

Peace Project Water Use Plan

Annual Report: 2009

Physical Works

- [GMSWORKS#1: PCR Aerial Photos](#)
- [GMSWORKS#2: PCR Baseline TGP/Temperature](#)
- [GMSWORKS#3: PCR Side Channels](#)
- [GMSWORKS#4: PCR Hydraulic Habitat](#)
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- [GMSWORKS#6: PCR Mainstem Stage Discharge](#)
- [GMSWORKS#7: PCR Riparian Habitat Assessment](#)
- [GMSWORKS#8: DNR Demonstration Tributary](#)
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- [GMSWORKS#10: PCR Industry & Taylor Water Quality Assessment](#)
- [GMSWORKS#12: PCR & WLL Recreation Access](#)
- [GMSWORKS#13: PCR Recreation Access](#)
- [GMSWORKS#14: WLL Air Photos & DEM](#)
- [GMSWORKS#16: WLL Wetland Inventory](#)
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- [GMSWORKS#26: WLL Communications/Safety](#)
- [GMSWORKS#27: WLL Finlay River Access Information Plan](#)
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Monitoring Programs

- [GMSMON#1: PCR Creel Survey](#)
- [GMSMON#2: PCR Fish Index](#)
- [GMSMON#3: PCR Fish Stranding](#)
- [GMSMON#4: WACB Entrainment](#)
- [GMSMON#5: PCR Productivity](#)
- [GMSMON#6: PCR Riparian Flooding](#)
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For Water Licences 123018, 123019, 123020, 123021, 123025

June 30, 2009

BC Hydro Peace Project Water Use Plan Annual Report: 2009

1 Introduction

This document summarizes the status of Peace Project Water Use Plan (WUP) physical work and monitoring program projects as of 30 June 2009 (financial information is current to 31 May 2009). BC Hydro is required to provide this information to the Comptroller of Water Rights (CWR) pursuant to sections 7, 4, 5, and 4 of Schedules A, B, C, and D, respectively, to the Peace Order made by the CWR under section 88 of the *Water Act* and dated 09 August 2007 (the "Order").

This Annual Report is also public and provides a concise summary of the status of the Peace WUP projects as of 30 June 2009 (31 May 2009 for financial information).

2 Glossary

The following acronyms, words, or phrases used throughout this document have the meanings given below:

Committee Report: The consensus recommendations of the WUP Committee set forth in their report of December 2003. An Executive Summary of those recommendations can be viewed online at:

http://www.bchydro.com/etc/medialib/internet/documents/environment/pdf/wup_peace_river_executive_summary_pdf.Par.0001.File.wup_peace_river_executive_summary.pdf

CWR: The Comptroller of Water Rights for the Province of British Columbia.

DNR: Dinosaur Reservoir, used only in project or management plan names.

GMS: Gordon M. Shrum Generating Station at WAC Bennett Dam.

Order: The order of the CWR, identified as the "Peace Order" and dated 09 August 2007, made pursuant to s. 88 of the *Water Act* of British Columbia and pertaining to implementation of the Peace WUP.

PCR: Peace River, used only in project or management plan names.

PSP: The Peace Spill Protocol, a group of projects to be implemented in the event of spill releases of water from WAC Bennett Dam or Peace Canyon Dam. The PSP is described in detail in Appendix 3 of the WUP and is ordered pursuant to Schedule D of the Order.

TGP: Total gas pressure.

ToR: Terms of Reference for WUP projects ordered by the CWR pursuant to the Order. The ToR can be viewed online at:

http://www.bchydro.com/planning_regulatory/water_use_planning/northern_interior.html

WLL: Williston Reservoir, used only in project or management plan names

WUP: The Peace Project Water Use Plan accepted by the CWR on 21 August 2007. The WUP can be viewed online at:

http://www.bchydro.com/etc/medialib/internet/documents/environment/pdf/peace_river_water_use_plan.Par.0001.File.peace_river_wup.pdf

WUP Committee: The Peace Water Use Planning Committee as described in the Committee Report.

3 Background

The water use planning process for BC Hydro's Peace River hydroelectric facilities was initiated in February 2001 and completed in December 2003. The conditions proposed in the WUP for the operation of the facilities reflect the December 2003 consensus recommendations (the Committee Report) of the Peace Water Use Planning Committee (the WUP Committee).

Following review by the provincial Cabinet, BC Hydro submitted the WUP to the CWR in June 2006. The CWR accepted the WUP on 21 August 2007.

On 09 August 2007, BC Hydro was ordered to implement the operating conditions proposed in the WUP and to prepare terms of reference (ToR) for specified physical work and monitoring program projects.

GMSWORKS#11 FSJ Water Well, a proposed project relating to the water supply to the community of Fort St. John, was conducted outside the WUP and is not part of this report.

GMSWORKS#15 WLL Digital Elevation Model has been combined with GMSWORKS#14 Airphotos and is described in the section relating to the latter project.

Between 09 February 2008 and present, ToR were submitted to the CWR at various times for approval and leave to commence ordered projects. Leave to commence all projects for which ToR have been submitted has been granted.

ToR for the following three ordered projects have not yet been submitted to the CWR:

- GMSWORKS#23: WLL Erosion Control Trial
- GMSMON#19: WLL Erosion Control
- GMSWORKS#28: Industry Feasibility & Design Study

The status of those projects is described in Section 5, below.

The WUP includes a number of “management plans”, each addressing a key area of concern for the WUP Committee. Many WUP projects are intended to address specific management plans. The management plans and the projects addressing them are:

For Williston Reservoir:

- The Riparian and Wetland Habitat Management Plan, addressed primarily by GMSWORKS#16 and 17, and GSMON#15.
- The Tributary Habitat Enhancement Management Plan, addressed primarily by GMSWORKS#19 and GSMON#17.
- The Dust Control Management Plan, addressed primarily by GMSWORKS#20 and 21, and GSMON#18.
- The Erosion Management Plan, addressed primarily by GMSWORKS#23 and GSMON#19.
- The Williston Access, Navigation, and Safety Plan, addressed primarily by GMSWORKS#24 and GSMON#20.
- The Debris Management Plan, addressed primarily by GMSWORKS#18 and 22 and GSMON#16.
- The Peace/Williston Marine Radio Communications and Improved Signage Plan, addressed primarily by GMSWORKS#26.

For Dinosaur Reservoir, the Dinosaur Reservoir Management Plan, addressed primarily by GMSWORKS# 8, 9, and 12, and by GSMON#14.

For the Peace River:

- The Peace Side Channel Plan, addressed primarily by GMSWORKS#3 and GSMON#7.
- The Peace Ramping Plan, addressed primarily by GMSWORKS#3 and GSMON#7.
- The Peace Flood Pulse Plan, addressed primarily by the Peace Spill Protocol (PSP), a collection of projects to be implemented in the event of a spill from the WAC Bennett or Peace Canyon Dams. The PSP includes GMSWORKS#2 and 7, and GSMON#3, 4, 6, 7, 8, 9, 10, 11, 12, and 13.

The remainder of the Peace WUP projects either support multiple management plans or do not address a specific management plan.

The Order will be implemented until 2020, when the longest-running projects will end, except for ongoing maintenance on the GMSWORKS#26 marine communications system and any WUP boat ramps constructed.

A review of Williston Reservoir operations is to occur approximately five years after commencement of the WUP. The timing is not yet finalized but will likely be in 2013

because of the staggered start years of projects. During the review, the WUP Committee, as it is then constituted, will:

1. Consider the results of WUP projects and may recommend long-term operating constraints for Williston Reservoir to replace those currently in effect pursuant to the Order;
2. Review the results of all projects and consider what adjustments, if any, are required to scope or methodology; and
3. Make decisions about proceeding with conditional next steps for appropriate projects.

A full review of the WUP will occur approximately ten years after commencement of the WUP. The timing is not yet finalized but will likely be in 2020 because of the staggered start years and fixed durations of the WUP projects.

4 Project Timing

Tables 4-1 and 4-2 outline the Peace WUP Physical Works and Monitoring Program projects implementation schedules.

Table 4-1: Schedule of Peace WUP Physical Works Projects Implementation as of June 2009

Project	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
GMSWORKS#1: PCR Aerial Photos	✓ ⁷	u/w	▪						▪ ⁸	▪				
GMSWORKS#2: PCR Baseline TGP/Temperature	✓	u/w	▪	▪	▪	▪	▪	▪	▪	▪	▪			
GMSWORKS#3: PCR Side Channels	Del	u/w ⁴	▪											
GMSWORKS#4: PCR Hydraulic Habitat	Del	u/w ⁴	▪											
GMSWORKS#5: PCR Hydraulic Model	Del	u/w ⁴	▪	▪	▪	▪ ⁶								
GMSWORKS#6: PCR Mainstem Stage Discharge	Del	u/w ⁴	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵	
GMSWORKS#7: PCR Riparian Habitat Assessment			▪	▪										
GMSWORKS#8: DNR Demonstration Tributary			Del ⁴	▪	▪ ⁵									
GMSWORKS#9: DNR Tributary Inventory & Feasibility		u/w												
GMSWORKS#10: PCR Industry & Taylor Water Quality Assessment	Del	u/w ⁴	▪ ⁵	▪ ⁵	▪ ⁵	▪ ⁵								
GMSWORKS#12: DNR Recreation Access	✓	u/w ^{4,9,11}	▪ ⁶											
GMSWORKS#13: PCR Recreation Access	✓	u/w ^{4,9,11}	▪ ⁶											
GMSWORKS#14: WLL Air Photos & DEM		u/w	▪			▪					▪			
GMSWORKS#16: WLL Wetland Inventory		u/w ⁴	▪ ⁶											
GMSWORKS#17: WLL Trial Wetlands				▪	▪ ⁵	▪ ⁵	▪ ⁵							
GMSWORKS#18: WLL Debris Field Survey		u/w	▪											
GMSWORKS#19: WLL Trial Tributaries	Del	u/w ⁴	Del	▪	▪ ⁵									
GMSWORKS#20: WLL Dust Source Survey		u/w	▪ ³											
GMSWORKS#21: WLL Dust Control Trial	✓	u/w	▪											
GMSWORKS#22: WLL Debris Management		u/w	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪ ³		
GMSWORKS#23: WLL Erosion Control Trial	Del ¹	Del ¹												
GMSWORKS#24: WLL Boat Access	Del	u/w ^{4,11}	▪ ⁶											
GMSWORKS#25: WLL Bathymetric Mapping			▪											
GMSWORKS#26: WLL Communications/Safety	Del	u/w ⁴	▪	▪ ⁵	▪ ^{5,10}									
GMSWORKS#27: WLL Finlay River Access Information Plan		u/w ⁴	▪ ⁶											
GMSWORKS#28: Industry Feasibility & Design Study	Del ²	Del ²												
Legend	<ul style="list-style-type: none"> ▪ Program to be undertaken/initiated in identified year u/w Project is under way ✓ Project is completed for the year Del Project is delayed for the year 													

Footnotes:

1. Delayed pending final contract between BC Hydro, the Province of BC, and the Tsay Keh Dene First Nation.
2. Delayed pending redesign of project.
3. Final report completion only.
4. ToR is being resubmitted. This chart reflects the planned schedule as outlined in the resubmission.
5. Work in this year represents maintenance at existing sites.
6. Project wrap up costs, only (i.e. data archiving, report edits, etc.)
7. One of five flows captured in 2008, remaining to be taken in 2009 and 2010.
8. Flows not captured in Yr 9 will be taken in Yr 10.
9. Work in this year represents completion of work not finished in previous years.
10. Maintenance work will continue in future years.
11. This work represents feasibility only. ToR's for design and construction will be submitted following completion of feasibility.

