Seven Mile Project Water Use Plan

Monitoring Program Terms of Reference

- **Seven Mile Tailrace Fish Stranding Monitoring**

March 2007

Terms of Reference for the Seven Mile Project Water Use Plan Monitoring Program

Overview

This document presents Terms of Reference for the effectiveness monitoring programs approved by the Consultative Committee for the Seven Mile Project Water Use Plan (WUP). These programs will provide information on which to base future operating decisions or physical works. This document provides detailed Terms of Reference for the following programs:

1) Seven Mile subadult bull trout entrainment monitoring: A three-year monitoring program to determine whether subadult bull trout from the Salmo River migrate to Seven Mile Reservoir and are entrained though the dam.

2) Seven Mile tailrace fish stranding monitoring: A one-year monitoring program to determine the rate of fish stranding downstream of the Seven Mile Dam.

Description of Facility

Located on the Pend d'Oreille River approximately 15 km south-east of the city of Trail, the Seven-Mile project consists of a concrete gravity dam and a four-unit 817 MW powerplant. There are ten hydroelectric facilities on the Pend d'Oreille River upstream of the facility, with the closest being Seattle City Light's Boundary Project. Teck-Cominco's Waneta Project is located 9 km downstream.

Inflow is regulated by upstream projects, and is generally high from the spring runoff starting April/May and tapering off in August.

The run-of-river reservoir fluctuates daily but is restricted in the winter to avoid bank erosion and in the summer for recreation. Deep drawdown can affect fish passage to tributaries. During the white sturgeon spawning and hatching period of June, July and August, Seven Mile is operated to minimize spills at the downstream Waneta project.

The location and general layout of the project is illustrated in Figure 1.

