PROJECT DESCRIPTION

AMISK HYDROELECTRIC PROJECT

EXECUTIVE SUMMARY

Submitted to:

Canadian Environmental Assessment Agency (CEAA)

October 2015

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1. GENERAL INFORMATION AND CONTACTS

The Amisk Hydroelectric Project (Project), as proposed, would be a 330 megawatt (MW) facility that would generate approximately 1,875 gigawatt hours (GWh) per year of electricity, which is enough to supply roughly 250,000 average Alberta residences. It would be located on the Peace River, approximately 15 km upstream of the community of Dunvegan, in northwestern Alberta.

Project components would consist of a powerhouse, spillway, headpond, fish passage, boat passage, access roads, connecting transmission line and substation and other construction related components (e.g. cofferdams, quarries, camp, laydown areas, etc.). The following sections summarizes information about the Project and its anticipated environmental and social effects.

1.1 Nature of Project

The Project is a hydroelectric facility involving the following main components: a spillway and powerhouse (headworks) 370 m in length, a headpond that will extend approximately 50 km upstream and have an estimated surface area of 30 km^2 and other components, currently under consideration but not fully defined, including fish and boat passage, access roads, an electrical substation and a transmission line connector.

1.2 Proponent Information

The Project is being developed by AHP Development Corporation ("AHP") on behalf of a number of partners, including Concord Green Energy. Concord Green Energy has invested in several renewable energy projects across Canada and is a wholly owned subsidiary of Concord Pacific, a Vancouver based company.

All components of the Project, as described in Section 2.0, will be within the care and control of AHP.

1.3 Consultation Undertaken

AHP has initiated contact and had communications through phone, mail, email and/or face-to-face meetings with the following entities: counties and municipal districts, towns and cities, Aboriginal groups, landowners and occupants, industry and special interest groups.

1.4 Regulatory Requirements

In addition to regulatory requirements under the *Canadian Environmental Assessment Act 2012* (CEAA 2012), the Project will require additional approvals and compliance with a variety of provincial and municipal authorities. The Project will require an Environmental Impact Assessment (EIA) under the *Environmental Protection and Enhancement Act* (EPEA) as regulated by Alberta Environment and Parks (AEP). Applications will also be submitted to the Natural Resources Conservation Board (NRCB) and the Alberta Utilities Commission (AUC).

Development permits will also be required from the Alberta municipal districts of Clear Hills County, Saddle Hills County and MD of Fairview No. 136.

1.5 Environmental Studies

In support of the Project's environmental impact assessment process, a number of environmental baseline and effects assessments will be completed including: air, fish/aquatics, terrain, vegetation, wildlife, water quality, surface water flows, sediments and ice formation.

There are no regional studies, as defined under *CEAA 2012*, being conducted in the area.

Previous environmental assessments and panel reports for Glacier Power Ltd.'s Dunvegan Hydroelectric Project will be reviewed, as will similar documents for the British Columbia Hydro and Power Authority's Site C Clean Energy Project.

Information from other regional studies, including that from the Northern Rivers Basin Study, the Northern Rivers Ecosystem Initiative, the Mighty Peace Watershed Alliance, the Mackenzie River Basin Board, and the Peace-Athabasca Delta Ecological Monitoring Program will also be consulted.

Under the Government of Alberta Land-Use Framework, the Lower and Upper Peace regional plans have yet to be completed. The Lower Athabasca Regional Plan, which was approved in August 2012, will be reviewed within the context of the Project.

2. PROJECT INFORMATION

2.1 General Description, Context and Objectives

2.1.1 Project Context and Objectives

The Project is being proposed to provide Alberta electricity consumers with a long-term, reliable, cost effective supply of renewable electricity.

The electricity market in Alberta is deregulated, and therefore left to market participants to add additional electrical generating capacity when supply and demand fundamentals suggest that additional generation capacity is warranted. In Alberta, the majority of electricity generated is currently from coal-fired generation, which contributed approximately 68% of the electricity supplied to the Alberta Interconnected Electric System (AIES) in 2014. In comparison, hydroelectric generation supplied approximately 3%[1].

A significant amount of the coal-fired generation in Alberta is approaching retirement, with 3,760 MW mandated to be retired by 2029 at the latest under the federal government's *Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations*. In addition to the federal regulations, the province has rules regarding other emissions, including NO_x and SO_x, which were previously agreed to by the Clean Air Strategic Alliance (CASA). The requirements under CASA could accelerate the retirement of all coal-fired units, including 2,460 MW of coal-fired generation slated for retirement after 2029, based on federal regulations.

Sufficient generating capacity must also be added to the AIES to address increasing demand for electricity in Alberta. Over the last ten years, electricity demand in Alberta has grown by approximately 170 MW per year[2].

The Project represents an attractive replacement for a portion of the coal-fired fleet slated for retirement and/or to address electricity demand growth as it will provide a long-term, reliable and cost-effective source of renewable electricity.

The Project provides the following benefits to Albertans:

- Generates 1,875 GWh per year of electricity, which is the equivalent to supplying roughly 250,000 average Alberta homes;
- Supplies renewable electricity that will displace approximately 1.1 million tonnes per year of CO_2 equivalent emissions, which is equivalent to removing over 210,000 cars from the road[3];
- Provides a firm and reliable source of renewable electricity throughout the year;
- Cost-effective source of renewable electricity; and
- Supports regional and provincial economic development.

[1] Alberta Electric System Operator, *2014 Annual Market Statistics Data File*

[2] Ibid

[3] Based on current Grid Displacement Factor of 0.59 tonnes of CO2e/MWh under Alberta's Specified Gas Emitters Regulation.

2.1.2 General Description of Project Components

The Project is independent and not a component of a larger project. It is a described physical activity under Schedule 2(c) of the *Regulations Designating Physical Activities (SOR/2012-147)* as a new hydroelectric generating facility with a production capacity of 200 MW or more.

Project engineering is currently at the prefeasibility level. Major Project components consist of an east and west powerhouse, a spillway, a substation, a transmission line, and access roads. Additional incidental components under consideration include fish and boat passage.

The following sections provide additional information on each of the main project components, including:

- Dam;
- Powerhouses;
- Spillway;
- Headpond;
- Substation and Transmission Line;
- Access Roads;
- Fish Passage Facility; and
- Boat Passage Facility.

Project dimensions and levels are conceptual in nature and subject to change, based on the results of the ongoing preliminary engineering design.

Dam

The east and west powerhouses and the spillway will act collectively as the main dam and have a combined length of approximately 370 m. The main dam will be constructed across the Peace River, which is approximately 360 m wide at the proposed facility location[4]. The total height of the dam from the existing river bed will be approximately 24 m and water levels immediately upstream from the dam are expected to increase by about 17 m over average water levels. The main dam structure will consist of reinforced concrete; various steel gates will control headpond levels and water passage. A cut-off wall will be constructed directly beneath the structures at the upstream side to reduce the uplift pressure and permeability of the foundation. Two additional gravity dams are anticipated between the powerhouse and the abutments on both sides of the river. These dams may be constructed of concrete, earthfill or roller compacted concrete (RCC).

Spillway

The spillway will be located at the approximate mid-point of the dam structure in the centre of the river between the east and west powerhouses. The spillway will pass all Peace River flow not directed through the powerhouses and the fish and boat passage facilities. The spillway is divided into 11 spillway bays, separated by 2 m wide piers. Each spillway bay will be 10 m long, resulting in a total length of about 130 m. Flow through each bay will be controlled by adjustable gates. The type of gates to be used

[4] As currently planned, the centroid of the dam headworks is located at 55°58'19.6" North latitude and 118°48'28.8" West longitude

will be determined as the engineering design progresses, although vertical lift gates are currently contemplated.

The preliminary inflow design flood for the Project is based on a one in 1,000 year flood event, or approximately 12,300 m^3/s. The current configuration of the spillway can pass a flood event of 12,900 m^3/s at the proposed headpond Full Supply Level (FSL) of 362.5 masl. The top of the spillway structure is 363.5 masl, which provides additional capacity for the spillway. For the larger events, the powerhouse will be designed to overtop, if river flows exceed the spillway capacity.

Powerhouses

The facility will consist of two powerhouses; one on the east bank and one on the west bank of the Peace River. Each powerhouse unit is close-coupled where the intake, turbine passageway, and draft tube form a single structural element. The current facility design is configured to have a total of 22 turbines (11 per powerhouse) with a maximum generating capacity of 15 MW each, for an overall facility capacity of 330 MW. Currently, each powerhouse will be approximately 120 m long, including a repair and maintenance bay, for a combined powerhouse length of 240 m. The number of turbines at each side of the spillway may be altered in the final design. The upstream side of each powerhouse will have a foundation (or bottom) elevation of about 336.5 masl and a top elevation of 363.5 masl.

Ongoing geotechnical investigation and additional engineering design will confirm these elevations and finalize turbine generator orientation (i.e. whether vertical or horizontal). The rated discharge capacity of each turbine is anticipated to be approximately 80 m^3/s, resulting in an overall capacity of approximately 1,760 m^3/s combined for the two powerhouses. The turbines are currently anticipated to be propeller turbines installed in an "S" configuration, although this will be confirmed during future design phases.

The powerhouses will consist of an excavated intake channel to transition from the existing river bed to the base of the powerhouse, with an intake structure consisting of trashracks to prevent passage of debris through the turbines and fixed wheel vertical lift maintenance gates to facilitate dewatering of turbines.

A tailrace will be excavated downstream from the powerhouse to transition from the draft tube level back up the existing river bed. Provisions will be made in the intake and or draft tubes to allow for dewatering of individual turbine units. A riprap apron will be installed, extending approximately 40 m downstream from the powerhouse, to prevent riverbed scour.

Headpond

The anticipated FSL of 362.5 masl is anticipated to increase the water level of the Peace River immediately upstream from the dam by approximately 17 m during average flow conditions. The existing Peace River channel at the dam location is approximately 4 – 5 m deep during average flow conditions. This will create a headpond that will extend approximately 50 km upstream and will inundate about 800 ha (8 km^2) of the Peace River valley walls. The headpond (including the existing river channel and incremental inundated area) will have an overall surface area of approximately 30 km^2. The existing river channel averages 350 – 400 m wide but is up to approximately 1 km wide in some locations within the proposed headpond. The average width of the headpond is anticipated to be 400 m.

The headpond is anticipated to be contained within the existing Peace River valley, without resulting in extensive inundation of the existing riparian parts of the valley or adjacent tablelands.

A bathymetric survey of the headpond has been completed that shows an approximately 17 m rise in water level at the headworks to a 1.5 m increase at a distance 50 km upstream. No significant inundation of existing tributaries of the Peace River is expected. The longitudinal and lateral extent of the headpond will be further confirmed after initial survey completion.