Table 4-2: Schedule of Peace WUP Monitoring Program Projects Implementation as of June 2009

Project	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
GMSMON#1: PCR Creel Survey	✓ ³		▪		▪		▪		▪		▪	▪ ²		
GMSMON#2: PCR Fish Index	✓	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪ ²			
GMSMON#3: PCR Fish Stranding		▪ ⁴												
GMSMON#4: WACB Entrainment	✓	▪ ⁴												
GMSMON#5: PCR Productivity			▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		
GMSMON#6: PCR Riparian Flooding												▪ ⁵	▪ ⁵	
GMSMON#7: PCR Side Channel Fisheries			▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪ ²	
GMSMON#8: PCR Side Channel Response		▪ ⁴												
GMSMON#9: PCR Spill Hydrology		▪ ⁴												
GMSMON#10: PCR Spill Photos		▪ ⁴												
GMSMON#11: PCR Spill TGP/Temperature		▪ ⁴												
GMSMON#12: PCR Wildlife Survey		▪ ⁴												
GMSMON#13: WLR Fish Index	✓	u/w ²												
GMSMON#14: DNR Tributary Habitat			▪		▪		▪		▪		▪			
GMSMON#15: WLL Wetland Habitat			▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		
GMSMON#16: WLL Debris Trends				▪	▪ ²	▪	▪ ²				▪	▪ ²		
GMSMON#17: WLL Tributary Habitat			▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		
GMSMON#18: WLL Dust Control	✓	u/w	▪	▪	▪	▪	▪	▪	▪	▪	▪ ²			
GMSMON#19: WLL Erosion Control	Del ¹	Del ¹												
GMSMON#20: WLL Recreation Use		u/w	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪ ²		
GMSMON#21A: WLL Archaeological Overview Assessment		u/w												
GMSMON#21B: WLL Erosion Monitoring of Archaeological Resources		Del	▪	▪	▪	▪	▪	▪	▪	▪	▪			
Legend	▪ Program to be undertaken/initiated in identified year u/w Project is under way ✓ Project is completed for the year Del Project is delayed for the year													

Footnotes:

1. Delayed pending final contract between BC Hydro, the Province of BC, and the Tsay Keh Dene First Nation.
2. Final report completion only.
3. Results of Creel Study undertaken by BC Hydro to study potential impacts of Site C to be incorporated into WUP monitoring program data.
4. Opportunistic study to be implemented in the event of a spill meeting the criteria of the PSP. Contract to be awarded and any preliminary work conducted in 2009; majority of work will be carried over to following year if spill event does not occur.
5. Opportunistic study to be implemented only in the event of a spill meeting the criteria of the PSP.

5 Summary of Peace WUP Projects

This section outlines the status of each of the Peace WUP projects as of 30 June 2009 (financial status is covered in Section 6, below). Each subsection describes one project, including an overview outlining the objective, giving a brief description of the project, identifying the contractor, and providing an update of the ToR status for that project. The overview is followed by a description of the current status of the project. Physical works are described first, in Section 5.1, followed by monitoring programs in Section 5.2.

5.1 Peace WUP Physical Works Projects

5.1.1 GMSWORKS#1 – Peace River Aerial Photos

Order Clause: Schedule C clause 1

BC Hydro Project Manager: Kim Hawkins

5.1.1.1 Overview

Project Objective: The objectives of this project are to:

- Conduct a mapping inventory to organize a bibliography of all existing maps associated with the Peace River, and
- In Years 1 and 9 of this project, acquire aerial photos of the Peace River between the Peace Canyon Dam and the confluence with the Pine River, at five different flows within normal operating range.

Project Description: The Peace River Aerial Photos project supports physical works and monitoring programs within all of the Peace River management plans. Specifically, this project will provide spatial data to support the PSP and the PCR Flood Pulse, PCR Side Channel, and PCR Ramping Plans.

The project entails capturing photos, at a scale of 1:5000, at flows of approximately 10K cfs, 20K cfs, 70K cfs and 2 additional flow rates between 20K and 70K cfs. At least one set of photos is to be taken when foliage is present to form the basis of vegetation maps. The photos are to be orthorectified and both digital and hard copies of the map files delivered. Completion of any aerial photography not taken in Years 1 and 9 is to be conducted in Years 2 and 10. A status report will be completed after each year of work.

Contractor: The mapping inventory work was conducted by Geomatics and Research. Aerial photography work is being conducted by Selkirk Remote Sensing Ltd., photogrammetry scanning by Aero Geometrics Ltd. and aerial triangulation by 4DGIS Ltd. All three contractors have conducted similar work for BC Hydro in the past. The BC Hydro Photogrammetry Services Department also provided project coordination, supervision and compilation assistance.

ToR Compliance: In March 2009 the CWR approved a resubmission of the GMSWORKS#1 ToR with updated project implementation costs. The project complies with the revised ToR; no further resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.1.1.2 Status

This work was initiated in October 2008; one set of photos were taken at mid-range flow. It is anticipated the remaining photos will be taken between June and September 2009, with the exception of the high flow value which will not be achieved this calendar year, unless a spill release is conducted, due to generator outages at the Gordon M. Shrum Generating Station (GMS). Aerial photos of the high flow are scheduled to be taken in 2010.

The bibliography of Peace River maps was completed in April 2009.

5.1.2 GMSWORKS#2 – Peace River Baseline TGP and Temperature

Order Clause: Schedule D clause 1

BC Hydro Project Manager: Kim Hawkins

5.1.2.1 Overview

Project Objective: The objectives of this project are to:

- Determine the temperature regime on the Peace River including the spatial and temporal variation, and
- Maintain total gas pressure (TGP) data loggers and related equipment.

Project Description: The PCR Baseline TGP and Temperature project is a component of the PSP and the PCR Flood Pulse Plan. Baseline temperature data collection will provide information on the temperature regime of the river under normal operating conditions and the influence of reservoir operation on downstream temperature.

The work involves the installation of temperature loggers at various sites around the W.A.C. Bennett Dam, the Peace Canyon Dam and the Peace River to the confluence of the Pine River. Temperature monitoring will occur continuously over the 10-year study period with downloading of temperature data undertaken a minimum of four times per year. Data will be entered into a database and analysis will entail summary statistics describing the temporal and spatial variation in temperature. The level of correlation between forebay temperature at the dams and downstream temperature will also be assessed and an annual report generated.

As part of GMSMON#11, TGP equipment is to be calibrated and maintained such that it will be ready for installation in the event of a spill.

Contractor: The temperature loggers were purchased from Hoskin Scientific Ltd. and the TGP equipment from Point Four Systems Inc.; both companies are located in Vancouver, BC.

Temperature gauge installation and monitoring and TGP equipment maintenance are being conducted by Diversified Environmental Services Ltd. (Diversified) under a five year contract. Diversified is located in Fort St. John and has conducted similar work for BC Hydro in the past.

ToR Compliance: The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.1.2.2 Status

Monitoring equipment was purchased in August 2008 and the temperature gauges deployed the following month.

5.1.3 GMSWORKS#3 – Peace River Side Channels

Order Clause: Schedule C clause 1(a)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.3.1 Overview

Project Objective: The objective of this project is to restore riparian access to side channel habitat that is currently isolated at minimum flows. This will allow BC Hydro to operate the Peace River generation facilities with greater flexibility. A key benefit of successful side channel restoration will be the ability to operate at minimum flows, when electricity market demand is low, without compromising fish and fish habitat.

Project Description:

- Inventory
 - Provide an inventory of side channel complexes in the Peace River between Peace Canyon Dam and the Pine River with prescriptive commentary on each side channel complex
 - Select two or more side channel complexes as demonstration sites for habitat improvement, preferably demonstrating different enhancement techniques and habitat objectives.
- Design
 - Design physical works for selected side channels
- Construct
 - Construct physical works at selected side channels

Contractor: This work is being conducted by Northwest Hydraulic Consultants Ltd. (NHC). NHC has conducted similar work for BC Hydro on other systems.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.3.2 Status

This work was initiated in May 2009 and is scheduled to be completed by January 2010. A final report will be completed by April 2010.

5.1.4 GMSWORKS#4 – Peace River Hydraulic Habitat

Order Clause: Schedule C clause 1(b)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.4.1 Overview

Project Objective: The objective of this physical work is to estimate hydraulic habitat types as a function of flow. This approach is more cost effective than physical habitat modeling yet produces an effective tool for assessing the utility of management plans and impacts of daily and seasonal flow changes. The model that is developed from these data will allow some interpolation and extrapolation of benefits or impacts of changes in flow to fish habitat.

Project Description:

- Develop a habitat classification scheme and rules for Peace River hydraulic habitat types.
- Delineate the habitat classification on aerial photos for five different flows.
- Digitize habitat types from photos into a GIS-based mapping system (ARC INFO).
- Develop a model of hydraulic habitat as a function of flow.
- Produce a report describing the classification scheme (bias, error, etc.), mapping process, results and discussion of QA.

Contractor: This work is being conducted by Mainstream Aquatics Ltd (Mainstream). Mainstream has previously conducted similar work for BC Hydro on the Peace River.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.4.2 Status

This work was initiated in May 2009 and is scheduled to be completed by January 2011. An annual report will be submitted by April 2010.

5.1.5 GMSWORKS#5 – Peace River Hydraulic Model

Order Clause: Schedule C clause 1(b)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.5.1 Overview

Project Objective: The objective of this physical work is to support other Peace River projects that are addressing side channel habitat restoration and ramping rate strategies. The model is needed to estimate the degree of side channel inundation as flows increase. Information on water levels at various flows is integral to the design of habitat elements in the side channels project.

Project Description:

- Survey ten new cross-sections between Peace Canyon Dam and the Pine River.
- Produce an interim report on the cross-sections established plus any other cross-sectional data and other survey and hydraulic data that will be beneficial to the modeling effort.
- Develop a working hydraulic model of the Peace River that will provide measures of mainstem and side channel inundation for various discharge regimes.

Contractor: This work is being conducted by Northwest Hydraulic Consultants Ltd. (NHC). NHC has conducted similar work for BC Hydro on other systems.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.5.2 Status

This work was initiated in May 2009 and is scheduled to be completed by January 2013. An annual report will be submitted by April 2010.

5.1.6 GMSWORKS#6 – Peace River Mainstem Stage Discharge

Order Clause: Schedule C clause 1(b)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.6.1 Overview

Project Objective: The objective of this project is to establish stage discharge relationships at strategic points along the Peace River such that side channel inundation can be inferred from mainstem discharges. This ability will be of particular utility when BC Hydro is ramping discharges down and fish can become stranded in side channels. The project will assist in the fine tuning of ramping sequences, helping to reduce fish stranding and stress mortality tolls on fish.

Project Description:

- Establish transects and install gauges at five sites on the Peace River between Peace Canyon Dam and the Pine River Confluence.
- Develop Stage-Discharge relationships for each site covering flows related to Peace Canyon Dam discharges (283 to 2000 cms).

- Develop a protocol and schedule for maintenance and data quality checks.

Contractor: This work is being conducted by Northwest Hydraulic Consultants Ltd. (NHC). NHC has conducted similar work for BC Hydro on other systems.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.6.2 Status

This work was initiated in May 2009 and is scheduled to be completed by January 2019. An annual report will be submitted by April 2010.

5.1.7 GMSWORKS#7 – Peace River Riparian Habitat Assessment

Order Clause: Schedule C clause 1(c)

BC Hydro Project Manager: Kim Hawkins

5.1.7.1 Overview

Project Objective: The objectives of this project are to:

- Determine species composition of vegetation in the riparian zone of the Peace River, and
- Determine spatial distribution of vegetation in the riparian zone of the river.

Project Description: The WUP Committee recommended an assessment of the large-scale temporal and spatial trends of the vegetative community along the Peace River. This study will focus on the current status of riparian habitat and, if a spill occurs during the 10-year management plan study period, this riparian data will be used to assess the impacts.

The project will occur over two years using the air photos taken as part of GMSWORKS#1 to produce vegetation inventory maps in the first year and ground-truthing and surveying sites of key concern, including sites located around the side channel areas that have been selected as part of GMSWORKS#3, in both years. The study area extends from the Peace Canyon Dam to the confluence of the Pine River. A report will be produced each year detailing the progress of the project.

Contractor: This project is scheduled to commence in 2010; the contractor has not yet been selected.

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.1.7.2 Status

In order to develop the vegetation maps, this project will utilize the aerial photos taken as part of GMSWORKS#1, including at least one set of photos taken when

foliage is present. Therefore the project is scheduled to commence in 2010 following the acquisition and development of the air photos in 2008 and 2009.

5.1.8 **GMSWORKS#8 – Dinosaur Reservoir Demonstration Tributary**

Order Clause: Schedule B clause 1(a)&(b)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.8.1 **Overview**

Project Objective: The objective of this project is to select up to two of the tributary sites inventoried and described under GMSWORKS#9 and design and construct habitat improvements at these sites. Ideally, each site design would showcase different enhancement techniques.

Project Description:

- Design and construct habitat enhancement for up to two selected tributaries to the Dinosaur Reservoir

Contractor: This work has not yet been awarded pending the completion of GMSWORKS#9.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.8.2 **Status**

This work is scheduled to start in spring 2011 following the completion of GMSWORKS#9 and a year of “baseline” data collection.

5.1.9 **GMSWORKS#9 – Dinosaur Reservoir Tributary Inventory and Feasibility**

Order Clause: Schedule B clause 1(a)

BC Hydro Project Manager: Kim Hawkins

5.1.9.1 **Overview**

Project Objective: The objectives of this project are to:

- Identify the tributaries around the Dinosaur Reservoir that are impacted by the operation of the reservoir and/or by accumulations of debris, and
- Provide a ranking for the tributaries based on biological impact and mitigation potential for success from which one or more sites may be selected for remediation, enhancement, and management of debris.

Project Description: The operation of Dinosaur Reservoir, as well as debris accumulations in tributaries from upstream logging activities, has an impact on the fish access to tributary streams and the utility of these streams as fish habitat. The

Committee endorsed a plan to gauge the effectiveness of restoring access to, and fisheries habitat within, these tributaries. The assessment and ranking of the tributaries will be undertaken by reviewing existing studies of the reservoir and conducting a field survey. A final report outlining the results of the assessment will be provided.

