

GMSWORKS 12/13 – Water License Requirements

Peace and Williston Recreational Access Feasibility Study Feasibility Study for Boat Launch Ramps along the Peace River

FINAL REPORT



In association with





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MN Project 6683

BChydro II Peace River and Williston Recreational Access Feasibility Study

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1.0 Introduction

1.1 Project Background

The headwaters of the Peace River, a tributary of the Mackenzie River, are located in north-western British Columbia as shown in Figure 1.1. The Peace Reach is formed by the confluence of the Finlay and Parsnip rivers flowing in opposite directions in the Rocky Mountain Trench. At the confluence, the Peace Reach flows east and is the only river to cut through the Rocky Mountains. Once out of the Peace Canyon, the river maintains an easterly direction, crossing the British Columbia/Alberta border. The Peace River is confluent with the Slave River that, in turn, flows north into Great Slave Lake in the Northwest Territories. The Mackenzie River begins at the outlet of Great Slave Lake and flows north to the Arctic Ocean.

The existing works comprising the Peace Hydroelectric System include the W.A.C. Bennett Dam; the G.M. Shrum Generating Station; the Peace Canyon Dam; and the Peace Canyon Generating Station. The Williston Reservoir was formed after the completion of the W.A.C. Bennett Dam (the construction of the W.A.C. Bennett Dam and the G.M. Shrum hydroelectric generating station were completed between 1961 and 1968) and the reservoir extends 200 km north of the Mackenzie along the Parsnip and Findlay Reaches. These reaches join to meet the Peace Reach which extends approximately 100 km east to the WAC Bennett Dam near Hudson's Hope. The Dinosaur Reservoir was formed on 1979 after the completion of the Peace Canyon Dam. This run of the river reservoir is 20.5 km long and is the backwater up to the tailrace of the W.A.C. Bennett Dam.

The Peace Water Use Plan Consultative Committee recommended a package including operating constraints and physical works for the Peace Hydroelectric System that would result in enhanced recreational access to the Williston Reservoir, the Dinosaur Reservoir, and the Peace River below Peace Canyon Dam. The objectives of this feasibility study are to review options and to provide recommendations for such physical works.



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Figure 1.1: Site Location Map



1.2 Scope of Work

In accordance with the Terms of Reference (TOR) provided by BCH and with discussions at the project initiation meeting held on August 12, 2008, the present phase of the feasibility study includes the following tasks:

- Perform a reconnaissance survey of the existing boat launch ramp location at Halfway River (a tributary of the Peace River below Peace Canyon Dam) and up to two other possible locations near the confluence of Halfway River and Peace River, to be identified by BCH and the project team.
- Perform a reconnaissance survey of the existing boat launch ramp at Blackfoot Park and other possible locations at Blackfoot Regional Park.
- Determine the feasibility of the boat launch ramps based on engineering technical feasibility, archaeological feasibility, and environmental criteria, and also provide recommendations for each site as per section 2.2 of the TOR.

The feasibility of enhanced recreational access to the Williston Reservoir and the Dinosaur Reservoir will be investigated in a later phase of the feasibility study.

1.3 Report Organization

The data collection and field investigation program for this study are described in Sections 2 and 3 below. The analysis of ramp design alternatives is provided in Section 4. Sections 5 and 6 respectively present a summary of the environmental and heritage issues associated with the proposed developments. Cost-benefit analyses of the development options are presented in Section 7, with conclusions and recommendations for further work in Section 8. Our closing remarks are in Section 9.

Appendix A contains drawings including a project location map, site map with opportunities and constraints, and concept layout plans of the existing facility and potential locations. Appendix B contains photographs taken during the field visits. Appendix C contains the full Environmental Overview Assessment report prepared by our team partner, Triton Environmental (Triton). Appendix D contains the Archaeological Overview Assessment (AOA) report prepared by our team partner, Golder Associates (Golder).



2.0 Data Collection and Analysis

The following background data and information were provided by BCH and are referenced for this report:

- Appendix R: Boat Access, Communications and Safety Improvement Proposals. Excerpts from the Peace Use Water Plan, BC Hydro Project Team and the Peace Water Use Plan Committee, undated.
- Water level and flow measurements for Peace River above Alces River, Peace River at Hudson's Hope, and Halfway River for the period January 1999 through August 8, 2008.



3.0 Inspection Findings of the Potential Boat Launch Ramp Sites and Existing Boat Launch Facilities

3.1 Site Locations

The project team of Moffatt & Nichol (M&N), Golder Associates (Golder), Triton Environmental Consultants (Triton), Atek Hydrographic Surveys Ltd. (Atek), and members from the Saulteau, Blueberry, and Mcleod Lake First Nations participated in the field investigations for the potential boat launch ramp sites at the Halfway River sites, conducted on August 12 and 13, 2008.

Initially, the project team met with Stuart McGregor and Dawn Cowie of BC Hydro at the existing Halfway River boat launch ramp site and discussed possible alternative locations. Later in the day on August 12, 2008, members of the project team performed a reconnaissance survey from the hydrographic survey vessel of Halfway Creek downstream of the existing ramp and the north bank of Peace River near the confluence to identify possible locations. Two site locations were identified for investigation and were confirmed with Stuart McGregor during a subsequent telephone conversation.

The project team and a representative from the Saulteau First Nation participated in the field investigations at Blackfoot Regional Park, conducted on August 14, 2008. As described below, only the existing boat launch ramp location was considered suitable.

The four sites investigated for feasibility are shown on the site location plan on Drawing No. 6683 - 010 in Appendix A. Drawing No. 6683 - 050 also provides a summary of the constraints and opportunities for each site are discussed in detail in Sections 3.2 - 3.5. The sites are listed as follows:

- Halfway Creek Existing Site;
- Halfway Creek West Bank Site;
- Peace River Site near confluence with Halfway River; and,
- Blackfoot Park Site.

3.2 Halfway River Existing Site

The Halfway River existing site features a boat launch area immediately south (downstream) of the Highway 29 bridge over the Halfway River, on the east bank. The site is approximately 40 km from Hudson's Hope and 50 km from Fort St John, directly between the two locations. Access to the site from Highway 29 is via a short gravel road, which connects directly to a turnaround and to the launch ramp access. Photos No. 1 and 2 in Appendix B show the waterside conditions at the site, while the access roads on the site are shown in Photos No. 3 and 4.

Figure 3.1 shows the overall layout of the site. The general boundary of the site is outlined in a yellow broken line. The relief at the site is relatively high, as indicated in Drawing No. 6683-100 in Appendix A.



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Figure 3.1: Existing Boat Launch Ramp Site at Halfway River

Photograph Source: BC Hydro

The water level at the site was unusually high (approximately 433 metres relative to geodetic datum at the 97th percentile, see Section 4.1) at the time of the site visit. The water was also unusually turbid. Consequently, the physical condition of the boat launch ramp could not be investigated as part of the reconnaissance survey. Information was obtained from BC Hydro staff, boat users, and the underwater contours from the hydrographic survey. Photo No. 5 shows the upper portion of the ramp a few days after the site visit, when the water level had subsided by almost one metre.

The launch ramp is located adjacent to the riprap protection for the Highway 29 Bridge over Halfway River. According to BC Hydro staff, it is often necessary to clear riprap that has fallen onto the ramp during the winter. The river is often frozen during winter.

There is a sandbar that lies generally shore-parallel, starting at the central bridge pier (see Photo No. 6) and connecting to the logjam south of the boat launch (see Photo No. 2).

Generally, it is preferable for ramps to be oriented such that vessels are launched in the downstream direction rather than the upstream direction. At this site, the water depth in the downstream direction is too shallow to make this feasible without dredging. According to Mr. David Woinarski of Landsong Heritage Consulting, the water level can be lower in the afternoon than in the morning. Boaters unfamiliar with the site are sometimes caught on this sandbar on their return.

Parking at the site is limited to the turnaround area and the approach to the old Highway 29 Bridge (see Photos No. 3 and 4). According to Mr. Woinarski, the parking and turnaround area are occasionally backed up with traffic; more parking would be needed if the boat launch were improved. One boater encountered by the Project Team in Hudson's Hope commented that she would use the boat launch more often if the approach were not as steep (see Photo No. 7).

An additional amenity offered by the site is a gravely beach, suitable for picnicking, located south of the boat launch (see Photos No. 8 and 9).

Advantages of the site are:

- Very easy access from Highway 29;
- The existing access road is in good condition, although the approach to the ramp is very steep (up to 18 percent);
- The site is protected from the highest currents by the bridge pier; and,
- The site is protected from winds by the topography.

Disadvantages of the site are:

- Dredging will be necessary to provide sufficient water depth for year-round launch, although dredge quantity would be minimal and it seems likely the maintenance of the dredged area could also be minimal;
- The upland area is relatively high relief, and there is limited level area available for additional parking; and,
- Halfway River is often blocked by ice during the winter.

3.3 Halfway River West Bank Site

The Halfway River West Bank site is located directly across from the existing site; see Photo No. 10 for a waterside view. Access from Highway 29 is available along a good-quality gravel road (Photo No. 11), a distance of approximately 270 metres; see Figure 3.2 below. With the exception of this road, and the remains of the approach to the old Highway 29 bridge, this site is essentially undeveloped; the upland area is shown in Photo No. 12. Based on the online cadastral map obtained from the BC Ministry of Agriculture and Lands web site, the area south of Highway 29 is designated Crown Lands.

The shoreline at and immediately south of the bridge is a steep, riprap-protected bank. Moving further south, a low, soft bluff is present (see Photos No. 13 to 15). Starting approximately 50 m south of the bridge, a flat sandy beach is present (see the foreground in Photo No. 1; this beach was not visible during the initial site visit because of the high water level). The area near the sandy beach is not suitable for a boat launch ramp, since the water remains shallow for a long distance from shore, and the physical works required to overcome this would affect the valuable shoreline habitat downstream (see Photo No. 16). However, a new launch ramp could be constructed at the southern boundary of the riprap, in the location indicated in Photos No. 17 (taken from the bridge) and 18 (taken from downstream). This ramp would be similar to the existing ramp, except that it would be aligned more directly into the flow of the river.





Figure 3.2: Halfway River West Bank Site

Photograph Source: BC Hydro

In contrast to the existing site, there is no readily accessible beach and picnic area. The sandy beach is relatively low and accessed over a low bluff (typically 1.5 to 2 metres high).

Advantages of the site are:

- Easy access from Highway 29;
- The existing access road is in good condition;
- There is a large area available for parking and other upland development; and,
- The site is protected from winds by the topography.

Disadvantages of the site are:

- Dredging would be necessary to provide sufficient water depth for year-round launch, would be more extensive than at the existing site, and could be difficult to maintain;
- Halfway River is often blocked by ice during the winter; and,
- Picnic or other public areas would not provide easy access to the water without additional physical works, and a wide beach area is not available.

If it is desired to develop this site, it would be necessary to carefully examine the potential for adverse effects on the downstream habitat. It may also be necessary to provide additional shore protection armouring, or to set the parking and turnaround areas back from the river to provide stable bank.



3.4 Peace River Site near Confluence with Halfway River

The Peace River site is located approximately 1 km upstream of the confluence with Halfway River. Access to the Peace River site is along an unimproved, single-lane track (see Photo No. 19) and the cost associated with improving this track to provide adequate boat launch access is likely to be the main barrier for developing this site. Figure 3.3 shows the general topography of the area and the main features at the site. Based on the online cadastral map obtained from the BC Ministry of Agriculture and Lands web site, the area between the proposed site and Highway 29 is designated Crown Lands.



Figure 3.3: Peace River Site near Confluence with Halfway River

Photograph Source: BC Hydro

The shoreline at the site is characterized by a soft, low bluff (typically 2 to 3 m tall) fronted by a narrow, mixed sand and gravel beach. The upland wooded area has a relatively high relief. Photos No. 20 to 22 illustrate the shoreline condition at the site.

Immediately west (upstream) of the proposed site is a blind channel (there is minor runoff from the upland wooded area), and a low lying marsh area is located on the west side of this channel: see Photos No. 23 and 24. These areas have high habitat value and are at too low an elevation to be feasible for upland infrastructure such as parking: consequently, the proposed boat launch ramp and associated works would be confined to the area east of the blind channel.

The upland areas are heavily wooded and have relatively high relief, as shown in Photos No. 25 and 26.

Advantages of the site are:

• There is sufficient water depth for year-round boat launches;

- There is a large area available for upland parking and other development;
- Water level fluctuations and currents associated with rainfall run-off are less dramatic compared to the Halfway River sites;
- The boat launch ramp will rarely be blocked by ice during the winter; and,
- There are significant interpretive opportunities associated with the adjacent wetland area and blind channel.

Disadvantages of the site are:

- Additional shore protection armouring may be required upstream and downstream of the potential boat launch ramp location to maintain stable bank. It is recommended that a hydraulic model and analysis should be done at the design stage to ensure bank stability;
- The site is more exposed to winds compared to the Halfway River site; and,
- Significant expense would be associated with the construction and maintenance of an access road to the site, and other new infrastructure.

3.5 Blackfoot Park Site

The existing boat launch ramp at Blackfoot Regional Park is located close to the Alberta border, and is immediately downstream (east) of the Clayhurst Road Bridge. Figure 3.4 illustrates the site, while Photo Nos. 27 and 28 show the shoreline upstream and downstream of the existing boat launch ramp.

The water level at the site was unusually high at the time of the site visit on August 14, 2008 (approximately 384.5 metres relative to geodetic datum and 93rd percentile, see Section 4.1). As a result, it was not possible to assess the condition of the boat launch ramp during the reconnaissance survey. The upper portions of the boat launch ramp appeared to be in good condition: see Photo No. 29 in Appendix B. Furthermore, little scour was evident in the exposed portion of the ramp.

The park infrastructure is extensive and includes camping and picnic areas in addition to the concrete boat launch ramp. Access to the boat launch ramp is over a well-maintained gravel road (see Photo No. 30), while the turnaround and parking area at the ramp has a sandy surface (see Photos No. 31 and 32).

The riprap slope protecting the bridge abutment has lost several rocks, although the remainder of sections of the slope and the exposed geotextile are in good condition: see Photos No. 33 to 36.

Signs posted at the site indicate that the boat launch is currently closed. Discussions with Joan Dickinson, a relatively regular visitor to the site, indicated that the boat launch is closed because of concrete debris on the ramp. More generally, she and her family have indicated that the concrete ramp is in poor condition. Ripples in the water over the ramp (see Photo No. 37) support the presence of debris over the ramp.

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A sandy track (see Photo No. 38) runs east from the boat launch site. During the site visit, this track terminated in the water. However, during more normal water levels (see Photo No. 39, supplied by Joan Dickinson, and Figure 3.4) it appears that the track reconnects to the main park road forming a loop. Mrs. Dickinson indicated that the logjam, visible in Figure 3.4 but disconnected from the shoreline during the site visit (see Photo No. 40), varies in extent according to recent flows but often extends most of the way to the bridge.



Figure 3.4: Blackfoot Park Site

Source: Google Earth

Based on the headway made by the survey vessel, the current in the river was estimated at approximately 2.5 m/sec (4.9 kts) during the site visit.

Due to the flat topography and shallow water east of the site in the area indicated in Figure 3.4, no suitable boat launch areas were found in the park downstream of the site. Additionally, the logjam would form a barrier to boat access when it is in a relatively large configuration. Similarly, no suitable areas were observed upstream, and it would be undesirable for park users to be required to cross over Clayhurst Road to use the ramp. Consequently, no alternative sites were investigated in detail.



The existing site has many advantages:

- Easy access from Clayhurst Road;
- The existing access road is in good condition;
- There is sufficient water depth for year-round launch;
- There is good upland infrastructure in Blackfoot Regional Park; and,
- If desired, there is ample space to increase parking at the boat launch ramp.

The main disadvantage of the site appears to be occasional high currents, which have damaged the riprap slope. The concrete boat launch ramp may have suffered direct damage from falling and tumbling riprap or other debris; it may also have suffered indirect damage from scour caused by the high currents. However, both of these problems can be overcome through appropriate engineering of the riprap, ramp, and scour protection.



4.0 Feasibility Design of Boat Launch Ramp at the Study Locations

4.1 Design Basis

This feasibility study is based on the following parameters and assumptions.

Design Elevations

Design elevations are based on the water levels provided by BC Hydro and obtained from the Environment Canada web site, for the Halfway River gauging station. These water levels are quoted relative to an arbitrary datum. Moffatt & Nichol has converted these measurements to geodetic datum based on the water surface measured during the site visits and the real-time water surface elevations provided by BC Hydro. These conversions should be considered approximate (accuracy 0.2 m at best).

Based on these measurements, Figure 4.1 shows the annual variability in water level at the Halfway River site.



Figure 4.1: Water Surface Elevations at Halfway River

Based on the 5th and 95th percentile water levels, the design water levels for Halfway River are as follows:

- Design High Water Level Elevation 432.8 m;
- Design Low Water Level Elevation 431.3 m; and,
- Elevation at the toe of the ramp Elevation 430.1 m.

Note the elevation during the site visit was approximately 433.0 m, at the 97th percentile.

The same design low water level is used for the Peace River site near the confluence with Halfway River.

At Blackfoot Park, a similar procedure is used to relate the quoted elevations in arbitrary datum to geodetic datum. Figure 4.2 illustrates the annual variability of water surfaces at Blackfoot Park.





Figure 4.2: Water Surface Elevations at Blackfoot Park (Peace River at Alces River)

Based on the 5th and 95th percentile water levels, the design water levels for Halfway River are as follows:

- Design High Water Level Elevation 384.7 m;
- Design Low Water Level Elevation 382.7 m; and,
- Elevation at the toe of the ramp Elevation 381.5 m.

Note the elevation during the site visit was approximately 384.6 m, at the 93rd percentile.

Water Areas

The general requirements for water areas are as follows:

- Minimum water depth: 1.2 m at design low water;
- Minimum bottom width: not less than the combined width of the launching ramp, boarding floats and rip rap shoulders or other shore protection immediately adjacent to the launching ramp; and,
- Minimum length 15 m (approx. 50 ft) beyond toe of ramp at design low water. Area in front of the ramp will be clear of navigational obstructions.

Launching Ramps

The general requirements for the launching ramps are as follows:

- 4.6 m lane widths for launching ramps of two (2) or more lanes;
- 4.9 to 6.1 m for single lane launching ramp;
- The number of launching lanes will be dictated by the demand and the characteristics of the site. One launching lane will handle up to 50 launchings and 50 retrievals per day at a well designed and operated facility;
- On launching ramps over 61 m (200 ft) long and less than 16.3 m wide or four launching lanes, a 16.3 m minimum diameter turn-around should be provided every 61 m to minimize car-trailer backing distances;
- The head of the ramp should be constructed to an elevation not less than 0.6 m above design high water;
- The toe of the ramp should not be constructed less than 0.9m below design low water level;
- Slope of ramp -10% minimum, 15% maximum; and,
- A vertical curve must be constructed at the head of the ramp, providing a smooth transition between the launching ramp and the launching apron.

