

Aberfeldie Project Water Use Plan

Monitoring Program Terms of Reference

- **ABFMON 5 - Effectiveness Monitoring Fish Habitat Works**

September 2008

Terms of Reference for the Aberfeldie Project Water Use Plan Monitoring Programs

OVERVIEW

This document presents Terms of Reference for the Effectiveness Monitoring Fish Habitat Works program (ABFMON5). ABFMON#5 is a requirement of the revised Aberfeldie Water Use Plan, which was completed as part of the Aberfeldie Redevelopment Project. The Aberfeldie Redevelopment Project is scheduled to be complete in September 2008, followed by a commissioning period.

- 1) ABFMON-5 Effectiveness Monitoring Fish Habitat Works: A five year monitoring program to assess the effectiveness of the constructed compensation fish and aquatic habitat located on the north bank of the Bull River approximately 1 km downstream of the Aberfeldie Dam. This program is associated with four other monitoring programs.
- 2) ABFWORKS-1 Benthic Habitat Physical Works: Physical works to be undertaken at the BC Hydro Aberfeldie Site to compensate for the potential loss of approximately 3000 m² of productive capacity from Bull River mainstem. This physical work is in the form of an off-channel to Bull River that will provide high quality fish and benthic habitat.

Terms of Reference for ABFMON#1-4 were submitted at an earlier date. The Terms of Reference for the compensation fish and aquatic habitat works are included in ABFWORKS#1.

Table 1: Aberfeldie Water Use Plan Physical Works and Monitoring Program Terms of Reference Submission Information

Name of Monitoring Program or Physical Works	Order Clause Fulfilled	Submitted with this Package	Previously Submitted To CWR	Submission Date	Leave to Commence
ABFMON-1 Baseline Productivity Monitoring	Clause 6(a)(i)	No	Yes	31 Mar 2008	N/A
ABFMON-2 Primary and Secondary Productivity Monitoring	Clause 6(a)(ii)	No	Yes	31 Mar 2008	Yes
ABFMON-3 Habitat Impact Monitoring	Clause 6(c)	No	Yes	31 Mar 2008	Yes
ABFMON-4 Winter Flow Effectiveness Monitoring	Clause 6(d)	No	Yes	31 Mar 2008	Yes
ABFMON-5 Effectiveness Monitoring Fish Habitat Works	Clause 6(b)	Yes	No	30 Sept 2008	No
ABFWORKS-1 Fish and Benthic Habitat Physical Works Design	Clause 5	Yes	No	30 Sept 2008	No

Monitoring Program No. ABFMON#5 – Effectiveness Monitoring Fish Habitat Works

1.0 MONITORING PROGRAM RATIONALE

1.1 Background

Until it ceased operation in October 2006, the Aberfeldie Generating Station was a run-of-river hydroelectric facility with water flowing over the spillway about 70% of the year and minimal storage capacity. BC Hydro is currently redeveloping the Aberfeldie facility in order to replace all the facility equipment that has reached its end of life.

The old 5 MW power plant will be replaced with a new generating station with a capacity of approximately 25 MW. The redeveloped facility will provide additional power using newer, more efficient turbines and by routing more water through the penstock and the generating station rather than spilling water over the dam. The maximum diversion flows will increase from 8.5 m³/s to 40 m³/s. The period of spill over the dam crest is predicted to decrease from 8–9 months of the year (generally from late March to late December) to 3–4 months of the year (primarily from late April to late July). During the new non-spill periods, river flow in the diversion reach would have decreased from current levels of 6 to 30 m³/s, to between 0.05 and 1.0 m³/s (i.e., gate leakage and dam seepage). With the prescribed minimum flow requirements, the actual range in flow will be between 0.25 and 2.0 m³/s. The largest decline in flow in the diversion reach is expected to occur at the peak of the freshet, typically in June. Under normal operating conditions, river levels and flows downstream of the generating station will not be altered. Refer to Figure 1 for the geographic location and layout of the redeveloped Aberfeldie Hydroelectric Generating Facility.