Contractor: This work is being conducted by Triton Environmental Consultants Ltd. (Triton). Triton has conducted similar work for BC Hydro in other areas of the province.

ToR Compliance: The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.1.9.2 Status

This project was awarded to Triton in May 2009 and will be completed within this calendar year.

5.1.10 GMSWORKS#10 – Peace River Industry and Taylor Water Quality Assessment

Order Clause: Schedule C clause 4(e)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.10.1 Overview

Project Objective: The objective of this study is to answer four questions surrounding sedimentation issues at the Spectra surface intakes in the District of Taylor (i.e., What, Where, When, How). The information collected and the recommendations of the study will allow BC Hydro to design specific flow increases from Peace Canyon Dam or to identify a non-operating alternative to address any issues.

Project Description:

- Collect information that would determine the cause of the sedimentation. This would include an estimate of the quantity of deposition under a range of flow conditions.
- Collect information that would determine whether increased flow from BC Hydro's Peace Canyon Dam would affect water temperatures at the intakes during the summer.
- Characterize the Peace/Pine River flow relationship, specifically what Peace channel flow is required to prevent Pine River flows from reaching the north bank.

Contractor: This work is being conducted by Knight Piesold Ltd. Knight Piesold has conducted similar work for other clients in the past.

ToR Compliance: The Project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.1.10.2 Status

This work was initiated in May 2009 and is scheduled to be completed by December 2013. An annual report will be submitted by April 2010.

5.1.11 GMSWORKS#12 – Peace and Williston Recreational Access (Feasibility of Boat Ramps)

Order Clause: Schedule B clause 2(a)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.11.1 Overview

Project Objective: The overall objective of this physical work is to improve boat launch facilities on Dinosaur Reservoir at the day-use park near Hudson's Hope. Improving this facility will enhance the recreation experience on the reservoir and improve safety when accessing the reservoir.

Project Description:

- Feasibility
 - Determine the feasibility and cost of relocating the dock associated with the Dinosaur boat launch as recommended by the WUP Committee.
 - Evaluate the feasibility and cost improvements to the rock berm adjacent to the Dinosaur boat launch.
- Design
 - Design berm improvements.
- Construct
 - Construct berm improvements and relocate the dock.

Note: This project is for feasibility only.

Contractor: This work is being conducted by Moffatt & Nichol Engineers Corporation (M&N). M&N has conducted similar work for BC Hydro on other systems.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.11.2 Status

This work was initiated in August 2008 and is scheduled to be completed by January 2010. An annual report will be submitted by April 2010.

5.1.12 GMSWORKS#13 – Peace River Recreational Access

Order Clause: Schedule C clause 3(a)&(b)
Schedule A clause 4(a)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.12.1 Overview

Project Objective: The overall objective of this physical work is to create boat launch facilities that allow campers, day visitors, fishers, and other recreational focused users to safely and easily launch boats off trailers through the range of average seasonal water level fluctuations. Having such facilities will enhance the recreation experience on the Peace River and the Peace arm of the Williston Reservoir.

Two boat ramp locations recommended for investigation by the WUP Committee—Taylor and Lynx Creek—were developed outside the WUP.

Project Description:

- Feasibility
 - Determine the feasibility of extending existing or constructing new boat ramps as recommended by the WUP Committee.
 - Evaluate the feasibility of each site in terms of engineering technical feasibility, a cost/benefit analysis, heritage values, and environmental values.
- Design
 - Design boat ramps at feasible locations.
- Construct
 - Construct boat ramps at feasible locations.

Note: This project is for feasibility only.

Contractor: This work is being conducted by Moffatt & Nichol Engineers Corporation (M&N). M&N has conducted similar work for BC Hydro on other systems.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.12.2 Status

The feasibility portion of this work was initiated in August 2008 and is scheduled to be completed by January 2010. An annual report will be submitted by April 2010.

5.1.13 GMSWORKS#14 – Williston Air Photos and DEM

Order clause: Schedule A 3(d)

BC Hydro Project Manager: Karen Skibo

5.1.13.1 Overview

Project Objective: The objective of this project is to (1) conduct a mapping inventory to compile a bibliography of all existing maps of Williston Reservoir, (2) acquire aerial photos of Williston Reservoir at low pool in 2009 and develop a bare earth digital elevation model, and (3) acquire aerial photos of the Williston Reservoir in 2013 and 2018 and re-compile the DEM based on new data.

This project is designed to support the Williston Reservoir management plans. Specifically, this project will provide spatial data and information to support projects within the Riparian and Wetland Habitat, Tributary Access, Dust Control, Erosion Control, and Access, Navigation and Safety Management Plans.

Project Description: In 2009/10, a bibliography of existing maps will be developed and aerial photos will be acquired at 1:5000 and 1:20,000 for the entire reservoir. A digital elevation model (DEM) will also be developed based on LiDAR. In 2013 and 2018, new air photos will be acquired at targeted WUP sites at a scale of 1:5000 and of the entire reservoir at 1:20000. The DEM will also be updated at that time.

Contractor: This work in 2009/10 is being conducted by Groupe Alta.

ToR Compliance: Presently, scope and schedule are in compliance. Implementation costs are also expected to be on budget. Direct management costs are presently over budget; however, given the project is in its early stages, we anticipate that costs will balance out over the life of the project.

5.1.13.2 Status

The first stage of work was initiated in April 2009 and is scheduled to be completed by December 2010. A final report for this stage is expected in December 2010. The second set of air photos occurs in 2013 and the third set in 2018.

5.1.14 GMSWORKS#16 – Williston Wetland Inventory

Order Clause: Schedule A clause 2(a)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.14.1 Overview

Project Objective: The objective of this physical work is to inventory wetland habitats in areas that may be dewatered for long periods in order to later improve reservoir habitat and increase the utility of the drawdown zone for some wildlife and fish species. Wetlands are often considered one of the most productive habitats types in the temperate region and are one of the habitat types that are significantly impacted when reservoirs, such as Williston, are created by flooding large valleys. This project is for the feasibility / inventory work only.

Project Description:

- Compile a list of candidate sites, adjacent to the Williston Reservoir, which would be useful for the creation of permanent or ephemeral wetland habitats following some physical works modification.
- Describe the biophysical characteristics (including a map) of each site such that they can be suitably ranked on the basis of:
 - Area of inundation potential,
 - Wildlife and fisheries benefits,
 - Overview environmental and archaeological assessments of the sites,
 - Accessibility,
 - Capital cost of the physical works required,
 - Projected maintenance costs (debris management, erosion control), and
 - Ancillary benefits for all stakeholders and First Nations
 - Rank the candidate sites.

Contractor: This work is being conducted by Golder and Associates Ltd. Golder has conducted similar work for BC Hydro on other systems.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.14.2 Status

This work was initiated in May 2009 and is scheduled to be completed by January 2010. An annual report will be submitted by April 2010.

5.1.15 GMSWORKS#17 – Williston Trial Wetlands

Order Clause: Schedule A clause 2(a)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.15.1 Overview

Project Objective: The objective of this physical work is to create wetland habitats in areas that may be dewatered for long periods in order to improve reservoir habitat and increase the utility of the drawdown zone for some wildlife and fish species. Wetlands are often considered one of the most productive habitat types in the temperate region and are one of the habitat types that is significantly impacted when reservoirs, such as Williston, are created by flooding large valleys.

Project Description:

- Design
 - Develop a preliminary engineering design for candidate wetland sites selected in GMSWORKS #16.
 - Develop a final engineering design for each candidate wetland site selected in GMSWORKS #16.
- Construction
 - Implement the engineering design.
 - Develop an annual maintenance schedule, as-built drawings, site map, landscape scheme, and vegetation list for each constructed site.

Contractor: This work has not started and has not been awarded.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.15.2 Status

This work has not started. It is currently planned to begin in 2011.

5.1.16 GMSWORKS#18 – Williston Debris Field Survey

Order clause: Schedule A 3(c)

BC Hydro Project Manager: Karen Skibo

5.1.16.1 Overview

Project Objective: The objectives of the Williston Debris Field Survey are to collect baseline information on volume of debris within the reservoir and recruitment of debris to the reservoir, as well as to develop a management strategy for debris. The volume and recruitment data will be used together with the data collected as part of the Williston Debris Trends monitoring program (GMSMON#16) to assess the effectiveness of the Williston Targeted Debris Management Project (GMSWORKS#22) at removing debris. The debris management study will provide an overall strategy for debris management on Williston Reservoir for the next 10 years.

Project Description: The debris field survey entails map and air photo review and ground-truthing to develop an estimate of the (i) debris volume, (ii) sources of recruitment, (iii) rate of recruitment to the reservoir from known sources, and (iii) potential wood value categories of the debris. The debris management study will assess the cost effectiveness and feasibility of alternative means of debris control/management methods, develop an inventory of suitable sites for handling debris, and recommend a strategy and schedule of operations based on study findings and management priorities.

Contractor: This work is being conducted by AECOM Canada Ltd.

ToR Compliance: Presently, scope, schedule, and budget are in compliance.

5.1.16.2 Status

This work was initiated in April 2009 and is scheduled to be completed by December 2010. A report for the debris field survey is expected for April 2010 and a report for the debris management study is expected in December 2010.

5.1.17 GMSWORKS#19 – Williston Reservoir Trial Tributaries

Order Clause: Schedule A clause 2(b)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.17.1 Overview

Project Objective: The overall objective of this physical work is to improve or restore the access to rivers that are tributary to Williston Reservoir. A build-up of debris or seasonal water level fluctuations may compromise access at the mouth of the tributary. The first phase of this project will inventory tributaries impacted by reservoir operations and/or debris fields.

Project Description:

- Inventory
 - Develop an inventory of tributaries impacted by reservoir operations and/or debris fields.
 - Rank these tributaries based on biological impact, mitigation costs and application to other programs.
 - Develop a plan for the removal, on site disposal, or management of any debris accumulations that are limiting tributary access.
 - Create an annual debris management plan and maintain tributary access for five years.
- Implementation
 - Produce a pre-construction report that outlines potential construction techniques.
 - Remediate of access at two Tributary sites.
 - Produce an end-of-project report.

Note: This project is for feasibility only.

Contractor: This work is being conducted by Synergy Applied Ecology Ltd. (SAE). SAE has conducted similar work for other clients in the past.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.17.2 Status

This work was initiated in May 2009 and is scheduled to be completed by January 2010. A final report will be completed by April 2010.

5.1.18 GMSWORKS#20 – Williston Dust Mapping

Order clause: Schedule A 3(a)

BC Hydro Project Manager: Karen Skibo

5.1.18.1 Overview

Project Objective: This is a feasibility study to assess the practicality of using satellite technology to predict dust emission potential based on soil characteristics of Williston beaches. The outcome, if the study is successful, is a reliable management tool for predicting in near real-time which beaches are likely to erode and allow fast response and treatment of those areas to minimize dust emissions. The four principal objectives of the study are:

- 1) Assess the ability of satellite technology to predict near surface soil moisture and surface roughness, which critically control the wind erosion threshold, at appropriate spatial and temporal scales on a representative beach;
- 2) Assess the ability of satellite technology to differentiate the textural characteristics of the surface sediments;
- 3) Characterize the wind erosion threshold and dust emission potential of selected beach surfaces and evaluate the relationship between those measurements and the satellite signals for soil moisture, roughness, and texture; and
- 4) Develop a preliminary near real-time algorithm to predict potential dust emission for typical wind speeds at Williston Reservoir based on weekly satellite scenes.

Project Description: The project entails (i) conducting a field soil survey on a select beach in Finlay arm, (ii) estimating the threshold velocity required to entrain sediment and PM₁₀ concentrations at the sampling locations, (iii) acquisition of at least four satellite images and evaluation of available models to determine the most promising technique for assessing surface texture, roughness and moisture, and (iv) incorporating the data into a wind erosion model that will detect areas of potential high erosion.

Contractor: This work is being conducted by Dr. William Nickling of the University of Guelph and Dr. Jack Gillies of the University of Nevada.

ToR Compliance: A ToR resubmission was approved in March 2009 with respect to required changes to scope and budget. Presently, scope, schedule, and budget are in compliance.

5.1.18.2 Status

This work was initiated in May 2009 and is scheduled to be completed by February 2010. A final report is expected for February 2010.

5.1.19 GMSWORKS#21 – Williston Dust Control Trials

Order clause: Schedule A 3(a)

BC Hydro Project Manager: Karen Skibo

5.1.19.1 Overview

Project Objective: Since the creation of Williston Reservoir, winds have picked up fine particles of silts and clays (“dust”) from the exposed drawdown zone of the Finlay arm of the reservoir. This aerial movement of particulates is of concern to residents and users of the area, particularly the Tsay Keh Dene and Kwadacha First Nations. This project will assess and validate mitigation techniques for controlling aeolian dust erosion on Williston Reservoir. The specific objectives are to:

- assess the effectiveness of tilling the beaches;
- test the feasibility of using an irrigation system;
- assess the feasibility of re-establishing vegetation in the drawdown zone;
- test different barriers for the protection of vegetation;
- investigate the optimum nutrient conditions for biostimulating the growth of native plants; and
- develop a composting process for debris.