Access Walkway

The general requirement is the minimum overall width shall not be less than 1.5 m.

Vehicle and Trailer Traffic

The pavement thickness for the parking areas will be designed to support car and light truck loads using the latest version of the AASHTO "Guide for the Design of Pavement Structures".

4.2 Conceptual Design of Boat Launch Ramps

The layout and general features for the conceptual design of the boat launch ramps will be based on the design basis in Section 4.1. The main issues for the ramp feasibility design include but are not limited to:

- Provision of adequate parking areas and turnarounds;
- Provision of ramps and access roads with suitable slopes;
- Halfway River: Provision of boat launch access to Peace River when Halfway River is iced up; and,
- Peace River at Blackfoot Park: Protection of the boat launch ramp.

Conceptual layout for boat launch ramps will be presented for the following potential locations:

- Halfway River Existing Site;
- Halfway River West Bank site;

- Peace River near the confluence with Halfway River; and,
- Blackfoot Park Site.

4.3 Halfway River Existing Site

The main features for the conceptual design for the boat launch ramp are shown on Drawing No. 6683-100 in Appendix A. As shown on the drawing, the main features of the facility shown on the plan layout are described as follows:

- A concrete single lane ramp, in the general location of the existing ramp, will be approximately 75 m long and 6.0 m wide. Although the guideline recommends a turnaround should be provided at every 61 m, the ramp is not much longer than this and no intermediate turnaround is considered necessary. The ramp and access road will be regraded to a constant 10 percent, at the lower limit of the recommended range. The ramp surface will be made of concrete for resisting the damaging effects of ice and for ease of maintenance. The slab surface will also have a grooved pattern for improved traction on the ramp;
- A fixed walkway adjacent to the ramp, which doubles as a retaining wall to decrease loss of riprap from the bridge abutment onto the ramp;
- Widening the existing gravel roads on site; and,
- A gravel parking area approximately 30 m × 15 m to accommodate 10 vehicles and trailers, together isolated parking spaces; with parking along the sides of the existing roads this allows for a total of 15 vehicle/trailer combinations and five single vehicle spaces.

In order to achieve the recommended toe elevation of 430.1 m for the ramp, it is necessary to dredge at the toe of the ramp. Without dredging, the ramp toe elevation would be approximately 430.5 m. It seems likely dredging would be feasible at this site, given the ramp is directed into one of the two main channels of Halfway River at this site.

4.4 Halfway River West Bank Site

The main features of the conceptual design of the boat launch ramp are shown on Drawing No. 6683-200 in Appendix A.

As shown on the drawings, the main features of the facility are described as follows:

- A concrete single lane ramp, will be approximately 55 m long and 6.0 m wide. No turnaround is necessary. The ramp and access road will be graded to a constant 10 percent, at the lower limit of the recommended range. The ramp surface will be made of concrete for resisting the damaging effects of ice and for ease of maintenance. The slab surface will also have a grooved pattern for improved traction on the ramp. The toe elevation of the ramp is 430.5 metres;
- A fixed walkway adjacent to the ramp;
- Widening the existing gravel access road and new gravel roads and turnaround area on the site; and,
- Two gravel parking areas, approximately 40 m x 30 m in total, to accommodate 15 vehicles with trailers and five vehicles without trailers.

The toe elevation shown here is higher than the recommended toe elevation of 430.1 m. To achieve the recommended elevation, it would be necessary to dredge at the toe of the ramp. The river bed is relatively flat at the toe, so the dredge prism would be much larger than at the existing site: maintenance of the dredged toe would also be more problematic. Overall, it does not appear feasible to achieve the recommended toe elevation at this site.

Although it is not shown on the drawing, ample upland space is available for future parking expansion.

4.5 Peace River Site near Confluence with Halfway River

The main features for the conceptual design for the boat launch ramp are shown on Drawing No. 6683-300 in Appendix A. As shown on the drawing, the main features of the facility shown on the plan layout are described as follows:

- New gravel access road from Highway 29 to the site, approximately 1.7 km long and 7.5 m wide;
- A concrete single lane ramp, approximately 50 m long and 6.0 m wide. The toe of the ramp will be at an elevation 430.0 m. The ramp will be graded to a constant 13 percent. The ramp surface will be made of concrete for resisting the damaging effects of ice and for ease of maintenance. The slab surface will also have a grooved pattern for improved traction on the ramp;
- A fixed walkway adjacent to the ramp; and,
- A gravel parking area approximately 40 m x 15 m to accommodate 14 vehicles and trailers and six vehicles without trailers; there is upland area available to provide future expansion of the parking area.

The drawing also shows an area that could be improved for picnicking. However, improvements at this picnic area would not be included in the scope of the proposed project.

4.6 Blackfoot Park Site

The main features of the conceptual design of the boat launch ramp are shown on Drawing No. 6683-400 in Appendix A. The main intent of this drawing is to describe upgrades to the physical boat launch ramp and the riprap protecting the bridge abutment. Ample upland space is available to increase parking and turnaround area, as described in Section 3.6, however this is not considered further here.

As shown on the drawing, the main features of the facility upgrade are described as follows:

- The riprap revetment at the bridge abutment will be repaired and the toe reinforced with rock characterized by a median diameter D₅₀ of approximately 1,000 mm (the rock presently appears to have a D₅₀ no greater than 500 mm);
- The existing boat launch ramp will be replaced by a single lane ramp approximately 45 m long and 7.0 m wide, matching the existing ramp. The toe of the ramp is at an elevation 381.0 m. The ramp surface will be made of concrete for ease of maintenance. The slab surface will also have a grooved pattern for improved ramp traction. The slope of the ramp is 10% to match the existing ground levels;



- A fixed walkway will be constructed adjacent to the ramp; and,
- A scour pad will be constructed to protect the base of the riprap revetment and will be continuous with the foundation of the new walkway and boat launch ramp. The scour pad will be constructed of riprap characterized by a D₅₀ of approximately 500 mm, and will be grouted beneath the new boat launch ramp.

The drawing also shows an area that could be improved for picnicking. However, improvements at this picnic area would not be included in the scope of the proposed project



5.0 Environmental Assessment Overview

5.1 General

M&N Team member Triton Environmental conducted a screening level environmental assessment of the sites. For the entire Environmental Assessment report, please refer to Appendix C. A summary of the assessment is provided below.

All options will be discussed with BC Hydro and other interested parties and once sites are selected, additional surveys and permitting documents will need to be prepared prior to submission to the agencies for their review.

5.2 Halfway River Existing Site

Based on the assessment of environmental conditions at this site, it is recommended that the existing Halfway River site be upgraded. This site is already disturbed and the proposed upgrades would have the least impact on the surrounding environment providing that the limits of construction are properly flagged and an Environmental Monitoring Plan (EMP) is followed.

5.3 Halfway River West Bank Site

The Halfway River west side may impact the downstream side channel, which provides refuge habitat for fish as well as foraging and nesting habitat for wildlife. The upland area, while used as a picnic area/campsite, has significant ungulate usage.

5.4 Peace River Site near Confluence with the Halfway River

The Peace River Site would require the upgrading of an existing road, which would require clearing of mature aspen stand that provides wildlife habitat. The back channel area, while not part of the construction footprint, may be affected both by the ramp (hydrological affects upstream) and as more humans are drawn to this area given the improved access and ramp facilities.

5.5 Blackfoot Park Site

Based on the assessment of environmental conditions at this site, it is recommended that the existing Blackfoot Park site be upgraded. This site is already disturbed and the proposed upgrades would have the least impact on the surrounding environment providing that the limits of construction are properly flagged and an EMP is followed.



6.0 Archaeological Assessment Overview

6.1 General

M&N Team member, Golder Associates Ltd. (Golder), conducted an archaeological overview assessment (AOA) for one existing and two potential boat launch ramp locations at Halfway and Peace Rivers sites, and the existing site at Blackfoot Regional Park. The AOA consisted of a combination of background research and preliminary field reconnaissance (PFR).

In general, all four project areas are considered to have potential archaeological material or features and further archaeological work will be required.

For the entire Archaeological Assessment Overview report, please refer to Appendix D.



7.0 Cost Benefit Analysis

While assessing the capital and maintenance costs of the proposed ramp improvements is relatively straight forward, assessing the benefits in this case is much more difficult, at least in quantitative terms. BCH does not currently charge a fee for using the boat ramps, so there are no actual revenues associated with these facilities. Apart from meeting BCH's goals recommended in the Peace Water Use Plan Consultative Committee, there does not appear to be any direct financial benefit to offset against the capital costs. There are also no usage statistics to indicate how many boaters take advantage of the Peace River amenities, nor the seasonal distribution of that use. It is therefore impossible to quantify the non-financial societal benefits based on industry averages or other "rules of thumb".

To develop quantitative cost/benefit ratios or internal rates of return, it would first be necessary to conduct a number of socio-economic studies which are outside the scope of this assignment, such as collecting seasonal usage statistics, conducting market surveys, estimating population growth projections and demographic shifts over time, and so forth.

On a qualitative basis, some of the societal benefits which may accrue from the ramp improvements include:

- Improved access for area residents to recreational activities (e.g. fishing, boating);
- Short-term economic spin-off in the region from the construction program (employment wages, taxes, materials purchases, meals and accommodations during construction); and,
- Long-term economic spin-off from increased usage, tourism, and local resident day-trips to the area.

Since it is not possible to establish a "dollar value equivalent" for these societal benefits, it is necessary to make a value judgement on the viability of each project on its own merits.

The estimated costs of making the improvements noted on the drawings are summarized in the tables below. Cost estimates are considered upper bound, order-of-magnitude estimates based on providing the maximum possible benefit. In each case, the proposed improvements could be scaled back to provide less benefit at a correspondingly reduced cost.

7.1 Halfway River Existing Site

Table 7.1 provides the estimated construction cost for upgraded 6.0 m wide boat launch ramp with a turnaround and additional parking area at the existing Peace River site.

Table 7.2 shows the estimated annual maintenance cost for the boat launch ramp, including removing silt build-up at the end of the ramp and allowances for repairs to the appurtenances of the ramp. The other items in Table 7.2 are provisional sums.



ltem No.	Item Description	Unit	Quantity	Rate	Total
1	Excavate at ramp and parking areas	m ³	400	\$20	\$8,000
2	Fill at ramp and parking areas	m ³	800	\$33	\$26,000
3	Dredge at toe of ramp	m ³	6	\$25	\$200
4	Install precast concrete slab for in-water portions of the ramp	m ³	30	\$1,300	\$39,000
5	Install cast-in-place concrete for upland portions of the ramp	m ³	65	\$300	\$20,000
6	Place Lock Blocks for retaining wall/ walkway	m²	136	\$450	\$61,000
7	Rework riprap to place retaining wall	sum	-	-	\$10,000
8	Place scour protection at edges of ramp	m³	170	\$78	\$13,000
9	Construct gravel surface for roads and parking areas	m³	400	\$30	\$12,000
Sub-Total					\$189,000
Mobilization/Demobilization (5% of Total)					\$10,000
Contingencies (25%)					\$47,000
Total					\$246,000

Table 7.2: Halfway River Existing Site – Estimated Annual Maintenance Cost

ltem No.	Item Description	Unit	Quantity	Rate	Total
1	Remove silt build-up on ramp and dredge at toe as needed	sum	-	-	\$2,000
2	Repair scour protection	sum	-	-	\$5,000
3	Repair road and car park pavement	sum	-	-	\$5,000
				Total	\$12,000

7.2 Halfway River West Bank Site

Table 7.3 provides the estimated construction cost for a new 6.0 m wide boat launch ramp with upgraded road access, parking area, and picnic areas at the Halfway River West Bank site.

Table 7.4 provides the estimated annual maintenance cost for removing silt build-up at the end of the ramp and allowances for repairs to the appurtenances of the ramp.

ltem No.	Item Description	Unit	Quantity	Rate	Total
1	Excavate at ramp and parking areas	m ³	350	\$20	\$7,000
2	Fill at ramp and parking areas	m³	400	\$33	\$13,000
3	Install precast concrete slab for in-water portions of the ramp	m³	30	\$1,300	\$39,000
4	Install cast-in-place concrete for upland portions of the ramp	m³	40	\$300	\$12,000
5	Place Lock Blocks for retaining wall/ walkway	m²	96	\$450	\$43,000
6	Rework riprap to place retaining wall	sum	-	-	\$10,000
7	Place scour protection at edges of ramp	m³	120	\$78	\$10,000
8	Construct gravel surface for roads and parking areas	m³	800	\$30	\$24,000
9	Landscape new picnic areas	m²	2,000	\$30	\$60,000
Sub-Total					\$218,000
Mobilization/Demobilization (5% of Total)					\$11,000
Contingencies (25%)					\$55,000
Total					\$284,000

Table 7.3: Halfway River West Bank Site - Estimated Construction Cost

Table 7.4: Halfway River West Bank Site – Estimated Annual Maintenance Cost

ltem No.	Item Description	Unit	Quantity	Rate	Total
1	Remove silt build-up on ramp	sum	-	-	\$2,000
2	Repair scour protection	sum	-	-	\$5,000
3	Repair car park and roadway pavement	sum	-	-	\$5,000
4	Maintain landscaping and picnic area	sum	-	-	\$3,000
				Total	\$15,000

7.3 Peace River Site near confluence with the Halfway River

Table 7.5 below provides the estimated cost for construction of a new access road, boat launch ramp, parking, and other public areas. Table 7.6 provides the estimated annual maintenance cost for the site.



ltem No.	Item Description	Unit	Quantity	Rate	Total
1	Upgrade or construct new access road to site	m²	13,000	\$30	\$390,000
2	Grade (cut and fill) upland areas and ramp	m³	2,000	\$20	\$40,000
4	Construct gravel surface for on-site roads and parking areas	m³	250	\$30	\$8,000
5	Landscape new picnic areas	m²	2,000	\$30	\$60,000
6	Install precast concrete slab for in-water portions of the ramp	m ³	25	\$1300	\$33,000
7	Install cast-in-place concrete for upland portions of the ramp	m³	40	\$300	\$12,000
8	Place Lock Blocks for retaining wall/ walkway	m²	56	\$450	\$25,000
9	Place scour protection at edges of ramp	m³	105	\$78	\$8,000
Sub-Total					\$576,000
Mobilization/Demobilization (5% of Total)					\$29,000
Contingencies (25%)					\$144,000
Total					\$749,000

Table 7.5: Peace River Site near	Confluence with Halfway River
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Table 7.6: River Site near Confluence with Halfway River - Annual Maintenance

ltem No.	Item Description	Unit	Quantity	Rate	Total
1	Repair access road	sum	-	-	\$5,000
2	Repair car park and roadway pavement	sum	-	-	\$5,000
3	Maintain landscaping and picnic area	sum	-	-	\$5,000
4	Repair scour protection	sum	-	-	\$5,000
				Total	\$20,000

7.4 Blackfoot Park Site

Table 7.7 below provides the estimated cost for the upgrade of the existing riprap and replacement of the existing boat launch ramp with a new, heavier-duty ramp with significant scour protection. Table 7.8 provides the estimated annual maintenance costs for repairs to the appurtenances of the ramp.



ltem no.	Item Description	Unit	Quantity	Rate	Total
1	Demolish existing concrete ramp	m ³	50	\$80	\$4,000
2	Excavate in-water for scour protection and riprap toe	m³	300	\$30	\$9,000
3	Place riprap at abutment	m³	270	\$150	\$41,000
4	Place scour pad	m²	140	\$150	\$21,000
5	Place and anchor Lock Blocks for retaining wall/walkway	m²	96	\$450	\$43,000
6	Install precast concrete slab for in-water portions of the ramp	m³	65	\$1300	\$85,000
7	Install cast-in-place concrete for upland portions of the ramp	m ³	35	\$300	\$11,000
	\$214,000				
	\$11,000				
	\$54,000				
	\$279,000				

Table 7.8: Blackfoot Park Launch Ramp Replacement – Estimated Annual Maintenance

ltem No.	Item Description	Unit	Quantity	Rate	Total
1	Repair riprap and scour protection	sum	-	-	\$10,000
	\$10,000				

In reviewing the above cost estimates, it is important to note the following:

- The estimates are concept level only and are not intended to be used to establish a project budget. The estimates are intended to provide an indication of the probable costs to determine which boat launch ramp facility alternative(s) warrant further consideration;
- The estimates are based on Moffatt & Nichol's in-house experience and data for projects of a similar nature;
- The estimates are based upon mid-2006 to early 2007 price levels in Canadian dollars, and escalated by 6% for mid -2008 prices;
- The estimates exclude any archaeological investigation assessment, additional habitat compensation programmes, removal and remediation of contaminated materials and other hazardous waste;
- A contingency allowance of 10% was included in the cost estimates to cover unforeseen construction costs at the feasibility stage of this project; and,
- The estimates exclude the GST.



Table 7.9 below summaries the capital cost estimate and annual maintenance costs rounded to the nearest thousand for the various locations.

Location	Capital Costs	Annual Maintenance Cost
Halfway River Existing Site	\$246,000	\$12,000
Halfway River West Bank site	\$284,000	\$15,000
Peace River Site near the confluence with the Halfway River	\$749,000	\$20,000
Blackfoot Park Site	\$279,000	\$10,000

Table 7.9: Summary of Estimates for Capital and Annual Maintenance Costs

8.0 Conclusions and Recommendations

Our general conclusions and recommendations about the various sites are as follows:

8.1 Halfway River Existing Site

We recommend upgrading the existing facilities at this site.

8.2 Halfway River West Bank Site

Although a boat launch ramp is feasible at this location, a higher ramp toe elevation would limit boat launches at lower water levels. Also given its close proximity to the existing boat launch ramp, this site is not recommended.

8.3 Peace River Site near the Confluence with the Halfway River

This site is not recommended because development of a boat launch facility would be more costly than upgrading the existing boat launch ramp, as well as the environmental sensitivity of the location.

8.4 Blackfoot Park Site

We recommend upgrading the existing facilities.



9.0 Closure

This report has been prepared for the sole benefit of BC Hydro and its agents, and may not be used by any third party without the expressed written consent of Moffatt & Nichol and BC Hydro. Any use of this document by a third party is at the sole risk of such third party. The statements and conclusions presented herein are valid as of the date of publication. Future changes in the conditions affecting the underlying assumptions of this report may alter its findings and the conclusions. Moffatt & Nichol does not undertake to revise and update this report should future events reflect changed conditions.

