

Peace Project Water Use Plan

Monitoring Program Terms of Reference

Peace Spill Protocol

- **GMSMON-10 Peace River Spill Photos**

February 9, 2008

Terms of Reference for the Peace Project Water Use Plan Monitoring Programs Peace Spill Protocol

1.0 OVERVIEW

This document presents Terms of Reference for the effectiveness monitoring programs for the Peace Spill Protocol (Table 1). These programs will monitor and quantify the environmental effects of spills. Information collected through the Peace Spill Protocol will be used, if appropriate, in the revision of future spill strategies. This document provides detailed Terms of Reference for the following programs:

- 1) **GMSMON-3 Peace River Fish Stranding:** A conditional monitoring program to be implemented immediately following a spill event that will assess the magnitude of fish stranding in the Peace River.
- 2) **GMSMON-4 WAC Bennett Dam Entrainment Study:** A conditional monitoring program to be implemented for a spill event that will estimate the number of fish entrained through WAC Bennett Dam and the rate of mortality experienced by entrained fish. Formerly known as the GMS Entrainment Study. The original project title was misleading as the focus of the study is spillway entrainment and not turbine entrainment.
- 3) **GMSMON-6 Peace River Riparian Flooding:** A conditional 2-year monitoring program to be implemented in Years 9 and 10 of the Peace Project Water Use Plan should a spill event occur during the 10-period.
- 4) **GMSMON-7 Peace River Side Channel Fisheries:** A 10-year required program to provide baseline data on flow, fish use, and substrate changes in side channels as well as to assess the response of trial sites (a physical works project).
- 5) **GMSMON-8 Peace River Side Channel Response:** A conditional monitoring program to assess the response of side channels to spill events in terms of flow, fish use, and substrate.
- 6) **GMSMON-9 Peace River Spill Hydrology:** A conditional program to ensure the collection and reporting of hydrological data associated with a spill event.
- 7) **GMSMON-10 Peace River Spill Photos:** A conditional monitoring program that captures the Peace River at five different flows during a spill event.
- 8) **GMSMON-11 Peace River Spill TGP/Temp:** A conditional monitoring program that monitors TGP and temperature levels of the Peace River during a spill and two weeks following.
- 9) **GMSMON-12 Peace River Wildlife Survey:** A conditional monitoring program that assesses the impact of a spill event on ungulates, beavers, riparian birds, and toads.
- 10) **GMSMON-13 Williston Fish Index:** A study that will estimate the abundance of fish in the pelagic area of the Peace Arm of the Williston Reservoir to assist in assessing the impact of entrainment on fish populations during a spill.

Table 1 Peace Spill Protocol Monitoring Program Terms of Reference Submission Information

Name of Monitoring Program	Order Clause Fulfilled	Submitted with this Package	Previously Submitted To CWR	Ordered Submission Date
GMSMON-3 Peace River Fish Stranding	Schedule D 3(a)	Yes	No	February 2008
GMSMON-4 WAC Bennett Dam Entrainment	Schedule D 3(b)	Yes	No	February 2008
GMSMON-6 Peace River Riparian Flooding	Schedule D 3(c)	Yes	No	February 2008
GMSMON-7 Peace River Side Channel Fisheries	Schedule C 4(d)	Yes	No	August 2008
GMSMON-8 Peace River Side Channel Response	Schedule D 3(d)	Yes	No	February 2008
GMSMON-9 Peace River Spill Hydrology	Schedule D 3(e)	Yes	No	February 2008
GMSMON-10 Peace River Spill Photos	Schedule D 3(g)	Yes	No	February 2008
GMSMON-11 Peace River Spill TGP/Temp	Schedule D 3(f)	Yes	No	February 2008
GMSMON-12 Peace River Wildlife Survey	Schedule D 3(h)	Yes	No	February 2008
GMSMON-13 Williston Fish Index	Schedule D 3(i)	Yes	No	February 2008

Monitoring Program No. GSMON-10 Peace River Spill Photos

1.0 MONITORING RATIONALE

1.1 Background

The Peace River Spill Photos monitoring program was recommended by the Peace Water Use Plan Committee (hereafter known as the Committee) to support projects and monitoring programs within all of the Peace River management plans. The Peace River Spill Photos program support the Peace Spill Protocol (PSP), the Peace River Flood Pulse Plan management plans and the program has a secondary application for Peace River Side Channel Plan, and Peace River Ramping Plan. Monitoring programs within both the Peace Spill Protocol (PSP), and the Peace River Flood Pulse Plan will be conducted opportunistically as the management plans do not propose a planned spill release. Thus, photos from Peace River Spill Photos project will only be available to the projects and monitoring programs within the aforementioned management plans if a spill event occurs.