Project Description: Strategies for reducing aeolian erosion are being assessed via the following trials:

- tillage trial sites testing response of aeolian dust concentration to different treatments of beach surface roughness;
- irrigation trial system testing response of aeolian dust concentration to an increase in beach surface moisture;
- vegetation protection trial sites that use physical barriers to prevent destruction of existing vegetation in a wetland area; and

- vegetation enhancement trials testing plant response to (i) different nutrient treatments, (2) transplant to non-vegetated areas, and (3) native grass seed dispersal in non-vegetated areas.

Contractor: This work is being led by Dr. William Nickling of the University of Guelph, Dr. William Schillinger of the University of Washington, Dr. William Fryrear, Dr. Manivalde Vaartnou and Associates, Dr. Sietan Chieng of the University of British Columbia, and Dr. Abimbola Abiola of Olds Agricultural College.

ToR Compliance: A ToR resubmission was approved in March 2009 with respect to required changes to scope and budget. Presently, scope, schedule, and budget are in compliance.

5.1.19.2 Status

This is a three-year feasibility study. Work was initiated in April 2008 and is scheduled to be completed by February 2011. Annual reports are expected in February of each year.

5.1.20 GMSWORKS#22 – Williston Targeted Debris Management

Order clause: Schedule A 3(c) and 5(a)

BC Hydro Project Manager: Karen Skibo

5.1.20.1 Overview

Project Objective: Woody debris on Williston Reservoir has impacts on humans, fish, and wildlife. The objective of this project is to support the implementation of other WUP projects by (i) minimizing damage to sites associated with other projects, (ii) improving boat safety, (iii) improving fish access to tributaries, and (iv) reducing shoreline erosion and destruction of riparian vegetation.

Project Description: The project entails conducting an annual aerial debris reconnaissance survey, collecting debris (on land or water) at selected sites, and managing it to prevent negative impacts to WUP projects, navigational safety, fisheries, and shorelines. Management strategies could range from removing the woody debris from the reservoir (e.g., piling above high water line) or using it in the reservoir to create positive impacts (e.g., secured physical barriers to reduce destruction to vegetation)

Contractor: The first year of work is being conducted by Chu-Cho Enterprises Ltd., a local First Nations company.

ToR Compliance: Presently, scope, schedule, and budget are in compliance.

5.1.20.2 Status

This is a 10-year project. Work was initiated in May 2009 and is scheduled to be completed by January 2019. Annual reports are expected in January of each year.

5.1.21 GMSWORKS#23 Williston Erosion Control Trial

Order Clause: Schedule A clause 3(b)

BC Hydro Project Manager: Jay Joyner

5.1.21.1 Overview

Project Objective: This project will investigate the feasibility of erosion controls at the Tsay Keh village site and implement any chosen solution on a trial basis.

Project Description: This project has not been designed.

Contractor: This project has not been awarded.

ToR Compliance: The submission of ToR for this project is on hold pending a potential contractual agreement between BC Hydro, the Tsay Keh Dene First Nation (TKD), and the Province of British Columbia.

5.1.21.2 Status

BC Hydro, the Province of British Columbia, and the TKD have signed an interim agreement with respect to certain grievances of the TKD. The final agreement to settle those grievances has been accepted by all the parties but requires ratification by the TKD membership. A ratification vote is scheduled for 2009. Ratification impacts certain changes to Indian Reserve status in the area that may impact this project. This project is on hold pending resolution of the agreement status.

5.1.22 GMSWORKS#24 – Finlay Reach Access

Order Clause: Schedule A clause 4(b)&(c)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.22.1 Overview

Project Objective: The objective of these physical works on Williston Reservoir is to enhance recreational opportunities on the reservoir. Increasing the number of facilities and disbursing them throughout the reservoir will enhance recreational opportunities for campers, day visitors, fishers and other recreation-focused users, allowing them to safely and easily launch boats off trailers through the range of average seasonal water level fluctuations.

One boat ramp location recommended for investigation by the Water Use Plan Committee – “Fort Ware access at the Finlay River backwaters” – was completed outside the Water Use Plan.

Project Description:

- Feasibility

- Determine the feasibility of extending or constructing the Ingenika boat ramp and Tsay Keh Village barge landing.
- Determine the feasibility of extending or constructing the Parsnip Reach boat ramps.
- Evaluate the feasibility of each site in terms of engineering technical feasibility, a cost/benefit analysis, heritage values, and environmental values.
- Design
 - Design boat ramps at feasible locations.
- Construct
 - Construct boat ramps at feasible locations.

Note: This project is for feasibility only.

Contractor: This work is being conducted by Moffatt & Nichol Engineers Corporation (M&N). M&N has conducted similar work for BC Hydro on other systems.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.22.2 Status

This work was initiated in April 2009 and is scheduled to be completed by January 2010. An annual report will be submitted by April 2010.

5.1.23 GMSWORKS#25 – Williston Reservoir Bathymetry

Order Clause: Schedule A clause 3(d)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.23.1 Overview

Project Objective: A bathymetric map of the Williston Reservoir is an integral part of the integrated approach to the many diverse water management issues in the basin. Using this type of data, the amount and location of exposed reservoir bed can be identified. This information will allow more proactive and detailed planning for many of the WUP projects including: debris, dust, erosion, wetlands and tributaries. These bathymetric data can also be used to develop hydrographic charts of the shallower near-shore areas of the Williston Reservoir.

Project Description:

- Conduct a spring LiDAR survey, at annual low pool, of the shoreline around Williston Reservoir to elevation 678.3 m (~2225 ft.) including the dewatered near-shore reservoir bottomlands.

- Conduct a late summer Multi-beam Echo Sounding survey of the near-shore area, with an appropriate overlap of the LiDAR coverage, to an elevation of 652 m (2140 ft.).
- Develop hydrographic charts, bathymetric contour maps, 3-D projections, and bathymetric profiles of Williston Reservoir.

Contractor: This work has not started. It is currently planned to begin in 2010.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.23.2 Status

This work has not started. It is currently planned to begin in 2010.

5.1.24 GMSWORKS#26 – Williston Communication and Safety

Order Clause: Schedule A clause 5(b)&(c)
Schedule B clause 2(b)
Schedule C clause 3(a)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.24.1 Overview

Project Objective: This package of work includes two “broad” projects that focus on safety: radio communication and signage, with the objective of improving the overall safe use of the two reservoirs and the Peace River. The WUP Committee concluded that marine radio communication and improved signage was required in order to improve the quality and safety of the recreation experience in the Peace system. The radio channel would provide a valuable safety net for boaters. Improved signage would provide information about the location of access facilities, hazards associated with the hydroelectric facilities, and the marine channel.

Project Description:

- Conduct a study that details current radio communication resources covering the Williston and Dinosaur reservoirs and the Peace River (from Peace Canyon Dam to Taylor) including private repeaters and public access frequencies.
- Recommend a plan for a radio communication network that will provide public access coverage to the reservoirs and the river.
- Develop a radio network for the Williston and Dinosaur reservoirs and the Peace River between Peace Canyon Dam and Fort St. John.
- Install information signage at all boat launch facilities on the two reservoirs and the Peace River.
- Install electronic signage at Hudson’s Hope Park to display current reservoir levels and daily forecasts.

- Develop an annual maintenance plan and budget for the repeater stations and the signage.

Contractor: This work is being conducted by HN Telecom Ltd. (HN). HN has conducted similar work for other clients.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.24.2 Status

This work was initiated in January 2009. The construction portion of the project is scheduled to be completed by the fall of 2010 with the maintenance portion of the project continuing through 2029. An annual report will be submitted by April 2010.

5.1.25 GMSWORKS#27 – Finlay River Access Information Plan

Order Clause: Schedule A clause 6(a)

BC Hydro Project Manager: Alan Chan-McLeod

5.1.25.1 Overview

Project Objective: Investigate the cause of sediment build-up in the Finlay River upstream of its confluence with the Williston Reservoir.

Project Description: This work will accept or reject the hypothesis that Williston Reservoir is contributing to sediment deposition in Deserter's Canyon and thereby affecting boating access to the Finlay River. If a positive relationship is shown to exist, both operating and non-operating alternatives could be considered in a future Peace Water Use Plan review.

Contractor: This work is being conducted by Knight Piesold Ltd. Knight Piesold has conducted similar work for other clients in the past.

ToR Compliance: The ToR for this project is being resubmitted because of a financial variance. The approved costs included in the original ToR did not include either inflation or contingency amounts.

5.1.25.2 Status

This work was initiated in May 2009 and is scheduled to be completed by January 2010. A final report will be completed by April 2010.

5.1.26 GMSWORKS#28 Industry Feasibility & Design Study

Order Clause: Schedule A clause 1

BC Hydro Project Manager: Alan Chan-McLeod

5.1.26.1 Overview

Project Objective: This project was intended to be an engineering feasibility and design study to determine practical and cost-effective solutions to the following issues associated with lower reservoir levels at Mackenzie:

- water supply at the Abitibi newsprint and Pope & Talbot pulp mills;
- effluent disposal at Abitibi's newsprint mill, Pope & Talbot pulp mill, and District of Mackenzie; and
- log supply for Canfor and Abitibi sawmills.

Project Description: This project has not been designed.

Contractor: This project has not been awarded.

ToR Compliance: The submission of ToR for this project is on hold pending a redesign necessitated by the current status of the various mills in Mackenzie.

5.1.26.2 Status

This project is being redesigned to reflect the changes in the status of the various mills in Mackenzie. ToR for the revised study will be submitted later in 2009.

5.2 Peace WUP Monitoring Program Projects

5.2.1 GMSMON#1 – Peace River Creel Survey

Order Clause: Schedule C clause 4(a)

BC Hydro Project Manager: Kim Hawkins

5.2.1.1 Overview

Project Objective: The objective of this project is to assess catch and effort of sport fishing over time and to determine if it is a confounding variable for stock assessment of fish populations in the Peace River. It is not the intention of the monitoring program to assess recreational or tourism-related issues such as angler satisfaction.

Project Description: The results of the PCR Creel Survey monitoring program are designed to complement the PCR Side Channels, PCR Ramping, and PCR Flood Pulse Plans. The Creel Survey is scheduled to take place every second year between May and September over a 10-year period. Data will be collected on all fish species by interviewing both shoreline and boat anglers on the Peace River between the Peace Canyon Dam and the confluence with the Pine River. Data analyses and reports will be completed for the years the survey is undertaken and a final study report will be produced at the conclusion of the monitoring program.

Contractor: LGL Ltd. was contracted by the BC Hydro Site C Project Team in 2008 to conduct a PCR Angling and Recreational-Use Creel Survey from May to

December 2008. GSMON#1 will build off of that work, commencing in 2010. The contractor has not yet been selected.

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.2.1.2 Status

The study undertaken by LGL Ltd. was designed to determine how the potential construction and operation of the Site C dam would change the pattern of river use. However, the parameters of that study fulfilled the requirements of the first year of GSMON#1. The results of the LGL study will be added to the data acquired during the implementation period of this WUP monitoring program. GSMON#1 is scheduled to commence in 2010.

5.2.2 GSMON#2 – Peace River Fish Index

Order Clause: Schedule C clause 4(b)

BC Hydro Project Manager: Kim Hawkins

5.2.2.1 Overview

Project Objective: This project addresses the question: “What is the population response of fish in the Peace River following the addition/modification of in-stream physical works or the implementation of an alternative minimum discharge regime?”

In addition to addressing the management question, the objectives of this project are to:

- Collect a time series of data on the abundance, spatial distribution, and biological characteristics of nearshore and shallow-water fish populations in the Peace River that will build upon previously collected data by Peace River fish community indexing programs;
- Build upon earlier investigations for further refinement of the sampling strategy, sampling methodology, and analytical procedures required to establish a long-term monitoring program for fish populations; and
- Identify gaps in understanding or data in current knowledge about fish populations and in procedures for sampling them.

Project Description: By monitoring target fish populations to assess population abundance, distribution and growth, the PCR Fish Index project will evaluate the effectiveness of PCR management plans designed to improve fish habitat and productivity. Largely following the design and protocol that has been refined during the years of the Peace River fish community indexing program, a mark-recapture study will be employed using a boat electrofisher. The study area is the stretch of the river from the Peace Canyon Dam to the confluence with the Pine River. Monitoring is scheduled to occur annually, in late summer, over 10 years. A report will be prepared each year following the field work and data analysis. After the 10th year of monitoring a final completion report will be prepared.

The project contractor is also required to attend the BC Hydro annual Large Rivers Workshop to present and discuss the results of the field season and overall trends of the monitoring program.