We trust that this report meets BC Hydro's requirements at this time. Should you have any questions, or if we can be of further assistance, please contact the undersigned at any time.

Prepared by:

MOFFATT & NICHOL

Reviewed by:

MOFFATT & NICHOL

[Original signed by: Paul Hoo, P.Eng.]

[Original signed by: Susan Tonkin, P.E.]

Susan Tonkin, P.E. Coastal Engineer Paul Hoo, P.Eng. Project Manager

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Appendix A: Drawings







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A B DATE: Path: **Vo**






Appendix B: Photographs Taken on Field Trip at Halfway River and Peace River, August 12-14, 2008



Photo No. 1: Taken by Golder Associates on 8-25-2008 at Halfway River, Existing Site Existing site viewed from the west bank of Halfway River; shoreline of West Bank site is in the foreground.



Photo No. 2: Taken on 8-12-2008 at Halfway River, Existing Site Approach to and location of the (submerged) boat launch ramp, looking south.



Photo No. 3: Taken on 8-12-2008 at Halfway River, Existing Site Old bridge approach (with truck) and western access road to the boat launch ramp, from the entrance.



Photo No. 4: Taken on 8-12-2008 at Halfway River, Existing Site Eastern access road to the boat launch ramp, looking southeast.



Photo No. 5: Taken on 8-25-2008 at Halfway River, Existing Site by Golder Associates Approach to the (submerged) boat launch ramp; water level is approximately 1 metre lower compared to Photo No. 2.



Photo No. 6: Taken on 8-13-2008 at Halfway River, Existing Site Riprap at bridge; former bridge pile stubs are visible mid-river.



Photo No. 7: Taken on 8-12-2008 at Halfway River, Existing Site Approach to and location of the (submerged) boat launch ramp, from the bridge. Note the steep approach section.



Photo No. 8: Taken on 8-12-2008 at Halfway River, Existing Site Beach or picnic area south of the boat launch ramp and north of the logjam.



Photo No. 9: Taken on 8-12-2008 at Halfway River, Existing Site Beach or picnic area south of the boat launch ramp and north of the logjam.



Photo No. 10: Taken on 8-13-2008 at Halfway River, West Bank Site View of the West Bank site from the existing Halfway River site, looking west.

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Photo No. 11: Taken on 8-13-2008 at Halfway River, West Bank Site Existing entrance to the West Bank site, looking west along Hwy 29.



Photo No. 12: Taken on 8-13-2008 at Halfway River, West Bank Site Looking east at the main upland areas of the West Bank site; the old bridge approach is at the left of this photograph.





Photo No. 13: Taken on 8-13-2008 at Halfway River, West Bank Site Shoreline looking upstream.



Photo No. 14: Taken on 8-13-2008 at Halfway River, West Bank Site Shoreline looking downstream, taken from the same location as Photo No. 13.



Photo No. 15: Taken on 8-13-2008 at Halfway River, West Bank Site Typical condition of the soft bank at the West Bank site.



Photo No. 16: Taken on 8-13-2008 at Halfway River, West Bank Site View of wetland areas downstream of the site.

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Photo No. 17: Taken on 8-13-2008 at Halfway River, West Bank Site View of the West Bank site from the bridge, looking southwest.



Photo No. 18: Taken on 8-13-2008 at Halfway River, West Bank Site Shoreline looking upstream.





Photo No. 19: Taken on 8-13-2008 at Peace River Typical condition of track to Peace River site.



Photo No. 20: Taken on 8-13-2008 at Peace River Peace River site from the south.

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Photo No. 21: Taken on 8-13-2008 at Peace River Typical bluff condition at Peace River site.



Photo No. 22: Taken on 8-13-2008 at Peace River Beach substrate at Peace River site.



Photo No. 23: Taken on 8-12-2008 at Peace River Shoreline at west end of Peace River site; note high water level indicated by upland vegetation in the water.



Photo No. 24: Taken on 8-13-2008 at Peace River Marsh area west of Peace River site, taken from the site and looking southwest.





Photo No. 25: Taken on 8-13-2008 at Peace River Typical upland condition at Peace River site.



Photo No. 26: Taken on 8-13-2008 at Peace River Gully in upland wooded area at Peace River site.





Photo No. 27: Taken on 2008-08-14 at Blackfoot Park View to the west (upstream) from the boat launch ramp. The bridge is the Clayhurst Road Bridge.



Photo No. 28: Taken on 2008-08-14 at Blackfoot Park View to the east (downstream) including the boat launch ramp. The portion of the concrete exposed at this high water level appears in good condition.





Photo No. 29: Taken on 2008-08-14 at Blackfoot Park

Close-up of the boat launch ramp; the book is 180 mm long. Some scour is observed at the upstream edge of the ramp; scour was not visible on the downstream end.



Photo No. 30: Taken on 2008-08-14 at Blackfoot Park Upland track and picnic/parking area, including trash can. The camping areas are behind the trees to the right of the photograph (south).





Photo No. 31: Taken on 2008-08-14 at Blackfoot Park Parking and turnaround area at the boat launch ramp.



Photo No. 32: Taken on 2008-08-14 at Blackfoot Park Parking and turnaround area at the boat launch ramp.



Photo No. 33: Taken on 2008-08-14 at Blackfoot Park Revetment at the bridge immediately east of the boat launch ramp.



Photo No. 34: Taken on 2008-08-14 at Blackfoot Park Upper (undamaged) part of the revetment.

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Photo No. 35: Taken on 2008-08-14 at Blackfoot Park Lower part of the revetment, with geotextile exposed. Note the exposed roots suggesting the loss of rock is relatively recent or ongoing.



Photo No. 36: Taken on 2008-08-14 at Blackfoot Park Close-up of exposed geotextile.



Photo No. 37: Taken on 2008-08-14 at Blackfoot Park

Ripples over the boat launch ramp offshore, indicating the presence of obstructions on the ramp.



Photo No. 38: Taken on 2008-08-14 at Blackfoot Park Track to the east from the boat launch area. Note the sandy substrate.



Photo No. 39: Taken in July 2008 at Blackfoot Park View of the shoreline at typical (low) water. Photograph source: Joan Dickinson.



Photo No. 40: Taken on 2008-08-14 at Blackfoot Park View of the logjam from the shoreline.

Appendix C: Environmental Report

4025//WP-P1884

Peace River Boat Ramps Feasibility Study – Environmental Component.

January 2010

Prepared for:

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Peace River Boat Ramps Feasibility Study – Environmental Component

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January, 2010

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LIST OF ATTACHMENTS

Attachment 1. Digital CD with all project photographs and final report (PDF).

1.0 INTRODUCTION

1.1 Purpose of Document

The purpose of this document is to identify the environmental sensitivities at four potential boat ramp locations along the Peace River \mathcal{G} at Halfway River and one at Clayhurst/Blackfoot Park). This report is prepared in response to the BC Hydro Peace River Water Use Plan Feasibility of Boat Ramps Study Terms of Reference. This report will be submitted in conjunction with the associated Engineering Technical and Archaeological Feasibility reports completed by Moffatt & Nichol (M&N) and Golder Associates (Golder).

This report has been prepared to:

- Provide a description of the environmental setting;
- Document baseline environmental conditions based on existing information, field data and observations;
- Identify valued ecosystem components (VEC) at or near each of the proposed sites;
- Provide an assessment of potential impacts of development on the VEC's at each site;
- Provide an Environmental Management Plan (EMP) for each site;
- Identify regulatory permitting and approval requirements necessary to proceed with construction at each site; and
- Identify if any additional environmental investigations may be required.

1.2 Environmental Setting

The four potential boat ramp sites are located along the Peace River near the communities of Hudson's Hope and Clayhurst, BC. The first three sites are located to the east of Hudson's Hope along Highway 29 near Halfway River. The fourth site (Blackfoot Park) is located near the Clayhurst Bridge on Clayhurst Road, which is off Cecil Lake Road east of Fort St. John (Figure 1).

The project is within the Alberta Plateau in the Peace Lowland area. The Boreal White and Black Spruce biogeoclimatic zone (BWBS) is characteristic of the lower elevations of this region, with aspen, white spruce, lodgepole pine and black spruce predominating (DeLong 1990). The climate and vegetation communities of project area are described by the Peace moist warm (mw1) subzone of the BWBS zone. The BWBSmw1 occurs at elevations ranging from 350 to 1050 m along the Peace River and all the potential sites are at approximately 440 m elevation.

The climate of this subzone is represented by dry cool, summers and warm moist winters with moderate snowfall. The mean annual temperature for this subzone is 1.1° C. For the Fort St. John area, daily maximums average 6.9° C and daily minimums average -2.9° C (Environment Canada 2008). The mean annual precipitation in the BWBSmw1 is 485 mm and the average

yearly precipitation recorded at Fort St. John between 1971 – 2000 is 465.6 mm (Environment Canada 2008).

Within this subzone, the dominant tree species is trembling aspen. Along the river breaks, much of this zone has been converted to agricultural land. White spruce is found in the moister sites that have had little fire disturbance and lodgepople pine can be found in the drier and poorer soil areas. Black spruce occurs in the wetter and more organic soils. Shrub species include prickly rose (*Rosa acicularis*), soopolallie (*Shepherdia canadensis*), red-osier dogwood (*Cornus stolonifera*), and high-bush cranberry (*Viburnum edule*). Herbaceous species include bunchberry (*Cornus canadensis*), fireweed (*Epilobium angustifolum*) and showy aster (*Aster conspicuus*).



Figure 1. Peace River Boat Ramp Site Locations.

2.0 METHODOLOGY

Field surveys were conducted in conjunction with the engineering and archaeological surveys between August 12 and 14th 2008 to document existing conditions in aquatic and terrestrial habitats surrounding the existing and proposed boat ramp locations.

2.1 Fish and Fish Habitat

Aquatic habitats were assessed in terms of substrate, gradients (% slope), and drawdown zone vegetation. No fish sampling was conducted but existing data on the potential fish species within the project area was reviewed (FISS 2008; Pattenden *et al* 1991) along with the associated habitat requirements of those species for all life stages. Habitat observed at each boat ramp site was described in terms of its suitability to provide habitat for the identified species.

2.2 Wildlife and Wildlife Habitat

In order to determine the local, regional and provincial significance of habitats within the study area, it is necessary to consider the full range of wildlife species known, or with significant potential, to occur in the vicinity of each boat ramp. Key references that were utilized to achieve this include:

- Stevens *et al.* (1994) provide a breakdown of wildlife species by biogeoclimatic zones and subzones with some habitat cross referencing, and habitat preferences;
- The Mammals of British Columbia (Eder and Pattie, 2001);
- The Birds of British Columbia Vol 1, Vol 2, Vol 3, Vol 4 (Campbell *et al.* 1990);
- A field guide to site identification and interpretation for the Nelson Forest Region (Braumandl and Curran 1992);
- A Field Guide for Identification and Interpretation of Ecosystems of the Rocky Mountain Trench, Prince George Forest Region (Meidinger *et al* 1998; 2007);
- BC Conservation Data Centre tracking lists (BC CDC 2007a);
- Bats of British Columbia (Nagorsen and Brigham 1993); and
- The Amphibians and Reptiles of British Columbia (Matsuda et al. 2006).

2.2.1 Wildlife Species of Management Concern

The primary warehouse of information on the status of flora and fauna in the province is the BC Conservation Data Centre (CDC). The CDC provides tracking lists for flora, fauna, and plant communities for each Forest District in the province. The District lists identify species that can be expected to occur within the District boundaries, which is often coincident with watershed divides. These areas can include the bulk of some wildlife sub-populations. These status lists

use a colour-coding system to rank the status and management priorities for species at risk. Following is a breakdown and brief description of the status and ranking criteria used in developing these lists:

Red-listed Species:

- candidates for legal designation as threatened or endangered under Federal legislation;
- include threatened species any indigenous species of fauna or flora that is likely to become endangered in British Columbia if the factors affecting its vulnerability do not become reversed; and
- include endangered species any indigenous species of fauna or flora that is threatened with imminent extinction or extirpation throughout all or a significant portion of its British Columbia range.

Blue-listed Species:

- considered to be vulnerable or sensitive and are candidates for upgrade to the redlist or downgrade to yellow; and
- include vulnerable species any indigenous species of fauna or flora that is particularly at risk in British Columbia because of low or declining populations.

Yellow-listed Species

• the yellow-listed species are those considered not at risk in British Columbia and are considered for management emphasis for various reasons including recent declines in population numbers, restricted distribution, losses of habitat, public interest, species that are maintained by ecosystem management and species for which the Province has a global responsibility.

In addition to red, blue, and yellow-listed species, numerous other species are of management concern within the province due to:

- populations that are actively managed;
- species that are of commercial value;
- species with specific habitat requirements (e.g. nest cavities);
- species found at low densities; and
- colony nesters.

In order to identify species of management concern that potentially occur in the study area, the full list of wildlife species known to occur, or with significant potential to occur within the BWBSmw1 were considered. Based on sub-regional wildlife distribution, abundance, and species sensitivities the CDC has developed tracking lists for individual forest districts. The CDC red, blue and yellow lists for rare vertebrate species within the Peace Forest District were acquired. In addition, the Federal Species at Risk Act Registry (SARA) was also reviewed for the potential of any Schedule 1 listed species to be present within the project area (Appendix 2).

The Species at Risk list can be reduced based on known regional distributions, specialized habitat requirements, and extreme rarity to a subset of species that is more reasonable to expect within the project area. This was done using the descriptions of terrestrial habitat observed at each boat ramp site to determine its suitability to provide habitat for identified wildlife species. Seven SARA listed species may be found within the vicinity of the project areas (Table 1).

Scientific name	Common Name	SARA Category
Falco peregrinus anatum	Peregrine Falcon	Special Concern
Asio flammeus		Special Concern
	Short-eared Owl	
Coturnicops noveboracensis	Yellow Rail	Special Concern
Bos bison athabascae	Wood Bison	Threatened
Rangifer tarandus caribou	Caribou (Northern Mountain population)	Threatened
Rangifer tarandus	Caribou (Boreal Population)	Threatened
Bufo boreas	Western Toad	Special Concern

Table 1. SARA listed species which may occur on the landscape surrounding the project area.

2.3 Vegetation

There are two useful land classification schemes that capture the variation in plant and animal communities at a sub-regional scale. Ecosections (Regional Ecosystem Classification) are contiguous areas with similar climate and physiography, which are large enough to sustain a variety of plant and wildlife communities. Biogeoclimatic subzones and subzone variants (Biogeoclimatic Ecosystem Classification, BEC) are characterized by a particular combination of dominant plant species. Subzones and subzone variants are dispersed within sub-regional areas and often occur within a relatively narrow elevational range and/or in relation to aspect.

The Province has protected representative natural examples of both ecosections and subzones/variants at the landscape level. Site associations or site series units are the fine units of the biogeoclimatic classification system that capture plant community variation at the stand or operational level and these are the ecosystems that are tracked by the Conservation Data Centre (CDC). The CDC red and blue-lists identify ecosystems that are considered rare or at risk. The biogeoclimatic site series unit is also routinely used by forest and wildlife resource managers, and provides an appropriate means to assess the local, regional and provincial significance of potential effects of habitat alteration in the study area. The ecosystems of the study area have been described at the biogeoclimatic site series level.

A review of Species at Risk and the CDC red and blue-lists was completed prior to the field assessments. Plant species that were located in areas that may be affected by boat ramp construction were identified. An assessment of the risk of species occurring within the affected area and their habitat requirements was also conducted rather than attempting to conduct an actual detailed inventory across each site.

2.4 Potential Effects

Valued Ecosystem Components (VECs) are elements of the biophysical and socio-economic environment that are valued by society and have particular relevance in completing the project scoping. They may be landscape level features (ecosystems), or individual fish, wildlife or plant species that are recognized as rare, sensitive or vulnerable to human activity. VEC's were identified by reviewing the fish and fish habitats, wildlife and wildlife habitat and vegetation at each site and assigning an Environmental Sensitivity Rating (ESA) of either low, moderate or high, based on how sensitive that habitat feature would be to the proposed boat ramp construction at each site.

3.0 ENVIRONMENTAL OVERVIEW ASSESSMENT

3.1 Fish and Fish Habitat

All four potential sites are located on and/or near the Peace River. Two sites are located on the Halfway River, one on the Peace River upstream of Halfway River and the final site is located on the Peace River across from Alces River. The Peace River provides habitat for a variety of fish species including several fish species of management concern within the Peace Forest District (Table 2) (BC CDC 2008).

Scientific Name	Common Name
Hiodon alosoides	Goldeye
Margariscus margarita	Pearl Dace
Thymallus arcticus	Arctic Grayling
Notropis hudsonius	Spottail Shiner
Salvelinus confluentus	Bull trout

Table 2. Fish Species of Management Concern within the Peace River Drainage.

Goldeye can be found in both the upper and lower Peace River. Within BC, adult goldeye can be found in the turbid waters of the Peace River usually associated with deep, quiet waters near mouths of tributaries or in the lee of islands. It is possible that this species may be found near the Halfway River and Blackfoot Park sites. The juveniles may be found along channel margins in slow moving water and associated with silt and sand substrates (McPhail 2007).

Pearl Dace has two subspecies and the one that may be found in the Peace River system is the Northern Pearl Dace (*Margariscus margarita nachtriebi*). Within northern BC, pearl dace can be found in sluggish streams, small lakes, and pools where water is less than 2 m deep. They are usually found in association with substrate of sand, silt and small gravel and close to vegetation (McPhail 2007). Given the fast flowing river habitat observed during this assessment, it is unlikely that this species will be found in the vicinity of the proposed ramps.

Arctic grayling is known to be present within the Peace River systems however; it is only the Williston Reservoir population that is Red-listed. Arctic grayling are found within the Halfway and Alces River systems. The adults are likely to be found in mainstem habitats where upstream riffles break into pools. The juveniles prefer slower velocities glides usually associated with large valley floor reaches. Fry are found along channel margins of tributary streams or in slow side channels of larger systems.

Spottail Shiner has been found within the Peace River since 1989. They have been sampled upstream in the Alces River, which flows into the Peace River at Clayhurst Bridge (Zimmerling

and Zimmerling 2002) and have also been sampled in Halfway River (FishWizard 2008). The majority of these are likely from the Charlie Lake population, which was introduced (McPhail 2007). Within riverine habitats, they can be found along the channel margins where there is little current. It is unlikely they are found at the potential sites given the currents observed during the assessment.