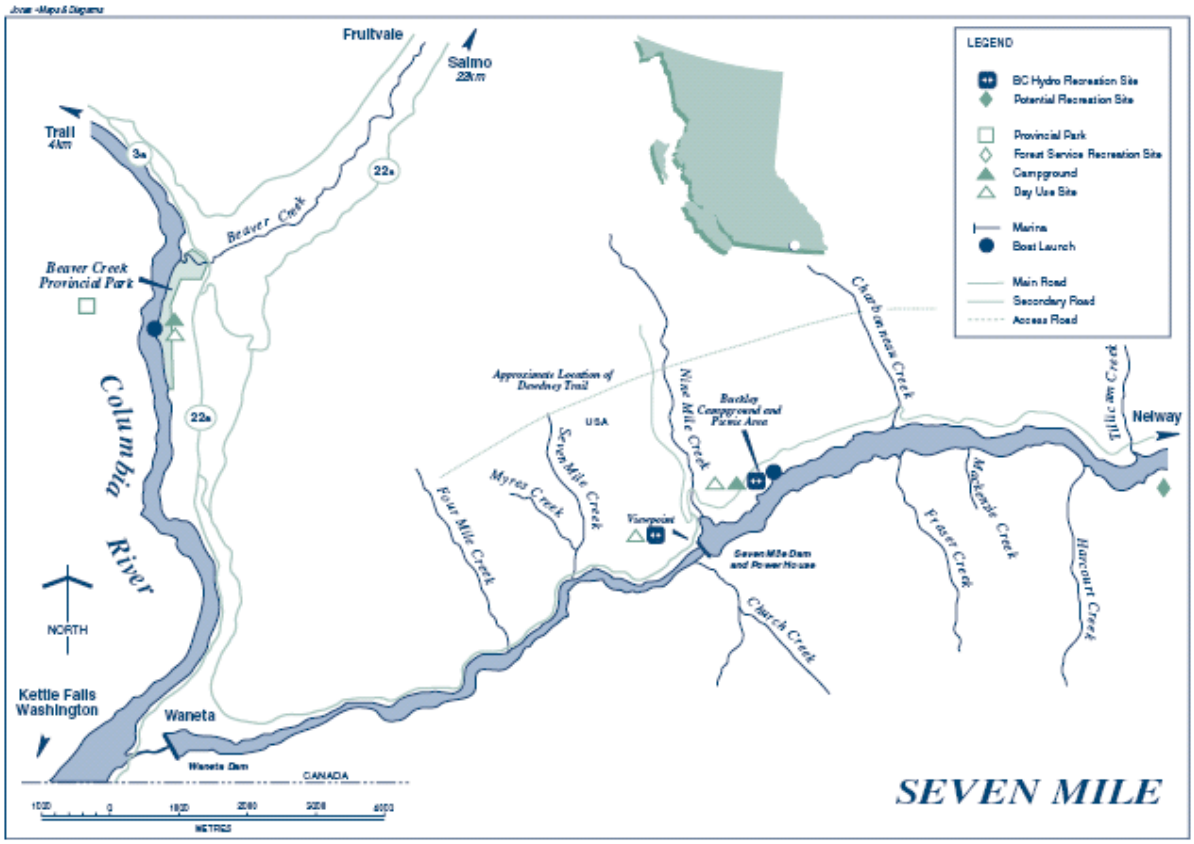

Figure 1: Map of Seven Mile Project

Terms of Reference for the Seven Mile Project Water Use Plan Monitoring Program: Seven Mile tailrace fish stranding monitoring

1.0 Monitoring Program Rationale

1.1 Background

The Consultative Committee for the Seven Mile Dam and Generating Station Water Use Plan expressed some concern that fish may become stranded in the Seven Mile Dam tailrace area during flow fluctuations. Aerial surveys at several water elevations identified three areas (bars) where fish could be stranded (BC Hydro 2001; Table 2). However, the extent of stranding was unknown, and the CC recommended that stranding be assessed at these bars. This document outlines a monitoring program that will document the extent of stranding at these sites.

Table 2: Areas in the Seven Mile Dam Tailrace Where Fish May Become Stranded. Data from BC Hydro (2001) and Golder (2002). Downstream right bank = north bank.

Bar	Location	Substrate	Notes	Species observed
1	Downsream right bank, ~400 m downstream of dam	boulder, cobble	Previously re-contoured	Largescale sucker
2	Downstream left bank, ~700 m downstream of dam	cobble, gravel	Side-channel at low flow, several small pools at zero discharge	Smallmouth bass
3	Downstream left bank, ~750 m downstream of dam	sand, gravel	2 large pools	Sculpin sp.

Fish habitat along the shorelines of the Seven Mile tailrace and extending down Waneta Reservoir has a steep gradient and substrate ranges from fines to boulders. Water levels downstream of the Seven Mile Generating Station fluctuate daily and are influenced by Waneta Reservoir levels (controlled by Teck-Cominco's Waneta hydroelectric facility[2]), and discharge from the Seven Mile Generating Station. Water levels in the first ~750 m downstream of the Seven Mile Dam are influenced primarily by discharge from the Seven Mile Generating Station at low Waneta Reservoir levels. Water levels downstream of this point are primarily influenced by Waneta Reservoir elevations (BC Hydro 2001). The influence of Seven Mile discharge on water levels likely extends to ~1,500 m downstream of the dam (i.e., when the Waneta Reservoir is low, ~457.8 m).

[2] FortisBC operates the Waneta facility.

Post-WUP Stranding Work

Two stranding assessments were completed and one bar was recontoured after the consultative process ended in January 2002 (Anon 2003). Stranding was assessed at three sites (Table 2) during periods of zero discharge on 28 September and 6 October 2002 (Golder 2002). Minimal fish stranding was observed during the assessments. Bar #1 was later recontoured.

1.2 Management Questions

The key management question is whether fish become stranded during fluctuations in water levels and whether recontouring would reduce stranding.

1.4 Key Management Action Affected

The key management action affected by the results of the monitoring program would be whether to recontour two bars to minimize fish stranding.

2.0 Monitoring Program Proposal

2.1 Objective and Scope

The primary objective of the monitoring study is to reduce uncertainty related to the extent of fish stranding in the Seven Mile tailrace. The scope of the sampling will include the two bars where stranding is a concern, and the bar that has been recontoured (Table 2).

2.2 Approach

Fish stranding will be assessed at three bars (Table 2). Assessing fish stranding at the bar that has been recontoured will provide a provisional assessment of the effectiveness of recontouring. To account for possible seasonal variation in fish distribution, stranding will be assessed during two periods; once during the spring prior to freshet (March - May) and once during the summer post-freshet (mid-July to mid-September).

2.3 Methods

2.3.1 Task 1: Operations Coordination

BC Hydro Generation Operations will coordinate with the operators of the Waneta Reservoir to provide the operating conditions necessary to review the effects of stranding during daylight hours. These conditions are zero discharge from Seven Mile and Waneta Reservoir elevation at or below approximately 460.1 m. A communication protocol between the BC Hydro

Generation Operations planning engineer, BC Hydro environmental staff, and the field crew will be established to communicate the timing for the operating conditions.