The Aberfeldie Consultative and Fisheries Technical committees (CC and FTC, respectively) from the original Water Use Plan (WUP) (BC Hydro 2003) were reconvened to identify issues associated with the additional diversion flows and changes in operations with the redeveloped Aberfeldie facility. These committees identified the potential loss of productive capacity associated with the increased diversion of flows, particularly during summer months, as a concern (BC Hydro, 2006).

To assuage this concern, a fish habitat-flow study was commissioned to assess changes in fish habitat and pool connectivity in the diversion reach as a result of operating the redeveloped Aberfeldie Generating Station. The study focused on flows between 0.25 m³/s and 5.0 m³/s (Rodman and Cope 2005).

The main habitat of concern for productivity losses is a pool-riffle sequence with a mid-channel bar that connects the generating station tailrace pool with the deep bedrock pool at the base of the first upstream barrier. Streambed in this section of the Bull River is dominated by large cobbles, boulder, rubble and bedrock. This habitat is not considered to be critical, high quality or high productivity habitat but does provide low-density summer rearing habitat for longnose dace, largescale sucker, sculpins, Westslope cutthroat trout, mountain whitefish, kokanee and possibly bull trout (Cope 2006).

Based on the results of this study, the reconvened WUP CC felt that increasing the period when habitat in the diversion reach is dewatered would have little cumulative impact on fish production capabilities for the lower Bull River; however the WUP CC also felt that the provision of a minimum flow designed to ensure ecological connectivity while mitigating for the majority of lost aquatic habitat productivity (*i.e.*, periphyton and benthic invertebrates) would be a risk averse strategy that would also ensure ecological integrity to other resources (*i.e.*, vegetation, wildlife) (Cope 2006).

The WUP CC therefore supported a seasonally staged minimum instream flow release to ensure ecological connectivity during the winter low flow period, mitigate for the majority of lost summer aquatic productivity, including fish rearing and primary and secondary productivity (*i.e.*, periphyton and benthic invertebrates), and ensure connectivity flows during spring and fall fish migration windows. The recommended instream flow schedule consists of the following:

- 0.5 m³/s during the spring fish movement period (April 1 – May 31);
- 2.0 m³/s summer productivity (primary and secondary productivity) flows (June 1 – September 30);
- 0.5 m³/s during the fall fish movement period (October 1 – November 30); and
- 0.25 m³/s winter flows (December 1 – March 31).

To meet the conditions of both the Province's Section 88 *Water Act* Order (Condition 5) and the *Fisheries Act* Section 35(2) Authorization, 3000 m² of fish and aquatic habitat are to be created to compensate for residual losses of productive capacity at the prescribed instream flows¹. The compensatory fish and benthic habitat works may be achieved in whole or in part with each other.

In 2007, an investigation was undertaken to identify a suitable location to construct the compensatory habitat (Streamworks 2008). The study reviewed available site information (*e.g.*, aerial photography), assessed potential off-channel configurations and carried out sub-surface investigations to determine the composition of the floodplain deposits and suitability of the groundwater for developing the off-channel habitat. A suitable location was identified on the north bank of Bull River approximately 500 m downstream from the Aberfeldie Generating Station (Figure 1) and channel design was initiated. The habitat layout and design details are included in the ABF Fish and Benthic Habitat Physical Works Design Terms of Reference (ABFWORKS#1).

¹ DFO Policy for the Management of Fish Habitat addresses the productive capacity rather than the net area, and the guiding principle is for no net loss of productive capacity of fish habitat. Given that the habitat lost is relatively homogeneous and of low productivity (Cope 2006), and that the new off-channel habitat will be complex and considerably more productive, the FTC agreed to accept a ratio of 1:1 in net area of habitat replaced.