Data Interpretation: As in-stream physical works projects intended to improve fish habitat and productivity have not yet commenced, the 2008 fish indexing program information was integrated into that from previous years to increase the baseline data for future analysis. Recommendations from the 2008 field season included maintaining the current study design and sampling protocols but expanding the scope of the program to include collection of additional information with regards to the recruitment of younger-aged fish into target populations and interpreting the ecological meaning of the indexing information.

Contractor: Mainstream Aquatics Ltd. has conducted the Peace River fish indexing program since its inception in 2001 and continued to undertake the work in 2008, in association with W.J. Gazey Research. BC Hydro issued a Request for Proposals for the 2009 field season and is currently evaluating the responses.

ToR Compliance: The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.2.2.2 Status

Field work was successfully completed in 2008 and the annual report received in March 2009.

5.2.3 GMSMON#3 – Peace River Fish Stranding

Order Clause: Schedule D clause 3(a)

BC Hydro Project Manager: Kim Hawkins

5.2.3.1 Overview

Project Objective: The objective of this project is to address the following key management questions:

- What is the magnitude of entrapment/stranding along the Peace River after a spill?
- Which species and life stages are affected by stranding and is the level of stranding biologically significant to fish populations in the Peace River?
- What areas of the Peace River have the highest risk of stranding?

Project Description: The PCR Fish Stranding monitoring program will address the PSP and the PCR Flood Pulse Plan. This project will be conducted opportunistically as no spill release is proposed at this time. If a spill event occurs that meets the criteria of the program, the survey will be undertaken immediately after the spill when total discharge has returned to within the normal operating range and will be completed within one day. The study area is the stretch of the Peace River from the Peace Canyon Dam to the confluence of the Pine River.

Prior to the completion of the spill, a study review and aerial survey will be used to plan the survey design of the assessment. Fish stranding will be assessed at pre-selected sites. Any captured fish from isolated pools will be transferred to the main channel. Following completion of the survey a summary report will be prepared.

Contractor: BC Hydro recently issued a Request for Proposals and is currently evaluating the responses. The contract will be awarded for a period of 5 years (2009-2013).

ToR Compliance: In November 2008 the CWR approved a resubmission to reflect updated project implementation costs. The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.2.3.2 Status

Opportunistic study to be implemented in the event of a spill. There has not been a spill event to date. Pre-spill work will be undertaken in 2009.

5.2.4 GMSMON#4 – WAC Bennett Dam Entrainment

Order Clause: Schedule D clause 3(b)

BC Hydro Project Manager: Kim Hawkins

5.2.4.1 Overview

Project Objective: The objectives of the monitoring program are to:

- Estimate the number of fish, size of fish, and species of fish entrained through the spillway into Dinosaur Reservoir;
- Determine the relationship between spill discharge rate and number of fish entrained through the spillway during spill releases at WAC Bennett Dam;
- Determine the level of correlation between diel/spatial variables (i.e., time of day, fish depth in water column) and number of fish entrained through the spillway during spill releases at WAC Bennett Dam, and
- Estimate the rate of acute mortality in fish entrained through the spillway.

Project Description: The WAC Bennett Dam Entrainment monitoring program will address the PSP and the PCR Flood Pulse Plan. Implementation of this study is conditional on the opportunistic occurrence of a spill event where spill discharge exceeding 7240 cfs (205 cms) at WAC Bennett Dam occurs for two days or longer. The study will be implemented for each spill event that meets this criterion.

Monitoring of fish entrainment, using a fixed-station hydroacoustic system, will occur at the spillway of the WAC Bennett Dam during the entire period of a spill, or some statistically representative period of time should there be time constraints. The rate of fish mortality will be estimated using a pilot study in the first spill event. In the event of a second spill within the 10-year study period, the pilot study will be expanded or modified accordingly based on the initial results. The study could be broadened to

examine factors influencing mortality rate such as variation in spill discharge and fish species. Following completion of the survey a summary report will be prepared.

Contractor: BC Hydro contracted BioSonics Inc. (BioSonics) to undertake the hydroacoustic portion of the study should a spill occur. In the summer of 2008, as the spill risk at the Bennett Dam increased, BioSonics mobilized and, when the spill did not occur, conducted an onsite trial installation of the remote hydroacoustic fish monitoring system. BC Hydro will issue a Request for Proposals for the fish mortality portion of the program in the near future and the contract will be awarded for a period of 5 years (2009-2013).

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.2.4.2 Status

Opportunistic study to be implemented in the event of a spill. There has not been a spill event to date.

5.2.5 GMSMON#5 – Peace River Productivity

Order Clause: Schedule C clause 4(c)

BC Hydro Project Manager: Kim Hawkins

5.2.5.1 Overview

Project Objective: The objective of this project is to address the following key management questions:

- What is the composition of the invertebrate and periphyton community in the side channels of the Peace River?
- Does increased water flow to side channels as a result of side channel enhancement or change in the minimum base flow regime alter the biomass/composition of the periphyton and invertebrate community?
- After side channel enhancement or implementation of an alternative minimum base flow regime, does the resulting periphyton and invertebrate community increase the food availability (i.e., increased abundance of invertebrate prey) to fish populations?

Project Description: The PCR Productivity monitoring program will assess the effectiveness of the PCR Side Channels and the PCR Ramping Plans, and address a data gap in the ecological knowledge of periphyton and invertebrate communities in Peace River side channel habitat.

Annual monitoring will occur during the growing season when monthly flows from Peace Canyon Dam are near or at their minimum (May-July). One year of pre-enhancement data will be collected to provide a baseline. The study area will include the section of the Peace River from the Peace Canyon Dam to the confluence with the Pine River. Within the study area, study sites will include two trial side channels

(selected as part of GMSWORKS#3) as well as control side channels. If possible, the control side channels will be the same as those selected under the PCR Side Channel Fisheries project (GMSMON#7).

Project reporting will consist of a series of annual data reports and a single final report at the conclusion of the program.

Contractor: This project is scheduled to commence in 2010; the contractor has not yet been selected.

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.2.5.2 Status

Implementation of this project is dependant on sites being chosen as part of GMSWORKS#3, which is being conducted in 2009. This project is scheduled to commence in 2010.

5.2.6 GMSMON#6 – Peace River Riparian Flooding

Order Clause: Schedule D clause 3(c)

BC Hydro Project Manager: Kim Hawkins

5.2.6.1 Overview

Project Objective: The objectives of this study are to:

- Determine species composition of vegetation in the riparian zone of the Peace River;
- Determine spatial distribution of vegetation in the riparian zone of the Peace River, and
- Assess changes over time in species and spatial composition in the riparian zone of the river.

Project Description: This riparian habitat assessment will examine the impact of a spill event on large-scale temporal and spatial trends of the vegetative community along the Peace River. The monitoring program primarily addresses the PSP and PCR Flood Pulse Plan, and secondarily the PCR Ramping Plan.

The study area includes the riparian area of the Peace River from Peace Canyon Dam to the confluence with the Pine River. Vegetation maps for the study area will be developed and a riparian vegetation assessment will occur on the ground. Vegetation maps will be created for the riparian area at normal flows and of the river channel elevation during a 120,000 cfs discharge event. Six sites, at a minimum, will undergo a detailed riparian vegetation assessment on the ground. Air photos will be interpreted in 2020 and riparian assessment of study sites will occur in 2019 and 2020 if a spill occurs prior to those years. The information will be used to assess trends in the community over time as well as response to changes in flow regimes.

An annual report will describe the methods, status of the study, and results-to-date. In the final year, the report will include a complete description of methodologies, results and statistical analyses used to assess changes in vegetation over time.

Contractor: This project is scheduled to be undertaken in 2019 and 2020 if a spill occurs prior to those dates; the contractor has not yet been selected.

ToR Compliance: The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.2.6.2 Status

Opportunistic study to be implemented in 2019 and 2020 in the event of a spill release prior to 2019. There has not been a spill event to date.

5.2.7 GMSMON#7 – Peace River Side Channel Fisheries

Order Clause: Schedule C clause 4(d)

BC Hydro Project Manager: Kim Hawkins

5.2.7.1 Overview

Project Objective: This PCR Side Channel Fisheries program will monitor side channels enhanced through physical works to assess their effectiveness at improving fish habitat. Specifically, the objectives of this monitoring program are to:

- Monitor stage and flow in Peace River side channels;
- Assess degradation/aggradation in side channels;
- Assess bed-texture changes (infilling/armouring) in side channels; and
- Determine abundance and distribution of small fish within side channels.

The objectives are designed to develop a baseline of information from which spill-induced and habitat manipulation changes can be measured.

Project Description: Changes in the Peace River morphology due to reduced peak flows are suspected of creating loss and degradation of fish habitat in side channels. The PCR Side Channel Fisheries project will assess the effectiveness of the PCR Side Channels Plan and the PSP, and will include monitoring of hydrological and physical properties of side channels, as well as fish utilization, during normal operations.

This monitoring program will characterize the side channels of the Peace River in terms of flow, physical state, and fish use/presence under normal dam operations. The small-fish survey will target juveniles and other small fish in the side channels as little is known about their presence or use of this habitat. The fish survey component will also complement the PCR Fish Index monitoring program, which focuses on the mainstem of the river, by providing a more complete picture of the Peace River fish community.

The study area is the Peace River from Peace Canyon Dam to the confluence with the Pine River. Study sites to be monitored over the 10-year period will include the trial (habitat manipulation) side channels selected in GMSWORKS#3 PCR Side Channels project and two control side channels.

Contractor: This project is scheduled to commence in 2010; the contractor has not yet been selected.

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.2.7.2 Status

Implementation of this project is dependant on sites being chosen as part of GMSWORKS#3, which is being conducted in 2009. This project is scheduled to commence in 2010.

5.2.8 GMSMON#8 – Peace River Side Channel Response

Order Clause: Schedule D clause 3(d)

BC Hydro Project Manager: Kim Hawkins

5.2.8.1 Overview

Project Objective: The objective of this monitoring program is to assess the impact of high flow rates in side channels on:

- Channel morphology and the physical dimensions of the side channels;
- Textural changes to the bed;
- Abundance and distribution of fish species, and the relative importance of fish species life stage use within side channels; and
- Changes relative to pre-spill conditions in the side channels.

Project Description: Changes in the Peace River morphology due to reduced peak flows are suspected of creating loss and degradation of fish habitat in side channels. Spill events are a means of changing fish habitat by scouring new channels and modifying the riverbanks. The PCR Side Channel Response monitoring program will include monitoring of hydrology, physical properties, and fish utilization of the side channels immediately (within a month) following a spill event.

This monitoring program will characterize the side channels of the Peace River in terms of morphology and fish presence and distribution following a spill event, and will assist in measuring the effectiveness of the PSP and the PCR Ramping Plan. Changes to the side channels will be quantified by comparing the data to baseline data collected as part of the GMSMON#7 PCR Side Channel Fisheries monitoring program.

The study area includes the Peace River from Peace Canyon Dam to the confluence with the Pine River. Study sites will be the same (two trial habitat manipulation side

channels and two control side channels) as those monitored in the PCR Side Channel Fisheries project. Implementation of this monitoring project is conditional on a spill event occurring where total discharge from the Peace Canyon Dam exceeds 88287 cfs (2500 cms) for two or more days. It will be implemented following each spill that meets this criterion during the 10-year study period.

Contractor: BC Hydro will issue a RFP in the near future and the contract will be awarded for a period of 5 years (2009-2013).

ToR Compliance: The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.2.8.2 Status

Opportunistic study to be implemented in the event of a spill starting in 2010. There has not been a spill event to date. The sites to be monitored will be based on the site selection process imbedded in GMSWORKS#3, which commenced in 2009.

5.2.9 GMSMON#9 – Peace River Spill Hydrology

Order Clause: Schedule D clause 3(e)

BC Hydro Project Manager: Kim Hawkins

5.2.9.1 Overview

Project Objective: The objective of this monitoring project is to compile and analyze the hydrology data that will be useful for investigating the effects of spill events on the aquatic systems downstream of the GMS and Peace Canyon generating stations. Without a proper understanding of the hydrology of the spill in the context of pre- and post-spill conditions, it will be difficult to understand the responses observed in the aquatic ecosystem during and after the spill.

Project Description: Much of the hydrology data that would be useful to analyze a spill event is already collected by BC Hydro and Water Survey Canada. Additional gauging may be required on some tributaries to increase data resolution or make the data more accessible. As well, other Peace WUP projects, such as the Mainstem Stage Discharge project or the PCR Hydraulic Model project may provide important spill hydrology data (e.g. cross sections, water level gauges).

The first stage in the PCR Spill Hydrology project is to assess data that is being routinely collected and to identify any additional data requirements. If a gap exists between needs and availability, an assessment will have to be made on whether or not there is value in closing that data gap. The current budget for this project includes assessment of data collection requirements, development of the framework and the analysis of the spill event. If additional data collection platforms are deemed to be necessary in order to improve the coverage of a spill event, additional funds would be required to purchase and install the instrumentation.

