSR Part 4.2O – 4.23 requires employers to provide a means of periodically checking the well-being of a worker where the worker is employed under conditions which present a risk of disabling injury and when the worker might not be able to secure assistance in the event of injury or other mishap.

3.2 Before a worker is assigned to work alone or in isolation, the Manager must identify any hazards to the worker and take measures to eliminate the hazard or minimize the risk from the hazard. For further information, refer to hazard methodology in OSH Standard 11O – Hazard Identification and Risk Assessment.

3.3 To determine when a working alone procedure is required, the following factors need to be considered:

- Work on the electrical system including:
- Substations
- Working aloft
- Working on towers
- Hazardous process
- Hazardous locations (physical or chemical, confined space, enclosed space)
- Remote locations
- Access (working on ladders)
- Road conditions
- Weather conditions
- Frequency and duration of exposure
- Working on waterways
- Animals and people
- Availability of communications
- Availability of responsible personnel who would initiate a rescue.

3.4 The need for worker checks can be identified during the following times:

- If a hazardous situation is identified prior to a job, (worker–check procedures are required)
- If a hazardous or potentially hazardous situation arises during the course of work, the worker recognizes this and initiates a worker–check to cover the duration of the activity.

3.5 A written Working Alone procedure for checking the well-being of a worker must be developed prior to the worker being assigned hazardous work to work alone or in isolation and communicated to all applicable workers (Appendix 1 and 2 provide sample procedures).

3.5.1 Before starting a job where hazards exist and the worker will be working alone, the worker must implement worker check procedures by notifying a worker–check authority and providing:

- The location of the job
- The nature of the job
- The expected time to complete the work
- Pre-determined time intervals the worker will call in at
  - Note: Time intervals must be appropriate to the nature, hazards, and circumstances of the work and cannot be less frequent than on arrival to and departure from the worksite.
- Means of communication, and
- Nature of rescue mission

3.5.2 Worker–check authorities must be capable and competent to discharge their work–check duties, and can include but are not limited to:

- Office Staff
- Control Centre
- Customer Restoration Centre (see Appendix 2 – CRC – Safety Check on One Man Crews)
- Headquarters
- Other workers
- Manager or crew leader
- Spouse/family member

3.5.3 The circumstances in which the worker might be required to work are many and varied; therefore worker checks shall be made at time intervals appropriate to the nature, hazards, and circumstances of the work. In no case shall these checks be less frequent than on arrival to and departure from the worksite.

- 3.5.4 The worker–check authority, when notified that a worker is working alone or travelling in remote areas, must record in the daily log, the time and all pertinent information regarding the worker involved as stated in clause 3.5.1. In addition, the worker–check authority must set a timer to alarm at the prearranged time as agreed with the worker in clause 3.5.1.
  - 3.5.5 If a worker fails to call the work–check authority at the agreed upon time, the worker–check authority will attempt to contact the worker via the means identified in clause 3.5.1.
  - 3.5.6 If the work–check authority is unsuccessful in contacting the worker, the worker–check authority will initiate a rescue response to the worksite of the worker and, shall remain involved with the rescue mission to its conclusion. The worker–check authority will ensure that all other persons are safe and/or transported from the site.
  - 3.5.7 Worker–check shall not be passed from one worker–check authority to another without the worker being contacted and the worker setting up a worker–check with the new worker–check authority.
- 3.6 All workers in section 3.5 and any person assigned as worker check authority must be trained in the written procedure and be familiar in what actions are necessary.
- 3.7 The working alone check procedure must be reviewed annually or more frequently if
- There is a change in work arrangements which could adversely affect a worker’s well-being or safety, or
  - A report that the procedures are not working effectively

#### 4. Roles and Responsibilities

##### 4.1 Managers

- 4.1.1 Ensure that hazard identification and risk assessments have been carried out to identify any hazards to the worker and take measures to eliminate the hazard or minimize the risk from the hazard as per OSH Standard11O—Hazard Identification and Risk Assessment.
- 4.1.2 Ensure that a written working alone procedure (which includes the time interval between checks, the procedure to follow in case the worker cannot be contacted and provisions for emergency rescue) is developed to check the well-being of workers who are assigned work where hazardous conditions are present and who work alone.
- 4.1.3 Ensure that workers in 3.5 and their Work Check Authority are trained in the written procedure.
- 4.1.4 Ensure that workers telecommuting (working from home) have conducted a self assessment of their work area for hazards (e.g. loose electrical cords, ergonomic hazards) prior to authorizing the work.
- 4.1.5 Ensure the written procedure is reviewed annually, or more frequently as per 3.7.

##### 4.2 Workers

- 4.2.1 Ensure Working Alone procedures are appropriate for the job and risk involved
- 4.2.2 Follow the Working Alone procedure
- 4.2.3 Notify a worker–check authority before starting each hazardous job requiring worker check procedures and provide information as per 3.5.1
- 4.2.4 Call the worker–check authority at the agreed upon time
- 4.2.5 Ensure training in the Working Alone procedure was received and understood

#### 4.3 Worker Check Authority

- 4.3.1 Must be capable and competent to implement their worker check duties
- 4.3.2 When notified that a worker is working alone or travelling in remote areas, must record information received in 3.5.1
- 4.3.3 Must set a timer to alarm at the prearranged time as agreed with the worker in 3.5.1
- 4.3.4 Attempt to contact the worker via the means identified in clause 3.5.1 if the worker fails to call at the agreed upon time
- 4.3.5 If unsuccessful in contacting the worker, initiate a rescue response to the worksite of the worker and, shall remain involved with the rescue mission to its conclusion
- 4.3.6 Ensure that all other persons are safe and/or transported from the site
- 4.3.7 Shall not pass on the worker–check authority without contacting the worker to enable the worker to set up a worker–check with the new worker–check authority