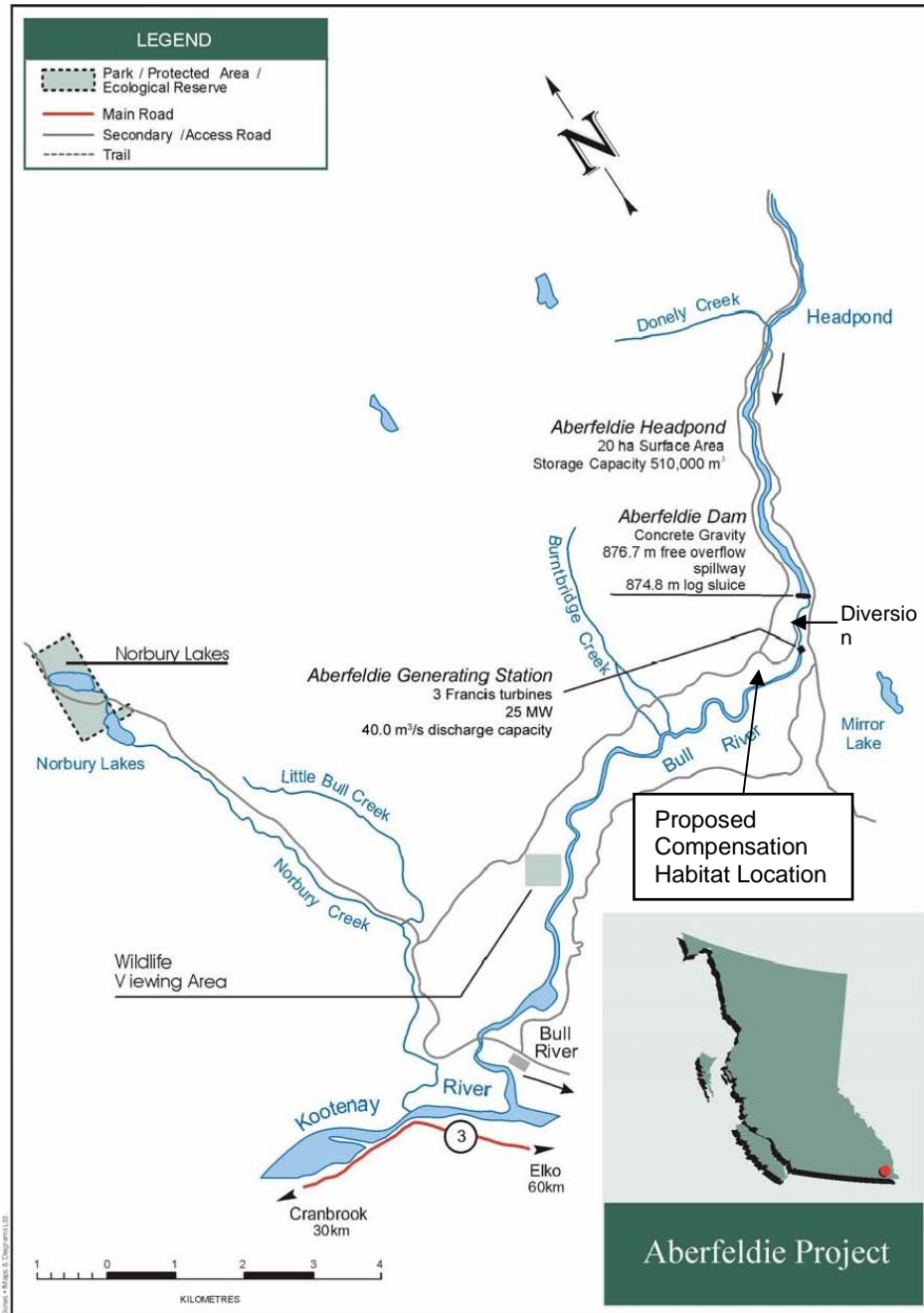


Figure 1: Map showing the layout and geographic location of Aberfeldie Hydroelectric Generating Facility, diversion reach, and proposed compensation habitat location.