A data collection framework will be constructed to describe the kinds of data to be collected, how the data will be reported, and the end use of that data. This framework would essentially be an outline of the report analyzing the spill event.

In the event of a spill meeting the PSP criteria, the entire cycle of the spill event (pre-spill, spill, and post-spill) will be captured for analysis. The spill event will be analyzed and a report compiled once the spill event has passed and all the data has been collected. The analysis will include a review of the data and a discussion of the relevance of data and will identify additional data needs that can be addressed during the next spill event.

Contractor: This work is being conducted by Northwest Hydraulic Consultants Ltd. in conjunction with work they are undertaking for GMSWORKS#5 and #6.

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.2.9.2 Status

Opportunistic PSP study with a pre-spill research component that commenced in June 2009. There has not been a spill event to date.

5.2.10 GMSMON#10 – Peace River Spill Photos

Order Clause: Schedule D clause 3(g)

BC Hydro Project Manager: Kim Hawkins

5.2.10.1 Overview

Project Objective: The objective of the monitoring program is to collect aerial photos of the Peace River during and immediately after a spill event.

Project Description: The PCR Spill Photos project supports the PSP and the PCR Flood Pulse Plan management plans. The program has a secondary application for the PCR Side Channel and PCR Ramping Plans.

Photos will be taken for each spill event with total discharge exceeding 70,629 cfs (2000 cms) for at least two days. Aerial photographs will be acquired of the Peace River during spill events at a scale of 1:5000 from the Peace Canyon Dam to the confluence with 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). Aerial photos will undergo orthorectification. A summary report will be prepared describing the work conducted and 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.

Contractor: In the event of a spill in 2009 aerial photography work will be conducted by Selkirk Remote Sensing Ltd. BC Hydro's Photogrammetry Services Department will provide project coordination, supervision and compilation assistance.

ToR Compliance: In March 2009 the CWR approved a resubmission for GMSMON#10 that reflected updated project implementation costs. The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.2.10.2 Status

Opportunistic study to be implemented in the event of a spill. There has not been a spill event to date.

5.2.11 GMSMON#11 – Peace River Spill TGP and Temperature

Order Clause: Schedule D clause 3(f)

BC Hydro Project Manager: Kim Hawkins

5.2.11.1 Overview

Project Objective: The objectives of this monitoring program are to:

- Measure TGP for the duration of a spill and immediately after, and
- Assess TGP levels in terms of impact on fish populations in the Dinosaur Reservoir and the Peace River downstream of the Peace Canyon Dam.

Project Description: Spill releases at GMS may affect the quality of downstream waters. Specifically, supersaturation of dissolved gases during a spill may occur as water plunges from the dam into the receiving waters, entraining air into the flow. The result is partial pressures of atmospheric gases in solution that are greater than in the atmosphere. TGP is a measure of dissolved gas supersaturation. At high TGP levels, lethal and sub-lethal effects in fish have been documented. Water quality guidelines for fish populations in BC specify that TGP should not exceed levels of approximately 110% and 103% for water depths greater and less than one metre, respectively. Prolonged exposure to TGP levels exceeding 115% may result in acute physiological effects on fish. This project will monitor TGP levels to assess dissolved gas supersaturation downstream of a spill event.

The PCR Spill TGP and Temperature monitoring project addresses two Peace WUP management plans; the PSP and the PCR Flood Pulse Plan.

This monitoring is conditional on the occurrence of a spill event. TGP monitoring will begin immediately prior to a spill and will be measured continuously throughout the spill and for 2 weeks after spill completion. If possible, equipment will be installed 1-2 weeks before the spill to collect data on pre-spill conditions.

TGP meters will be installed at stations within the forebay of the dams, tailraces, and in the Peace River downstream of the Peace Canyon Dam at various locations to the confluence with the Pine River. Data will be analyzed to determine the relationship between dam discharge and TGP, and assess the extent of fish exposure to deleterious levels of gases. A report detailing the findings will be produced following the spill.

Contractor: This work will be conducted by Diversified Environmental Services Ltd., the company that also has the contract to maintain the TGP meters and conduct temperature monitoring under GMSWORKS#2.

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.2.11.2 Status

Opportunistic study to be implemented in the event of a spill. There has not been a spill event to date.

5.2.12 GMSMON#12 – Peace River Wildlife Stranding Survey

Order Clause: Schedule D clause 3(h)

BC Hydro Project Manager: Kim Hawkins

5.2.12.1 Overview

Project Objective: The objective of this project is to address the following key management questions:

- What are the impacts of a spill event on ungulates and their habitat?
- What are the impacts of a spill event on beavers and their habitat?
- What are the impacts of a spill event on riparian birds and their habitat?
- What are the impacts of a spill event on the western toad and their habitat?

Project Description: Wildlife may be impacted when a spill event occurs at Peace Canyon Dam. This project will assess these impacts and address two Peace WUP management plans: the PSP and the PCR Flood Pulse Plan.

The study area is the floodplain of the Peace River from the Peace Canyon Dam to the confluence with the Pine River. Aerial and boat surveys will be conducted to determine the number of ungulates on islands and beavers along the river. An assessment of bird and toad populations will be based on (i) a literature/expert review to determine the bird species of greatest concern based on the timing of the spill and size of spill expected, (ii) index sites selected using existing terrestrial ecosystem mapping and flow mapping, and (iii) a survey of western toad and targeted bird species to assess mortality or risk of mortality. A final report will be prepared at the end of the monitoring program.

Contractor: BC Hydro recently issued a RFP and is currently evaluating the responses. The contract will be awarded for a period of 5 years (2009-2013).

ToR Compliance: In November 2008 the CWR approved a resubmission reflecting updated project implementation costs. The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.2.12.2 Status

Opportunistic study to be implemented in the event of a spill. There has not been a spill event to date.

5.2.13 GMSMON#13 – WLL Fish Index

Order clause: Schedule D 3(i)

BC Hydro Project Manager: Karen Skibo

5.2.13.1 Overview

Project Objective: The objective of the project is to collect one year of baseline information on the fish populations in the Peace arm of Williston Reservoir under normal operating conditions at the dam. The impact of a spill at WAC Bennett Dam on reservoir fish may then be assessed based on the results of this study in combination with GMSMON#4, which estimates the number of fish entrained through the spillway.

Project Description: Fish sampling (gillnetting) and hydroacoustic surveying occurred in July/August 2008. Data was collected relating to fish spatial distribution, size, and abundance.

Data Interpretation: The total number of pelagic fish in the Peace arm was estimated at 3.2 million. In comparison to a previous (non-WUP) study in 2000, the abundance of fish was greater in 2008 but individual fish were smaller overall in size. Kokanee and lake whitefish may be more susceptible to entrainment than other fish species captured due to their vertical distribution in the water column and their behavioural patterns. However, limited inference can be made on fish vulnerability to entrainment at other times of the year from this one-year study alone. Changes in fish vulnerability to entrainment over the course of a year are uncertain as fish behavioural patterns will change with reservoir conditions (e.g., mixed water column).

Contractor: This work is being conducted by Peace-Williston Fish Wildlife Compensation Program and Ministry of Environment.

ToR Compliance: Scope and schedule are presently in compliance. The project is expected to be completed under budget.

5.2.13.2 Status

This work was initiated in July 2008 and is scheduled to be completed by July 2009. The final report is targeted for completion by July 2009.

5.2.14 GMSMON#14 – Dinosaur Reservoir Tributary Habitat

Order Clause: Schedule B clause 3(a)

BC Hydro Project Manager: Kim Hawkins

5.2.14.1 Overview

Project Objective: The objective of this project is to address the following key management questions:

- Is the tributary enhancement work pursuant to GMSWORKS#8 effective at increasing usable habitat?
- Is the area and quality of fish habitat created by the tributary enhancement work sufficient to noticeably increase spawning and rearing opportunities in the reservoir?
- Is the area and quality of fish habitat created by the tributary enhancement maintained over time?

Project Description: The productive capacity of fish populations in Dinosaur Reservoir is constrained by habitat conditions. Within tributaries, quantity of habitat is limited by fish barriers such as waterfalls, and habitat quality is affected by debris flows and silt loads from upland areas. Consequently, rearing and spawning habitat in and around the reservoir is poor. These factors, as well as increased fishing pressure, have resulted in low sportfish recruitment in the reservoir.

Fish access to tributaries and fish habitat quality within the tributaries is impacted by dam operations and by debris from upstream logging. This project is a trial attempt to improve access and/or enhance fish habitat in a selected tributary. Other tributaries may be selected for enhancement if the Dinosaur Tributary Enhancement management plan proves to be effective over its first five years.

Monitoring will include collection of at least one year of pre-enhancement data and up to four years of data from the enhanced tributary. Monitoring will occur every second year over the 10-year study period, beginning the same year as, but prior to, the enhancement work. Data collection, data analyses, and a report will be completed each study year and a final study report will be produced in Year 10.

Contractor: This project is scheduled to commence in 2010; the contractor has not yet been selected.

ToR Compliance: The project complies with the ToR; no resubmission is anticipated at this time. There is currently a minor financial variance—see Table 6.1 for details.

5.2.14.2 Status

This project is contingent on a site being identified under GMSWORKS#8 for remediation and/or enhancement. If a site is identified, this monitoring project is scheduled to commence in 2010.

5.2.15 GMSMON#15 – Reservoir Wetland Habitat

Order clause: Schedule A 6(b)

BC Hydro Project Manager: Karen Skibo

5.2.15.1 Overview

Project Objective: The objective of the monitoring project is to assess the effectiveness of a wetland enhancement trial (GMSWORKS#17 Wetland Trials) to improve foreshore habitat for fisheries, wildlife, and riparian areas as well as maintain the enhancement over the life of the project.

Project Description: The current plan is to monitor fish, vegetation, waterfowl, and amphibian response to the enhancement. This plan is dependent on the outcome of GMSWORKS#16 Wetland Inventory, which determines the wetland site and design.

Data Interpretation: No data are yet available as the project is scheduled to begin in 2010.

Contractor: The contractor has not yet been selected as the project is scheduled to begin in 2010.

ToR Compliance: Scope and schedule for the project are presently in compliance. Direct management costs are forecast to run under budget; however, the project has yet to begin so any resubmission to adjust the approved budget will be deferred until a later time.

5.2.15.2 Status

This work is scheduled to begin in May 2010 and to be completed by November 2019. Annual reports are expected in November of each year.

5.2.16 GMSMON#16 – Williston Debris Trends

Order clause: Schedule A 6(g)

BC Hydro Project Manager: Karen Skibo

5.2.16.1 Overview

Project Objective: The objective of the monitoring project is to assess the effectiveness of GMSWORKS#22 WLL Targeted Debris Management in reducing debris-related navigational hazards, minimizing debris-related destruction to WUP project sites, and decreasing overall volume of debris fields.

Project Description: Volume of woody debris and its recruitment to the reservoir will be assessed using field measurements and air photos. Data will be compared to the baseline survey (GMSWORKS#18 Williston Debris Field Survey) conducted in 2009 to determine if the volume of wood is decreasing over time.

Data Interpretation: No data are yet available as the project is scheduled to begin in 2011.

Contractor: The contractor is AECOM Canada Ltd., which is also conducting GMSWORKS#18 Williston Debris Field Survey.

ToR Compliance: Scope and schedule for the project are presently in compliance. Direct management costs are forecast to run under budget; however, the project has yet to begin so any resubmission to adjust the approved budget will be deferred until a later time.

5.2.16.2 Status

This first project year is scheduled for March 2011 to January 2012, the second project year from April 2013 to January 2014, and the third year from April 2018 to January 2019. Final reports are expected in January of each project year.

5.2.17 GMSMON#17 – Tributary Habitat Review

Order clause: Schedule A 6(c)

BC Hydro Project Manager: Karen Skibo

5.2.17.1 Overview

Project Objective: The Tributary Habitat Review monitoring project will assess the effectiveness of tributary enhancement under GMSWORKS#19 Williston Trial Tributaries in improving fish and wildlife habitat. The tributary enhancement trial is expected to remove obstructions that may be blocking fish access and debris that may be eroding the shoreline.

Project Description: The current plan is to monitor fish, vegetation, songbird, and amphibian response to the tributary enhancement. This plan, however, is dependent on the outcome of inventory and design components of the GMSWORKS#19 Trial Tributaries, which identifies the project site and design.

Data Interpretation: No data are yet available as the project is scheduled to begin in 2010.

Contractor: The contractor has not yet been selected as the project is scheduled to begin in 2010.

ToR Compliance: Scope and schedule for the project are presently in compliance. Direct management costs are forecast to run under budget; however, the project has yet to begin so any resubmission to adjust the approved budget will be deferred until a later time.

5.2.17.2 Status

This work is scheduled to begin in May 2010 and to be completed by December 2019. Annual reports are expected in December of each year.