Substation and Transmission/Power Supply Line

A substation containing switchgear and transformers will be located onsite to transform power generated by the facility to the transmission voltage of 240 kV. A new, approximately 25 km long transmission line will be required to connect the Project to the Alberta Interconnected Electricity System (AIES) located east of the site. The exact location of the transmission line has yet to be determined.

The right-of-way width for the transmission connection corridor could range from 35-74 m and will be confirmed once more Project details become available.

Access Roads

Permanent road access to the site will be provided on both the east and west sides of the Peace River valley via connections with existing local roads. A total of 7 km of new access roads will be required for both sides of the Peace River. Anticipated grades will not exceed 8% and roads will be designed to accommodate two-way construction traffic. The access road width is anticipated to be approximately 7 – 10 m, but this is subject to confirmation during the design process. In addition to new roads, approximately 18 km of existing roads will require upgrading to handle the anticipated construction traffic.

Fish Passage

To date, criteria required for managing upstream fish passage is under development. The Project has initially made an allowance to accommodate upstream fish passage. Consultation with Fisheries and Oceans Canada is planned to establish regulatory requirements and the type of fish passage facility that will be required.

Boat Passage

The Peace River between Williston Reservoir and the Slave River is explicitly classified as a navigable waterway under the *Navigation Protection Act* (*NPA*). Regulatory approval under the *NPA* is expected to be required for the Project. Consultation with Transport Canada (Navigation Protection Program) is planned to establish regulatory requirements. AHP is currently evaluating a number of options for boat passage including a possible boat lock, portage system or a combination of boat launches.

2.2 Project Activities

2.2.1 Construction

Construction of the proposed facility is scheduled to take place over approximately five years from 2018 to 2023. A detailed construction schedule will be prepared as part of the Project application process and

will take into consideration potential environmental constraints including work to avoid sensitive timing windows and minimize Project effects on breeding birds and other wildlife species.

Construction activity details will be developed as part of Project feasibility study but it is anticipated that construction would likely include the following activities (with potential timing and duration in parentheses):

Site Preparation (2018)

- Installation of sediment and erosion controls, as required prior to ground disturbance;
- Installation of construction camp (if required), including provisions for potable water and sewage collection/discharge;
- Construction of permanent granular access roads to each side of the proposed facility, with activities including:
  - Vegetation clearing;
  - Topsoil stripping;
  - Grading and foundation preparation;
  - Installation of granular fill (granular sources to be determined); and
  - Ditching and other stormwater/erosion and sediment control mitigation
- Construction of works and laydown areas including office facilities.

Stage 1 Construction (2018-2020)

- Installation of the first stage cofferdam in the river to facilitate construction of facilities on one side of the river (e.g. powerhouse, fish passage facility, partial portion of spillway) in a dry condition. Potential cofferdam designs will be determined during future engineering phases.
- Construction of facilities behind the cofferdam, with general construction activities including:
  - Mechanical excavation of existing soils and sediments (temporary and/or permanent disposal on or off-site to be determined);
  - Bedrock excavation (if required) mostly mechanical removal (temporary and/or permanent disposal locations on or off-site to be determined). Some local blasting may be required for large boulders;
  - Installation of water management measures within excavation;
  - Foundation preparation;
  - Installation of formwork and concrete for powerhouse and spillway (on-site requirements for a concrete batch plant to be determined);
  - Installation of powerhouse and spillway mechanical equipment (e.g., spillway gates, turbines, generators) as well as balance of plant equipment (e.g. electrical, HVAC, water supply, sewage, office facilities, etc.); and
- Commissioning of water passage through partially constructed spillway and/or powerhouse, and removal of stage 1 cofferdam.

Stage 2 Construction (2021-2023)

- Installation of Stage 2 cofferdam to construct the remaining portion of facility, with all flow diverted through the portion of the facility constructed during Stage 1;

- Construction of remaining facilities within the area dewatered behind the Stage 2 cofferdam;
- Removal of Stage 2 cofferdam;
- Construction of substation and transmission line, including vegetation removal within right-of-way;
- Headpond preparation including vegetation removal within the anticipated inundation area (as necessary);
- Inundation of headpond by slowly decreasing flow through powerhouse/spillway (maintaining a minimum downstream flow at all times);
- Testing and commissioning; and
- Site rehabilitation (e.g. stabilization, re-vegetation, removal of all temporary features).

The staging noted above is subject to change pending the completion of the Feasibility Study.

2.2.2 Operation

The Project will operate as a run-of-river facility, which is a term used to describe hydroelectric facilities that do not have significant long-term storage[5]. It will operate with a full supply level (FSL) of about 362.5 masl. This would result in a total headpond volume of about 124,000,000 m^3. The potential for a limited amount of drawdown during times of peak demand and/or supply shortfall on the Alberta electricity grid is currently under evaluation.

Flow up to the facility's capacity (approximately 1,760 m^3/s) will be directed through the powerhouse and turbines, and any flow required for operation of the fish and boat passage facilities will be passed through those facilities. All excess flows over and above this amount will be passed through the spillway. It is anticipated that the powerhouses and spillway will be operated to maintain the headpond within a narrow band around the FSL in order to ensure the run-of-river mode of operation is maintained. Due to this run-of-river mode of operation, there will not be a meaningful change to existing flow patterns in the Peace River.

An operating plan will be prepared as part of the Project application process and it is anticipated that the facility will be required to regularly monitor river flow and water levels.

The facilities will be designed for remote operation in addition to having on-site controls. It is anticipated that at least one permanent operator will be at the facility on a regular basis.

Regular facility monitoring, periodic testing (e.g. backup diesel generators, if present) and routine maintenance will be conducted throughout the life of the facility.

Routine maintenance may include items such as:

- access road grading, granular addition, dust suppression and snow ploughing and/or de-icing;
- grass cutting around the facility;
- periodic tree/shrub removal along the transmission line corridor;
- mechanical equipment maintenance (e.g. fluid changes); and
- concrete spot repairs.

[5] Run-of-river implies a less than 48 hour retention time for river flows in the headpond according to the Quantification Protocol for Run-of-River Projects under Alberta's Specified Gas Emitters Regulation.

2.2.3 Decommissioning

Presently, there are no plans to decommission the Project. Upgrading or rehabilitation to extend the facility's life will take place as part of major maintenance expenditures and depend on the condition of the plant and equipment. Decommissioning, if required, would typically occur 100 years or later following construction. It would depend on the structural/historic attributes of the facility as well as economic and financial considerations at the time. The decision on decommissioning (or alternatively upgrading or further rehabilitation to extend facility life) will depend on numerous factors which will be considered. A Conceptual Decommissioning Plan will be prepared as part of the Project application process.

2.3 Emissions, Discharges and Waste

2.3.1 Atmospheric Emissions

During construction, gaseous emissions to the atmosphere will occur from various pieces of operating construction equipment, including heavy machinery and generators. Blasting, if required, may also result in periodic air emissions during construction. It is not anticipated that any explosives will be manufactured on-site. Any explosives stored on-site will be contained in a manner compliant with Natural Resources Canada requirements and industry standards. Transport of explosives will be done in accordance with Transport Canada requirements (i.e. Transportation of Dangerous Goods Regulations). Fugitive dust may also occur periodically during construction.

Gaseous wastes from the facility are not anticipated to occur during normal operations, although air from the powerhouse will be vented through the facility's HVAC system. This is not anticipated to include any potentially harmful gases or particles. However, periodic operation of back-up diesel generators (during testing and on an as-required basis during power outages) would result in some air emissions.

2.3.2 Liquid Discharges

Industrial Liquids

Fuels, hydraulic fluids, and lubricants will be used in equipment during Project construction and operation. The storage facilities for these materials will comply with all current regulations and guidelines.

No specific discharge of these materials is anticipated to occur during Project construction. A spill prevention and response plan will be prepared and implemented throughout the construction process to ensure that accidental spills are prevented to the best extent practicable, and that mitigation measures are implemented to minimize negative effects in the event of an accidental spill.

An operational spill prevention and response plan will be prepared and implemented during long-term operation of the facility. This will include specific protocols on storage, handling and use of industrial liquids at the facility. In addition, spill containment facilities are anticipated to be included in the powerhouses and at the substation to prevent accidental discharge of industrial liquids to the environment, should a spill occur.

Any waste fluids generated during construction or operations will be retained in an appropriate storage container and transported and disposed off-site at an appropriate disposal facility, in accordance with all regulatory requirements.

Water Management during Construction

It is anticipated that stormwater management and/or sediment control ponds will be required during construction to manage stormwater and/or water seeping into excavations and prevent discharge of sediment laden water back to the Peace River. The locations for these facilities have not been determined, but it is anticipated that they will be required on both sides of the Peace River and will discharge back to the river immediately downstream. Treatment requirements and control measures will be determined during the Project application process.

It is anticipated that the powerhouse will discharge water that may accumulate within the structure, through a sump pump or other similar system. Spill containment measures will be in place to prevent discharge of industrial liquids through this system in the event of an accidental spill occurs inside the powerhouse.

Sewage

Human sewage generated during construction at the camp (if required) and working areas will either be contained and hauled off-site or treated through an appropriately designed sewage treatment or disposal system.

It is anticipated that the powerhouses will have washroom and sink facilities. The method of collection and treatment of sewage from these features has not yet been determined, but it is anticipated that sewage will either be collected and transported off-site, or treated and disposed in an appropriate designed sewage treatment or disposal system.

2.3.3 Waste Disposal

Solid nonhazardous construction waste (e.g. material packaging), generated during the construction process, will be removed from the site to an approved disposal location (likely a municipal landfill) or recycling/composting facility, as available. Waste debris from clearing activities (e.g. grubbing, non-merchantable timber) will be disposed of in accordance with regulatory requirements. Industrial liquids such as paints, sealants, fuels, and lubricating fluids will be stored in a secure containment area and disposed in accordance with applicable regulations.

3. PROJECT LOCATION

3.1 Description of Project Location and Site Plan

3.1.1 Project Coordinates

The proposed Project would be located on the Peace River in northwestern Alberta approximately 28 km southwest from the town of Fairview.

As currently planned, the centroid of the dam headworks is located at 55°58'19.6" North latitude and 118°48'28.8" West longitude. The western extent of the headpond is located at 56°18'05" North latitude and 119°11'45" West longitude.

3.1.2 Site Plan

The Project headworks and an approximately 50 km long headpond constitute the Project area as shown in the site map (Figure I). The right and left banks of the Peace River, upstream of the headworks consist generally of steep valley walls that have been dissected by frequent large gullies and ravines.

Maps showing the relation of the Project to a variety of land uses are shown in Section 3 of the Project Description.