This monitoring program, in combination with ABFMON#1, 2, and 3, will provide a quantitative assessment to verify if compensation requirements have been achieved and will provide information upon which to base future operating decisions. After five years, the results from the Aberfeldie monitoring programs will be used to determine the acceptability of the recommended minimum flow regime. If there have been no significant unforeseen impacts associated with the operations of the new facility or compensatory habitat, the planned review of the Water Use Plan will occur in 15 years as recommended by the reconvened WUP CC. A re-opening of the WUP

could be triggered if biologically significant issues occur with the recommended flow option, or if it is shown that the goal of no-net-loss of productive capacity can be achieved with a lower summer flow release in combination with the productive capacity realized from the compensatory habitat.

1.2 Management Questions

The primary management questions to be addressed by this monitoring program are:

1. Does the productive capacity realized in the constructed habitat, in combination with the productive capacity of the diversion reach at the 2 m³/s summer minimum flow, achieve the Aberfeldie Redevelopment project compensation goal of no-net-loss of productive capacity?
2. Is there a lower summer minimum instream flow discharge that, in combination with the productive capacity of the compensation habitat, could achieve the Aberfeldie Redevelopment project compensation goal of no-net-loss of productive capacity?

Information from ABFMON#1 (Primary Productivity Monitoring), ABFMON#2 (Primary and Secondary Productivity Monitoring), and ABFMON#3 (Habitat Impact Monitoring) will be required to fully address the management questions.

1.3 Monitoring Hypotheses

The hypotheses associated with these management questions all relate to ecological productivity of the constructed habitat coupled to that of the diversion reach (i.e., the section of the Bull River located between the dam and powerhouse) (Figure 1) during the summer 2.0 m³/s productivity flow release. Should the compensation be successful, there will be no difference in ecological productivity between **before** ABF redevelopment (diversion reach only) and **after** ABF redevelopment (combined diversion reach under the post redevelopment 2 m³/s minimum summer flow release and off-channel habitat productivities). Testing of these hypotheses will require results from programs ABFMON#1 (Baseline Productivity Monitoring) and ABFMON#2 (Primary and Secondary Productivity Monitoring).

The hypotheses are:

Periphyton

- Ho₁: There is no difference between the peak biomass of periphyton in the diversion reach before redevelopment and in the combined off channel habitat and diversion reach of Bull River under the post redevelopment 2 m³/s minimum summer flow release.
- Ho₂: There is no difference between the total abundance and diversity of periphyton in the diversion reach before redevelopment and in the combined off channel habitat and diversion reach of Bull River under the post redevelopment 2 m³/s minimum summer flow release.

Benthic invertebrates

- Ho₃: There is no difference between the total abundance, biomass and diversity of benthic invertebrates in the diversion reach before redevelopment and in the combined off channel habitat and diversion reach of Bull River under the post redevelopment 2 m³/s minimum summer flow release.

1.4 Key Water Use Decision Affected

The results from this monitoring program will be integrated into the revised Aberfeldie Water Use Plan to:

- verify that the compensation targets for the Aberfeldie Redevelopment Project are met;
- support inferences about the adequacy of the recommended staged minimum flow regime; and
- support the scientific rationale for selecting a long-term flow regime for the redeveloped Aberfeldie Generating facility.

The water use decision specifically affected by the results of the productivity component of the monitoring program is whether the summer minimum flow releases of 2.0 m³/s from Aberfeldie Dam into the diversion reach of the Bull River between June 1 and September 30 combined with productivity measured in the constructed habitat are sufficient to increase the aquatic productivity to levels such that there is no net loss in productive capacity between before ABF redevelopment (diversion reach only) and after ABF redevelopment.