5.2.18 GMSMON#18 – Williston Dust Control

Order clause: Schedule A 6(d)

BC Hydro Project Manager: Karen Skibo

5.2.18.1 Overview

Project Objective: The objective of the monitoring project is to provide long-term data on airborne particulate matter concentrations in the upper Finlay arm airshed and to evaluate the effectiveness of dust mitigation treatments in the drawdown zone of Finlay arm.

Project Description: Air quality monitors and meteorological instruments are installed each spring at select sites in Finlay arm. Instrumentation measures wind speed and direction, particulate matter sized $10\ \mu\text{m}$ (PM_{10}) and $2.5\ \mu\text{m}$ ($\text{PM}_{2.5}$), rainfall, temperature, and relative humidity. Data is collected from approximately early May to late June of each year.

Data Interpretation: In general, both PM_{10} and $\text{PM}_{2.5}$ concentrations were very low in 2008 but varied considerably from one site to another over the study period due to exposure, wind speed and direction as well as local sediment sources and surface moisture content. It is likely that only one dust event at one monitoring location would have exceeded the proposed Canada Wide Standard for PM_{10} . Low $\text{PM}_{2.5}$ concentrations can likely be attributed to the relatively low concentration of very fine particulates in the local beach sediments. Data results are consistent with an earlier non-WLR study that found low PM_{10} and $\text{PM}_{2.5}$ concentrations at Tsay Keh village.

Contractor: This work is being conducted by Dr. William Nickling of the University of Guelph.

ToR Compliance: Currently, scope, schedule, and budget are expected to be met. The project financials are currently showing under-expenditure in the budget; however, this variance is due to the difference between the standardized contouring of monthly forecasted expenditures and the actual monthly expenses submitted by the contractor.

5.2.18.2 Status

This work was initiated in April 2008 and is scheduled to be completed by March 2017. Annual final reports are expected in February of each year.

5.2.19 GMSMON#19 – Williston Erosion Control

Order clause: Schedule A 6(e)

BC Hydro Project Manager: Karen Skibo

5.2.19.1 Overview

Project Objective: This project will monitor the effectiveness of any constructed erosion works under GMSWORKS#23 WLL Erosion Control Trial.

Project Description: This project has not been designed, pending completion of GMSWORKS#23.

Data Interpretation: This project has not yet started.

Contractor: This project has not yet been awarded.

ToR Compliance: The submission of ToR for this project is on hold pending a potential contractual agreement between BC Hydro, the Tsay Keh Dene First Nation (TKD), and the Province of British Columbia.

5.2.19.2 Status

BC Hydro, the Province of British Columbia, and the TKD have signed an interim agreement with respect to certain grievances of the TKD. The final agreement to settle those grievances has been accepted by all the parties but requires ratification by the TKD membership. A ratification vote is scheduled for 2009. Ratification impacts certain changes to Indian Reserve status in the area that may impact this project. This project is on hold pending resolution of the agreement status.

5.2.20 GMSMON#20 – Reservoir Recreation Use

Order clause: Schedule A 6(f)

BC Hydro Project Manager: Karen Skibo

5.2.20.1 Overview

Project Objective: The objective of the monitoring project is to assess boat ramp usage on Williston Reservoir. If new boat ramps are constructed or improvements made to existing ramps as part of GMSWORKS#24 Williston Boat Access, the Reservoir Recreation Use project is designed to determine the frequency of use of newly constructed boat ramps and measure the change in use of boat access following physical improvements.

Project Description: Vehicle traffic counters and cameras will be used to assess boat ramp usage between May and October of each year. Monitoring is taking place at existing boat ramps where site enhancements are expected based on the scope of GMSWORKS#24. The number of monitoring sites will increase in the event that new boat ramps are constructed as part of GMSWORKS#24.

Data Interpretation: No data are yet available as the project started in May 2009.

Contractor: This work is being conducted by Synergy Applied Ecology.

ToR Compliance: Scope and schedule for the project are presently in compliance. Direct management costs are forecast to run under budget; however, the project is only mid-way through Year 1 so any necessary resubmission to adjust the approved budget will be deferred until a later time.

5.2.20.2 Status

This work was initiated in May 2009 and is scheduled to be completed by February 2019. Annual final reports are expected in February of each year.

5.2.21 **GMSMON#21a – Heritage and Culture Information Plan: Archaeological Overview Assessment**

Order clause: 7 (a)

BC Hydro Project Manager: Karen Skibo

5.2.21.1 **Overview**

Project Objective: The objective of the study is to collect information on the heritage resource potential or sensitivity within portions of the drawdown zones on the Williston and Dinosaur reservoirs and along the banks of the Peace River, and, based on this research, identify heritage site locations suitable for long-term erosion monitoring.

Project Description: The project entails a review of existing documentation (e.g., maps, reports) and undocumented information (i.e., available from local First Nations) to develop a landscape-based analysis that will identify sites with archaeological potential. Preliminary field reconnaissance work will confirm the archaeological resource potential of the identified sites.

Data Interpretation: No data are yet available as the project started in April 2009.

Contractor: The work is being conducted by Millennia Research Ltd.

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.2.21.2 **Status**

This work was initiated in April 2009 and is scheduled to be completed by November 2009. A final report is expected for November 2009.

5.2.22 **GMSMON#21B – Peace River Erosion Monitoring – Archaeological Resources**

Order Clause: 7(b)

BC Hydro Project Manager: Kim Hawkins

5.2.22.1 **Overview**

Project Objective: The objective of this monitoring study is to collect quantitative measures of the magnitude, severity, rate of change and estimated duration of erosion effects caused by reservoir operations on selected heritage sites.

Project Description: This project will involve research and analysis, as well as an in-field component for establishing monitoring stations and subsequent annual data collection. Erosion monitoring stations will be established at a minimum of six locations within the study area, divided between the Williston and Dinosaur Reservoir draw down areas and along the banks of the Peace River from the Peace Canyon Dam to the confluence with the Alces River near the BC/Alberta.

Archaeological sites identified from GSMON#21A will be selected according to their suitability for long-term monitoring based upon their location in areas affected by reservoir operations, the presence of cultural materials on the surface, accessibility, and community preference. Non-intrusive methods of monitoring will be employed. As this study is not being carried out under a Provincial Heritage Inspection Permit, no artifacts or other cultural materials will be collected from the monitoring stations and no subsurface testing will be conducted.

Both archaeological and geospatial data collection will take place in each of the nine years of this study. Baseline LIDAR scans will be established in Year 1, with successive LIDAR scans (epochs) in each of years 2-9, inclusive. A draft interim report that summarizes the methods employed and study findings will be prepared shortly after the conclusion of the data collection each year. A final report for the study will also be provided.

Contractor: This project is scheduled to commence in 2010; the contractor has not yet been selected.

ToR Compliance: Schedule and budget changes are requested pursuant to a June 2009 ToR resubmission.

5.2.22.2 Status

This monitoring project is scheduled to commence in the spring of 2010.

6 Peace WUP Project Costs

Table 6-1 summarizes the financial status of all Peace WUP projects as of 31 May 2009.

Table 6-1: Peace Project WUP Monitoring Programs and Physical Works Costs

Monitoring Programs and Physical Works	Approved Costs	Total Forecast (Actuals + Forecast) Life to Date May 31, 09	Total Variance (Approved - Forecast)	Variance Explanation	Corrective Action
GMSWLR ANNUAL REPORT	\$164,803	\$164,333	\$470	Trivial variance.	None. Costs expected to balance out over life of program.
Peace River and Dinosaur Reservoir Monitoring Program Projects		\$5,820,494			
GMSMON#1 PCR CREEL SURVEY	\$288,430	\$281,624	\$6,806		
GMSMON#1 Direct Management	\$60,879	\$54,724	\$6,155	Direct management over estimated	None - project is not yet underway so reassess at the end of year one
GMSMON#1 Implementation	\$227,551	\$226,900	\$651	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to schedule and cost change because of inflation
GMSMON#2 PCR FISH INDEX	\$2,285,174	\$2,260,347	\$24,827		
GMSMON#2 Direct Management	\$112,133	\$91,099	\$21,034	Direct Management over estimated	None - Yr 1 of annual 10-year project completed; costs expected to balance out over life of project
GMSMON#2 Implementation	\$2,173,041	\$2,169,248	\$3,793	Project efficiencis found to date	None - Yr 1 of annual 10-year project completed; costs expected to balance out over life of project
GMSMON#3 PCR FISH STRANDING	\$165,449	\$158,975	\$6,475		
GMSMON#3 Direct Management	\$17,079	\$10,575	\$6,504	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place.
GMSMON#3 Implementation	\$148,370	\$148,400	(\$30)	Trivial variance.	None. Costs expected to balance out over life of program.
GMSMON#4 WACB ENTRAINMENT	\$254,678	\$246,285	\$8,393		
GMSMON#4 Direct Management	\$19,987	\$13,973	\$6,014	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place
GMSMON#4 Implementation	\$234,691	\$232,312	\$2,379	Required reservoir or flow conditions did not materialize; TOR resubmission also required	Resubmission required due to schedule and cost changes
GMSMON#5 PCR PRODUCTIVITY	\$1,114,285	\$1,073,926	\$40,359		
GMSMON#5 Direct Management	\$129,576	\$99,126	\$30,450	Direct management over estimated	None - project is not yet underway so reassess at the end of year one
GMSMON#5 Implementation	\$984,709	\$974,800	\$9,909	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to schedule and cost change because of inflation
GMSMON#6 PCR RIPARIAN FLOODING	\$226,273	\$222,008	\$4,265		
GMSMON#6 Direct Management	\$31,213	\$26,908	\$4,305	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place
GMSMON#6 Implementation	\$195,060	\$195,100	(\$40)	Trivial variance.	None. Costs expected to balance out over life of program.
GMSMON#7 PCR SIDE CHANNEL FISHERIES	\$828,066	\$807,407	\$20,659		
GMSMON#7 Direct Management	\$148,761	\$128,407	\$20,354	Direct management over estimated	None - project is not yet underway so reassess at that time
GMSMON#7 Implementation	\$679,305	\$679,000	\$305	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to schedule and cost changes
GMSMON#8 PCR SIDE CHANNEL RESPONSE	\$69,846	\$62,668	\$7,178		
GMSMON#8 Direct Management	\$16,812	\$9,668	\$7,144	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place
GMSMON#8 Implementation	\$53,034	\$53,000	\$34	Trivial variance.	None. Costs expected to balance out over life of program.

Monitoring Programs and Physical Works	Approved Costs	Total Forecast (Actuals + Forecast) Life to Date May 31, 09	Total Variance (Approved - Forecast)	Variance Explanation	Corrective Action
GMSMON#9 PCR SPILL HYDROLOGY	\$68,979	\$63,594	\$5,385		
GMSMON#9 Direct Management	\$18,979	\$13,594	\$5,385	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place
GMSMON#9 Implementation	\$50,000	\$50,000		Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSMON#10 PCR SPILL PHOTOS	\$198,742	\$190,270	\$8,472		
GMSMON#10 Direct Management	\$10,950	\$7,983	\$2,967	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place
GMSMON#10 Implementation	\$287,045	\$182,287	\$104,758	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place
GMSMON#11 PCR SPILL TGP/TEMP	\$42,332	\$42,143	\$189		
GMSMON#11 Direct Management	\$17,264	\$9,890	\$7,374	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place
GMSMON#11 Implementation	\$25,068	\$32,253	(\$7,185)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to schedule and cost changes
GMSMON#12 PCR WILDLIFE SURVEY	\$205,448	\$197,869	\$7,579		
GMSMON#12 Direct Management	\$20,214	\$12,669	\$7,545	Required reservoir or flow conditions did not materialize	Opportunistic study - forecast to be updated if spill event does take place
GMSMON#12 Implementation	\$185,234	\$185,200	\$34	Trivial variance.	None. Costs expected to balance out over life of program.
GMSMON#13 WLL FISH INDEX	\$124,909	\$71,381	\$53,528		
GMSMON#13 Direct Management	\$14,296	\$10,836	\$3,460	Direct Management over estimated	None--project to complete July 2009
GMSMON#13 Implementation	\$110,613	\$60,545	\$50,068	Efficiencies found in project delivery	None--project to complete July 2009
GMSMON#14 DNR TRIBUTARY HABITAT	\$150,364	\$141,995	\$8,369		
GMSMON#14 Direct Management	\$57,080	\$48,795	\$8,285	Direct Management over estimated	None - project is not yet underway so reassess after Year 1
GMSMON#14 Implementation	\$93,284	\$93,200	\$84	Trivial variance.	None. Costs expected to balance out over life of program.
Peace River and Dinosaur Reservoir Physical Works Projects		\$3,009,895			
GMSWORKS#1 PCR AERIAL PHOTOS	\$511,369	\$677,889	\$32,105		
GMSWORKS#1 Direct Management	\$15,317	\$13,212	\$2,105	Direct Management over estimated	None at present, pending completion of this year's work.
GMSWORKS#1 Implementation	\$694,677	\$664,677	\$30,000	Efficiencies found in project delivery	None at present, pending completion of this year's work.
GMSWORKS#2 PCR BASELINE TGP/TEMP	\$254,554	\$221,844	\$32,710		
GMSWORKS#2 Direct Management	\$77,340	\$68,762	\$8,578	Direct Management over estimated	None - Yr 1 of annual 10-year project completed; costs expected to balance out over life of project
GMSWORKS#2 Implementation	\$177,214	\$153,082	\$24,132	Delay in obtaining access to site to undertake work	None. Costs expected to balance out over life of program.
GMSWORKS#3 PCR TRIAL SIDE CHANNELS	\$478,339	\$451,254	\$27,085		
GMSWORKS#3 Direct Management	\$128,339	\$45,954	\$82,385	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#3 Implementation	\$350,000	\$405,300	(\$55,300)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#4 PCR HYDRAULIC HABITAT	\$117,728	\$100,745	\$16,983		
GMSWORKS#4 Direct Management	\$17,728	\$17,108	\$620	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#4 Implementation	\$100,000	\$83,637	\$16,363	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency

Monitoring Programs and Physical Works	Approved Costs	Total Forecast (Actuals + Forecast) Life to Date May 31, 09	Total Variance (Approved - Forecast)	Variance Explanation	Corrective Action
GMSWORKS#5 PCR HYDRAULIC MODEL	\$231,742	\$269,255	(\$37,513)		
GMSWORKS#5 Direct Management	\$31,742	\$41,955	(\$10,213)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#5 Implementation	\$200,000	\$227,300	(\$27,300)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#6 PCR MAINSTEM STAGE DISCHARGE	\$262,664	\$321,368	(\$58,704)		
GMSWORKS#6 Direct Management	\$37,664	\$90,568	(\$52,904)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#6 Implementation	\$225,000	\$230,800	(\$5,800)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#7 PCR RIPARIAN HABITAT ASSESSMENT	\$175,682	\$169,715	\$5,967		
GMSWORKS#7 Direct Management	\$22,854	\$17,515	\$5,339	Direct Management over estimated	None - project is not yet underway so reassess after Year 1
GMSWORKS#7 Implementation	\$152,828	\$152,200	\$628	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to schedule and cost changes
GMSWORKS#8 DNR RIPARIAN HABITAT ASSESSMENT	\$188,222	\$291,516	(\$103,294)		
GMSWORKS#8 Direct Management	\$63,222	\$121,116	(\$57,894)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#8 Implementation	\$125,000	\$170,400	(\$45,400)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#9 DNR TRIBUTARY INVENTORY & FEASIBILITY	\$41,013	\$33,626	\$7,387		
GMSWORKS#9 Direct Management	\$16,031	\$8,626	\$7,405	Direct Management over estimated	None - project just commenced so anticipate utilizing funds over time
GMSWORKS#9 Implementation	\$25,000	\$25,000		None	None
GMSWORKS#10 PCR INDUSTRY & TAYLOR WATER QUALITY ASSESSMENT	\$220,253	\$225,239	(\$4,986)		
GMSWORKS#10 Direct Management	\$69,761	\$80,062	(\$10,301)	Direct Management under estimated	None, pending reforecast of direct management costs
GMSWORKS#10 Implementation	\$150,492	\$145,177	\$5,315	Efficiencies found in project delivery	None at this time
GMSWORKS#12 DNR RECREATION ACCESS	\$110,765	\$112,501	(\$1,736)		
GMSWORKS#12 Direct Management	\$60,765	\$8,607	\$52,158	Approved costs include design, construction, and maintenance of ramps, which require further TOR following feasibility study	Resubmission required
GMSWORKS#12 Implementation	\$50,000	\$103,894	(\$53,894)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#13 PCR RECREATION ACCESS	\$296,825	\$134,943	\$161,882		
GMSWORKS#13 Direct Management	\$96,825	\$8,090	\$88,735	Approved costs include design, construction, and maintenance of ramps, which require further TOR following feasibility study	Resubmission required
GMSWORKS#13 Implementation	\$200,000	\$126,853	\$73,147	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
Williston Reservoir Monitoring Program Projects		\$12,193,191			
GMSMON#15 WLL WETLAND HABITAT	\$981,420	\$972,070	\$9,350		
GMSMON#15 Direct Management	\$157,922	\$148,570	\$9,352	Direct Management over estimated	None - project is not yet underway so reassess after Year 1
GMSMON#15 Implementation	\$823,498	\$823,500	(\$2)	Trivial variance.	None. Costs expected to balance out over life of program.

Monitoring Programs and Physical Works	Approved Costs	Total Forecast (Actuals + Forecast) Life to Date May 31, 09	Total Variance (Approved - Forecast)	Variance Explanation	Corrective Action
GMSMON#16 WLL DEBRIS TRENDS	\$215,563	\$214,039	\$1,524		
GMSMON#16 Direct Management	\$46,859	\$45,339	\$1,520	Direct Management over estimated	None - project is not yet underway so reassess after Year 1
GMSMON#16 Implementation	\$168,704	\$168,700	\$4	Trivial variance.	None. Costs expected to balance out over life of program.
GMSMON#17 WLL TRIBUTARY HABITAT	\$1,467,158	\$1,454,375	\$12,783		
GMSMON#17 Direct Management	\$133,598	\$120,675	\$12,923	Direct Management over estimated	None - project is not yet underway so reassess after Year 1
GMSMON#17 Implementation	\$1,333,560	\$1,333,700	(\$140)	Trivial variance.	None. Costs expected to balance out over life of program.
GMSMON#18 WLL DUST CONTROL	\$3,595,427	\$3,466,667	\$128,760		
GMSMON#18 Direct Management	\$250,306	\$162,582	\$87,724	Direct Management over estimated	None--CWR notified
GMSMON#18 Implementation	\$3,345,121	\$3,304,085	\$41,036	Internal accounting methods create temporary variance	None
GMSMON#19 WLL EROSION CONTROL		\$5,003,276	(\$5,003,276)		
GMSMON#19 Direct Management		\$2,976	(\$2,976)	Leave to Commence on TOR not Received	Project on hold pending BC Hydro/TKD agreement
GMSMON#19 Implementation		\$5,000,300	(\$5,000,300)	Leave to Commence on TOR not Received	Project on hold pending BC Hydro/TKD agreement
GMSMON#20 WLL RECREATION USE	\$268,906	\$257,400	\$11,506		
GMSMON#20 Direct Management	\$115,060	\$100,859	\$14,201	Direct Management over estimated	None. Costs expected to balance out over life of program.
GMSMON#20 Implementation	\$153,846	\$156,541	(\$2,695)	Internal accounting methods create temporary variance	None
GMSMON#21A WLL ARCHAEOLOGICAL OVERVIEW ASSESSMENT	\$111,703	\$117,226	(\$5,523)		
GMSMON#21A Direct Management	\$16,186	\$16,005	\$181	Trivial variance.	None. Costs expected to balance out over life of program.
GMSMON#21A Implementation	\$95,517	\$101,221	(\$5,704)	Change to ToR schedule and monthly forecast contouring differs from contractor spending	Resubmission to correct ToR schedule
GMSMON#21B WLL EROSION MONITORING OF ARCHAEOLOGICAL RESOURCES	\$694,175	\$708,137	(\$13,962)		
GMSMON#21B Direct Management	\$119,954	\$122,437	(\$2,483)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and schedule
GMSMON#21B Implementation	\$574,221	\$585,700	(\$11,479)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and schedule
Williston Reservoir Physical Works Projects		\$18,702,957			
GMSWORKS#14 WLL AIR PHOTOS & DEM	\$2,804,180	\$2,844,479	(\$40,299)		
GMSWORKS#14 Direct Management	\$30,295	\$46,601	(\$16,306)	Direct Management under estimated	None:costs in future years expected to balance out overexpenditure this year
GMSWORKS#14 Implementation	\$2,773,885	\$2,797,878	(\$23,993)	Internal accounting methods create temporary variance	None
GMSWORKS#16 WLL WETLAND INVENTORY	\$125,156	\$135,522	(\$10,366)		
GMSWORKS#16 Direct Management	\$12,656	\$18,866	(\$6,210)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#16 Implementation	\$112,500	\$116,656	(\$4,156)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#17 WLL TRIAL WETLANDS	\$411,764	\$415,086	(\$3,322)		
GMSWORKS#17 Direct Management	\$78,264	\$73,686	\$4,578	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#17 Implementation	\$333,500	\$341,400	(\$7,900)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency

Monitoring Programs and Physical Works	Approved Costs	Total Forecast (Actuals + Forecast) Life to Date May 31, 09	Total Variance (Approved - Forecast)	Variance Explanation	Corrective Action
GMSWORKS#18 WLL DEBRIS FIELD SURVEY	\$258,412	\$243,282	\$15,130		
GMSWORKS#18 Direct Management	\$20,735	\$23,891	(\$3,156)	Direct Management under estimated	None. Costs expected to balance out over life of program.
GMSWORKS#18 Implementation	\$237,677	\$219,392	\$18,285	Internal accounting methods create temporary variance	None
GMSWORKS#19 WLL TRIAL TRIBUTARY(S)	\$485,156	\$418,533	\$66,623		
GMSWORKS#19 Direct Management	\$135,156	\$96,033	\$39,123	Efficiencies found in project delivery	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#19 Implementation	\$350,000	\$322,500	\$27,500	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#20 WLL DUST SOIL MAPPING	\$351,569.00	\$306,521	\$45,048		
GMSWORKS#20 Direct Management	\$16,111.00	\$15,298	\$813	Direct Management over estimated	None. Costs expected to balance out over life of program.
GMSWORKS#20 Implementation	\$335,458.00	\$291,223	\$44,235	Internal accounting methods create temporary variance	None
GMSWORKS#21 WLL DUST CONTROL TRIAL	\$1,444,279	\$1,314,371	\$129,908		
GMSWORKS#21 Direct Management	\$46,373	\$44,038	\$2,335	Direct Management over estimated	None. Costs expected to balance out over life of program.
GMSWORKS#21 Implementation	\$1,397,906	\$1,270,333	\$127,573	Internal accounting methods create temporary variance	None
GMSWorks#22 WLL DEBRIS REMOVAL	\$10,940,198	\$10,633,244	\$306,954		
GMSWorks#22 Direct Management	\$151,838	\$146,267	\$5,571	Direct Management over estimated	None. Costs expected to balance out over life of program.
GMSWorks#22 Implementation	\$10,788,360	\$10,486,977	\$301,383	Internal accounting methods create temporary variance	None
GMSWORKS#23 WLL EROSION CONTROL TRIAL		\$33,290	(\$33,290)		
GMSWORKS#23 Direct Management		\$90	(\$90)	Leave to Commence on TOR not Received	Project on hold pending BC Hydro/TKD agreement
GMSWORKS#23 Implementation		\$33,200	(\$33,200)	Leave to Commence on TOR not Received	Project on hold pending BC Hydro/TKD agreement
GMSWORKS#24 WLL BOAT ACCESS	\$777,592	\$267,409	\$510,183		
GMSWORKS#24 Direct Management	\$427,592	\$32,838	\$394,754	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#24 Implementation	\$350,000	\$234,571	\$115,429	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#25 WLL BATHYMETRIC MAPPING	\$1,058,957	\$1,198,899	(\$139,942)		
GMSWORKS#25 Direct Management	\$48,957	\$28,299	\$20,658	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#25 Implementation	\$1,010,000	\$1,170,600	(\$160,600)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#26 WLL COMMUNICATIONS/SAFETY	\$1,351,173	\$819,743	\$531,430		
GMSWORKS#26 Direct Management	\$425,173	\$240,445	\$184,728	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#26 Implementation	\$926,000	\$579,299	\$346,701	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#27 WLL FINLAY RIVER ACCESS INFORMATION PLAN	\$73,784	\$72,578	\$1,206		
GMSWORKS#27 Direct Management	\$21,284	\$11,578	\$9,706	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency
GMSWORKS#27 Implementation	\$52,500	\$61,000	(\$8,500)	Change to TOR. TOR needs to be resubmitted.	Resubmission required due to cost change because of inflation and contingency

Monitoring Programs and Physical Works	Approved Costs	Total Forecast (Actuals + Forecast) Life to Date May 31, 09	Total Variance (Approved - Forecast)	Variance Explanation	Corrective Action
Williston Reservoir Industry Feasibility and Design Study		\$2,729,593			
GMSWORKS#28 INDUSTRY FEASIBILITY AND DESIGN STUDY		\$2,729,593	(\$2,729,593)		
GMSWORKS#28 Direct Management		\$31,093	(\$31,093)	Leave to Commence on TOR not Received	Project on hold pending redesign due to changes in industry situation
GMSWORKS#28 Implementation		\$2,698,500	(\$2,698,500)	Leave to Commence on TOR not Received	Project on hold pending redesign due to changes in industry situation