85 - 7 W6 M
85 - 8 W6 M
84 - 6 W6 M
84 - 7 W6 M
83 - 5 W6 M
82 - 4 W6 M
83 - 6 W6 M
82 - 5 W6 M
84 - 8 W6 M
81 - 4 W6 M
50 km from Headworks
119°6'26"W
56°17'9"N
Extent of Anticipated Headpond
119°11'45"W
56°18'5"N
83 - 7 W6 M
82 - 6 W6 M
82 - 7 W6 M
81 - 6 W6 M
81 - 7 W6 M
80 - 5 W6 M
80 - 6 W6 M
TWP 82
RGE 9
RGE 8
RGE 7
RGE 6
RGE 5
Center of Headworks
118°48'28.8"W
55°58'19.6"N
1:10,000
0 1 2 3 4
Kilometers
Map Scale 1:125,000
British Columbia
Alberta
Peace River
Fairview
Proposed
Dam Structure
Grande Prairie
wson Creek
964m
Bear River
Peace River / Rivière de la Paix
Hines Creek
N
Legend
Dam Structure
Anticipated Areal Extent Headpond
Wetland
Waterbodies
Dunvegan West Wildland Provincial Park

AMISK SITE MAP
PROJECT OVERVIEW

Integrated Environments
Planning • Integration • Management

Projection: NAD 83 UTM Zone 11N.
When printed on 8.5" X 11" sheets, scale is 1:125,000

Figure Number	I	IEL Project Number	16049

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Waterbodies and Fishing Areas

There are several watercourses which drain into the Peace River within the Project area: Blueberry, Hamelin, Josephine, Mulligan, and Fourth Creeks (near the headworks) and the Montagneuse River (approximately 38 km upstream from the headworks). A number of unnamed tributaries flow into the Peace River between the headworks and the upstream extent of the headpond. Numerous small waterbodies (wetlands) occur within the Project area. Aboriginal and recreational fishing areas are yet to be determined.

There are three boat launches currently located along the proposed headpond and one downstream of the headworks.

Existing Infrastructure

One railway line runs northeast of the Project area and there are several roads in proximity, with the Dunvegan Bridge crossing the Peace River approximately 15 km downstream of the headworks. No pipelines have been identified crossing the Peace River within the Project Area, although several related to oil and gas activities are in proximity. There is one major electrical transmission line which crosses the Peace River at approximately 51 km upstream of the headworks (just east of Many Islands).

At least 13 groundwater wells are located within 1 km from the midstream of the Peace River between the headworks and the western extent of the headpond. These wells consist of domestic, industrial, municipal, observation and structure test holes uses.

A search made on AEP's Authorization Viewer on August 31, 2015 for municipalities within the Project area identified licensees holding surface water diversion licenses for the Peace River.

Land Use

Duncan's First Nation and Horse Lake First Nation are approximately 60 and 90 km away respectively from the Project. The Peavine (Métis) Settlement is approximately 159 km from the Project area. The location of traditional territory and its proximity to the Project area is still to be determined.

Several small communities are in proximity to the Project area, the largest being the town of Fairview. There are at least three permanent residences on the east side of the Project area at approximately 5.5, 6, and 18 km upstream from the headworks. Seasonal residences are located at Pratt's Landing and Carter Camp at approximately 12 and 38 km upstream from the headworks.

The Project is not located on any federal lands, however the nearest lands belonging to the Department of National Defence are approximately 420 km southeast (Edmonton Garrison) and the nearest National Park is Jasper National Park, located approximately 278 km southwest. Locations of First Nations are described above.

Environmentally Sensitive Areas

The Project is located within the Dunvegan West Wildland Provincial Park on the west bank of the Peace River. This 20,968 ha park was established in 2000 and includes a unique mixture of grassland, aspen forest and steep-sided creek valleys. Several plants and birds located in the park are more typical of those in the Foothills Parkland subregion. The areas of the park are limited to unleased Alberta Crown land resulting in a non-contiguous park boundary (ATPR, 2014).

Key Wildlife and Biodiversity Zones are present throughout the river valley of the Project area. These areas are considered to be a combination of key winter ungulate habitat and higher habitat potential for biodiversity (ESRD, 2010). Protective notations have been established by the Alberta Crown along the Peace River to protect ungulate habitat and winter ranges as well as watercourse protection, recreational natural area potential and fragile slopes.

3.2 Land and Water Use

3.2.1 Zoning Designations

The Peace River forms a portion of the boundary between the Alberta municipal districts of Clear Hills County, Saddle Hills county and MD of Fairview No. 136.

Clear Hills County

Clear Hills County is on the north side of the Peace River. Current zoning in Clear Hills County within the area impacted by the Project is predominantly agricultural district 1 on the left bank of the river, with agricultural district 1 further from the river. Agricultural district 1 focuses on encouraging agricultural use. Agricultural district 2 serves to control larger scale use around urban centres. Rural recreational district zoning and highway development zoning may also impact aspects of the Project. No zoning specifically permits or prohibits the Project; however, components will require changes or relaxations in the existing bylaws to ensure compliance with county requirements. Impacts on environmentally sensitive lands require review by the county (Clear Hills Bylaw, 2015).

Municipal District of Fairview No. 136

The MD of Fairview No. 136 is on the north side of the Peace River, adjacent to Clear Hills County. Current zoning in the MD of Fairview No. 136 contains agricultural zoning for conservation of contiguous agricultural lands and complimentary agricultural industry. Rural recreational district zoning and highway development zoning may also impact aspects of the Project. No zoning specifically permits or prohibits the Project; however, components will require changes or relaxations in the existing bylaws to ensure compliance with county requirements. Impacts on environmentally sensitive lands require review by the MD (MD of Fairview, 2015).

Saddle Hills County

Saddle Hills County is on the south side of the Peace River. Current zoning in Saddle Hills County within the area impacted by the Project contains agricultural zoning and Alberta Crown lands. The agricultural use focuses on compatibility and Alberta Crown land use varies in purpose. The zoning immediately adjacent to the Peace River is Alberta Crown land district. Rural recreational district zoning and highway development zoning may also impact aspects of the Project. No zoning specifically permits or prohibits the Project; however, components will require changes or relaxations in the existing bylaws to ensure compliance with county requirements. Impacts on environmentally sensitive lands are impacted by zoning and require review by the county (Saddle Hills County, 2015). The Dunvegan West Wildland Provincial Park lies within Saddle Hills County. Re-designation of any portion of this park to allow the Project to proceed will be made through Alberta Environment and Parks.

3.2.2 Legal Land Descriptions

The land within the Project local study area (LSA), as represented by all sections within a 1 km buffer on either side of the centre line of the river, contains a mix of private and Alberta Crown for both surface and subsurface ownership. There are no surface or subsurface Federal lands within this area.

The Crown in the right of Alberta (referred to as "Alberta Crown") owns the Peace River, including the beds and shores. The *Public Lands Act* section 3(1) confirms this ownership and the *Surveys Act* section 17 confirms the definition of the boundaries. References to left and right bank indicate the position of the bank in relation to a downstream facing direction.

Surface Description

Surface ownership of the sections of land within the 1 km study area is held by both Alberta Crown and private owners. There is no federal ownership within the LSA.

The planned inundation will exceed the current boundary of Alberta Crown ownership along the shore and impact privately held lands.

Private Surface

Ownership

Based on searches conducted in June 2015, private land within the Project area occurs mostly along the left bank of the Peace River.

Occupants

Information on the individual occupants, residents or lessees with respect to private lands, where they are not the landowner, will be gathered during contact with the landowners and during any land surveying activities.

Alberta Crown Surface

Ownership

Land adjoining the Peace River for the extent of the Project is predominantly owned by the Alberta Crown. The lands immediately adjacent to the proposed headworks are currently part of the Dunvegan West Wildland Provincial Park.

Occupants

Agreements for occupation on Alberta Crown surface encompasses activities for the oil and gas, forestry, recreation and agriculture sectors, as well as trapping and county use. Protective notations are also present to provide ongoing protection with respect to slope stability, erosion prone areas, and ungulate zones.

Subsurface Description

Subsurface or mineral ownership of the land within the Project study area is predominately held by the Alberta Crown. There is no Federal mineral ownership within the LSA.

Private Subsurface

Ownership

Private ownership of minerals within the one km study area accounts for 1% of the total acreage.

Alberta Crown Subsurface

Ownership

Alberta Crown subsurface ownership encompasses 99% of the total acreage within the Project study area.

Lessees

Lessees of the Alberta Crown subsurface are oil and gas industry corporations, or their representatives.

3.3 Relevant Planning Documents used for Consultation Purposes

AHP is currently in the process of determining applicable resource management and conservation plans to the Project.

Land on the west/south side of the river bank required for the headworks and associated access roads are within the Dunvegan West Wildland Provincial Park and construction of the Project is not permitted. Park lands affected by the Project will require rezoning or re-designation to another recreational use. Counties, towns and government authorities have been made aware of these potential impacts to the Park.

3.4 Use of Traditional Lands for Project Development

Early consultation has indicated that Duncan's First Nation and Horse Lake First Nation are the two most likely Aboriginal Groups to have their traditional territory impacted by the Project. AHP is currently working with these Aboriginal Groups to determine the extent of their traditional use on the Peace River. Meetings, open houses, boat and helicopter tours with elders and knowledge keepers have been conducted with both Aboriginal Groups to further understand impacts to traditional use. The involvement of Aboriginal Group members in AHP environmental studies has been proposed to both Aboriginal Groups.

AHP will continue to work with these Aboriginal Groups to understand traditional use in the area and the potential impacts to traditional use.

AHP will work with all Aboriginal groups to address concerns the Project will impact their traditional territory and traditional use of that territory.

4. FEDERAL INVOLVEMENT

4.1 Federal Financial Support

The Project will be privately financed. There is no proposed nor anticipated federal financial support from federal authorities.

4.2 Use of Federal Lands for Project

The Project will be located entirely on Alberta provincial Crown land or privately held land. There are no federal land holdings or interests involved.

4.3 Federal Regulatory Requirements

The Project requires an environmental assessment under the terms of the *Canadian Environmental Assessment Act, 2012*.

The Project activities will require compliance with additional federal regulations. These will be fully assessed as part of the Project Application. If the Project changes, further compliance or additional applications may be necessary. The impact on regulatory requirements will be assessed with these changes in Project components.

Specific federal regulatory requirements are described in Section 4 of the Project Description.

5. ENVIRONMENTAL EFFECTS

This section discusses baseline environmental conditions and how these may be affected by the Project.