Adult bull trout found within the Peace River system spawn between August and October in several large tributaries to the Peace, including Halfway and Alces River (FISS 2008). They are usually found in the upper reaches of these tributaries and are associated with steeper, colder waters, with cobble and gravel substrates. Adults within the Peace River are usually found in deeper water and associated with some form of cover. Spawning habitat in the Peace system is characterized by water depths of about 40 cm, on substrate 4 cm diameter or greater and in flows 0.20 to .60 m/s. Cover in the form of boulders of LWD is usually within 5 m of the spawning location (McPhail 2007; McPhail and Baxter 1996).

3.2 Wildlife and Wildlife Habitat

The CDC red, blue and yellow list for rare species (excluding fish) within the BWBS subzone of the Peace Forest District was acquired and a total of 13 red-listed and 24 blue-listed species were identified (Table 3). Seventeen bird species, 12 invertebrates, and 8 mammal species were identified. Twelve species have formal COSEWIC designations (5 special concern, 5 threatened/special concern, and 2 not at risk), 12 species are Identified Wildlife, and 6 species are listed under the Species at Risk Act.

English Name	COSEWIC	BC Status	Identified Wildlife	SARA	Occurrence in Project Area	Potential Effects
American Bittern	No	Blue	No		Unlikely given habitats present.	None anticipated.
Barn Swallow	No	Blue	No		Unlikely given habitats present.	None anticipated.
Bay-breasted Warbler	No	Red	Y (Jun 2006)		Unlikely given lack of mature coniferous forest in area.	None anticipated.
Black-throated Green Warbler	No	Blue	Y (Jun 2006)		Potential in river floodplains and stands of aspen/spruce.	None anticipated.
Broad-winged Hawk	No	Blue	No		Potential given aspens stands near sites.	None anticipated.
Canada Warbler	T (Mar 2008)	Blue	No		Potential in aspen stands with red-osier dogwood understory.	None anticipated.
Cape May Warbler	No	Red	Y (Jun 2006)		Unlikely given lack of coniferous stands present.	None anticipated.
Connecticut Warbler	No	Red	Y (Jun 2006)		Potentially in aspen forests with well developed shrub layers.	None anticipated.

 Table 3. Red and blue-listed species in the BWBS zone of the Peace Forest District.
Le Conte's Sparrow	No	Blue	No		Potentially in willows associated	None
					with wetland and fens.	anticipated.
Nelson's Sharp-tailed	NAR (May	Red	Y (Jun 2006)		Unlikely given habitats present.	None
Sparrow	1998)					anticipated.
Peregrine Falcon,	SC (Apr 2007)	Red	No	1	This subspecies occurs in	None
anatum subspecies					southern interior, not expected	anticipated.
Ĩ					in project area.	1
Sandhill Crane	NAR (May	Blue	Y (Jun 2006)		Occasional visitor during	None
Sultaini Cruite	1979)	Dide	1 (Juli 2000)		migration	anticipated
Short agred Owl	SC (Mar 2008)	Pluo	V (May 2004)	2	Potentially found in fields in	Nono
Short-eared Own	SC (Wai 2008)	Diue	1 (Way 2004)	5	study or a	none
0.00.4	ŊŢ	DI	NT			anticipateu.
Suri Scoter	INO	Blue	INO		Unlikely given habitats present	None
						anticipated.
Swainson's Hawk	No	Red	No		Unlikely given habitats present	None
						anticipated.
Upland Sandpiper	No	Red	No		Potential user of fields in study	None
					area.	anticipated.
Yellow Rail	SC (Nov 2001)	Red	No	1	Occasionally use hay fields.	None
						anticipated.
Arctic Skipper,	No	Blue	No		Potential occurrence in Peace	None
mandan subspecies					River area. Moist open meadows	anticipated.
I					along streams	1
Common Wood-	No	Blue	No		Possible along roadways near	None
nymph <i>nenhele</i>	110	Diac	110		project	anticipated
subspecies					project.	unticipated.
Common Ringlet	No	Blue	No		Potential occurrance in Peace	None
Common Kinglet,	INU	Diue	INU		Potential occurrence in Feace	anticipated
subspacies					River area/Claynuist.	anticipateu.
Subspecies	ŊŢ	D 1	NT		TT 1'1 1 1 1 1 4	NT
Yellow-dotted Alpine	INO	Red	NO		Unlikely given habitats present	None
						anticipated.
White-veined Arctic,	No	Blue	No		Unlikely given habitats present	None
edwardsi subspecies						anticipated.
Old World	No	Blue	No		Potential around Clayhurst	None
Swallowtail, pikei					Bridge.	anticipated.
subspecies						
Tawny Crescent	No	Blue	No		Potential mature open aspen	None
					stands from Attachie to AB	anticipated.
Arctic Blue, lacustris	No	Blue	No		Unlikely given habitats present.	None
subspecies						anticipated.
Striped Hairstreak	No	Red	No		North banks of peace river	None
I I I I I I I I I I I I I I I I I I I					canyon associated with	anticipated.
					chokecherry.	
Callused Vertigo	No	Blue	No		Potential in aspen stands	None
Canused Vertigo	140	Diuc	110		i otentiai în aspen stands.	anticipated
						anticipateu.
Prairie Bluet	No	Blue	No		Unlikely given habitats present.	None
						anticipated.
Hagen's Bluet	No	Blue	No		Unlikely given habitats present.	None
Ŭ						anticipated.
Wood Bison	T (May 2000)	Red	No	1	Unlikely given habitats present	None
	(,			-	, <u>,</u>	anticipated
Plains Bison	T (May 2004)	Red	No		Unlikely given habitats present	None
	1 (1014) 200 P)	1100	110		Sinter, grou nuoraus present	anticipated

Wolverine, <i>luscus</i> subspecies	SC (May 2003)	Blue	Y (May 2004)		Unlikely given habitats present	None anticipated.
Fisher	No	Blue	Y (Jun 2006)		Unlikely given habitats present	None anticipated.
Northern Myotis	No	Blue	No		Potential given aspens stands near sites.	None anticipated.
Caribou (boreal population)	T (May 2002)	Red	Y (May 2004)	1	Unlikely given habitats present	None anticipated.
Caribou (northern mountain population)	T/SC (May 2002)	Blue	Y (May 2004)	1	Unlikely given habitats present	None anticipated.
Grizzly Bear	SC (May 2002)	Blue	Y (May 2004)		Unlikely given habitats present	None anticipated.

Peace River Boat Ramps Feasibility Study

The comprehensive list can be reduced based on known regional distributions, specialized habitat requirements, and extreme rarity to a subset of species that is more reasonable to expect may occur within the project area. In general, the upland areas found within the BWBSmw1 are known to provide habitat for moose, elk, caribou, black bear, gray wolf and grizzly bear. The numerous wetlands support large populations of breeding waterfowl, such as mallard, northern pintail, Barrow's goldeneye, common snipe and occasionally, trumpeter swans. However, the lowlands, where our project sites are location, are not known to provide habitat for wood bison, grizzly bear and gray wolf (DeLong 1990).

The invertebrates listed above may occur within the project area; however, it is difficult to determine their use of the area at this level of assessment. Life history and distribution data for these species are not readily available, and directed searches for these species were not conducted. In general, the available habitats and plant species of the project area are common and not limiting on the landscape, therefore it is unlikely that they are critically important for the invertebrate species at risk, which are likely to be habitat or plant species specialists.

Of the listed vertebrate species, ten have potential to occur with the assessed area including: Black-throated Green Warbler, Broad-winged Hawk, Canada Warbler, Connecticut Warbler, Le Conte's Sparrow, Sandhill Crane, Short-eared Owl, Upland Sandpiper, Yellow Rail, and Northern Myotis.

3.3 Vegetation

3.3.1 Rare Plant Communities

The CDC Rare Natural Plant Community Tracking List for the Peace Forest District identifies three red-listed, two blue-listed, and 11 yellow-listed plant communities (site series unit) in the BWBSmw1 biogeoclimatic subzone (Table 4). Where there is poor representation of mature

natural examples of subzones in protected areas and there has been substantial modification of existing areas, most or all site series units in a subzone often appear on the CDC lists.

Scientific Name	English Name	BC Status	Site Series
Betula nana / Carex aquatilis	scrub birch / water sedge	Yellow	BWBSmw1/Wf02
Juncus arcticus - Puccinellia nuttalliana	arctic rush - Nuttall's alkaligrass -	Red	BWBSmw1/00
- Suaeda calceoliformis	seablite		
Larix laricina / Aulacomnium palustre	tamarack / glow moss	Yellow	BWBSmw1/10
		D 1	BWBSmW1/W006
Muhlenbergia richardsonis - Juncus arcticus - Poa secunda ssp. juncifolia	mat muhly - arctic rush - Nevada bluegrass	Red	BWBSmw1/00
Picea glauca / Leymus innovatus -	white spruce / fuzzy-spiked wildrye -	Yellow	BWBSmw1/03
Lathyrus ochroleucus	creamy peavine		
Picea glauca - Populus tremuloides /	white spruce - trembling aspen / step	Yellow	BWBSmw1/01
Hylocomium splendens	moss		BWBSmw2/01
Picea glauca - Populus tremuloides /	white spruce - trembling aspen /	Yellow	BWBSmw1/00
Shepherdia canadensis	soopolallie		
Picea glauca / Ribes triste / Equisetum	white spruce / red swamp currant /	Yellow	BWBSmw1/07
spp.	horsetails		
Picea glauca / Ribes triste /	white spruce / red swamp currant /	Blue	BWBSmw1/05
Gymnocarpium dryopteris	oak fern		
Picea glauca / Ribes triste / Mertensia	white spruce / red swamp currant / tall	Blue	BWBSmw1/06
paniculata	bluebells		
Picea mariana / Equisetum arvense /	black spruce / common horsetail /	Yellow	BWBSmw1/11
Sphagnum spp.	peat-mosses		BWBSmw1/Wb09
Picea mariana / Ledum groenlandicum /	black spruce / Labrador tea / peat-	Yellow	BWBSmw1/08
Sphagnum spp.	mosses		
Picea mariana / Vaccinium vitis-idaea /	black spruce / lingonberry / knight's	Yellow	BWBSmw1/04
Ptilium crista-castrensis	plume		
Pinus contorta / Vaccinium myrtilloides /	lodgepole pine / velvet-leaved	Yellow	BWBSmw1/02
Vaccinium vitis-idaea	blueberry / lingonberry		
Populus balsamifera (ssp. balsamifera,	(balsam poplar, black cottonwood) -	Red	BWBSmw1/09
ssp. trichocarpa) - Picea spp. / Cornus stolonifera	spruces / red-osier dogwood		BWBSmw1/Fm02
Salix reticulata - Salix polaris	net-veined willow - polar willow	Yellow	BWBSmw1

 Table 4. Listed plant communities in the BWBSmw1.

Other vegetation communities of particular importance and sensitivity include riparian communities, which are not described in the site identification field guide, but typically have high wildlife values and are sensitive to disturbance.

3.3.2 Rare Plant Species

Plant species can be identified using several keys. Generally the nomenclature follows Hitchcock *et al.* (1973), however The Vascular Plants of British Columbia (Ministry of Forests 1989, 1990, 1991 & 1994) was used where there were discrepancies in the species names used. There are 20 plant species that appear on the CDC red-list and 33 that occur on the blue-list of rare vascular plant species within the BWBS subzone of the Peace Forest District (BC CDC 2008).

This list was further examined to determine if the listed plant species have the potential to occur within the BWBSmw1 subzone. The examination revealed that 20 red-listed and 26 blue-listed species may occur within this subzone (Appendix 3). Focus was placed on the potential for red-listed species to occur within the project areas and based on their known distribution and habitat requirements, 8 have the potential to occur at these boat ramp locations (Table 5).

English Name	BC Status	Habitats	Occurrence in Project Area
riverbank anemone	Red	moist to mesic gravel bars, streambanks and forests in the steppe and montane	Potential but not observed.
sickle-pod rockcress	Red	mesic to dry grasslands, gravelly river banks and disturbed areas in the steppe and montane	Potential but not observed.
long-leaved mugwort	Red	mesic sreambanks and terraces in the montane zones	Potential but not observed.
Canada Ryegrass	Red	perennial ryegrass - mesic to moist pastures, fields, meadows, roadsides, and disturbed areas in the lowland, steppe and montane	Potential but not observed.
heart-leaved buttercup	Red	moist to mesic grasslands, meadows and forest openings in the montane	Potential but not observed.
prairie buttercup	Red	dry grasslands, thickets, and open forests in the montane	Potential but not observed.
rivergrass	Red	ponds, marshes, lakeshores and streamsides in the steppe and montane	Potential but not observed.
marsh fleabane	Red	wet to moist streambanks, lakeshores, ponds, and marshes in the montane	Potential but not observed.

Table 5. R	Red listed plant species	that may occur in the Pea	ace River boat ramp project area.
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The CDC has an occurrence record from 1979 of riverbank anemone occurring 1km west of Halfway River (CDC 2008). While none of these species were observed during this assessment, this does not preclude them from occurring in the area. However since, very minimal upland clearing will be required for any of the potential ramp locations, these species would not be negatively affected.

3.3.3 First Nations Traditional Plant Use

A variety of plants have been identified as providing value to First Nations people. Indigenous peoples throughout BC have used plants for food, medicine, tools, transportation, and shelter (Davis 1993). Foods such as berries, roots, fruits, bark, shoots, leaves and lichens have been included in their diets for centuries. Plants also provide forage for the animals on which they hunted and relied on for meat. Table 6 outlines those species of importance that were observed or are likely to occur in the upland areas of these sites.

Common Name	Scientific Name	Use
Saskatoon	Amelanchier alnifolia	Berries.
Trembling aspen	Populus tremuloides	Tent poles, deodorizer,
		absorbent material.
Black cottonwood	Populus balsamifira	Canoes and fire sets.
Red osier dogwood	Cornus sericea	Smoked for lung disease
False Solomon's seal	Smilacina racemosa	Berries, sweetener or
		flavouring.
Wild raspberry	Rubus idaeus	Popular berry.
Soapberry	Sherperdia canadensis	Confection, ailments, trade
		item.
Wild strawberry	Fragaria virginiana	Berries.

Table 6. Plant species found within the project area with traditional uses.

4.0 HALFWAY RIVER EXISTING SITE

4.1 Fish and Fish Habitat

The existing informal boat launch is located along the left (east) bank of Halfway River (WSC: 235) 503 m upstream of its confluence with the Peace River (Appendix 1: Plates 1, 3 and 4). Halfway River is known to provide habitat for several fish species including: Arctic grayling, bull trout, burbot (*Lota lota*), flathead chub (*Platygobio gracilis*), Kokanee (*Oncorhynchus nerka*), lake chub (*Couesius plumbeus*), lake whitefish (*Coregonus clupeaformis*), largescale sucker (*Catostomus macrocheilus*), longnose dace (*Rhinichthys cataractae*), longnose sucker (*Catostomus catostomus*), mountain whitefish (*Prosopium williamsoni*), northern pike (*Esox lucius*), northern pikeminnow (*Ptychochelius oregonesis*), rainbow trout (*O. mykiss*), redside shiner (*Richardsonius balteatus*), slimy sculpin (*Cottus cognatus*), spottail shiner, and white sucker (*Catostomus commersoni*) (FISS 2008). No other unnamed or unmapped drainages were observed in the vicinity of this location.

The streambed substrates in the area of the proposed boat ramp extension were composed of fines with the odd interspersed cobble (Appendix 1; Plates 5 and 6). The fine substrates do not provide adequate rearing or spawning habitat for most species in the river however, they may provide habitat for a variety of aquatic invertebrates.

Recent studies have not captured young of year or juveniles near the boat launch location indicating that spawning occurs elsewhere and that the habitat within the boat launch location is not limited (Winarski 2008). The cobbles and boulders are located within the thalweg area. In the immediately boat launch location there was little aquatic vegetation but some LWD was found just downstream and in the middle of the river downstream of the middle pier.

The area that is proposed for the ramp construction is not likely to provide habitat for the species of special concern in this region. Goldeye could be found in the turbid waters of the Peace/Halfway River confluence but they are usually associated with deeper water and bull trout have been found more in the thalweg and further upstream of the bridge (Cowie 2008; Winarski 2008). Spottail shiners prefer channel margins where flows are slow however at this site, the flows are fairly high. Pearl dace prefer slow sluggish streams, small lakes, and pools which are not found at this site.

4.2 Wildlife and Wildlife Habitat

During the field assessment, ungulate tracks and pellets were observed in the fine substrates near the high water mark (Appendix 1; Plate 7). Canada geese, swallows, gulls (sp.), western garter snake, and plovers (sp.) were observed around the upland area where there are some suitable nesting sites provided by the vegetation bordering the channel (Appendix 1; Plate 8). Although not observed, it is likely that other songbirds, small mammals, and amphibians utilize this area. Humans frequently use this area and as such its usage by wildlife may be sporadic.

While this area may be used by a variety of species, the habitat is not deemed critical and is not limited upon the landscape. A further review of these listed wildlife species and their habitat requirements are not required. Of the SARA species listed in Table 1, none of them are likely to be affected if boat ramp construction occurs at this location given habitat present. In addition, the footprint of the ramp upgrades proposed for this site would not impact critical habitat for the provincially listed species.

The upgrade of the boat ramp in this location would not affect the already developed upland area. Minimal clearing would be necessary to facilitate the construction of the ramp and associated parking areas as per the conceptual design drawings (Moffat & Nichol 2008). The noise of construction may temporarily displace wildlife from this area and therefore, critical periods such as nesting should be avoided. If clearing is to occur, critical periods such as nesting (May 1 to July 31st) are to be avoided. A nest survey should be conducted prior to construction and if no nests are found, then clearing could proceed within the critical nesting window.

4.3 Vegetation

Plant species observed at this location included trembling aspen, balsam poplar, coyote willow, wolf willow, prickly rose, white sweet clover, yarrow, false Solomon's seal, red-osier dogwood, timothy, slender wheatgrass, Saskatoon, and snowberry. Some horsetails were observed along the high water mark but the moss layer is poorly developed. The upland area had a westerly aspect (280 degrees) and the soils were shallow. Mature balsam poplars were present along the channel margin downstream of the ramp (Appendix 1; Plate 9). Recent flood signs along the edge were limited as a logjam just downstream is now directing the thalweg of the Halfway River westward and away from this vegetation. Given this combination of plant species and its location on the floodplain of the Halfway and Peace Rivers, this may be representative of the red-listed balsam poplar, black cottonwood - spruce / red-osier dogwood plant community (BWBSmw1/09 or BWBSmw1/Fm02). However, it is lacking the high percentage of high-bush cranberry and black twinberry that is typical of this community (CDC 2008).