This decision has implications for ecological and power generating values. It is possible that the prescribed summer flow releases combined with aquatic habitat compensation works could exceed the compensation objectives of no-net-loss of primary and secondary productivity; this may allow further reduction of the minimum flows requirements and increase the amount of water available for power generation (Cope 2006). Alternately, additional flow releases from the dam to support achievement of productivity compensation objectives would decrease the amount of water available for power generation.

2.0 MONITORING PROGRAM PROPOSAL

2.1 Objective

The main goal of the monitoring program is to assess whether there is no net loss of productive capacity before vs. after ABF redevelopment. Results from ABFMON#1, 2 and 3 will also be required to fully meet this goal. An additional goal for this monitoring program, although not one of the main objectives, is to provide information on fish usage and habitat quality in the constructed fish and aquatic habitat.

The specific objectives of the monitoring program are to:

- monitor flow regime, abundance of habitat types, woody debris cover and other fish habitat features in the constructed habitat;
- monitor water quality parameters in the constructed habitat as they relate to the health of aquatic organisms to ensure that they are within British Columbia Approved Water Quality Guidelines for the protection of aquatic life (Ministry of Environment 2006);
- qualitatively and quantitatively describe the establishing ecological community in the constructed habitat (including periphyton, benthic invertebrates and fishes);
- monitor survival of riparian vegetation planted at the compensation habitat site; and

- monitor the structural integrity of the compensation habitat.

The scope of the monitoring program is:

- To sample physical parameters such as water temperature, flow, current velocity, water depth, wetted width, turbidity, and approximate particle size distribution over the range of habitat types in the off-channel habitat;
- To evaluate water quality parameters at prescribed sampling points along the constructed habitat;
- To assess periphyton and benthic invertebrates species richness, abundance, community composition, and peak biomass in the constructed habitat;
- To monitor fish species, abundance, and life stages over the range of habitat types;
- To assess the survival of riparian vegetation planted at the compensation habitat site; and
- To make qualitative observations regarding stability of the constructed habitat.

2.2 Approach

The primary and secondary productivity monitoring component will follow the same methodology as ABFMON#1 (Baseline Productivity Monitoring) and ABFMON#2 (Primary and Secondary Productivity Monitoring) to compare productivity in the off-channel habitat with that of the mainstem, and to ultimately assess whether or not a net loss of productive capacity has been achieved. This analysis will be part of the reporting requirements for ABFMON#2. The primary and secondary productivity monitoring will be completed in Years 1, 2 and 4 following construction of the compensation habitat (note that Year 0 = the year of construction).

The fish and fish habitat components will consist of field surveys at key times of year to record fish presence by habitat type, species, use, and life stage within the off-channel habitat while documenting physical attributes of these habitats. Fall spawner surveys will occur in Years 1, 3, and 4; spring spawner surveys and juvenile assessments will occur in Years 1, 2, 4 and 5 following construction of the compensation habitat.

Winter flows and ice monitoring will be conducted in concert with monitoring in the Bull River mainstem (ABFMON#4 – Winter Flow Effectiveness Monitoring).

The riparian vegetation monitoring component of ABFMON#5 will consist of field surveys to evaluate survival of riparian vegetation planted as part of the habitat compensation works. The vegetation surveys will occur in Years 1, 2, 3 and 4 following construction of the compensation habitat.

2.3 Methods

2.3.1 Task 1 Project Coordination

Project management involves the general administrative and technical oversight of the project. This task will include, but not be limited to: 1) budget management, 2) study team management, 3) logistic coordination, 4) technical oversight of field and analysis components, and 5) facilitation of data transfer among members of the WUP CC and FTC.

A safety plan must be developed and submitted to the BC Hydro contract manager for all aspects of the monitoring program involving field work, in accordance with BCH procedures and guidelines. Specific safety training may be required.

2.3.2 Task 2 Field Data Collection & Analyses

Tasks 2.5.1, 2.5.2, and 2.5.3 may be bundled as separate Requests for Proposals (RFPs).