5.1 Air, Noise and Climate

5.1.1 Air Quality

Air quality in the vicinity of the Project can be classified as "good," with little to no industrial presence. Data from nearby monitoring stations, maintained by the Peace Airshed Zone Association (PAZA), will be used to assess air quality and the following contaminants of concern: sulphur dioxide (SO_2), hydrogen sulphide (H_2S), oxides of nitrogen (NO_X), carbon monoxide (CO), ozone (O_3), fine particulate matter ($PM_{2.5}$), and various hydrocarbons. There are no other airshed zones located north of PAZA, nor any closer to the Project from which to acquire ambient data. Two stations, Beaverlodge and Smoky Heights, are the most representative due to their more rural surroundings and their proximity to the Project.

5.1.2 Noise

The environmental noise setting in the vicinity of the Project can be classified as "rural" in the context of AUC's Rule 012 – Noise Control. The acoustic environment is currently characterized by sounds due to natural sources (wildlife, wind and the river) as well as occasional boat and vehicle traffic. There is no significant industrial activity in the area that impacts the ambient noise levels near the Project.

5.1.3 Climate

The climate setting in the Project area can be summarized as "humid continental" and borderline "sub-arctic." It is characterized by a long and cold winter season, followed by a relatively short-lived but warm and moist summer. Days where the temperature exceeds 30^{o}C are rare and the summer months (June to August) are typically those with the most precipitation (Environment Canada, 2015).

5.1.4 Potential Project Effects on Air Quality, Noise and Climate

The Project could impact air quality due to emissions from trucks and heavy equipment during construction.

Operational air quality emissions will be negligible due to the nature of hydroelectric power generation, and may be impacted due to increases in localized traffic.

The Project could contribute to elevated noise levels primarily from construction activities and increases in vehicle traffic. The operational noise levels from the Project will be minimal, as all electrical generating equipment will be located within the headworks.

The Project's effects on climate will be via the emissions of greenhouse gases, expressed as equivalent tonnes of carbon dioxide (CO_2e) from construction equipment and vehicles. Other Project contributions to climate change include methane emissions from decaying organic material in the headpond.

5.2 Geology, Terrain and Soils

5.2.1 Geology

Unconsolidated surficial geological deposits over the upper bedrock range from 0 — 15 m in thickness within the region (Pawlowicz and Fenton, 1995). Surficial geology of the Project consists of fine to coarse textured fluvial deposits (river deposited sediments) and colluvial deposits (sediments from gravity induced movements), as well as shallow bedrock outcrops (Fenton et al., 2013).

Upper bedrock materials of the region have been identified to consist of the Upper Cretaceous Shaftesbury Formation (exposed at the base of the Peace River valley) and the Dunvegan Formation (exposed along the slopes of the Peace River valley) (Alberta Geological Survey, 2015). The Upper Shaftesbury Formation is characterized as marine off-shore dark grey, blocky-weathering mudstone with concretionary sideritic nodules that are silty in the upper part, while the basal Fish Scales Zone consists of fissile fish scale-bearing shale with thin interbeds of siltstone and very fine grained sandstone, generally including sand-grade fish-debris bone beds and bentonite. The Dunvegan Formation consists of marginal marine (deltaic) to locally non-marine, light to yellow-grey sandstone interbedded with laminated siltstone and dark grey shale (Alberta Geological Survey, 2015). These marine bedrock formations are documented to have elevated sodicity characteristics, particularly with magnesium sulphate, which contributes to the presence of naturally-occurring saline soils in the region (Alberta Agriculture and Forestry, 2012).

5.2.2 Terrain

The Project is located at the base of the deeply incised Peace River valley within the Northern Alberta Lowlands (Pettapiece, 1987). The Peace River channel along the Project is comprised of a low-gradient (1% slope) surrounded by extreme steep slopes (> 45 – 70%) with an approximately 250 m elevation change (Government of Canada, 2015).

5.2.3 Soils

The Project is located within Soil Correlation Area 18 coinciding within the Dry Mixedwood Natural Subregion of the Boreal Natural Region (Pedocan Land Evaluation Ltd., 1993). Soils consist of a mix of Orthic Regosols and Orthic Humic Gleysols. Orthic Regosols are poorly developed soils with a thin A (topsoil) horizon (less than 10 cm thick) and B (subsoil) horizon (less than 5 cm thick). Orthic Regosols are identified in areas of poor slope stability and high erosion risks. Orthic Humic Gleysols are water saturated soils with thick A and B horizons present (greater than 10 cm thick) (Soil Classification Working Group, 1998). Orthic Humic Gleysols are located in low elevations, where water can accumulate in soils for prolonged periods (Alberta Agriculture and Forestry, 2015). The occurrence of extreme slopes contribute to exacerbation of severe water erosion risks potentially associated with development of the Project (Tajek and Coote, 1993). Wind erosion risks have been identified as negligible as a result of the fine-textured soil characteristics found within the Project area (Coote and Pettapiece, 1989).

Land Suitability Rating System for Spring Seeded Small Grains (Pettapiece, 1995) uses soil, landscape, and climatic information to determine the capability of land for agricultural production. The Project area are predominantly Class 5 lands — having very severe limitations for sustained small grain production within slopes of the Peace River. Annual cultivation on Class 5 lands using common cropping practices

are not recommended. Class 5 lands at the Project are limited by steep slopes, lack of water holding capacity or excess water (Pettapiece, 1995). Most agricultural activities occur on flat lands and productive soils outside of the Peace River valley.

5.2.4 Potential Project Effects on Geology, Terrain and Soils

Construction and operation of the Project infrastructure and facilities could contribute to increased soil erosion risks and slope instability. Slope instability and water erosion could also increase by changes to the groundwater regime and wave action from the development of the headpond.

The construction of Project infrastructure and development of the headpond could contribute towards to the loss or inundation of soil resources.

Project construction and operation activities could contribute towards soil contamination from spills associated with Project equipment and facilities. Potential environmental effects with soil contamination could also occur with the weathering of naturally saline parent materials and bedrock spoil stockpiles on undisturbed soils.

Soil reclamation suitability could decline from vehicle and equipment rutting, soil compaction, and topsoil-subsoil admixing from Project infrastructure construction and operations. Improper soil conservation methods during construction activities for future use could impact the Project's reclamation suitability.

5.3 Vegetation

The Project occurs primarily in the Dry Mixedwood Natural Subregion that contains extensive tracts of native mixedwood aspen upland forest, cultivated lands, and wetlands occurring in low areas (NRC, 2006).

Key vegetation resource features include forested native lands, wetlands, riparian areas, rare plant communities, sensitive plant communities (e.g., exposed slopes), and rare plant species. Within the Project Area, the driest sites occur along the bare, steep south and west facing upper slopes of the Peace River and include species such as Porcupine grass, June grass, sedges, and sagewort.

Tall tree stands, mixed with thick shrub understories, occur at the top of the Peace River valley and along river and tributary terraces. Lower shrub patches are restricted to ravines or riparian areas. Wetlands occur along the banks of the Peace River and in low moist areas covered by trees such as trembling aspen, white spruce, and pine species.

The Project Area traverses the Dunvegan West Wildland Provincial Park located on the west side of the Peace River. The park serves as a wildlife corridor and has the potential to contain rare plants and rare plant communities.

5.3.1 Potential Project Effects on Vegetation and Wetlands

The main Project impact will be the loss of vegetation communities under the headpond and also at the location of the headworks. A permanent loss of 800 ha of vegetation communities will occur within the flooded extent of the headpond. The extent of this loss will be determined by vegetation community mapping and ecotype classification.

In addition to the loss of vegetation communities, there could be potential loss of rare plants or sensitive vegetation communities.

A number of wetlands have been identified within the Project area. The loss of or alteration to wetlands will be assessed within the extent of the headpond and considered in relation to the 2013 Alberta Wetland Policy implementation process released in 2015.

Finally, there will be impacts related to the loss of bottom land riverine forest and resultant methane emissions due to decay of organic material in the headpond.

5.4 Water

5.4.1 Ice Processes

Ice forms in the Peace River each winter as the water temperature cools to the freezing point. Frazil [6] particles form and rise to the surface forming frazil pans which are carried downstream by the flow, with the surface concentration of the pans increasing downstream along the river. This process continues until the concentration of frazil pans is high enough that the pans jam and a stationary ice cover is formed. The ice cover then builds upstream as more frazil pans accumulate at the ice front. Freeze-up typically is initiated in the vicinity of Fort Vermilion and the ice front progresses upstream over the winter reaching its maximum upstream position somewhere between the towns of Peace River and Taylor. Towards the end of the winter, the water in the upstream open water reach warms up, begins to melt the ice and as a result the ice front recedes downstream.

The operation of the G.M. Shrum (located at the W.A.C. Bennett Dam) and Peace Canyon generating stations in BC cause winter flows in the Peace River to be warmer and greater than they would be under natural conditions. These higher flows cause higher freeze-up levels to occur in the reach near the Town of Peace River and fluctuating flows have increased the risk of an ice jam. The effect of these higher freeze-up levels is most serious at the Town of Peace River. A Joint Task Force consisting of Alberta Environment, BC Ministry of Environment and BC Hydro has been set up to manage the operation of the Peace River through the winter months to reduce flood associated risk.

The proposed Site C Project upstream of Taylor will further alter the existing ice regime by changing the water temperatures in the river and by blocking ice from drifting downstream. Both these factors are expected to delay freeze-up and reduce the upstream extent of the ice cover.

The magnitude and timing of the Project effects on ice processes will be modelled and ice formation, freeze-up progression and breakup will be evaluated between Hudson Hope and Fort Vermilion to assess potential changes to ice conditions.

Potential Project Effects on Ice Processes

The presence of the Project will affect ice cover both upstream and downstream by blocking ice movement. The Project headworks will trap ice that has formed in the river upstream and initiate an ice cover in the headpond. The ice cover will progress upstream earlier and farther than it would without the Project. This process will tend to counteract the effects of Site C. The Project is expected to cause ice cover to progress farther upstream than it would with just Site C in operation.

[6] Frazil ice is soft or slush like ice formed by the accumulation of ice crystals in water that is too turbulent to freeze solid.

Analysis of ice effects of the Site C Project presented by BC Hydro indicated that the now cancelled Dunvegan Project would have had an effect on upstream ice cover formation in BC. This analysis indicated that the Site C project by itself would delay the upstream progression of the ice front so that the probability of an ice cover forming in BC was reduced from about 22% to 10%. The Dunvegan Project would have increased this probability to about 15%. The proposed Project is expected to have a similar effect.

Downstream of the Project, the advance of the ice cover upstream will be delayed because of the reduction in ice supply due to the trapping of ice in the headpond. The timing of freeze-up in the lower reaches of the river is not expected to be affected because all the ice that contributes to the development of the ice cover during this period forms downstream of the dam. However, it is expected that ice cover formation at the Town of Peace River will be delayed somewhat due to the reduction in ice supply. The length of time that the Shaftesbury ice bridge is in operation may also be reduced. A reach of open water will exist downstream of the dam throughout the winter, and this zone will continue to produce frazil ice. However, these frazil ice particles are expected to be swept under the ice cover and be transported downstream.