Since this area has some characteristics of a potential red-listed community, it is recommended that no clearing of the mature poplars and the associated understory be conducted at this site. Given the conceptual drawing for upgrades to this existing ramp, minimal clearing of the existing parking area would be required and would likely be limited to prickly rose and grasses around the parking perimeter (Appendix 1; Plate 2). None of the red listed plants species were observed. Species of importance to First Nations are present; however, it is unlikely that these are utilized from this location.

4.4 Potential Environmental Effects

The fisheries habitat and wildlife habitat existing at this site are not deemed critical habitats and are not limited upon the landscape. These ecosystem components have been previously disturbed and are assigned an ESA rating of low.

The vegetation present is assigned a High ESA rating given that the upland vegetation located south of the existing ramp along the channel margin is a potential red-listed plant community. As such, the existing parking areas should not be extended into this area and flagging of the site is recommended prior to construction to ensure minimal vegetation clearing is conducted. The vegetation surrounding the existing road is not limiting on the landscape and may be clearing to widen the road as per the conceptual drawing.

The proposed boat ramp is a single lane gravel filled berm (80 m long) with either a gravel or concrete slab surface. The associated parking area required for this ramp would be expanded by approximately 200 m², to facilitate parking and a turnaround area. Given the size of the ramp required, the overall disturbance footprint below the high water mark is expected to be approximately 300 m². While the riprap berm and gravel ramp will provide some interstitial space and cover for fish, it will also displace natural streambed substrate.

Given the size of the footprint, DFO may consider this a Harmful Alteration Destruction or Disturbance (HADD) and the project will need to be Authorized. If so, compensation may be required and further investigation into compensations options will be prepared and incorporated into the final design. Options may include the placement of LWD features into the riprap berm during construction to provide cover habitat at varying water levels.

This design and corresponding environmental information should be provided to DFO to provide comment but due to various constraints, the DFO is not reviewing conceptual projects solely for the purpose of providing advice or comments. Their review will occur if/when a final design is selected for this site.

It is anticipated that, based on conceptual design, that no significant unmitigable affects would occur as a result of the construction of this boat ramp. An appropriate Environmental Management Plan would be required for submission to the agencies prior to construction.

5.0 HALFWAY RIVER WEST

5.1 Fish and Fish Habitat

The potential site is located along the right (west) bank of Halfway River immediately downstream of the highway bridge. The streambed substrates in the area of the proposed boat ramp were observed to be primarily composed of silt and sands (Appendix 1; Plate 14). The fine substrates do not provide adequate rearing or spawning habitat for most species in the river. The fine substrate likely provides habitat for a variety of aquatic invertebrates. No large boulders or LWD were visible that would provide cover habitat.

A significant side channel begins just downstream from this location and ramp construction may dewater the side channel (Appendix 1; Plate 13). This side channel may be used by some fish species as refuge during high freshet flows. No other streams or drainages were observed in close proximity to this site.

Recent studies have not captured young of year or juveniles in this area indicating that spawning occurs elsewhere and that the habitat within the boat launch location is not limited. The cobbles and boulders are located within the thalweg area. In the immediate vicinity of the boat launch location there was little aquatic vegetation but some LWD was found just downstream and in the middle of the river downstream of the middle pier.

The area that is proposed for the ramp construction is not likely to provide habitat for fish species of special concern in this region. Goldeye are usually associated with deeper water and bull trout have been found more in the thalweg and further upstream of the bridge. Spottail shiners prefer channel margins where flows are slow however at this site, the flows are fairly high. Pearl dace prefer slow sluggish streams, small lakes, and pools which are not found at this site.

5.2 Wildlife and Wildlife Habitat

During the field assessment, ungulate tracks, bedding sites, significant browse, and pellets were observed in the upland area and along the high water mark. Canada geese, swallows, gulls (sp.), and plovers (sp.) were observed around the upland area where there are some suitable nesting sites provided by the vegetation bordering the channel (Appendix 1; Plate 11). Although not observed, it is likely that other songbirds, waterfowl, small mammals, and amphibians utilize this area. Humans frequently use this area as a campsite and as such its usage by wildlife may be sporadic.

While this area may be used by a variety of species, the habitat is not deemed critical and or limited upon the landscape. However, the side channel and flooded islands located downstream of this site, may provide foraging and potential nesting sites for a variety of birds. Of the SARA

species listed in Table 1, none of them are likely to be affected if boat ramp construction occurs at this location. In addition, the footprint of constructing a ramp at this location would not impact critical habitat for the provincially listed species. However, the ramp may move the thalweg over preventing the occasional flooding of the side channel and island and reduce its foraging potential.

The construction of a boat ramp in this location would not affect the already disturbed upland area (Appendix 1; Plate 10). Minimal clearing would be necessary to facilitate the construction of the ramp and associated parking areas as per the conceptual design drawings (Moffat & Nichol 2008). The noise of construction may temporarily displace wildlife from this area and therefore, critical periods such as nesting should be avoided. If clearing is to occur, critical periods such as nesting (May 1 to July 31st) are to be avoided. A nest survey should be conducted prior to construction and if no nests are found, then clearing could proceed within the critical nesting window.

5.3 Vegetation

The vegetated upland area surrounding this location has been highly disturbed (Appendix 1; Plate 10). Plant species observed in the area included: balsam poplar, coyote willow, red-osier dogwood, prickly rose, wolf willow, red clover, bluejoint, white sweet clover, Canada goldenrod, purple peavine, and northern gooseberry. Although some species are representative of the BWBSmw1/fm02 site series, the poplars are few and infrequent and the majority of the area has been mowed and disturbed. Thus no natural representatives of the ecosystems found in the BWBSmw1 are found at this site. No rare plant or plant communities or plants used by First Nations people would be affected if construction occurs at this site.

5.4 Potential Environmental Effects

With respect to the terrestrial habitat within the vicinity of the proposed boat launch, no critical habitats are present and the habitat present is not limited upon the landscape. Thus the vegetation is assigned a low ESA rating.

The fisheries habitat and wildlife habitats are assigned moderate ESA ratings. While introduction of larger boulders into this area may provide more suitable fish habitat in the immediate area, there is refuge habitat and wildlife foraging habitat downstream of the proposed ramp location in the side channel and associated island, which may be lost due to the relocation of the thalweg after ramp construction. In addition, the toe of the ramp is located closer to the existing thalweg than the ramp proposed at the existing site.

The overall footprint below the high water mark for this option is 330 m^2 . Given the disturbance footprint, DFO will likely need to authorize this project and may require compensation. If so,

further investigation into compensation options will be conducted and incorporated into the final design. Options may include the placement of LWD features into the riprap berm during construction to provide cover habitat at varying water levels or to provide off channel refuge habitat.

This design and corresponding environmental information will be provided to DFO to provide comment, when the final design is prepared. This plan should also be provided to the Ministry of Environment or members of the Peace/Williston Fish and Wildlife Compensation Plan for their comments regarding wildlife habitats in this area. An appropriate Environmental Management Plan would be required for submission to the agencies prior to construction.

6.0 PEACE RIVER SITE

6.1 Fish and Fish Habitat

This potential site is located on the mainstem of the Peace River, approximately 1 km upstream of the confluence with Halfway River. Fish species that may utilize this area would include those that would be present in Halfway River (Section 4.1). A back channel refuge area is present immediately upstream which likely floods during high flows. No other streams were observed at this location however a gully was present in the upland area but may direct surface flow during rain events.

The streambed substrates in the area of the existing ramp were primarily composed of small gravels and cobbles (Appendix 1; Plate 18). The substrates may provide adequate rearing or spawning habitat for some species in the Peace River, however most species tend to spawn in tributary streams (Pattenden *et al* 1991). The finer substrate likely provides habitat for a variety of aquatic invertebrates. There was little aquatic vegetation and LWD found in the immediately area of the proposed launch however, deeper water and vegetation is present immediately upstream in the back channel area.

The area that is proposed for the ramp construction is not likely to provide habitat for the species of special concern in this region. Goldeye are usually associated with deeper water and bull trout have been found more in the thalweg and in tributary streams. Spottail shiners prefer channel margins where flows are slow however at this site, the flows are fairly high. Pearl dace may utilize the back channel area, as they prefer slow sluggish streams, small lakes, and pools. A ramp at this location may influence the flows in the back channel area but this area is subject to flooding so the use of this area by pearl dace may be sporadic.

6.2 Wildlife and Wildlife Habitat

During the field assessment, ungulate tracks, significant browse, pellets, and black bear tracks were observed in the upland area (Appendix 1; Plate 20). Canada geese, an owl (sp.), swallows, gulls (sp.), and plovers (sp.) were observed in the upland area and there are some suitable nesting sites provided by the vegetation surrounding the back channel (Appendix 1; Plate 21). Although not observed, it is likely that other songbirds, waterfowl, small mammals, and amphibians utilize this area. Humans potentially use this area as a campsite and as such its usage by wildlife may be sporadic.

While this area may be used by a variety of species, the habitat is not deemed critical and or limited upon the landscape. However, the back channel area located upstream of this site, may provide foraging and potential nesting sites for a variety of birds. The vegetated area along the top of bank may also be a travel corridor for a number of mammals including elk and deer (Appendix 1; Plate 19). In addition, a mature aspen stand is located adjacent to the access road that may provide habitat for some provincially listed species including: broad winged hawk,

northern myotis, Canada warbler, and Connecticut warbler. Of the SARA species listed in Table 1, none of them are likely to be affected if boat ramp construction occurs at this location.

6.3 Vegetation

The upland area at this location has been previously harvested as evident by cut stumps and young saplings (Appendix 1; Plates 16 and 17). Tree cover was dominated by white spruce with a smaller component of balsam poplar and trembling aspen. The understory consisted of purple peavine, yarrow, wild strawberry, red-osier dogwood, common horsetail, showy aster, timothy, and sitka alder. Due to the vegetation, topography, and the previous disturbance of the area, no natural representatives of the ecosystems found in the BWBSmw1 were identified. No rare plant or plant communities would be affected if construction were undertaken at this site. While these species have been identified as being used by First Nations, it is unlikely that these are utilized from this location.

6.4 Potential Environmental Effects

With respect to the terrestrial habitat within the vicinity of the proposed boat launch, no critical habitats are present and the habitat present is not limited upon the landscape. Thus the vegetation is assigned a low ESA rating.

The fisheries habitat and wildlife habitats are assigned moderate ESA ratings. While introduction of larger boulders into this area may provide more cover in the immediate area, there is refuge habitat and wildlife foraging habitat upstream and in the upland area, which may be lost or altered due to the construction. In addition, the access road would need to be upgraded which would require the clearing of the mature aspen stand which may provide habitat to listed species such as the Canada warbler or Northern myotis.

The proposed boat ramp is a single lane gravel filled berm (55 m long) with either a gravel or concrete slab surface. The associated parking and turnaround area required for this ramp would be approximately 1200 m^2 . Given the size of the ramp required, the overall disturbance footprint below the high water mark is expected to be approximately 150 m^2 . While the riprap berm and gravel ramp will provide some interstitial space and cover for fish, it will also displace natural streambed substrate.

Given the size of the footprint, DFO may consider this a HADD and the project will need to be Authorized. If so, further investigation into compensation options will be conducted and incorporated into the final design. Options may include the placement of LWD features into the riprap berm during construction to provide cover habitat at varying water levels.

This design and corresponding environmental information should be provided to DFO to provide comment but due to various constraints, the DFO is not reviewing conceptual projects solely for the purpose of providing advice or comments. Their review will occur if/when a final

design is selected for this site. This plan should also be provided to the Ministry of Environment or members of the Peace/Williston Fish and Wildlife Compensation Plan for their comments regarding wildlife habitats in this area. An appropriate Environmental Management Plan would be required for submission to the agencies prior to construction.

7.0 BLACKFOOT PARK

7.1 Fish and Fish Habitat

An existing concrete ramp is located on the right bank of the Peace River just downstream of the Clayhurst Bridge (Appendix 1; Plate 22). The nearest drainage is the Alces River (WSC: 230-702700) that flows into the Peace River immediately across from the boat launch. This river is known to provide habitat for the same species as found in Halfway River. The Peace River is approximately 240 m wide at this location therefore the ramp will not likely affect the fish populations using Alces River.

The stream substrates in the area near the existing ramp were primarily composed of silt and sands with a smaller component of cobbles and gravels (Appendix 1; Plate 26). The fine substrates do not provide adequate rearing or spawning habitat for most species found in the river. Additionally, limited cover was identified in the vicinity of the proposed ramp. Some cover would be provided at higher water levels by the riprap of the revetment under the bridge and some LWD located further downstream on the gravel bar.

The area that is proposed for the ramp construction is not likely to provide habitat for the species of special concern in this region. Goldeye are usually associated with deeper water and bull trout have been found more in the thalweg and in tributary streams. Spottail shiners prefer channel margins where flows are slow however at this site, the flows are fairly high. Pearl dace are also not likely to occur, as they prefer slow sluggish streams, small lakes, and pools.

7.2 Wildlife and Wildlife Habitat

During the field assessment, abundant deer tracks, swallows, and abundant toadlets were observed (Appendix 1; Plates 28 and 29). Given their physical characteristics and occurrence records, these toadlets may be western toads which is a SARA listed species (Matsuda *et al* 2006). A low depression is located downstream of the site between the channel bank and a downstream island. This area is flooded on occasion and provides good rearing and breeding habitat for amphibians. It is likely that other songbirds, small mammals, amphibians, and ungulates also utilize this area.

While this area may be used by a variety of species, the habitat within the construction footprint is not deemed critical and/or limited upon the landscape. The thick willow vegetation along the channel margin may provide foraging and potential nesting sites for a variety of birds. The upland area along the top of bank may also be a travel corridor for a number of mammals including elk and deer. Of the SARA species listed in Table 1, none of them, including the western toad, are likely to be affected if boat ramp construction occurs at this location. In addition, the footprint of constructing a ramp at this location would not affect critical habitat for the listed species.

7.3 Vegetation

The vegetated upland area surrounding this location has been disturbed (Appendix 1; Plates 23 and 24). Plant species observed in the area surrounding the ramp and campsite included: balsam poplar, coyote willow, red-osier dogwood, prickly rose, wolf willow, red clover, bluejoint, white sweet clover, Canada goldenrod, silverweed, purple peavine, and parsnip flower buckwheat. Although some species are found within the red-listed plant community (as observed on the east bank of Halfway River), the majority of the area has been mowed and disturbed. Thus producing no natural representatives of the ecosystems found in the BWBSmw1 at this site. No rare plant or plant communities or plants used by First Nations people would be affected if construction were to occur at this site.

7.4 Potential Environmental Effects

The fisheries, wildlife and terrestrial habitats at this site are not deemed critical habitat and are not limited upon the landscape. Based on the proposed construction, these ecosystem components have been previously disturbed and are assigned an ESA rating of low.

The proposed boat ramp is a single lane concrete ramp (45 m long extension to the existing ramp) with a concrete slab surface. The associated parking and turnaround area required for this ramp would be the same as current site conditions. Given the size of the ramp required, the overall disturbance footprint below the high water mark is expected to be approximately 270 m^2 . Additional riprap will be required for scour protection both underneath the bridge and along the perimeter of the ramp. While the riprap berm and concrete ramp will provide some interstitial space and cover for fish, it will also displace natural streambed substrate.

Given the presence of an existing ramp at this location and the extent of riprap stabilization required under the bridge, DFO may not need to authorize this project. However, if they deem a HADD is occurring, further investigations will be conducted to identify compensation options which will be incorporated into the final design. Options may include the placement of LWD features into the riprap along the downstream edge of the ramp to provide additional cover habitat at varying water levels or to provide off channel refuge habitat.

This design and corresponding environmental information should be submitted to DFO to provide comment but due to various constraints, the DFO is not reviewing conceptual projects solely for the purpose of providing advice or comments. Their review will occur if/when a final design is selected for this site. This plan should also be provided to the Ministry of Environment or members of the Peace/Williston Fish and Wildlife Compensation Plan for their comments regarding wildlife habitats in this area. An appropriate Environmental Management Plan would be required for submission to the agencies prior to construction.

8.0 MITIGATIVE MEASURES, GUIDELINES AND RECOMMENDATIONS

8.1 General Environmental Management Plan

The purpose of an Environmental Management Plan (EMP) is to identify the components of a project with may affect identified ecosystem components (see previous sections). It shall be used as a guide by all parties associated with the construction process to ensure best management practices are followed and impacts to the environment are minimized.

Potential impacts from the extension of an existing boat ramp or the construction of a new ramp are expected to be minimal and should be easily avoided and/or mitigated. The primary potential impact is the introduction and/or mobilization of deleterious substances into the lake habitat during construction. This may include the following:

- sediment mobilization during excavation of the lakebed in preparation for the installation of the concrete slab;
- oil/fuel spills to occur both on the soils surrounding the work area and into the water;
- disturbance to fish during pile driving operations;
- leaching of grouting materials, waste water or concrete slurry into the water if concrete poured on site; and
- erosion of exposed soils and transport into waterways.

The intent of this EMP is to limit the suspended sediment discharged from the site to within 25 mg/l under normal conditions and 75 mg/l during storm events, which is consistent with the recommendations in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck 1993). The general approach to meet the criteria will be to ensure construction works occur in the dry, isolate any sediment-laden water from the lake, minimize surface erosion, and minimize the size of disturbed areas.

8.1.1 Mitigative Measures

Specific mitigative measures that will be used during the course of construction at all of the boat ramp locations include the following:

1. Construction should be completed during the lowest water levels, which usually in August. This will help ensure that the work is completed in the "dry". If water levels begin to increase during the construction, an isolation fence or berm must be constructed to keep water out of the work site. If work is conducted in the wet, floating silt curtains or coffer dams may be required to ensure sediment is not mobilized outside the work area.