2.3.3 Task 2a. Primary and Secondary Productivity Monitoring

Periphyton and benthic invertebrate assessments will follow methods provided in ABFMON#1 and ABFMON#2 (from Perrin 2005, 2007; and Perrin and Bennet 2006).

Replicate periphyton plates will be randomly installed in the constructed habitat in riffle or run flows and sampled over 35-46 days in August through September in 2009, 2010 and 2012. A 2 cm diameter core of the Styrofoam™ and its attached biomass will be removed each week and analysed for chlorophyll-a (Chl a) concentrations using a fluorometer. The maximum concentration of Chl a found on a given artificial substrate sampler over the time series is considered to be the peak biomass. On the final sampling day of each series, an additional core will be removed and preserved in Lugol's solution for later taxonomic identification and enumeration in the laboratory.

Periphyton cells will be counted in the laboratory at 500x magnification after settlement in Utermohl chambers. Only cells containing cytoplasm will be enumerated. A minimum of 100 individuals of the most abundant species and a minimum of 300 cells in total will be counted. Cells of filamentous taxa will be separated from counts of unicellular taxa (Perrin 2007).

On the final day of periphyton sampling for each series, four replicates of benthic invertebrates will be collected using a Surber sampler (surface area of 900 cm² with a 250 µm net), using methods consistent with provincial standards (BC Ministry of Environment 1997a). The sampler will be placed at a randomly selected location within riffle or glide habitat in the off-channel habitat, and substrate within the sampling frame will be disturbed to a depth of 10 cm for a period of one minute. The sampler will then be moved upstream and the process repeated. The process will be repeated at five random riffle or glide locations. Contents accumulated in the net after completing the sampling in the five locations will be considered to be one complete sample (i.e., the surface area of one sample will be 4,500 cm²). Four replicate samples will be collected. Samples will be preserved in 10% formalin.

Benthic invertebrates will be enumerated in the laboratory using a set count approach: All large animals >1 mm will be picked from the complete sample and in the process all twigs, clumps of algae and other debris will be removed. All small organisms adhering to debris will also be picked, leaving the bulk of the sample without large particulate matter that can affect the distribution of organisms among subsamples. All animals picked from the large debris will be considered "macrobenthos" and identified and enumerated.

The remaining sample containing (microbenthos, organisms <1 mm) will be evenly split into 4 to 16 subsamples using a plankton splitter. The number of splits will depend on the total number of organisms in the sample. A minimum of 200 individuals will be picked from one or more of those subsamples or at least one

subsample will be examined in its entirety even if it contains more than 200 organisms. The total count of microbenthos in a whole sample will be extrapolated by taxa. The total sample count will be the sum of macrobenthos and microbenthos. All benthic animals retained on a 250 µm sieve will be identified to the lowest reliable taxonomic level.

One water sample will be collected at the start and the finish of the six weeks sampling program. Water samples will be analyzed for soluble reactive phosphorus (SRP), total P (TP), total dissolved P (TDP), and particulate P (PP), at a lab with detection capabilities below 1 µg/L. Water samples will also be analyzed for nitrogen components NH_4^{4+} and NO_3^- .

Physical measurements will be made on each weekly sampling day at each location, and include photosynthetically active radiation (PAR), current velocity and water depth. Water temperature will be measured continuously using a temperature logger installed at each site.

2.3.4 Task 2b. Fish and Fish Habitat Monitoring

Detailed mapping of habitat types will be completed in the off-channel habitat. The habitat map will provide a baseline to compare changes in habitat features over time and will provide data required for the estimation of total primary and secondary productivity in the off-channel habitat (Task 2.5.1 of ABFMON#5 and ABFMON#2).