The Project is not expected to have any effect on ice jam water levels in the Peace-Athabasca Delta (PAD). These ice jam-related water levels are thought to be affected by breakup flow rates and freeze-up water levels. The Project is not expected to have an effect on breakup flow rates or freeze-up levels. Most of the flow increases during breakup on the Peace River are supplied by the Smoky River, which enters the Peace River downstream of the Project. As well, the Project would operate as run-of-the-river with potentially limited active storage, so it will have virtually have no effect on flows originating from upstream of the Project. When freeze-up is occurring in the PAD, ice does not form in the Peace River until well downstream of the Project location. Therefore, the Project is not expected to affect the ice supply during freeze-up, and should have no effect on the timing and severity of freeze-up, and therefore it will have no effect on freeze-up water levels in the PAD.

5.4.2 Surface Water Flows

The Peace River originates in the Rocky Mountains of northeastern BC and flows eastward into Alberta before flowing in a north-easterly direction into the PAD. Flows from the Rivière des Rochers and other delta channels combine with the Peace River to form the Slave River which flows northward into Great Slave Lake in the Northwest Territories. The Mackenzie River then flows out of Great Slave Lake northward to the Beaufort Sea.

Presently there are two dams on the Peace River, the W.A.C. Bennett Dam and the Peace Canyon Dam, both located in BC. A third dam, the Site C Project, is proposed to be constructed downstream of the Peace Canyon Dam near Taylor, BC. The operation of the G.M. Shrum generating facility at the W.A.C. Bennett Dam reduces summer flows and increases winter flows relative to the unregulated condition. The operation of Peace Canyon and Site C do not have an effect on seasonal flow rates but do produce short term flow fluctuations.

Peace River flows are monitored by the Water Survey of Canada (WSC) at eight active stations between the W.A.C. Bennett Dam and the PAD. The drainage area at the hydrometric stations increases from 73,100 km^2 at Hudson Hope, just downstream of the Peace Canyon, to 293,000 km^2 at Peace Point. Once Site C is operational, 36% of the contributing area at the Dunvegan WSC gauge just downstream of the

Project will originate from unregulated tributaries downstream of Site C. At the Town of Peace River, 55% of the upstream basin is unregulated, with most of the additional drainage area being provided by the Smoky River, which enters the Peace River just upstream of the Town of Peace River.

Open water flows and water levels will be modelled and flows will be simulated from Hudson Hope to Peace Point to evaluate potential changes in flows rates and water levels during headpond filling and facility operations.

Potential Project Effects on Surface Water Flows

The operation of the proposed Project will not significantly affect flow rates in the Peace River. The Project is expected to operate as a run-of-river plant with a total headpond volume of about 124,000,000 m^3. The average open water flow rate in the Peace River at Dunvegan is about 1,600 m^3/s so the average retention time of the headpond would be less than one day.

The rate of initial filling is not known at present but it is anticipated that the headpond will be filled slowly to limit the impacts on downstream water levels and to minimize changes in water pressure at the dam. Assuming that the headpond is filled over a two week period, about 100 m^3/s (6% of the mean flow) would be extracted from the daily flow entering the headpond. This flow reduction is not expected to have a significant effect downstream because it is a one-time occurrence. At Peace Point it would only reduce water levels in the Peace River by 8 to 10 cm over the two week filling period. If the headpond is filled during high flows, it could be filled more rapidly without affecting downstream water levels significantly. Therefore, filling of the headpond is not expected to affect peak water levels during peak flow events in the PAD.

The full supply level of the headpond is proposed to be 362.5 m which represents a rise of about 17 m in water level, relative to existing water levels at average flows. The headpond is expected to increase water levels, relative to existing conditions, for a distance of approximately 50 km upstream of the dam. Additionally, there will be a backwater transition zone approximately 10 km long between the flat headpond and the uniform flow of the river. The exact termination of this transition zone is still under review.

5.4.3 Sedimentation and Morphology

The Peace River drains 293,000 km^2 of northeast BC and Alberta. Its headwaters lie in the northern Rocky and Omineca Mountains. Over most of its course the Peace River is entrenched into the Alberta Plateau within the Peace River Lowlands, a physiographic region that extends east of the Rockies and along both sides of the Peace River to about 80 km downstream of Fort Vermillion.

The Peace River Lowlands are characterized by steep valley walls and tributaries that deliver abundant sediments to the river. Pleistocene sediments are found along the valley including outwash gravels and glacio-marine, glacio-lacustrine, and post-glacial lacustrine silt and clay. A consequence of this is a general downstream increase in the sediment yield along the river (Church, 2015). Episodic events have a potential to rapidly deliver significant volumes of sediment to the channel either from the river valley walls or from tributaries.

Historically, the Peace River Lowlands are considered to be one of the most active regions of mass movement in western Canada (Morgan et al., 2012). Over the past 25 years, several Peace River

tributaries have experienced landslide events that, by volume, rank as some of the largest in Alberta: Hines Creek, Spirit River, Eureka River, Vessall Creek, and Saddle (Burnt) River (Miller, 2000). When the Saddle River event was triggered by a large flood event in June 1990, it resulted in lateral and vertical erosion of the river, formation of a temporary dam and mobilization of an estimated 40,000,000 m^3 of material (Cruden et al, 1993). The 1973 Attachie Slide at the Halfway River confluence in BC blocked the river for 12 hours and Cruden et al. (1990) reported more than 60% of the valley walls have failed in Alberta downstream to Fort Vermilion.

Channel Morphology

Near the BC-Alberta border, the Peace River is entrenched by more than 200 m into the surrounding plateau which partially or totally confines the river. This reach has an irregularly sinuous pattern with minor meander development in places. It is predominantly single threaded with an irregular spacing of islands and bars. The river bed consists of cobble and gravel downstream to the Smoky River confluence where it changes to sandy gravel. Downstream of the Smoky River, the Peace River has formed a series of sinuous meanders that are partly controlled by bedrock in the valley walls. The river changes to a sand bed river further downstream near Carcajou.

The hydrology, hydraulics, and morphology of the Peace River have been affected by construction of W.A.C. Bennett Dam in 1967. These effects have been monitored and assessed over the last 30 years by a number of scientific and technical authorities and researchers, particularly BC Hydro (Kellerhals and Gill, 1973) and Michael Church of the University of British Columbia (Church, 1995; Church, 2014). Contribution of sediment upstream of W.A.C. Bennett Dam is relatively minor in comparison to downstream areas; therefore, the downstream effects of W.A.C. Bennett Dam on sediment loads has been minor. The main effects of W.A.C. Bennett Dam have been caused by flow regulation, which has modified the temporal pattern of the flows and substantially reduced the peak discharges. The reduction in peak flows has reduced the sediment transport capacity of the river downstream of W.A.C. Bennett Dam, triggering morphological changes.

Changes to the river's morphology have been described as mainly passive in nature, due to the reduced competence of the river to transport and erode sediment. As a result, sediment inputs from tributaries tend to build out or aggrade into the main channel which has led to the river developing a more stepped profile than existed prior to regulation. The effect is most evident in the BC portion of the river and generally decreases with distance downstream. The Smoky River, which is the largest tributary of the Peace River and joins at the Town of Peace River, has extended into the Peace River by up to 200 m causing bar accretion around islands downstream of the confluence and causing backwatering of the Peace River (Church, 2014).

Tributaries on the BC portion of the river downstream of W.A.C. Bennett Dam have experienced degradation due to reduced water levels in the mainstem following regulation. However, tributaries downstream of the BC-Alberta border showed no consistent pattern of degradation or aggradation.

Because the regulated flows lack the capacity to move bed material along much of the river, the active channel has started to shrink along most of its length. At Many Islands and the Montagneuse River confluence, this has resulted in abandonment of secondary channels. Post regulation vegetation encroachment on formerly active bar surfaces and floodplain has been documented, most noticeably along the BC portion of the river but also in Alberta.

Predictions by Church (2014) suggest that the effects of W.A.C. will continue to alter the physical characteristics of the river and that channel width reductions by between 50% and 30% could occur along much of the river. The time scale for these adjustments to be completed is expected to span the remainder of this century or possibly longer. Therefore, the Peace River is continuing to adjust to flow regulation effects from the W.A.C. Bennett Dam that were initiated over 40 years ago.

Potential Project Effects on Sedimentation

Construction of the Project will alter the balance between the flow of water and sediment on the Peace River, both upstream and downstream of the dam. The effects on the Peace River include changes to the channel cross section, gradient, planform, and texture of the riverbed sediment. These changes will be superimposed on other ongoing long-term channel adjustments that are occurring as a result of flow regulation from W.A.C Bennett Dam as well as from other planned operations from the proposed Site C dam. Previous studies indicate that the Site C dam in BC will have a minor effect on sediment loads in Alberta (Knight Piésold, 2012).

Upstream Effects

Immediately after construction, the headpond will extend approximately 50 km upstream of the dam with the water depth in the headpond ranging from about 9 — 23 m. During average flow conditions, the current through the headpond will be relatively slow moving but will still act more like a river than a lake. The headpond will trap 100% of the incoming gravel bed load and a high percentage of the suspended sand load. Most of the incoming fine sediment (clay and silt) will be flushed through the headpond and will be discharged downstream.

A sandy delta will form near the upstream end of the headpond and will prograde downstream towards the dam over time. As sediment deposition continues, it will reduce the headpond depth and increase flow velocities, producing a backwater effect that will extend the headpond further upstream.

Downstream Effects

Sedimentation in the headpond will reduce the downstream sediment load on the Peace River, particularly the suspended sand load and gravel bed load. Preliminary sediment transport modelling indicates that after the Project is completed, the annual suspended sediment load downstream of the dam will be reduced by more than half immediately after construction. As the headpond fills, the trap efficiency will reduce, allowing more sediment to be discharged downstream.

At present, the Peace River near the dam site is estimated to transport somewhere approximately between 12 — 15.6 million tonnes of suspended sediment. The Smoky River adds in the order of 17 – 21 million tonnes/year at its confluence, more than doubling the load of the Peace River downstream of the Smoky River.

It is expected that the effect of the Project will be attenuated downstream of the confluence of the Smoky River though the effects of the reduction in sediment load that will occur to Peace Point. The distance and degree that downstream effects will occur is a function of the channel and bank composition, and tributary contribution of flow and sediment.

5.4.4 Water and Sediment Quality

Water quality data is currently being collected from the Peace River and selected tributaries. Sampling of the Peace River was initiated in 2014 and will continue in 2015. Samples are being collected from the Montagneuse River in 2015, which is a named tributary to the Peace River within the Project area. Sample locations include upstream, headpond and downstream sites in the Peace River and the lower section of the Montagneuse River. Sample frequency is intended to capture seasonal variation in water quality. Measured parameters include water temperature, turbidity and total suspended solids, nutrients, metals (including methylmercury), carbon and polycyclic aromatic hydrocarbons.