- 2. Isolation fences can be installed using a variety of materials. Concrete lock blocks can be placed and will provide a level of isolation. Also, a section of filter fabric with a sheet of heavy gauge polyethylene plastic, as a liner would be laid on the stream bed, the sandbags placed on top, and the fabric wrapped over the sandbags to create an impermeable barrier. Other materials such as rebar, hay bales and silt fencing can be combined to create an isolation fence. The availability of materials, site conditions, and access to the site will determine the type of fence constructed. Disturbed sediment within the construction site will be allowed to settle out prior to removal of the enclosure.
- 3. With most isolation features, some degree of seepage should be expected. If this does occur, any sediment-laden water that is created should be retained in the isolation area. If necessary, the turbid water can be pumped out of the area by a vacuum truck. If water is present within the work area, a fish salvage using an electrofisher should be completed prior to the beginning of works to prevent potential injury to fish.
- 4. Pre-cast concrete slabs are to be used in remote areas and in areas near the water. If a cast-in place concrete slabs are absolutely necessary, it is very important that no concrete or grout enters the water as the leachate is toxic and is considered a deleterious substance. To prevent this, the work area should be isolated from the water with a waterproof barrier such as polyethylene sheets or sealed coffer dams. These should remain in place during the curing period (at least 72 hours) (MOT 2004). Monitoring of the pH frequently in the watercourse immediately downstream of the isolated worksite will be required until completion of the works. Emergency measures will be implemented if downstream pH has changed more than 1.0 pH unit from the background level, or is below 6.0 or above 9.0 pH units (MWLAP 2004). Keeping a carbon dioxide (CO₂) tank with regulator, hose and gas diffuser readily available during concrete work is recommended as it can be used to neutralize pH levels if a spill occurs.
- 5. If there is surface flow at the time of construction, it will be necessary to dewater the work area. To facilitate pumping, a sump would need to be excavated in the drainage upstream of the work area as there is no well defined channel to dam, and the flow pumped out of the sump and into the bush for natural filtration. Once the water in the sump has clarified, the flows should be pumped around the work area and discharged directly back into the lake.
- 6. As heavy equipment activity will occur in close proximity to the stream, the equipment should be inspected to ensure it is clean, in good working order and free of any fluid leaks or excess grease. Equipment that uses synthetic biodegradable hydraulic fluid oil would be preferred. The environmental monitor should inspect the equipment for leaks and the operator should be asked to comment on the condition of the hydraulic lines. A spill kit should be present on any machinery working on this project.

- 7. Excavated material should be stockpiles should be placed on level ground, away from any concentrated flows. Stockpiled materials can be covered with polyethylene tarps, or silt fences may be placed around the perimeter of the pile if excessive erosion occurs that results in sediment laden water being transported off the site.
- 8. In order to minimize tracking dirt onto the access roads, gravel pads should be maintained at access points. If necessary these pads can be modified to function as active (pressure wash) or passive (wet trench) wash stations.

Other general mitigative measures may include but not be limited to:

- Flagging or otherwise delineating the limits of disturbance prior to initiating construction;
- A tailgate meeting to review environmental objectives and procedures with the construction supervisor and crew;
- If rocks, stumps or logs need to be moved from the lakebed to build the ramp, they should be relocated to an area of similar depth and not removed from the site;
- Ensuring that a spill kit is present on-site;
- Ensuring there are no fuel or fluid leaks from equipment;
- Prohibiting refueling or fuel storage within 20 m of waterbodies;
- Minimize unnecessary clearing; and
- Avoid working during heavy or prolonged rains

8.1.2 Monitoring Requirements

A suitably qualified professional should be retained as an environmental monitor during the construction process. The monitor should be on site prior to the start of the project to ensure all parties are aware and familiar with the EMP, during all phases of the construction that are in the wetted area, during significant weather events, and at completion to ensure site is left stable and environmentally sound.

Activities with associated environmental monitoring responsibilities can include:

- Installation of isolation structures at site to prevent mobilization of any sediment-laden water;
- Thoroughly monitoring machinery before and during works to ensure no hydraulic fluid leaks;
- Fish salvage within isolation area;
- Monitoring of water quality to ensure no sediment is mobilized during construction;
- Construction and decommissioning of any isolation structures and crane pads; and
- Mitigation activities (*e.g.* erosion and sediment control measures).

Additional monitoring requirements may be outlined in the Letter of Advice or Authorization issues by DFO. The monitor will complete daily environmental monitoring reports which will accurately document the daily activities and any problems/solutions that were managed on site. A post-construction monitoring will be completed and submitted to both BC Hydro and the appropriate agencies.

8.1.3 Timing Windows

In addition to the low water levels required, the timing of construction is also potentially limited by the Periods of Least Risk for Instream Works (MOE 1999). Based on the possible presence of bull trout, mountain whitefish, arctic grayling, and rainbow trout, the instream work window is July 15 to August 15th. Since this timeframe may not correspond with suitable water levels and if so, a variance must be obtained from MOE prior to construction (Section 8.1.2).

It is advised that f clearing of the upland area is required, operations such as brushing and mowing should not be conducted in the spring or early summer when birds are nesting. Work areas should be thoroughly inspected for occupied bird nests, eggs or nests of species protected under the Wildlife Act and Migratory Bird Convention Act (MOT 2004).

8.1.4 Permitting Requirements

If during construction, an isolation fence is required, fish salvage should be conducted. A fish collection permit for fish salvage must be obtained from MOE.

Since all construction must occur during low water levels, the timing of these works will be outside of the instream work window and a variance from MOE will be required. In order to satisfy MOE requirements for granting a variance, the basic requirements include:

- 1. Justification for why the works need to be conducted outside of the default instream work window;
- 2. Demonstration that fish passage will be maintained to accommodate fish migration to or from spawning areas; and
- 3. A sediment management plan that minimizes the potential for sediment release.

This feasibility study and associated EMP's should provide MOE with the required information to grant a variance.

Since the Peace River is navigable water, Transport Canada will also require notification under the Navigable Waters Protection Act. Once the final design is selected, an application should be submitted to the Navigable Waters Protection Program office (Vancouver, BC).

8.2 Specific Site Requirements

8.2.1 Halfway River Existing

Since the flows of Halfway River can fluctuate rapidly given heavy rainfall events, a coffer dam or other isolation structure may be required between the work area and this flow to ensure substances and/or sediment is not mobilized into the river and transported downstream. Alternatively, a floating silt curtain may be used to contain sediment created during the construction, however this will not be suitable if cast-in-place concrete is used; pre-cast slabs are preferred. A fish salvage within the isolated area will be conducted prior to construction. Silt fencing may be required further upslope if any soils are exposed during expansion of the parking area and roads.

Flagging of the construction limits are recommended prior to construction to ensure the redlisted plant community is not affected. Minimal clearing along the existing roads is feasible as long as the amount of area to be cleared is reviewed with the environmental monitor.

Prior to the construction of this ramp, a Section 9 Water Act *Approval* form must be submitted to the local Ministry of Environment office (FrontCounter BC, Fort St. John, BC). This form will notify MOE as to the location of the works, nature of the change, and contact information for the construction works.

This feasibility study along with the *Approval* form should be forwarded to the local DFO office (Jayson Kurtz, Prince George, BC) for their review prior to construction. DFO have not been able to provide preliminary comments regarding this option at this time. Normally the conversion of stream bed habitat to a hard surface (*ie.* concrete) would constitute a HADD under section 35(2) of the Federal Fisheries Act. DFO will determine if the project can proceed under a Letter of Advice (which approves the project without legal requirements for reporting or monitoring) or an Authorization (which may require legal compensation, post-construction monitoring, and reporting requirements).

Since this will involve the upgrade of an existing ramp, Transport Canada may not require a formal application submission for works approval pursuant to the Navigable Water Protection Act but they may wish to comment on the design (Mackie 2007).

8.2.2 Halfway River West

Since the flows of Halfway River can fluctuate rapidly given heavy rainfall events, a coffer dam or other isolation structure may be required between the work area and this flow to ensure substances and/or sediment is not mobilized into the river and transported downstream. A fish salvage within the isolated area will be conducted prior to construction. Silt fencing may be required further upslope if any soils are exposed during expansion of the parking area and roads. Flagging of the construction limits are recommended at this site to retain as much of the wildlife habitat as possible.

Prior to the construction of the ramp, a Section 9 Water Act *Approval* form must be submitted to the local Ministry of Environment office (FrontCounter BC, Fort St. John, BC). This form will notify MOE as to the location of the works, nature of the change, and contact information for the construction works.

This feasibility study along with the *Approval* form should be forwarded to the local DFO office (Jayson Kurtz, Prince George, BC) for their review prior to construction. DFO have not been able to provide preliminary comments regarding this option at this time. Normally the conversion of streambed habitat to a hard surface (*ie.* concrete) would constitute a HADD under section 35(2) of the Federal Fisheries Act. DFO will determine if the project can proceed under a Letter of Advice (which approves the project without legal requirements for reporting or monitoring) or an Authorization (which may require legal compensation, post-construction monitoring, and reporting requirements).

Since this will involve the construction of a new ramp, which may be a potential navigational hazard, Transport Canada will require the submission of an application for works approval pursuant to the Navigable Waters Protection Act.

8.2.3 Peace River near Halfway River

Based on the conceptual drawing for a new ramp at this location, key considerations will be to flag the limits of construction and to ensure no riparian vegetation and the back channel area is not impacted. In addition, the existing drainage ditchline should be retained (i.e. culvert installation) to facilitate proper draining of the area.

Significant amounts of fill will need to be excavated from the bank to obtain the proper ramp slope. This material will need to be removed from the site or stockpiled on level ground away from any drainage or watercourse. If this material is to be stockpiled near the site, a silt fence should surround the perimeter of the stockpile or the material should be covered with tarps until the material is either removed from the site or used for landscaping. A silt fence should be installed around the perimeter of the construction area both as a boundary delineator and to prevent sediment from leaving the area and enters the river.

The existing road would also need to be upgraded to facilitate access to this new ramp, which may require the installation of drainage crossing structures and vegetation clearing. Limits of clearing should be kept to a minimum as the aspen stand through which the existing road is location, provides habitat for numerous wildlife species.

Prior to the construction of the ramp, a Section 9 Water Act *Approval* form must be submitted to the local Ministry of Environment office (FrontCounter BC, Fort St. John, BC). This form will notify MOE as to the location of the works, nature of the change, and contact information for the construction works.

This feasibility study along with the *Approval* form should be forwarded to the local DFO office (Jayson Kurtz, Prince George, BC) for their review prior to construction. DFO have not been able to provide preliminary comments regarding this option at this time. Normally the conversion of streambed habitat to a hard surface (*ie.* concrete) would constitute a HADD under section 35(2) of the Federal Fisheries Act. DFO will determine if the project can proceed under a Letter of Advice (which approves the project without legal requirements for reporting or monitoring) or an Authorization (which may require legal compensation, post-construction monitoring, and reporting requirements).

Since this will involve the construction of a new ramp, which may be a potential navigational hazard, Transport Canada will require the submission of an application for works approval pursuant to the Navigable Waters Protection Act.

8.2.4 Blackfoot Park

The proposed improvement at the existing ramp at Blackfoot Park include the extension of the existing ramp and the addition of more scour protection around the perimeter and upstream of the ramp (Appendix 1; Plate 30). A coffer dam or other isolation fence will be required to divert the flows around the work area to allow work to be conducted in the dry. Alternatively, a floating silt curtain may be used to contain sediment created during the construction, however this will not be suitable if cast-in-place concrete is used; pre-cast slabs are preferred. The riprap used for the scour protection should be of adequate size to deflect the flows and filter cloth should be laid down prior to installation of scour pads.

Given that access and parking already exist at this location, it is likely that minimal disturbance of the upland vegetation would be required. Flagging the disturbance limits is recommended prior to construction. No drainages are in close proximity to this site and the area is relatively flat, therefore erosion and sediment issues should be minimal.

Prior to the upgrading of this ramp a Section 9 Water Act *Approval* form must be submitted to the local Ministry of Environment office (FrontCounter BC, Fort St. John, BC). This form will notify MOE as to the location of the works, nature of the change, and contact information for the construction works.

This feasibility study along with the *Approval* form should be forwarded to the local DFO office (Jayson Kurtz, Prince George, BC) for their review prior to construction. DFO have not been able to provide preliminary comments regarding this option at this time. Normally the conversion of streambed habitat to a hard surface (*ie.* concrete) would constitute a HADD

under section 35(2) of the Federal Fisheries Act. DFO will determine if the project can proceed under a Letter of Advice (which approves the project without legal requirements for reporting or monitoring) or an Authorization (which may require legal compensation, post-construction monitoring, and reporting requirements).

Since this will involve the upgrade of an existing ramp, Transport Canada may not require a formal application submission for works approval pursuant to the Navigable Water Protection Act but they may wish to comment on the design (Mackie 2007).

9.0 SUMMARY

Based on the assessment of environmental conditions at each of the four locations, it is recommended that existing Halfway River site and the Blackfoot Park site be upgraded. Both sites have existing footprints and the proposed upgrades to facilitate easier use and maintenance would have the least impact on the surrounding environment providing that the limits of construction are properly flagged and an EMP is followed.

The Halfway River west side may impact the downstream side channel, which provides refuge habitat for fish and foraging and nesting habitat for wildlife. The upland area, while used as a picnic area/campsite, has significant ungulate usage.

The Peace River Site would require the upgrading of an existing road, which would require clearing of mature aspen stand that provides wildlife habitat. The back channel area, while not part of the construction footprint, may be affected both by the ramp (hydrological affects upstream) and as more humans are drawn to this area given the improved access and ramp facilities.

All options will be discussed BC Hydro and other interested parties and the once sites are selected, additional surveys and permitting documents will need to be prepared prior to submission to the agencies for their review.

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APPENDIX 1

REPORT PHOTOGRAPHS

Halfway River Existing



Plate 1. Looking south at existing boat launch area on Halfway River.



Plate 2. Existing parking area at Halfway River.



Plate 3. Existing ramp at Halfway River Site



Plate 4. Existing ramp at lower water levels at Halfway River.



Plate 5. Substrate present at existing ramp on Halfway River.



Plate 6. Streambed substrate at existing ramp at Halfway River.



Plate 7. Evidence of elk activity in the area of existing ramp.



Plate 8. Older cottonwoods along the Halfway River channel margin provide wildlife habitat.



Plate 9. Mature balsam poplar along channel margin of Halfway River, beyond existing parking area.
Halfway River West Bank



Plate 10. Looking east towards possible Halfway River site, west bank.



Plate 11. Access to potential site on west bank of Halfway River. Note cleared area for parking.



Plate 12. West bank of Halfway River, potential boat launch location.



Plate 13. Downstream view of side channel along west bank of Halfway River.



Plate 14. Substrates along side channel margin near west bank potential site.



Plate 15. Evidence of elk bedding area, scat and browse present at Halfway River West bank site.

Peace River (near Halfway River)



Plate 16. Looking north along Peace River shoreline for potential boat ramp location.



Plate 17. Looking north at existing vegetation at potential Peace River site.



Plate 18. Existing shoreline and steep bank at potential Peace River site.



Plate 19. Evidence of ungulate trail along top of bank at potential Peace River site.



Plate 20. Evidence of ungulate usage of vegetated area near Peace River site.



Plate 21. Back channel area near the potential site location on the Peace River.

Blackfoot Park



Plate 22. Looking north east at existing Blackfoot Park boat launch on the Peace River.



Plate 23. View of the vegetation along floodplain of Peace River at Blackfoot Park.



Plate 24. Looking south at access road to Blackfoot Park boat launch.



Plate 25. Existing concrete boat launch ramp at Blackfoot Park.



Plate 26. Looking downstream along Peace River from Blackfoot Park ramp.



Plate 27. Upland vegetation along Peace River channel margin in Blackfoot Park.



Plate 28. Toadlet observed along channel margin of the Peace River in Blackfoot Park.



Plate 29. Evidence of ungulate usage near the ramp at Blackfoot Park.



Plate 30. Area of riprap under bridge that needs additional scour protection.

APPENDIX 2

SARA SPECIES LIST (not including marine species) **Table 7.** Schedule 1 species listed as extirpated, previously known to occur within British Columbia, and their accepted range within British Columbia.

Species	Category	Historical range within British Columbia ¹	Potential for habitat to occur in vicinity of project
Sage grouse (BC population)	Bird	Occurred in Okanagan and Similkameen valleys.	No
Pacific gopher snake	Reptile	Two historical (over 50 years ago) sightings in grasslands (southern BC).	No
Pygmy short-horned lizard (BC population)	Reptile	Two historical records from Okanagan Valley.	No
Pacific pond turtle	Reptile	Common in ponds and lakes of southern BC and Vancouver Island in the mid-1800s (no sightings Canada since 1959).	No
Island marble	Arthropod	Historically found on Gabriola and Vancouver islands.	No
Puget Oregonian snail	Molluscs	Extreme southwestern BC. Most recent record in Canada from 1905.	No

¹ Species range taken from Environment Canada (2007), except where otherwise noted.

Species	Category	Range within British Columbia ¹	Potential for
•			species to occur
			in vicinity of project
American badger (<i>jeffersonii</i> subspecies)	Mammal	Southeastern BC (south of Quesnel).	No
Vancouver Island marmot	Mammal	Vancouver Island.	No
Townsend's mole	Mammal	Restricted to about 20 km ² in the central Fraser Valley.	No
Horned Lark	Bird	Coastal BC and lower Fraser Valley	No
Williamson's Sapsucker	Bird	Lytton, Cache Creek area south to Manning Park.	No
Yellow breasted chat (<i>auricollis</i> subspecies)	Bird	Okanagan.	No
Western Screech Owl	Bird	Coastal BC and Okanagan Valley.	No
Spotted owl	Bird	Southwestern British Columbia.	No
Burrowing owl	Bird	A few in south-central BC. Requires treeless plains.	No
Sage thrasher	Bird	Extreme south-central BC.	No
White-headed woodpecker	Bird	Extreme south-central BC.	No
Nightsnake	Reptile	Extreme south-central BC.	No
Sharp-tailed snake	Reptile	Gulf Islands and southeastern Vancouver Island.	No
Oregon spotted frog	Amphibian	Lower Fraser River Valley ²	No
Northern leopard frog (southern mountain population)	Amphibian	Extreme southeastern BC.	No
Tiger salamander	Amphibian	Extreme south-central BC.	No
Rocky Mountain tailed frog (southern mountain population)	Amphibian	East Kootenays of extreme southern British Columbia.	No
Nooksack dace	Fish	4 small streams tributary to the Nooksack River in the Abbotsford, Aldergrove and Clearbrook areas of the lower Fraser Valley.	No
Morrison Creek lamprey	Fish	Morrison Creek watershed (Vancouver Island).	No
White Sturgeon	Fish	Nechako River Population	No
Stickleback (Enos and	Fish	Vancouver Island (Enos Lake), Texada	No
Paxton Lakes, and		Island (Paxton Lake and Vananda	
Vananda Creek		Creek).	
populations)			
Salish sucker	Fish	Nine populations in four creek	No

Table	8.	Schedule	1	species	listed	as	endangered	that	are	known	to	occur	within	British
	(Columbia, a	nd	their acc	cepted	ran	ge within Bri	tish (Colu	mbia.				