Monitoring for the fish and fish habitat component of ABFMON#5 will be conducted over a five year period. The fall and spring monitoring periods will assess kokanee and Westslope cutthroat trout spawning in the constructed habitat, respectively (fall monitoring will occur in Years 1, 3 and 4; spring monitoring will occur in Years 1, 2, 4 and 5). Summer monitoring will focus on assessing juvenile fish production of all species in the constructed habitat, and will occur in Years 1, 2, 4 and 5. Winter monitoring will assess habitat suitability for overwintering fish. Observations regarding structural stability of the constructed channel and measurements of physical parameters will be made at least once per season in conjunction with the various components of the fish and fish habitat monitoring work. Temperature loggers will be deployed in both pool and glide habitats to characterize temperature conditions in the constructed habitat on a year-round basis.

Spawning surveys will be conducted in spring and fall to target Westslope cutthroat trout and kokanee, respectively. Snorkel or ground-based redd surveys will be completed along the length of the off-channel habitat. Redds will be visually enumerated, photodocumented and geo-referenced. Redd attributes such as distance from large woody debris (LWD) and pools, site gradient, redd location (i.e., open vs. against stream banks or under LWD), will be recorded.

Juvenile fish production will be evaluated each summer with gee traps and through single pass electrofishing. Fish collection permits will be required.

Ice formation will be monitored in the off-channel habitat during specific winter conditions (five days with maximum hourly average air temperature less than -7.5°C , with no continuous spilling from Aberfeldie Dam). The procedures will follow those outlined in ABFMON#4 where applicable. Three surveys in total are recommended. These surveys may be conducted consecutively in a single calendar year if an extended period of low air temperature greatly exceeding the minimum threshold for

cold weather conditions is observed (13 days or more at $<-7.5^{\circ}\text{C}$; i.e., three full survey periods).

Alternatively, if weather conditions only marginally exceed the minimum threshold for cold weather then surveys may be completed in different years. Depending on ice conditions, field surveys to document physical conditions and ice development (spatial and water column coverage) are expected to take one day, and can be completed in concert with other surveys in the canyon. The spatial extent of ice cover will be mapped throughout the study area and photographed at reference locations during each survey. Index locations for repeated measurements of ice thickness will be used. Spot measurements of oxygen concentration and water temperature will be collected in the pools and riffle/run sections of the channel.

Structural Stability and Physical Parameters

Continuous flow gauging stations will be established and monitored at the downstream end and at the longitudinal midpoint of the channel (i.e., upstream from the section of the channel subject to back-watering during freshet flows) to develop stage/discharge curves with at least five points each over the expected range of Bull River discharge for the constructed habitat.

The following information will be collected during each monitoring period with photodocumentation where appropriate:

- Velocity metering in channel sections to record the range of hydraulic conditions in the off-channel habitat;
- Water quality parameters in pools and riffles;
- Observations on channel stability at index sites;
- Observations on stability and erosion of the berm on the east side of the channel;
- Observations on the effectiveness of the berm on west side of the channel to protect the channel from the existing ravelling slope;
- Observations on the distribution of woody debris throughout the channel;
- Observations on off-channel connectivity to Bull River, including stability of the outlet protection groyne, and signs of erosion and/or scour at the channel entrance;
- Observations on erosion and stability of the bank of Bull River near the upstream end of the off-channel habitat; and
- Observations of any physical damage to the channel associated with cattle usage of the area (excluding impacts to vegetation).

2.3.5 Task 2c. Riparian Vegetation Monitoring

Following planting, annual monitoring of riparian vegetation shall take place in July or August in Years 1, 2, 3 and 4 post construction and will follow methods established for the Aberfeldie Redevelopment construction site by Keefer (2006).

The monitoring will assess

- plant survival;
- plant condition (health and vigour);

- percent cover with a breakdown between desirable (native and/or palatable spp.) and undesirable (noxious weeds); and
- impacts to vegetation associated with cattle usage of the area.

Findings of noxious weed cover will be reported to BC Hydro within one week so that appropriate management action can be implemented.