Sediment quality data is currently being collected from the Peace River. Sampling of the Peace River was initiated in 2014 and will continue in 2015. Sample locations in the Project area include upstream of the headpond, upper, middle, lower sections of the headpond and downstream of the headpond. One set of samples are being collected each year. Measured parameters include particle size, nutrients, metals (including total and methylmercury), and organic carbon.

The water and sediment quality data collected by the baseline studies program will be augmented by data being collected by other Project disciplines, historical data available from government files, as well as information presented in support of environmental assessment applications for the Dunvegan and Site C projects.

Preliminary findings indicate that the Peace River is a cool water system that can exhibit high total suspended solids concentrations and levels of measured contaminants in both water and sediment are generally low. These characteristics likely influence fish distribution, fish species diversity and fish use of habitats.

Peace River water temperatures vary seasonally, but there is a minor difference in water temperature between upstream and downstream locations. Peace River water temperatures are cooler than tributary water temperatures during the summer months. Total suspended solids in the Peace River vary seasonally and can exceed values of 4,000 mg/L. Total suspended solids concentrations are highest from May to July, which corresponds to the period of increased tributary discharge and then decline during late summer, fall, and winter months.

Preliminary water quality results indicated that concentrations of some total metals (e.g., aluminum) recorded in the Peace River are related to the concentration of total suspended solids. Some total metal concentrations exceeded provincial and federal water quality guidelines for the protection of aquatic life. In contrast, concentrations of dissolved metals tended to be near or below detection limits. Preliminary results from sediment quality data indicate that total metal concentrations recorded in the Peace River sediment are low and do not exceed existing federal sediment quality guidelines for the protection of aquatic life.

Potential Project Effects on Water and Sediment Quality

Little changes in water temperature are expected to result from construction of the Project. While the Site C Dam may slightly raise water temperatures downstream, the Amisk project is not expected to affect water temperature due to low residence times.

Changes to water quality in the Project headpond could be impacted by increased erosion from the valley walls, from construction activities and from wave action on the new shoreline once the new headpond has formed. Spills during construction could also impact water quality.

Sediment will accumulate in the headpond, with coarse gravels and sand being trapped while fine sediments will be flushed downstream.

Flooding of organic soils in the headpond and the degradation of vegetative material could increase the concentration of organic or methylmercury concentration in the water column and bio-accumulate in fish.

5.4.5 Wildlife

The Project is located in the Peace River Valley which supports a wide and diverse range of wildlife and their associated habitats, representative of the Dry Mixedwood subregion (Boreal Forest Natural Region). Elements of the Peace River Parkland subregion (Parkland Natural Region) may also be present. The Peace River Valley provides seasonal and/or year round habitat for approximately 44 species of mammals, 166 species of birds, and seven species of reptiles and amphibians (Tera, 2000), (Federation of Alberta Naturalists, 2007). It is an important natural wildlife movement corridor offering a protective sanctuary from the highly human altered landscape that lies beyond the valley breaks.

Portions of the Project area also are contained within the Dunvegan West Wildland Provincial Park that covers 20,968 ha and is fragmented into 11 different sections to the west and southwest of the Peace River (Hermanutz and Stavne, 2009). A range of land uses occur outside of the valley, including oil and gas, agriculture, several traplines, and sand/gravel extraction. Recreational activities occur within the valley including canoeing, jet boating, fishing, hunting, camping, hiking, snowmobiling, and off road vehicle use. A spring bear hunt and fall hunt for moose, elk, and white-tailed and mule deer occurs both within the Park and elsewhere in the valley.

Wildlife baseline surveys will build on existing data sets prepared for the Glacier Power Environmental Impact Assessment (Jacques Whitford Limited, 2006) and the recent Site C Application (BC Hydro, 2013). Discussions about the scope of wildlife surveys have been held with Alberta Environment and Parks, previously Alberta Environment and Sustainable Resource Development, involving wildlife biologists in Grande Prairie and Peace River.

Potential Project Effects on Wildlife

The primary impact of the Project on wildlife will be direct and indirect habitat loss associated with flooding of the Project area. Due to the steep sided nature of the Peace River valley, this impact will be permanent over the 50 km extent of the headpond; approximately 800 ha of habitat will be lost.

Direct habitat loss and disturbance to wildlife may occur in the immediate area of the Project headworks, access roads, transmission lines, and associated camps and laydown areas.

Flooding may also impact calving habitat on river islands. Wildlife movements across the river during the winter months may be affected due to changes in ice conditions and the timing of ice formation.

The Project may also have the potential to increase wildlife vulnerability and resultant mortality due to predation, increased hunting and accidents (e.g. vehicle collisions, avian collisions with transmission

lines, drowning during headpond filling or operation etc.). Human disturbance during the construction phase may also lead to a temporary displacement of wildlife.

Baseline studies will allow for a further understanding of these Projects effects on animal distribution and movements, habitat use, reproduction, survival, and mortality. Wildlife mitigation, monitoring, and management measures will be developed as part of the Project Application.

5.4.6 Aquatic Resources

Components of the Aquatic Resources baseline studies program include fish and fish habitat studies, benthic productivity studies, and characterization of methylmercury in the aquatic environment. The information generated from the benthic productivity and methylmercury studies will be used to support the environmental assessment of fish and fish habitat.

Data collected by the current baseline studies program will be augmented by historical data, as well as information presented in support of environmental assessment applications for the Dunvegan and Site C projects.

Benthic Productivity

Benthic productivity is a key component of large river ecosystems. Productivity and diversity of benthic communities are indicative of aquatic ecosystem health and benthic communities are an important food source for fish. The benthic productivity program will collect data from the Peace River at locations within upstream, headpond and downstream sections of the Project area. The program will use protocols developed specifically for large rivers such as the Peace River (Schleppe et al., 2013). Artificial substrates will be deployed during the open water period from July to September. Sampling will include collection of time series data from the artificial substrates to ascertain peak biomass production. In addition, natural substrate sampling will augment artificial substrate sampling to provide insights into how established communities compare to more recent communities that establish on artificial substrates. Parameters to be measured will include abundance, diversity, and biomass of periphyton and benthic invertebrates.

From past studies of benthic communities in the Peace River in Alberta, the abundance, diversity and productivity of the benthic algae and benthic invertebrate community in the Project area is a function of habitat characteristics that define the area (i.e., water velocity, suspended sediment load and substrate particle size). The Project area contains two general types of benthic algae and invertebrate communities: hard substrate communities associated with swift water and large particle sizes and soft-substrate communities associated with slower water velocity and small particle sizes. Due to the high water velocities in the main channel, this part of the aquatic habitat likely supports hard-substrate communities, whereas the soft-substrate communities are likely to be restricted to habitats in low velocity areas found in near-shore areas.

The benthic algae and invertebrate communities in the Project area are currently influenced by several factors that limit their productivity capacity. Some important factors include the operational regime of the W.A.C. Bennett Dam that causes dewatering on a seasonal and daily basis, and high sediment loads that lead to reduced light penetration, scour and sediment deposition.

Methylmercury

Flooding of organic soils to create new reservoirs can increase the concentration of organic or methylmercury concentration in the environment, and bio-accumulate in fish. The magnitude and duration of increase in methylmercury in fish is highly dependent on site-specific conditions, with potential risks to wildlife and to humans changing over time, depending on fish mercury concentrations. The methylmercury program is designed to collect data needed to address the potential issue of mercury accumulation in aquatic biota related to the Project. This strategy is intended to build an information base to support the environmental assessment of fish and fish habitat and to allow informed decisions and predictions around impacts to human health.

Data collection was initiated in 2014, which focused on water and river sediment. Data collections in 2015 are expanded to include (in addition to water), soil, benthic invertebrates and fish. Sample locations in the Project area include upstream, headpond and downstream sites in the Peace River.

Initial findings shows that total mercury concentration in 2014 water samples is influenced by total suspended solids. Total mercury was highest in May (22 - 27 ng/L) during the period of elevated total suspended solids, but with low dissolved mercury (3 - 12 ng/L). During periods of low total suspended solids, total mercury concentration was lower (4 - 5 ng/L). Methylmercury was only detectable during May (0.15 ng/L), at less than 1% of the total mercury concentration. Total mercury concentration in sediment also was low and ranged from 0.049 mg/kg dry weight to 0.065 mg/kg dry weight. Sediment methylmercury concentrations ranged from 0.0003 - 0.0013 mg/kg dry weight. These values were very low and comprised only 0.6% - 2.4% of total mercury concentrations.

Fish

Fish studies are being undertaken to develop an understanding of baseline conditions of the Peace River fish community and species population life histories and habitat uses. Data collected by the Project will be used to augment the comprehensive information base used to support the environmental assessment and post-approval monitoring of Site C and the Dunvegan Hydroelectric Project.

The goal of the Project fish studies program is to address potential data gaps and to update the existing information base. The current program includes collection of fish data from the Project area with a focus on locations not previously investigated (i.e., the upper section of the headpond and Montagneuse River). Sample locations in the Project area include upstream, headpond and downstream sites in the Peace River, and the lower section of the Montagneuse River. Sample frequency is intended to capture seasonal variation and includes spring, summer and fall. Parameters being measured include species diversity, species abundance, life history characteristics, and habitat use.

Initial findings show that the Peace River is a transition zone between a cold clear water fish community located primarily upstream and a cool turbid fish community that dominates within the Project area. The community is composed of sportfish, suckers, minnows and sculpins. Of the 27 fish species recorded in the Project area, none are listed as endangered, threatened or of special concern under Schedule 1, or are being considered for official listing under Schedule 2 or 3, of the federal *Species at Risk Act (2014)*.

Four fish species that are infrequently encountered in the Project area are designated as sensitive by the Alberta government. These are Arctic Grayling, Bull Trout, Largescale Sucker and Northern Pikeminnow.

One species infrequently encountered in the Project area is designated as May be at Risk, the Spoonhead Sculpin.

The large-sized component (>200 mm length) of the fish community in the Project area is numerically dominated by sucker species, with the Longnose Sucker being the most numerous in this group. Sportfish are typically less numerous. Walleye, Burbot, Goldeye, Northern Pike, and Mountain Whitefish are the numerically dominant species in this group. The small-sized component (≤ 200 mm length) of the fish community consists primarily of fish in the minnow or sucker groups. Lake Chub and Longnose Sucker are the numerically dominant species. Small-sized sportfish are typically encountered in very low numbers. They can include Walleye, Burbot, Northern Pike, and Mountain Whitefish. During sampling of Peace River tributaries, including the Montagneuse River, only suckers and minnows were recorded. Low numbers of sculpins are recorded in the Project area, with Slimy Sculpin being the most frequently encountered.