#### 5. Records and Documentation

- 5.1 Local Working Alone Procedure (based on hazards and controls)

#### 6. References

- 6.1 WorkSafeBC OHSR Part 4 Working Alone or In Isolation Section 4.20 to 4.23
- 6.2 Appendix 1 – Example of Hazard Level Descriptions
- 6.3 Appendix 2 – Example of a Working Alone Procedure
- 6.4 Appendix 3 – Example of a Safety Check on One Man Crews

**Revision Rationale:** Completely revised to reflect WorkSafeBC revisions, improve clarity and include examples of hazard level descriptions, a sample working alone procedure and safety check on one person crews.

## Appendix 1

### Example of Hazard Level Descriptions

		Description	Check-In Required	Procedures
1	No Recognized Hazard	All work where no recognized hazard exists	No	Suggest sign-out board, itinerary or calendar
2	Recognized Hazard	Working with others around who would offer immediate assistance	No	Sign-out board, itinerary or calendar
3		No immediate assistance available	Yes	Written work-check procedure is required  Set communication time  Worker-check may require a sign-out board, itinerary, calendar and alternative contact.

## Appendix 2

### Example of a Working Alone Procedure

#### Procedure

As part of pre-job or preliminary job planning discussions, an appropriate check-in schedule must be arranged when a worker is working alone under conditions that present a significant hazard of disabling injury. The worker must comply with the following procedures:

- Before starting the job, the worker will call the worker-check authority giving the location, estimated duration of the job, check-in schedule and type of communication (radio, PAX, telephone, cell phone, etc.). This information shall be recorded in a "worker-check" log and a timer will be set to alarm at the end of the designated time.
- If the duration of the work exceeds the estimated time, the worker will call the worker-check authority before the time estimate expires and provide them with a new estimate.
- After completing the work, the worker shall call the worker-check authority to let them know.

#### Note:

Worker-check authority is usually staffed from 08:00 hours to 16:00 hours, Monday to Friday. Workers working alone during non-regular hours must report to a worker-check authority that is available in the applicable time period. This may be a control centre or a contracted agency that is available 24 hours per day.

#### Shift Change of Worker-check Authority

Worker-check shall not be passed from one worker-check authority to another without the worker being contacted and the worker setting up a worker-check with the new worker-check authority.

#### Failure to Check In

When a worker does not contact the worker-check authority within the time estimate, immediate attempts will be made to contact the worker. These calls must be completed within 10 minutes of the elapsed time. The worker in the field must respond immediately.

If there is no response to the call back, the worker-check authority shall arrange for someone to check the worker at the work site as soon as possible, starting with:

- Any crew or other individual known to be near the job site
- The worker's immediate Supervisor or Manager
- The Area Manager
- Local Police

#### Special Situations

This general procedure may not suffice to cover all situations. For specific requirements, pertinent work procedures will be issued by the worker's Manager.

**In House Worker-checks**

- The worker-check authority may be called upon to extend similar service after regular working hours to contractors and construction workers when on call out or working alone.

**Outside Services Worker-checks Can Include But Not Limited To:**

- Telecom Facilities Maintenance (TFM) Department may be called upon to extend similar service to personnel working alone at microwave sites under conditions which present a significant hazard to the worker.
- Customer Restoration Centre (see Appendix 2)
- Other crews or individuals

## Appendix 3

### Example of a Safety Check on One Man Crews

#### T1O-22 Safety Check On One Man Crews

**Policy** The Customer Restoration Centre (CRC) will be responsible for carrying out safety checks on one man crews

#### General

1. A safety check is done on a one man crew to ensure that the worker has not encountered a personal safety problem in performing his work.
2. The CRC has been designated the worker check authority.
3. The CRC has agreed to provide Field Operations with one man crew safety checks. Other departments that have requested the CRC to be their safety check authority are Vehicle Services, Telecontrol, Safety Division, and the Material Management Business Unit (MMBU).
4. The CRC maintains a daily man check log and elapsed time timers at each dispatcher station to record the location and duration of the crew's activity.

#### Procedure

1. Before starting each job, the worker contacts the CRC to let a dispatcher know:
  - His/her location
  - The estimated duration of the job (usually no longer than 30 minutes)
  - His/her contact number, i.e. cellular phone number, radio repeater, etc.)
2. The CRC dispatcher records the information in the daily man check log.
3. The dispatcher starts the timer which is set for no longer than 30 minutes.
4. When the worker has completed the job within the estimated time, he/she contacts the CRC dispatcher.
5. The dispatcher records the clearance time in the log, and clears the timer.
6. If the worker fails to check in within the time estimate, the dispatcher will immediately attempt to contact the worker. Three ③ attempts will be made to contact the worker.
7. All three attempts to contact the worker must be made within 10 minutes.
8. Each attempt made to contact the worker is recorded in the log.

Note: If the worker is at a known customer address with a valid phone number, the dispatcher can call that number to verify the status of the worker.

9. If there is no response within the 10 minutes, the CRC dispatcher will:
  - (a) Dispatch the nearest available fellow worker to check on the worker at the site as soon as possible, AND
  - (b) Notify the worker's immediate manager, or standby manager.
  - (c) Failing (a) or (b) above, request the fire department or police to check on the status of the worker.

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