2.3.2 Task 2: Field Sampling

Stranding Survey

During each survey, crews will search for stranded fish in intersitial spaces and in isolated pools. Pools will also be electrofished. Stranded fish will be measured and identified to species. Assessments will occur during the daytime for consistency with previous assessments (Golder 2002), and because stranding risk for some species is believed to be greater during the day.

Photopoints will be established at each site and sites will be photodocumented during each survey. Site GPS coordinates will be recorded.

Environmental Data

Records of Seven Mile discharge and tailrace water elevations will be obtained from BC Hydro Generation Operations. Crews will measure water temperature at each site.

2.3.3 Task 3: Data Entry

All data will be entered into a Microsoft Access database.

2.3.4 Task 4: Reporting

Following completion of the stranding assessments, a final report will be prepared that will include:

a) An executive summary of the data.

b) Methods.

c) River stage and discharge prior to and during the sampling, presented in tabular and graphical form.

d) A summary of fish stranding including a comparison of stranding among sites.

e) A summary of and comparison with stranding data collected in 2002 (Golder 2002).

f) Recommendations on the need for recontouring to reduce fish stranding, and the equipment that may be required for recontouring.

The report will follow the standard format that is being developed for WUP monitoring programs. The report will be provided in Microsoft Word and Adobe Acrobat (*.pdf) and all maps and figures will be provided in their native format either as embedded objects in the Word file or as separate files.

2.4 Interpretation of Monitoring Program Results

The key monitoring result is the number of fish stranded and the fish species stranded. The CC wanted to determine whether a large or small number of fish become stranded. The number of fish stranded at the bar that has been recontoured will provide a provisional assessment of the effectiveness of recontouring.

2.5 Schedule

Stranding will be assessed during two periods; once during the spring prior to freshet (March – May) and once during the summer post-freshet (mid-July to mid-September). Assessments will occur during the daytime. The exact timing of these assessments is dependent on the operation of the Seven Mile and Waneta facilities, and BC Hydro environmental staff will work with the BC Hydro Generation Operations planning engineer to coordinate the timing of the operations. Stranding assessments will be timed to occur when the Waneta reservoir is near low pool (approximately 460.1 m) and discharge from Seven Mile drops to zero. These conditions do not occur frequently during normal operations and may require that an outage be scheduled at Seven Mile and that the operators of Waneta hold the reservoir near low pool. Thus, a protocol between the BC Hydro Generation Operations planning engineer and the field crew will need to be established for 1) communication, 2) safety, and 3) operating protocol.

2.6 Budget

Table 3 summarizes the budget by labour and expenses. Costs are estimated in 2006 dollars and total inflation costs are included on the second to last line. The budget assumes that both stranding assessments occur during Year 1.

Table 3: Estimated Budget for the Seven Mile Tailrace Fish Stranding Monitoring.

Task	**Labour**		Units	
		Daily rate	Yr 1	Total Cost
Project coordination	Lead biologist	$750	1	$750
Travel / mobilization	Lead biologist	$750	2	$1,500
	Technician	$500	2	$1,000
Stranding survey	Lead biologist	$750	2	$1,500
	Technician	$500	2	$1,000
Data entry, analysis & reporting	Lead biologist	$750	2	$1,500
	Technician	$500	4	$2,000
	Contingency	10%	$1,131	$1,131
		Subtotal		*$10,381*
	Expenses	Unit Price		
	Electrofisher rental	$125	2	$250
	Fish collection permit	$25	1	$25
	Vehicle (per km)	$0.56	500	$280
	Boat rental and fuel	$250	2	$500
	Field supplies	$500	1	$500
	Report reproduction	$500	1	$500
		Subtotal		*$2,055*
	Future inflation	2%	$249	$249
		Total		**$12,684**

References

Anon 2003. Consultative report: Seven Mile Dam and generating station water use plan. Prepared for and by the Seven Mile Dam and Generating Station Water Use Plan Consultative Group.

Baxter, J. S. and G. Nellestijn (2001). Aspects of the biology of bull trout (*Salvelinus confluentus*) in the Salmo River watershed as identified through radio telemetry. Report on Columbia-Kootenay Fisheries Renewal Partnership and Columbia Basin Trust, Cranbrook, BC Report by Salmo Watershed Streamkeepers Society, Salmo BC and Baxter Environmental, Nelson, BC

BC Hydro 2001. Seven Mile tailrace fish stranding assessment. (summary of reconnaissance level assessment).

Golder Associates Ltd. 2002. Memo: Seven Mile tailrace fish stranding assessment, 28 September 2002 and 6 October 2002.