The monitoring will also report on:

- noxious weed infestations;
- slope stability problems; and
- repeat photography using fixed points

2.3.6 Task 3 Reporting

Detailed progress reports outlining field and analytical methods, results of field measurements, and data analyses and interpretation will be prepared annually for each component of the monitoring program, and shall be submitted no later than April 30 of the year following each year of monitoring.

A final, integrated, report will be developed at the end of the monitoring program. The final report will contain a summary of productive capacity parameters and a detailed analysis of fish presence and fish habitat parameters, success of the riparian vegetation planting program, structural stability of the channel and any recommendations for habitat improvements. Input will be required from consultants involved in the various components of ABFMON#5; however, the final report will be developed as a separate task from any one of the individual monitoring components.

The analysis of the effectiveness of the compensation habitat, in concert with the prescribed minimum flow requirements in the diversion reach of Bull River, to achieve the no-net-loss of productive capacity requirement for the Aberfeldie Redevelopment Project will be completed in the reporting task of ABFMON#2 (Primary and Secondary Productivity Monitoring).

2.3.7 Task 4 Attendance at an Annual Workshop

Consultants are requested to participate in a yearly one day workshop in Cranbrook, B.C., tentatively scheduled each summer/fall. The purpose of the workshop is to: 1) disseminate results of the components of the monitoring program including annual monitoring, program protocol development, and analytical methodology development, and, 2) to discuss results and provide recommendations for other ongoing investigations. Investigators will be requested to present results of their individual studies to other investigators, regulatory agency staff, other selected scientists, and B.C. Hydro employees. The cost of attending this workshop should be estimated as a separate task and included in the total cost estimate for the work.

2.4 Schedule

Components of the fish habitat works effectiveness monitoring program and associated reporting are scheduled to occur over a period of five years following construction of the constructed habitat, with the following exceptions: the primary and secondary productivity monitoring will occur for the first two years and then again in Year 4, in concert with summer post-redevelopment primary and secondary productivity monitoring in Bull River; and the structural stability of the channel will

continue to be monitored after high flow events (i.e., 1/10 year trigger) for the life of the project.

Based on the scheduled habitat construction completion date of October 15, 2008, the monitoring program will start in winter of 2008 and finish in fall of 2013. The final report on the program results will be submitted by June 30, 2014.

The timeline for completion of the various components of the monitoring program, and other key events is provided in Table 1.

2.5 Budget

The total estimated budget for the monitoring program is \$293,460. A breakdown of the budget by labour and expenses is provided. A 2% annual rate of inflation (based on 2004\$) and 5% contingency has been assumed.

2.6 References

BC Hydro. 2006. Aberfeldie Redevelopment Project Water Use Plan, Revised for Acceptance by the Comptroller of Water Rights.

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Streamworks Unlimited. 2008. Aberfeldie Redevelopment Project Off-Channel Habitat Site Investigation.

Table 1. Timeline showing approximate timing for components of the ABFMON#5 monitoring program and other key events

	Yr0			Yr1				Yr2				Yr3				Yr4				Yr5			Yr6		
	Sep-08	Fall 08	winter 08	Spring 09	Summer 09	Fall 09	Winter 09	Spring 10	Summer 10	Fall 10	Winter 10	Spring 11	Summer 11	Fall 11	Winter 11	Spring 12	Summer 12	Fall 12	Winter 12	Spring 13	Summer 13	Fall 13	Winter 13	Feb-14	Jun-14
Item																									
Construction of Habitat	■																								
Periphyton monitoring in habitat and mainstem					■				■								■								
Fish and Fish Habitat																									
Spawning - Ko						■								■				■							
Spawning - WCT				■				■								■				■					
Juveniles					■				■								■				■				
Winter habitat effectiveness			■				■				■														
Riparian Planting				■																					
Riparian Vegetation monitoring					■				■			■					■								
Draft Assessment Reports Submitted																								■	
Final Assessment Report submitted																									■

year 0 = 2008 (construction expected to be complete by October 15, 2008)