Species Population Structure

The majority of sportfish in the Project area are adults. The only exceptions are Mountain Whitefish (juveniles, adults and few young-of-the-year fish) and bull trout (primarily subadults). In contrast to sportfish, all life stages of non-sportfish species are well represented. The majority of fish species in the Project area spawn in spring or early summer and have short egg incubation periods. Burbot is the only species that spawns during winter (January or February), but the egg incubation period is also brief. Only two species recorded in the Project area are fall spawners with an extended egg incubation period – Bull Trout and Mountain Whitefish. It is suspected that this life history strategy is not appropriate for the Project area due to unfavourable sediment loads and ice conditions in the Peace River and the lack of water in tributaries, which are factors that minimize the probability of reproductive success.

Fish Movements

There is a substantial amount of information collected from the Project area that describes movements of several fish species. The information presented in this section is based on seasonal catch rates, tag returns, radio-telemetry data, and information from other studies.

Goldeye that occur in the Project area are part of a migratory population that overwinter in the Peace River downstream of the Smoky River confluence. A portion of the population moves upstream into and through the Project area to spawn and/or feed. Some Goldeye remain downstream of the Project area during their annual migration cycle. Other species populations in the Project area are non-migratory. Radio telemetry data for Burbot, Walleye and Longnose Sucker indicate that most fish undertake only local movements within a discrete section of the Peace River between the confluence of the Smoky River and the Many Islands area. Seasonal movement patterns were documented, but distances traveled were generally short (<20 km). Movement data for Walleye, Burbot, and Longnose Suckers indicate that at least a portion of each population spawns outside of the Project area.

For most fish species expected to occur in the Project area, upstream movements likely commence in April and end in October. Downstream movements likely occur from August to November. During the months of December to March, fish tend to be stationary.

Fish Habitat

Peace River fish habitats within the Project area are generally uniform and are dominated by instream Run mesohabitat. River bank mesohabitats provide limited amounts of cover for fish and unique instream mesohabitats are restricted in distribution. Backwaters that provide protected, low velocity areas for fish, although present, are not abundant. Shoal and riffle/rapid habitats that could potentially be used for spawning and rearing habitats are primarily restricted to the Montagneuse River area and the Many Islands area, which are localized areas of increased habitat complexity.

Peace River fish habitats are strongly affected by daily fluctuations in water elevation and are frequently damaged by the unconsolidated ice sheet that forms each year. These impacts are caused by the regulated flow regime associated with operation of the W.A.C. Bennett Dam.

Tributaries to the Peace River in the Project area are characterized by variable flows. Flows are highest during spring freshet or following major rain events. In summer and fall, fish habitat is frequently limited to isolated pools with no surface connection to the Peace River. Channel characteristics of the tributaries in the Project area indicate that they are subject to significant flow events and extensive bedload movement. Due to low or negligible flows, an absence of deep-water habitat capable of supporting overwintering fish, and the prevalence of fine substrates, tributaries in the Project area provide poor habitat for most fish species. They have very limited value to sportfish populations originating from in the Peace River; however, they provide seasonal habitats for minnow and sucker species.

The majority of habitats required by fish species in the Project area exhibit widespread distributions.

Potential Project Effects on Fish and Fish Habitat

The development of the Project would potentially affect fish populations and fish habitats in the Peace River and its tributaries. Changes would be associated with both construction and operational phases of the facility. Project effects would occur within the spatial footprint of the Project and would extend some distance downstream.

Impoundment of the river by the dam and operation of the facility may cause physical changes to fish habitat, and may alter temperature, sediment transport, nutrients and ice. Operation of the facility would result in entrainment of fish from the headpond over the spillway or through the turbines, which would result in loss of fish from upstream populations and could cause mortality of fish during passage. Spills of water over the spillway and water flow through the turbines may result in elevated levels of total dissolved gas, which could be detrimental to fish. Finally, the presence of the dam is a physical obstruction that would hinder upstream and downstream movements of fish.

These Project effects individually, or in combination, have the potential to destroy or alter fish habitat, alter aquatic productivity and kill fish. The outcome of these effects, without mitigation, would result in harm to fish by causing a shift in species composition, abundance and distribution.

5.5 Changes to Fish, Fish Habitat and Wildlife under Federal Responsibility

The following section describes potential effects of the Project on fish, fish habitat and wildlife under federal responsibility.

5.5.1 Fish and Fish Habitat

As identified above in Section 5.4.6, the Project effects individually, or in combination have the potential to destroy or alter fish habitat, alter aquatic productivity and kill fish. The outcome of these effects, without mitigation, would result in harm to fish by causing a shift in species composition, abundance and distribution.

Mitigation measures for Project effects will be examined, including use of a fish passage facility. Mitigation measures that are predicted to be both effective and practicable will be incorporated into Project design.

5.5.2 Migratory Birds

The development of the Project will result in a loss of riparian habitat as a result of inundation resulting from creation of the headpond. Approximately 800 ha of wildlife habitat will be lost affecting terrestrial migratory bird populations. A total of 166 bird species may occur in the LSA (Federation of Alberta Naturalists, 2007), 132 of which are protected under the Migratory Bird Convention Act. There were 79 bird species identified during the initial June 2015 breeding bird surveys.

The extent of this habitat loss and its consequence will be evaluated as part of breeding bird surveys that will be conducted in the Project area. An assessment will be made of Project effects on songbirds, including SARA listed species.

Waterfowl may use the Peace River valley for spring and fall staging during migratory movements. The extent of this use and potential project impacts will be assessed.

Mitigation measures for this habitat loss in the form of offset compensation will be discussed with Alberta Environment and Parks.

5.5.3 Changes to Environment on Federal Lands in another Province

The Project is not expected to impact any federal lands upstream in British Columbia, nor downstream within Alberta, or beyond.

5.6 Effects on Aboriginal Peoples

5.6.1 Effects on Health

Potential effects on health of aboriginal peoples are currently being evaluated.

5.6.2 Effects on Socio-economic Conditions

The Project socio-economic assessment is underway. Many key Project details have yet to be determined, which would significantly affect the socio-economic conditions. It is understood that the “construction phase” of the Project will last approximately 5 years. Direct, indirect and induced economic benefits will be most prevalent during this 5-year construction phase of the Project due to the large construction work force needed at the time. The workforce needed for the operation phase of the Project after construction would be significantly less than construction. These numbers are yet to be determined as are the locations of temporary construction camps.

AHP commits to using local (including Aboriginal) labour and services if they meet quality standards and are cost competitive. AHP is evaluating the opportunity to participate in Mutual Benefit Agreements with Aboriginal Groups significantly impacted by the Project.

5.6.3 Effects on Physical and Cultural Heritage Effects

Cultural heritage studies to assess possible Project effects are underway. Evidence of contemporary use of the Peace River has been minimal with a few references to fishing. Additional activities with potentially impacted Aboriginal Groups will be planned for 2015 to further understand potential effects. To date the following activities have been utilized to understand potential effects:

- Notification soliciting feedback;
- Meetings with Chief and Council;
- Meeting with Aboriginal Group's designated consultation personnel;
- Consultation with AEP noted First Nation contacts;
- Open Houses held at Aboriginal Group's designated locations;
- River boat tours starting 15 km downstream of the Project site to approximately 50 km upstream of the Project site to encompass the potential inundation area; and
- Helicopter tour of the river valley.

Potential impacts to the river valley include impacts to: vegetation, wetlands, wildlife (including avian and amphibian), aquatics (including fish habitat). Field studies in 2015 and 2016 will occur to understand the extent of these impacts.

To date, no Aboriginal cultural/historical sites have been identified in the river valley by the First Nation Aboriginal Groups or Metis groups, but consultation remains ongoing.

5.6.4 Effects on the Current Use of Lands and Resources for Traditional Purposes

AHP continues to work with Aboriginal Groups that may be impacted by the Project to understand their interests and concerns. Some general concerns that have been put forth to date include impact to fish, habitat (e.g. fish spawning grounds, bear dens), wildlife crossings (if ice composition is impacted) and stability of the river banks. Field studies are occurring to understand baseline information and Project effects. Discussion with Horse Lake First Nation and Duncan's First Nation has occurred regarding the participation of Aboriginal Group members in environmental studies.

5.6.5 Historical Resources

The proposed Project occurs within the Peace River valley, a major travel corridor utilized in both Pre-contact and Historic periods, with known exposures of fossil bearing Shaftesbury and Dunvegan Formation bedrock. The entire Project occurs in lands assigned Historic Resource Values (HRVs) of 4 and/or 5 for archaeology and/or palaeontology. This potential will be assessed during field surveys planned for the summer of 2015.

Archaeology

Based on preliminary geomorphological analysis, there exists potential for stable landforms within the valley itself, which may contain buried, intact cultural deposits, some of which may be deeply buried. This was confirmed during the Historical Resources Impact Assessment (HRIA) for the Dunvegan Hydroelectric Project, which selected target areas based on the same geomorphological applications and identified a number of sites within the proposed inundation area. In addition, the proposed access roads traverse areas of potentially deep sedimentation, given its location through the valley and upper margins of the Peace River.

Preliminary assessment using national topographic system (NTS) maps and ESRI World Imagery shows potential for well-defined, stable and elevated landforms in a number of areas throughout the valley. The Project is in close proximity to six known archaeological sites, four of which may be impacted by the inundation; of these, three are deemed to be of high historic resource significance (HRV 4).

Palaeontology

The Peace River is highly incised in the Project area and is likely to contain fossiliferous exposures of Lower Cretaceous (Albian to Cenomanian) Shaftesbury to Upper Cretaceous (Cenomanian) Dunvegan Formation bedrock. The entire Project footprint contains lands with an HRV of 5p (paleontology) and portions of least three fossil sites containing predominately invertebrate material.

The Dunvegan Formation contains abundant invertebrate material in the Project area including bivalves, gastropods, and ammonites. Ornithischian ichnites have been recorded from the Dunvegan Formation at a location near the Dunvegan Bridge, approximately 16 km downstream from the proposed Project headworks. Also of importance is a euselachian assemblage from the Dunvegan Formation which represent the northernmost such assemblage from the Western Interior Seaway. Three of the six sites where this fossil material occurs are located 4-15 km downstream of the proposed Project headworks.