Species	Category	Range within British Columbia ¹	Potential for
			species to occur
			in vicinity of
			project
		drainages in the lower Fraser Valley.	
Island blue	Arthropod	Vancouver Island.	No
Taylor's checkerspot	Arthropod	Vancouver Island.	No
Sand verbera moth	Arthropod	Coastal areas – Strait of Georgia.	No
Mormon metalmark	Arthropod	Okanagan.	No
(southern mountain			
population)			
Oregon forestsnail	Mollusc	Extreme southwestern BC.	No
Hotwater physa	Mollusc	Liard River hotsprings.	No
Scarlet ammannia	Vascular Plant	Osoyoos Lake area of south-central BC.	No
Spadling's campion	Vascular Plant	Southeastern BC.	No
Slender collomia	Vascular Plant	Single site near Princeton BC.	No
Deltoid balsamroot	Vascular Plant	Vancouver Island.	No
Tall bugbane	Vascular Plant	Chilliwack River Valley.	No
Water-plantain buttercup	Vascular Plant	Vancouver Island.	No
Coastal Scouler's catchfly	Vascular Plant	Limited to three small islands close to	No
		Victoria on Vancouver Island.	
Southern maidenhair fern	Vascular Plant	Fairmont Hot Springs (southeastern	No
		British Columbia).	
Small-flowered lipocarpha	Vascular Plant	BC southern border is the northern limit.	No
Seaside birds-foot lotus	Vascular Plant	Southern tip of Vancouver Island.	No
Prairie lupine	Vascular Plant	Southern tip of Vancouver Island.	No
Streambank lupine	Vascular Plant	Southwestern corner of BC (lower	No
		Fraser Valley and Vancouver Island).	
Bearded owl-clover	Vascular Plant	Southern tip of Vancouver Island.	No
Golden paintbrush	Vascular Plant	Southern tip of Vancouver Island.	No
Kellogg's rush	Vascular Plant	Southeastern Vancouver Island.	No
Bear's-foot sanicle	Vascular Plant	Southern tip of Vancouver Island.	No
Toothcup	Vascular Plant	Along Kamloops and Osoyoos lakes.	No
Howell's triteleia	Vascular Plant	Southeastern Vancouver Island.	No
Tall woolly-heads	Vascular Plant	Southern Vancouver Island.	No
Margined streamside	Moss	Kootenay region, along southern	No
moss		border.	
Poor pocket moss	Moss	North Vancouver.	No
Rigid apple moss	Moss	Eastern Vancouver Island and on some	No
		of the adjacent Gulf Islands.	
Rusty cord moss	Moss	Four sites - closest is North-east of	No
		Kamloops. Alkaline wetlands.	
Silver hair moss	Moss	Sumas Mountain (east of Abbotsford).	No
Seaside centipede	Lichen	Two locations on the west coast of	No
		Vancouver Island (Ucluth Peninsula	
		and Schooner Cove).	

¹ Species range taken from Environment Canada (2007), except where otherwise noted.

² Species range taken from Matsuda *et al.* (2006)

Table 9. Schedule 1 species listed as threatened that are known to occur within British Columbia, and their accepted range within British Columbia.

Species	Category	Range within British Columbia ¹	Potential for
			species to occur in
			vicinity of project
Pallid bat	Mammal	Okanagan Valley.	No
Wood bison	Mammal	Northeastern BC.	Yes
Woodland caribou	Mammal	Northeastern BC.	Yes
(boreal population)			
Woodland Caribou	Mammal	Central BC.	No
(Southern Mountain			
population)			
Ermine (haidarum	Mammal	Queen Charlotte Islands	No
subspecies)			
Pacific water shrew	Mammal	Lower Mainland of southwestern BC.	No
Peregrine falcon	Bird	Southwestern and west-central BC.	No
(anatum subspecies)			
Northern goshawk	Bird	Queen Charlotte Islands	No
(laingi subspecies)			
Marbled murrelet	Bird	Coastal BC (up to 75 km inland).	No
Great Basin	Reptile	Southern BC. Okanagan primarily.	No
gophersnake			
Western rattlesnake	Reptile	Southern BC, north to Cache Creek.	No
Coastal giant	Amphibian	Chilliwack River Valley.	No
salamander			
Great Basin spadefoot	Amphibian	Dry valleys of southern interior BC	No
		(especially the Okanagan Valley).	
Vancouver Lamprey	Fish	Southern Vancouver Island. ²	No
Cultus pygmy sculpin	Fish	Cultus Lake (Lower Mainland)	No
Shorthead sculpin	Fish	Southeast BC (Columbia River	No
		Basin).	
Behr's hairstreak	Arthropod	Southern Okanagan Valley.	No
Dun skipper	Arthropod	Southwestern BC including Vancouver Island.	No
Dromedary jumping-	Molluscs	Southern and western Vancouver	No
slug		Island.	
White-top aster	Vascular Plant	Southern Vancouver Island.	No
Scouler's corydalis	Vascular Plant	Western Vancouver Island.	No
Lemmon's holly fern	Vascular Plant	Eastern side of the Okanagan	No
		Valley.	
Lyall's mariposa lily	Vascular Plant	Between the Similkameen River and	No
		the Okanagan Valley (limited to a	
		single height of land adjacent to	
		the U.S. border).	

Species	Category	Range within British Columbia ¹	Potential for
			species to occur in
			vicinity of project
Mexican mosquito-fern	Vascular Plant	South central BC.	No
Macoun's meadowfoam	Vascular Plant	Vancouver Island, not on mainland	No
		of BC.	
Showy phlox	Vascular Plant	Most northern occurrence in BC is	No
		Summerland.	
Cliff paintbrush	Vascular Plant	Southwest BC around Chilliwack	No
		and Skagit Rivers.	
Phantom orchid	Vascular Plant	Extreme southwest of BC.	No
Purple sanicle	Vascular Plant	Southeastern Vancouver Island	No
		and the adjacent Gulf Islands.	
Yellow montane violet	Vascular Plant	East coast of Vancouver Island and	No
		on Saltspring Island.	
Alkaline wing-nerved	Moss	Southwest of Williams Lake, wet	No
moss		alkaline areas.	
Haller's apple moss	Moss	East central BC (close proximity to	No
		Alberta border).	

¹ Species range taken from Environment Canada (2007), except where otherwise noted.

² Species range taken from Froese and Pauly (2005).

Table 10.	Schedule 1 species listed as special concern that are known to occur	within British
С	Columbia, and their accepted range within British Columbia.	

Species	Category	Range within British Columbia ¹	Potential for species to occur in vicinity of project
Mountain beaver	Mammal	Extreme southwestern BC.	No
Woodland caribou (Northern Mountain population)	Mammal	Northern BC (north of Mackenzie).	No
Spotted Bat	Mammal	Okanagan, Chilcotin River and Williams Lake.	No
Long-billed curlew	Bird	South central British Columbia, but extending range into McBride, Prince George, and known to breed in the vicinity of Vanderhoof. ²	No
Ancient murrelet	Bird	Coastal areas only.	No
Peregrine falcon (<i>pealei</i> subspecies)	Bird	Queen Charlotte Islands, northern Vancouver Island.	No
Barn owl	Bird	Extreme southern BC and west coast of southern Vancouver Island.	No
Flammulated owl	Bird	South central BC (south of Quesnel).	No
Yellow rail	Bird	Eastern BC.	No
Western screech owl (kennicotti subspecies)	Bird	Coast of BC, including Vancouver Island but excluding Queen Charlotte Islands.	No

Lewis's woodpecker	Bird	Most common in the Okanagan Valley and Thompson Basin areas	No
Rubber boa	Reptile	Patchy distribution through major river basins in southern third of BC.	No
Western yellow-belly racer	Reptile	Hot and dry areas of the Okanagan and Similkameen.	No
Western skink	Reptile	Extreme southern portion of mainland BC.	No
Coast tailed frog	Amphibian	Coastal mountain ranges in BC.	No
Red-legged frog	Amphibian	Vancouver Island, the Gulf Islands, the mainland adjacent to the Strait of Georgia, and through the Fraser Valley to Hope.	No
Couer d'Alene salamander	Amphibian	Southeastern edge of Kootenay Lake in Creston Valley, the Moyie River drainage and in the Columbia River drainage	No
Western toad	Amphibian	Widespread across BC. ³	No
Columbia mottled sculpin	Fish	Columbia, Flathead, Similkameen and Kettle rivers.	No
Monarch	Arthropod	Southern BC.	No
Rocky Mountain ridged mussel	Arthropod	Southern BC, Columbia River System.	No
Warty jumping-slug	Mollusc	Southern Vancouver Island.	No
Vancouver Island beggarticks	Vascular Plant	Lower Fraser Valley and on southern Vancouver Island, with one additional record on the mainland coast of BC just north of Vancouver Island	No
Coastal wood fern	Vascular Plant	Southeastern Vancouver Island.	No
Columbia carpet moss	Moss	Bunchgrass BioGeozone of narrow valley in south-central part of BC.	No
Twisted oak moss	Moss	Coastal BC, Vancouver Island.	No
Banded cord moss	Moss	Southwestern coastal BC.	No

¹ Species range taken from Environment Canada (2007), except where otherwise noted.

² Species range taken from De Smet (1992). ³ Species range taken from Wind and Dupuis (2002).

APPENDIX 3

RARE PLANT SPECIES LIST

English Name	BC Status	Habitats
alpine meadow-foxtail	Red	moist meadows in the montane to subalpine
Canada anemone	Blue	moist meadows thickets and forest openings in the montane
riverbank anemone	Red	moist to mesic gravel bars, streambanks and forests in the steppe and
	nou	montane
sickle-pod rockcress	Red	mesic to dry grasslands, gravelly river banks and disturbed areas in the steppe and montane
meadow arnica	Blue	wet to mesic meadows and forest openings in the montane and subalpine
long-leaved mugwort	Red	mesic sreambanks and terraces in the montane zones
Nuttall's orache	Red	dry grassy slopes in the montane
plains reedgrass	Blue	dry slopes and open forests in the montane
two-coloured sedge	Blue	moist to wet meadows and shorelines in the montane to alpine
pointed broom sedge	Blue	moist to wet sites in the lowland and montane
Torrey's sedge	Blue	mesic to moist meadows and shrublands
dry-land sedge	Red	dry slopes and open forests in the steppe and montane
Hian's goosefoot	Red	moist, warm, south-facing slopes SWBSmw
lowa golden-saxifrage	Blue	north-facing cool, shaded slopes above streams
European water- hemlock	Blue	wet streambanks, marshes and lake and pond shores in the montane
Drummond's thistle	Red	dry open forests in the montane
northern bog bedstraw	Blue	bogs, wet measows and moist forests in the montane
slender mannagrass	Blue	streams sides, marshes, lake shores and ponds in the montane
Nahanni oak fern	Blue	moist cool shale or limestone slopes in the montane and subalpine
Nuttall's sunflower	Red	wet to moist fields and meadows in the lowland and montane
spike-oat	Blue	mesic to dry forest openings, grassy slopes and meadows in the
oratia ruch	Plue	montane and subalpine
formal loaved desort	Bide	dry grassy slopes in the montane
parsley	Reu	
rusty wood-rush	Blue	dry to mesic open forests and forest margins in the montane
Davis' locoweed	Blue	mesic to dry meadows, gravel bars, forest openings, turfy heath and tundra from the montane to alpine
slender penstemon	Red	dry to moist sandy or rocky grasslands
Canada Ryegrass	Red	perennial ryegrass - mesic to moist pastures, fields, meadows, roadsides, and disturbed areas in the lowland, steppe and montane
western Jacob's-ladder	Blue	wet to moist swamps, streambanks, meadows and thickets in the steppe and subalpine
Seneca-snakeroot	Red	moist to mesic grassy slopes in the montane
Siberian polypody	Red	dry to moist forests in the montane
purple rattlesnake-root	Red	dry grassy slopes in the montane
white wintergreen	Blue	dry to moist forests in the montane
heart-leaved buttercup	Red	moist to mesic grasslands, meadows and forest openings in the montane
birdfoot buttercup	Blue	moist meadows in the montane to alpine
prairie buttercup	Red	dry grasslands, thickets, and open forests in the montane
Arkansas rose	Blue	dry grassy slopes, cut banks, thickets, and open forests in the montane
meadow willow	Blue	wet thickets in the lower montane
autumn willow	Blue	wet thickets, meadows and fens in the montane

common pitcher-plant	Blue	bogs and fens in the montane
rivergrass	Red	ponds, marshes, lakeshores and streamsides in the steppe and montane
rock selaginella	Red	dry grassy ridges in the montane
marsh fleabane	Red	wet to moist streambanks, lakeshores, ponds, and marshes in the montane
plains butterweed	Blue	dry open meadows and forests in the steppe and montane
Drummond's campion	Blue	dry sites in the teppe to alpine
slender wedgegrass	Blue	moist meadows and streambanks, shallow ponds and hot springs in the steppe and montane
sheathing pondweed	Blue	lakes in the montane

Appendix D: Archaeological Report January 2010



ARCHAEOLOGICAL OVERVIEW ASSESSMENT

BC HYDRO PROPOSED BOAT RAMP DEVELOPMENTS ON HALFWAY AND PEACE RIVERS, NEAR HUDSON'S HOPE AND CLAYHURST, BC

Submitted to: Moffatt & Nichol 301 – 777 West Broadway Vancouver, BC V5Z 4J7

REPORT

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Executive Summary

At the request of Moffatt & Nichol, Golder Associates Ltd. (Golder) conducted a Archaeological Overview Assessment including Preliminary Field Reconnaissance for four existing and proposed boat ramp locations along the Halfway River (Localities 1 and 2) and Peace River (Localities 3 and 4), in the vicinity of Hudson's Hope and Clayhurst, BC.

The Archaeological Overview Assessment (AOA) consisted of a combination of background research and a field visit to examine each of the ramp locations. This report provides the results of the AOA and includes recommendations on the need for further archaeological work.

The project areas assessed during the AOA are considered to have potential for archaeological sites. The assessment is based on an evaluation of terrain within the project areas, including the presence of well-defined landforms, such as knolls, benches, or high cut banks, as well as the proximity of major aquatic features and proximity of known archaeological sites. Given that all four project areas are considered to have potential for archaeological sites, Golder recommends that further archaeological work, in the form of an Archaeological Impact Assessment (AIA) should be completed for the boat ramp locations selected for upgrades and/or new construction, prior to the commencement of land-altering activities. An AIA will require a provincial permit issued by the Archaeology Branch, Ministry of Tourism, Sport and the Arts.



ARCHAEOLOGICAL OVERVIEW ASSESSMENT

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ARCHAEOLOGICAL OVERVIEW ASSESSMENT

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1.0 INTRODUCTION

At the request of Moffatt & Nichol (M&N), on behalf of the British Columbia Hydro and Power Authority (BC Hydro), Golder Associates Ltd. (Golder) conducted an Archaeological Overview Assessment (AOA) of two existing and two proposed boat ramp locations, and ancillary developments, on the Halfway and Peace Rivers (Figure 1, 2). The AOA is part of a feasibility assessment to evaluate options and recommendations for increasing recreational boat access to the Peace River.

The AOA, which included a preliminary field reconnaissance (PFR) was conducted in conjunction with studies completed by M&N, Triton Environmental Consultants Ltd., and Atek Hydrographic Surveys Ltd., between August 11 and August 13, 2008. Field visits were made by the joint field investigation team to each existing or proposed boat ramp location as identified on the Halfway and Peace Rivers. In total, four locations were assessed as part of this AOA. These include: the existing boat ramp location at Halfway River Bridge (Locality 1); and a proposed boat ramp location on Halfway River (Locality 2); a second proposed boat ramp location on the Peace River (Locality 3) (approximately 2 km upstream from Localities 1 and 2); and, an existing boat ramp location (Locality 4) on Peace River, within Blackfoot Regional Park, near Clayhurst (Figures 1, 2).

For the purposes of this report, each locality is referred to as the "project area", whereas the four localities described above are collectively referred to as the "study area".

1.1 Proposed Project

BC Hydro has proposed a feasibility assessment to evaluate options and recommendations for the placement of public boat ramp facilities on the Halfway and Peace Rivers, near Hudson's Hope and Clayhurst, BC. The feasibility assessment includes an evaluation of two existing and two proposed boat ramp facilities, as well associated ancillary developments, such as vehicle parking areas. No specific development plans are available at this time and scheduling of the development remains uncertain.

1.2 Objectives

The objectives of the study included: 1) a background library and records search of ethnographic, environmental, and archaeological documents pertinent to the study area; 2) a statement of archaeological site potential and distribution within each project area; 3) a preliminary assessment of anticipated impacts in light of proposed development plans; and, 4) recommendations concerning the need for further archaeological impact assessment studies, if warranted.

1.3 Report Organization

This report includes the results of the background review, PFR and potential assessments and provides recommendations regarding the need for additional work within each of the project areas. This report follows the *Guidelines for Report Content* as outlined in the *BC Archaeological Impact Assessment Guidelines* (Archaeology Branch 1998).





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2.0 METHODS

2.1 First Nations Participation

The project area is located within the traditional territories of the Saulteau First Nation (SFN), McLeod Lake Indian Band (MLIB), West Moberly First Nation (WMFN), Blueberry First Nation (BBFN), Halfway River First Nation (HRFN) and Doig River First Nation (DRFN). Golder contacted these Bands to invite comment on the project area and to request field assistants. As per directives of BC Hydro, First Nations were to be included as part of the crew for the PFR.

2.2 Background Research

Background research included a general review of readily available cultural and environmental data pertinent to the Peace River area, including published and unpublished sources dealing with local and regional ethnography, history, archaeology and the environment. The Provincial Heritage Register was reviewed using the online Remote Access to Archaeological Data (RAAD) to determine if any recorded archaeological sites are present within the study area. Topographic maps and air photos of the study area were also reviewed.

2.3 Archaeological Potential

Archaeological potential relates to those biophysical characteristics that typically correlate with archaeological site locations. Areas often considered to have high archaeological potential include those places with south, southeast, or southwest aspect, good surface drainage, level terrain, suitable forest cover, proximity to water and food resources, as well as micro-topographical features such as terraces and knolls. For culturally modified tree sites, suitable forest cover is an important indicator. In contrast, those areas with less favourable biophysical characteristics such as steep or rough terrain and poorly-drained ground, or those which have been subject to extensive land disturbance, are generally considered to have lower archaeological potential.

2.4 Preliminary Field Reconnaissance

The PFR consisted of a visual inspection of the project area to assess the archaeological potential of terrain features and a surface inspection to identify visible archaeological materials.

2.4.1 Archaeological Potential Assessment

The archaeological potential of the project areas was assessed using judgemental pedestrian traverses conducted by three crew members spaced 5 m to 15 m apart, resulting in a total traverse width of 20 m to 60 m wide. High points of land were sought to provide views of the surrounding areas. Mature trees were examined for signs of cultural modification.