1.2 Management Questions

The key management question is:

- 1) What is the plan view of the Peace River at different flows during a spill event?

The Consultative Committee did not identify a specific management question to be addressed for this project as its purpose is to serve multiple applications.

1.3 Detailed Hypotheses about the Ecological Impacts

No specific hypotheses will be tested as part of this monitoring program.

1.4 Key Water Use Decision Affected

This monitoring program does not directly affect any key water use decisions but rather, provides supporting information to the various Peace River management plans. The success of these management plans will in turn affect water use decisions. The outcome of programs in the Peace Spill Protocol affect the revision of future spill strategies and the success of the Peace River Flood Pulse Plan may dictate the necessity of flood pulse events to maintain side channel and riparian habitat. Ramping regimes may also be affected if the Peace River Ramping Plan does not improve fish productivity. Lastly, the current minimum discharge regime may change to a novel experimental regime set between 7500 and 20,000 cfs after Year 5 of the PCR Side Channels Plan if the plan is shown to be ineffective at improving fish habitat. These decisions have important implications for power generation and ecological values.

2.0 MONITORING PROGRAM PROPOSAL

2.1 Objective and Scope

The objective of the monitoring program is to collect aerial photos for the Peace River during and immediately after a spill event. Photos will be taken for each spill event where total discharge exceeds 70,629 cfs (2000 cms) for at least two days.

The study area includes the Peace River from the Peace Canyon Dam to the confluence of the Pine River.

2.2 Approach

Aerial photo mapping will occur during a spill event at 10,000 cfs intervals above the normal operating range. Following the spill event, aerial photography will again be conducted over the study area. Aerial photos will undergo orthorectification. An annual report will provide a description of methodologies and results.

Photos will be made available to project coordinators of the projects and monitoring programs within the various Peace River management plans.

2.3 Methods

2.3.1 Task 1: Project Coordination

Project coordination will involve the general administrative and technical oversight of the monitoring program. 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 other investigators associated with the Peace Spill Protocol, Peace River Flood Pulse Plan, Peace River Side Channel Plan, Peace River Ramping Plan.

2.3.2 Task 2: Aerial Photography

Aerial photographs will be acquired of the Peace River during spill events at a scale of 1:5000 from the PCN Dam to the confluence of the Pine River. Photos will be captured at (i) three different flows that are at 10,000 cfs intervals above 70,000 cfs (2000 cms) and (ii) immediately following the spill event when flows are less than 70,000 cfs (2000 cms). Scheduling must be confirmed with operating engineers for the system before committing to photo-capture. Imagery will meet the standards for orthorectification, mapping requirements, and potential integration with digital elevation model. The aerial photos will be orthorectified using the overflight photography as the reference. The consultant will confirm standards with BC Hydro's Photogrammetry Department during the planning phase of this program and will confirm changes with the Peace Water Licence Requirements program manager to ensure that these changes do not confound other data collection programs or analysis issues.

2.3.3 Task 3: Analysis and Reporting

A summary report will be prepared annually describing the work conducted, the mapping and analytical methods used for a given spill event. The consultant will provide BC Hydro with final copies both digital and hard copy of the map files (digital files to be in both Micro Station dgn format and ESRI shp format)

2.4 Interpretation of Monitoring Program Results

Air photo mapping will provide information on channel morphology during periods of high flow events. Air photos will provide supplementary information to the Peace River management plans for attributing and quantifying changes in channel morphology over time to factors such as the spill event and natural river progression.

The observed changes will assist in assessing positive and negative impacts of spill from a vegetation, fisheries, and wildlife perspective.

2.5 Schedule

Monitoring is scheduled to occur during each spill event. Aerial photography of the study area will be taken at three different flows when total discharge (Q_{out}) exceeds a daily average of 70,000 cfs (2000 cms) and a fourth set of photos will be taken when the dams have returned to their normal operating range

2.6 Budget

The estimated cost per spill event for the monitoring program is \$182,041. Table 10-1 summarizes the budget by labour and expenses estimated in 2007 dollars.

Table 10-1: Estimated budget for the Peace River Spill Photos

Sub-total		\$153,950
Inflation	2%	\$19,423
Contingency	5%	\$8,669
Total		\$182,041