6. PROPONENT ENGAGEMENT AND CONSULTATION WITH ABORIGINAL GROUPS

6.1 Aboriginal groups that may be interested in, or potentially affected by, the Project

AHP has prepared a list of Aboriginal groups that may be interested or potentially affected by the Project. This scoping was based on:

- a preliminary understanding of the geographical extent of impacts of the proposed Project;
- reviewing the existing information for other proposed hydroelectric projects on the Peace River such as the Dunvegan and Site C projects;
- reviewing maps of First Nation reserves and Métis settlements located in the region of the proposed dam site;
- early consultation with the Alberta Environment and Sustainable Resource Development (ESRD), now Alberta Environment and Parks (AEP) and the Aboriginal Consultation Office (ACO);
- discussion with and input from representatives of the Canadian Environmental Assessment Agency; and
- discussion with Aboriginal Groups.

Aboriginal groups who believe they would be affected by the Project include the Duncan's First Nation and Horse Lake First Nation. Those Aboriginal groups who believe they are affected by the Project, and for which a determination will be made, are presented in Section 6 of the Project Description.

6.2 Engagement or consultation activities carried out to date with Aboriginal groups.

AHP began Aboriginal consultation activities in March, 2013 during the conceptual stages of the Project. AHP met with Aboriginal Groups, made a preliminary presentation of the Project and laid the foundation for future consultation should the Project move forward. Since then, AHP has made repeated calls and visits to Aboriginal groups, organised river tours and open houses, sent notification packages and Project updates by registered mail (or by alternate methods specified by the Groups) and exchanged several emails.

An Aboriginal Consultation Plan (ACP) which provides a detailed description of AHP's consultation methodology, timelines, milestones and procedures was approved by the Aboriginal Consultation Office (ACO) in August 2015.

One concern expressed by Aboriginal groups is the potential impact to the Peace Athabasca Delta. AHP has completed a preliminary assessment of the potential effects of the Amisk Hydroelectric Project on the PAD. This information has been shared with Aboriginal Groups and discussion has been initiated regarding potential implications to the PAD.

Some Aboriginal Groups have expressed concern about the potential impact to Peace River water levels and flow. AHP has responded by providing a "flow regime" section in its June 2015 brochure. This section explains that the Project will have little to no effect on the flow of the river as this flow is regulated through BC Hydro and the W.A.C. Bennett Dam.

Other comments and concerns expressed by Aboriginal groups include:

- Potential Project impact to the Peace Athabasca Delta;
- Potential Project impact to culturally sensitive sites;
- Potential Project impact to spawning grounds for fish;
- Potential impact to habitat, including bear dens;
- Potential Project impact to Treaty Rights and traditional land use;
- Potential Project impact to the ice regime;
- Potential Project impact of dam to debris flow downstream;
- Cumulative Effects of the Project (specifically taking in account W.A.C. Bennett Dam, Peace Canyon Dam, and the recently approved Site C dam); and
- Project benefits that will filter down to First Nations.

AHP has responded to Aboriginal groups stating that environmental baseline studies are currently being conducted for the Project. Furthermore, the Project application will address these concerns.

6.3 Consultation Plan

A proposed Aboriginal engagement or consultation schedule has been developed. Consultation began in the spring of 2014 with updated Project information and notification. Open houses and Project tours were completed in June of 2015 and Aboriginal groups participated in summer field baseline environmental studies. Ongoing consultation, Project updates and additional open houses are planned for the fall and winter 2015/2016.

6.4 Treaty Rights

AHP is currently assessing Project impacts on Treaty Rights with a number of Aboriginal Groups.

6.5 Overlap of Project Area with Traditional Land Use under Treaty Rights

AHP is currently engaged in consultation with potentially affected Aboriginal groups. As of September 2015, no specific Traditional Land Use information or land use maps have been supplied to AHP in relation to the Project and potential impacts. AHP is currently in meaningful consultation with Duncan's First Nation and Horse Lake First Nation and is seeking to understand the geographical extent of their traditional land use and how it overlaps with the Project area.

AHP continues to discuss the Project on an ongoing basis with potentially impacted Aboriginal Groups. To date, although many First Nations and Metis groups have been engaged, meaningful consultation has only occurred with Duncan's First Nation and Horse Lake First Nation. AHP has openly engaged other Aboriginal groups and actively seeks confirmation on adverse impacts upon which, once understood to be related to the Project, meaningful consultation would commence.

7. CONSULTATION WITH THE PUBLIC AND OTHER PARTIES (OTHER THAN ABORIGINAL CONSULTATION INCLUDED ABOVE)

7.1 Key Comments and Concerns from Stakeholders

A list of key comments and concerns put forth by stakeholders during the various notification and consultation activities carried out to date is shown in Table 7-1.

Table 7-1: Key Comments and Concerns from Stakeholders

Comment	AHP Response
How will boat passage occur?	AHP is currently evaluating boat passage options. Options being considered include; a boat lock, portage system, and a combination of boat launches.
What happens to wildlife and habitat along areas that will be inundated with the headpond (upstream)?	AHP understands that there will be impacts on wildlife and habitat. Wildlife and habitat studies are currently occurring to understand the extent of the impact.
How will the Project affect the ice regime of the Peace River, including the Shaftesbury Crossing?	Potential changes to the ice regime are currently being evaluated. It is expected that the total combined duration of ferry and ice bridge operations at Shaftesbury Crossing will be reduced. AHP commits to providing compensation to mitigate negative impacts to users of the Shaftesbury Crossing to the extent they are expected to occur as a result of changes to the ice regime precipitated by the Project.
What happens to recreational areas upstream (Pratt's Landing, Carter's Camp, and Many Islands)?	Early indications forecast that the Pratt's Landing and Carter's Camp campgrounds will be impacted to the extent that they would need to be relocated or reconfigured. Possible relocation and reconfiguration options are being evaluated. At this time the Project is not expected to affect the recreation value of the Many Islands area. AHP is evaluating means to create equivalent or greater recreational opportunities for those lost as a result of the Project.
How will the Dunvegan West Wildland Park be affected?	Initial calculations indicate that approximately 300 ha of the Park will need to be re-designated due to Project needs and the forecasted extent of the impoundment. AHP will work with the Province to provide compensation for lost Park land.
Will vegetation be removed prior to the creation	AHP expects to salvage merchantable timber and

Comment	AHP Response
of the headpond?	remove selected vegetation prior to the creation of the headpond. Ongoing studies will specify the type and location of vegetation management programs.
What roads and upgrade to roads are needed to construct and access the dam site?	Permanent road access from both sides of the river escarpment to the dam site will be required for the dam construction, operations and maintenance. Potential alignments of dam site access roads are being evaluated to determine the best option given the river escarpment characteristics. Existing county road interconnections and upgrade requirements for access from major highways to the river will be evaluated and discussed with municipal and provincial transportation authorities.
Will private land be lost and, if so, what compensation can be expected?	Some private land will be impacted by the Project. AHP commits to compensating landowners for this impact based on the specific extent of the impact to each individual owner.
What will be the impact on water temperature and subsequently on fish?	The existing upstream BC hydro dams on the Peace River have caused water temperatures to be warmer in the winter and colder in the summer. The change is due to the large headpond behind the Bennett Dam. The change in temperatures and other factors like sediment load and flow regime have allowed cold water fish species to extend their distributions downstream and cool water fish species to be "pushed" downstream. The Site C Project will extend this effect farther downstream. The Project is not expected to substantively change the Peace River water temperature because the headpond is not large enough. As such, the Project will not affect the Peace River fish community due to the influence on water temperature.
Will the Project create erosion and stability issues along the banks of the river?	The geologic conditions found upstream throughout the headpond area are favourable with respect to stability, as attributes that have led to largescale erosion upstream and downstream are not found along the headpond area. The impoundment of the headpond may result in an initial, modest increase in normal slope processes including weathering, erosion and slumping; however, those processes are not

Comment	AHP Response
	expected to impact dam stability. At the dam site, any slopes found to be unstable will be stabilized by common geotechnical practices e.g. use of wiremesh, shotcrete, retaining walls, consolidation grouting, etc. The geological mapping and geotechnical investigation will help to determine the best method to stabilize the banks and establish the design characteristics of the abutments. Access roads to the headworks will be designed and constructed to manage slope stability and erosion. Additional studies are being initiated to further understand the effects of the Project on bank erosion and stability.
Will the Project change the flow of the river?	The Project will have minimal effect on the flow of the river. A majority of the flow is regulated by BC Hydro operations of the W.A.C. Bennett Dam. Unregulated flow from tributaries below the Site C Project will not be regulated by the Project.
Where would the electricity created by the Project go?	Electricity generated by the Project will be supplied to the Alberta Interconnected Electricity System via an approximately 25 km transmission connection.
When would the dam be completed?	It is anticipated that after the regulatory process is completed the earliest the dam could be completed would be 2023 after a 5-year construction period.
What is the impact on sediment both downstream and upstream of the dam?	Potential impacts on sediment transport are currently being evaluated. It is expected that the Project will slightly reduce the amount of sediment transported downstream of the dam location. Sedimentation deposition at the upstream extent of the headpond are expected to cause the backwater effects to migrate further upstream over time.
With fishways and fish friendly turbines what will be the impact of the fish moving upstream and downstream of the dam?	Potential fish passage options are currently being evaluated. Preliminary analysis indicates that upstream fish passage using fishways and downstream fish passage using best available fish friendly turbines would provide potentially viable mitigation for direct effects on fish populations.

7.2 Ongoing or Proposed Consultation

AHP recognizes the consultation is an ongoing process. In these early stages of the Project, AHP is striving to identify key stakeholders and solicit feedback and discussion to incorporate input into the Project planning where feasible. AHP continues to build the stakeholder database for this Project.

Activities that facilitate the consultation process include:

- The first set of open houses occurred in June 2015 which provided stakeholders and interested parties the opportunity to receive detailed Project information as well as specific questions to discipline specialists of the Projects. In addition, attendees could provide their email address if they would like to receive future updates of the Project.
- Project notifications will be sent on an as needed basis. It is expected that update notifications will occur 1 to 3 times a year with additional updates occurring if a significant change is realized in the Project planning.
- In June 2015, the Project website was launched; www.amiskhydro.com. Project updates will occur on the website on a consistent basis. The website provides the opportunity to see frequently asked questions as well as pose new ones.
- In June 2015 a 1-800 number (1-844-287-1529) was created and provided to stakeholders as an additional medium to contact AHP directly. Phone calls that are received on this line are acknowledged and if specific information is requested the question is distributed to the relevant technical specialist for a prompt response, which is subsequently provided back to the interested stakeholder.
- AHP is currently planning early fall meetings in 2015 with town and municipal councils and a potential next set of open houses to the public in the spring of 2015 following a large scale notification mail/email process.

AHP continues to discuss the Project on an ongoing basis with interested parties. To date, AHP has responded to every inquiry needing a response by email, telephone, mail or personal meeting.

7.3 Consultation with Other Jurisdictions

AHP has discussed the Project with representatives of the Alberta government from the Ministries of Environment and Parks and Energy. Additional jurisdictions will be consulted as required on an ongoing basis.

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