2.4.2 Surface Inspection

During the pedestrian traverses, the ground surface was examined for archaeological materials. Three crew members, spaced 5 m apart, conducted parallel systematic pedestrian traverses across the project area. The ground surface was inspected for archaeological materials, such as stone artifacts, faunal remains, or fire-altered rock. Areas of exposed ground, such as cut banks and road cuts, were given extra focus during the surface inspection.

As part of the PFR, field notes were written describing the terrain as well as any other in-field observations. Traverse locations were tracked using a hand-held GPS. Digital photographs were taken of notable terrain features and the general project area.


3.0 RESULTS - BACKGROUND RESEARCH

The AOA included a review of readily available cultural and environmental data. This review included published and unpublished sources regarding local and regional history, archaeology, and the environment.

3.1 General Environment

The study area is situated within the eastern foothills of the Rocky Mountains and the project areas are all located within the moist, warm subzone of the Boreal White and Black Spruce (BWBS) biogeoclimatic zone (Meidinger and Pojar 1991). In general, the topography within the BWBS zone can be described as a wide plain that lies between rolling uplands to the north and the Peace River and its major tributaries to the south. As such, it would be anticipated that precontact aboriginal use of the area would be focused on those landforms along the Peace River and its major tributaries, and landforms such as mid-slope benches and valley bottoms.

3.2 Cultural Setting

According to the *Handbook of North American Indians*, the Beaver (*Dunne-za*) and Sekani (*Tsé-'kéh-ne*) people traditionally inhabited the study area in ethnographic times. Sources indicate that both the Beaver and the Sekani spoke slightly different dialects of the Northern Athapaskan language (Krauss and Golla 1981), and were highly mobile depending on hunting, gathering, and fishing for subsistence (Jenness 1937; Harmon 1957; Ridington 1981). While plants, fish and other small game constituted a portion of the traditional diet, large game, including bison, caribou, and moose were a vital component of the diet of the Beaver and Sekani peoples (Ridington 1981). In addition to forming the bulk of the food supply, the hides from these large game also supplied skins for clothing as well as lodging, in the form of tipis or summer lodges. In winter, the Beaver are reported to have lived in lodges constructed of logs covered with moss and sod (Ridington 1981), whereas the Sekani constructed conical lodges covered with spruce bark (Dennison 1981). For more information concerning the traditional cultures within the study area, the reader is referred to Krauss and Golla (1981); Jenness (1937); Harmon (1957); Ridington (1981); Dennison (1981). The above-cited list should not be considered exhaustive and these ethnographic sources are not the only resource in regards to understanding the histories of First Nations.

3.3 Previous Archaeology

The bulk of the archaeological investigations undertaken within the study were completed in the 1970s in response to the Site C hydroelectric development on the Peace River, as proposed by BC Hydro at that time. These investigations created an initial inventory of archaeological sites in the study area, as well as the larger Peace region (Fladmark 1975; Spurling 1978, 1979, 1980). The majority of the sites in the study area were identified during this time, on the basis of surface expression only. No systematic subsurface testing was undertaken at the time of recording to determine the horizontal or vertical extent of the site.

In response to the initial investigations in 1974, further work place between 1976 and 1979 at over 19 archaeological sites along the Halfway and Peace River. Many of these sites, including, but not limited to HbRi-2, HbRi-3, HbRi-4, and HbRi-5, had been previously disturbed by agricultural activities such as ploughing and clearing. At the time, many sites, including HbRi-6 and HbRi-11 were considered vulnerable to agricultural activities, such as cultivation.



3.4 Recorded Archaeological Sites

The Provincial Heritage Register, maintained by the Archaeology Branch, was consulted during the AOA by accessing the Remote Access to Archaeological Data (RAAD) application to determine if any recorded archaeological sites were present within or in the vicinity of the project areas.

Using RAAD, maps of the project areas were generated at 1:100,000, 1:50,000 and 1:20,000 scale which allowed for the identification of archaeological sites in possible direct conflict with the proposed developments as well as identification of sites in the general areas as a means of gaining information about the nature of regional archaeological resources. In reviewing archaeological potential layers within RAAD, the project areas have been initially identified as having archaeological potential, due to suitable terrain, the possibility of landform features, such as breaks-in slope or knolls, as well as the proximity of major aquatic features, and proximity to known archaeological sites.

Archaeological site types that would be expected in the study area include scatters of stone artifacts found on or below the ground surface. Fish or game traps, and/or culturally modified trees may also be found within the project areas.

According to the Provincial Heritage Register, as accessed using Remote Access to Archaeological Data (RAAD) on August 8, 2008, there are 14 archaeological sites located within 2 km of Locality 1 and 2 (Figure 1, Table 1). Notably, two archaeological sites, HbRi-10 and HbRi-12, are located within 500 m of the project areas. There are numerous other sites located beyond the immediate vicinity of the project areas. These consist primarily of surface scatters of stone artifacts.

Site Number	Site Type	Locality 1	Locality 2
HbRi-2	Surface lithic scatter	2000 m WSW	1950 m WSW
HbRi-4	Subsurface lithic scatter	1950 m WSW	1800 m WSW
HbRi-6	Surface lithic scatter	750 m N	800 m N
HbRi-7	Surface lithic scatter	1750 m NW	1700 m NW
HbRi-9	Surface lithic scatter	1750 m NE	2000 m NE
HbRi-10	Surface lithic scatter	250 m E	450 m E
HbRi-11	Surface lithic scatter	1300 m ENE	1500 m ENE
HbRi-12	Surface lithic scatter	750 m E	950 m E
HbRi-24	Surface lithic scatter	500 m NE	600 m NE
HbRi-25	Surface lithic scatter	1350 m NE	1500 m NE
HbRi-41	Surface lithic scatter	1000 m WSW	800 m WSW
HbRi-42	Surface lithic scatter	1900 m NE	2000 m NE
HbRi-43	Surface lithic scatter	1825 m NE	1950 m NE
HbRi-44	Surface lithic scatter	1750 m NE	1900 m NE
HbRi-46	Surface lithic scatter	1100 m WSW	900 m WSW

Table 1: Recorded Archaeological sites in Provimity to Localities 1 and 2 (H	alfway River Bridge)



	Surface lithic scatter	800 m W	600 m W	
HDRI-47	Surface littlic scatter	000 m vv	800 11 44	

Eight archaeological sites are located within 2 km of Locality 3 (Table 2, Figure 1). Two archaeological sites, Hbri-1 and HbRi-4, are located within 700 m of Locality 3. The majority of archaeological sites in the vicinity of the project areas are located along the south bank of the Halfway River, or north banks of the Peace River. These sites consist of scatters of stone artifacts found on and below the surface.

Site Number	Site Type	Locality 3	
HbRi-1	Surface lithic scatter	700 m NW	
HbRi-2	Surface lithic scatter	750 m NNW	
HbRi-3	Surface lithic scatter	1100 m NNW	
HbRi-4	Subsurface lithic scatter	650 m NNW	
HbRi-5	Surface lithic scatter	1300 m NNW	
HbRi-41	Surface lithic scatter	1200 m NE	
HbRi-46	Surface lithic scatter	1000 m NE	
HbRi-47	Surface lithic scatter	1400 m NE	

Table 2: Recorded Archaeological Sites in Proximity to Locality 3 (Peace River)

One palaeontological site and nine archaeological sites are located within 2 km of Locality 4 (Table 3, Figure 2). Two archaeological sites, HaRa-16 and HaRa-17, are located 425 m northwest and north, respectively, from Locality 4. However, these are located on the north side of the Peace River. There are numerous other sites located beyond 2 km, consisting primarily of surface scatters of stone artifacts.

Site Number	Site Type	Locality 4
HaRa-15	Palaeontological	1800 m WNW
HaRa-16	Subsurface	425 m NW
HaRa-17	Surface	425 m N
HaRa-21	Surface	1800 m W
HaRa-23	Surface	1600 m ENE
HaRa-24	Surface	1250 m SE
HaRa-28	Surface	1550 m NNW
HaRa-29	Surface	1100 m NNE
HaRa-30	Surface	800 m NNE

Table 3: Recorded Archaeological sites in Proximity to Locality 4 (Peace River)



4.0 RESULTS – PRELIMINARY FIELD RECONNAISSANCE

4.1 Project Area Descriptions

The existing and proposed boat ramp locations were visited by Chris Baker of Golder, between August 11 and 13, 2008. On August 11 and 12, 2008, representatives of the McLeod Lake Indian Band and Saulteau and Blueberry First Nations participated in the PFR. On August 13, 2008, a representative from Saulteau First Nation participated in the PFR.

4.2 Halfway River (Locality 1)

Locality 1 is located on the east side (left bank) of the Halfway River near the confluence with the Peace, south of Highway 29. At the time of the field visit, the project area was estimated to measure approximately 100 m x 200 m.

At this location, current infrastructure includes a gravel boat ramp which extends into Halfway River and associated parking facilities. The current facilities can accommodate several boats, and a few camp/picnic spots. The parking facilities are located on top of a small, steeply sloped knoll adjacent to Highway 29. The knoll provides views to Halfway River (Figure 3: Photographs 1 and 2). There is significant disturbance to the project area as a result of the construction of the current facilities, but this is limited to the area comprising the boat ramp and parking area. The remaining portion of the project area appears to be relatively intact and is comprised of flat level benches with an overall southwest aspect. While a mixed forest of spruce and poplar is present in the surrounding undisturbed area, no standing trees are found in the ramp area.

The proposed developments associated with Locality 1 may include extending and improving on the current boat ramp location, and improving and adding facilities for parking and camping. These activities have the potential to alter archaeological sites within the project area, if present.

4.2.1 Halfway River (Locality 2)

Locality 2 is located approximately 120 m west of Locality 1, on the west side of Halfway River, near the confluence with the Peace River. Locality 2 is situated on the right bank of Halfway River, approximately 1.5 m above the level of the river. At the time of the field visit, the project area was estimated to measure approximately 200 m x 400 m.

At this location, current infrastructure includes a gravel road, parking facilities, and camping areas. The current facilities can accommodate several vehicles, and a few camp/picnic spots. Locality 2 is largely undisturbed, with the exception of the camping areas and parking facilities which have been subject to soil compaction, and leveling to allow for vehicle access. Terrain within the project area consists of a bench, forming the right bank of Halfway River. Away from the river, terrain consists of gently sloped terrain with an overall south aspect (Figure 3: Photographs 3 and 4). Forest cover within the project area consists of sparse poplar with thick willows and grasses. Within the project area, observed sediments consist of a combination of silts and sand; larger materials, such as cobbles and boulders, were minimal.

The proposed developments associated with Locality 2 include the construction of either a gravel or concrete boat ramp, and improving and adding facilities for parking and camping. These activities have the potential to alter archaeological sites within the project area, if present.





Photograph 1: Looking south towards existing boat ramp (Locality 1).



Photograph 2: Looking southeast towards parking lot at existing boat ramp (Locality 1).



Photograph 3: Looking northwest towards proposed boat ramp (Locality 2).



Photograph 4: Looking northeast from proposed boat ramp (Locality 2).

SELECTED SITE PHOTOGRAPHS



4.2.2 Peace River (Locality 3)

Locality 3 is located on the north side of the Peace River, approximately 2 km west-southwest, and upstream, of the existing boat ramp at Locality 1. At the time of the field visit, the project area was estimated to measure approximately 200 m x 500 m.

At this location, current infrastructure consists only of a low-grade access road, extending from Highway 29 to the project area. As a result, the project area is largely intact, with the exception of the access road. Within the project area, terrain is typically gently sloped with an overall north aspect. A small knoll was observed along the bank of the Peace River, at the edge of the project area (Figure 4: Photograph 5). Forest cover within the project area consists primarily of poplar, with thick grasses, willow and alder (Figure 4: Photograph 6). A small wetland is located to the west and adjacent to the Peace River in the vicinity of Locality 3.

The proposed developments associated with Locality 3 include the construction of either a gravel or concrete boat ramp, construction of a high grade access road, and facilities for parking locations, camp sites and a vehicle turnabout. These activities have the potential to alter archaeological sites within the project area, if present.

4.2.3 Blackfoot Regional Park (Locality 4)

Locality 4 is located on the south bank of the Peace River, approximately 8 km south of Clayhurst, within Blackfoot Regional Park. The Rolla Road runs roughly north-south, just west of the project area. At the time of the field visit, the project area was estimated to measure approximately 100 m x 200 m.

At this location, current infrastructure includes a concrete boat ramp, extending into the Peace River, parking facilities, and several camp/picnic spots. The current facilities can accommodate several boats. There is significant disturbance to the project area as a result of the construction of the current facilities (Figure 4: Photographs 7 and 8). Terrain within the project area includes high cut banks along the Peace River, with flat to gently sloping terrain with an overall north aspect elsewhere in the project area. The parking area is located on a gently sloping bank adjacent to Rolla Road. Forest cover within the project area is sparse and the ground surface is covered with thick grasses.

The proposed developments associated with Locality 4 may include extending and improving on the current boat ramp location, and improving and adding facilities for parking. These activities have the potential to alter archaeological sites within the project area, if present.

4.3 Archaeological Potential Assessment

The archaeological potential of the project area was assessed during the field visit and the results are presented in Sections 5.3.1 - 5.3.4 below.





Photograph 5: Looking east towards proposed boat ramp (Locality 3).



Photograph 6: Looking northeast from proposed boat ramp (Locality 3).



Photograph 7: Looking northwest at existing boat ramp at Blackfoot Regional Park (Locality 4).



Photograph 8: Looking east along shore at proposed boat ramp (Locality 4).

SELECTED SITE PHOTOGRAPHS



4.3.1 Halfway River (Locality 1)

Locality 1, and the immediate surrounding area, is considered to have potential for archaeological sites, based on the following criteria:

- 1) Terrain the terrain within the project area exhibits break-in-slopes forming flat level benches, and an elevated knoll overlooking the Halfway and Peace Rivers, with moderate southwest slopes.
- 2) Previous disturbance the current boat ramp and parking facilities have resulted in extensive surface disturbance. However, deposits located beyond these facilities appear to be relatively undisturbed.
- 3) Erosion the elevated knolls and breaks-in-slope observed within the project area remain unaffected by erosion. However, the low lying bank of the Halfway River has been subject to erosion by the river and archaeological materials in this area may have been removed as a result.
- 4) Surface reconnaissance undertaken within Locality 1 during the field visit failed to identify archaeological materials. However, archaeological materials may be discovered during additional surface inspection and subsurface testing in undisturbed areas.

4.3.2 Halfway River (Locality 2)

Locality 2, and the immediate surrounding area, is considered to have potential for archaeological sites, based on the following criteria:

- Terrain the terrain within the project area consists of a flat bench along the right bank of the Halfway River. With the exception of the bank leading down to the waters' edge, slope elsewhere within the project area is minimal. Views south to the Halfway and Peace Rivers are afforded from the project area.
- Previous disturbance the project area has been subject to disturbance as a result of the construction of camping and parking facilities and access road. However, disturbance elsewhere in the project area is considered minimal.
- Erosion as with Locality 1, only the bank along the Halfway River is susceptible to water erosion.
 The remainder of the project area appears unaffected by erosion.
- 4) Surface reconnaissance undertaken within Locality 2 during the field visit failed to identify archaeological materials. However, archaeological materials may be discovered during additional surface inspection and subsurface testing in the project area.

4.3.3 Peace River (Locality 3)

Locality 3, and the immediate surrounding area, is considered to have potential for archaeological sites, based on the following criteria:

- 1) Terrain the terrain within the project area is gently south-sloping with an elevated knoll and includes the left bank of the Peace River. Views to the south are possible from within the project area.
- Previous disturbance with the exception of an existing low grade access road within the project area, the project area appears undisturbed.



- Erosion as with Localities 1 and 2, only the bank along the Peace River appears susceptible to water erosion. The remainder of the project area appears unaffected by erosion.
- 4) Surface reconnaissance undertaken within Locality 3 during the field visit failed to identify archaeological materials. However, archaeological materials may be discovered during additional surface inspection and subsurface testing in the project area.

4.3.4 Blackfoot Regional Park (Locality 4)

Locality 4, and the immediate surrounding area, is considered to have potential for archaeological sites, based on the following criteria:

- 1) Terrain the terrain within the project area is gently sloped (3-5%) to the north, with approximately 1.5 m high cut banks observed along the Peace River elsewhere in the project area.
- Previous disturbance the project area has been subject to disturbance as a result of the construction of camping and parking facilities and access road. However, disturbance elsewhere in the project area is considered minimal.
- Erosion as with the other localities, only the bank along the Peace River appears susceptible to water erosion. The remainder of the project area appears unaffected by erosion.
- 4) Surface reconnaissance undertaken within Locality 2 during the field visit failed to identify archaeological materials. However, archaeological materials may be discovered during additional surface inspection and subsurface testing in the project area.

5.0 RECOMMENDATIONS

Based on the results of the AOA, the four project areas are considered to have potential for archaeological sites. This assessment is based on an evaluation of the terrain within the project areas, including the presence of well-defined landforms, such as knolls, benches, or high cut banks, as well as the proximity of major aquatic features and proximity of known archaeological sites. Previous disturbance within each of the project areas has reduced the likelihood of discovering intact archaeological sites, and erosion may have eliminated archaeological materials along the banks of the Halfway and Peace Rivers, however, the possibility for archaeological sites within each project area remains. As such, further archaeological work, in the form of an Archaeological Impact Assessment (AIA), is recommended for the boat ramp location selected for upgrades and/or new construction. An AIA will require a provincial permit issued by the Archaeology Branch, Ministry of Tourism, Sport and the Arts. A summary of recommendations specific to each boat ramp location is presented in Table 4.

Project Location	Project Type	Results	Recommendation
Halfway River (Locality 1)	Upgrade existing ramp.	Project area has archaeological potential.	Further archaeological work required.
Halfway River (Locality 2)	New ramp required.	Project area has archaeological potential.	Further archaeological work required.
Peace River (Locality 3)	New ramp required.	Project area has archaeological potential.	Further archaeological work required.
Blackfoot Regional Park (Locality 4)	Upgrade existing ramp.	Project area has archaeological potential.	Further archaeological work required.

Table 4: Summary of Recommendations

6.0 CLOSURE

This report was prepared for Moffatt & Nichol, on behalf of BC Hydro, and is specific to the proposed development described herein. Any use, reliance, or decisions made by third parties on the basis of this report are the responsibility of such third parties. The study was not specifically designed to address issues of traditional aboriginal use of the subject property and does not constitute a traditional use study. This report was written without prejudice to issues of aboriginal rights and/ or title. We trust the information contained in this report is sufficient for your present needs. Should you have any questions regarding the project, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Original Signed By

Original Signed By

Chris Baker, B.Sc. Archaeologist Karen Brady, R.P.C.A. Associate/ Senior Archaeologist

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