Peace Water Use Plan
Williston Reservoir and Communications Management Plan

Monitoring Programs and Physical Works
Annual Report 2019

Implementation Period: May 2018 to April 2019

- GMSMON-15 WLL Wetland Habitat
- GMSMON-16 WLL Debris Trends
- GMSMON-17 WLL Tributary Habitat
- GMSMON-18 WLL Dust Control
- GMSMON-19 WLL Erosion Control
- GMSMON-20 WLL Recreation Use
- GMSWORKS-14 WLL Air Photos & DEM
- GMSWORKS-16 WLL Wetland Inventory
- GMSWORKS-17 WLL Trial Wetlands
- GMSWORKS-18 WLL Debris Field Survey
- GMSWORKS-19 WLL Trial Tributaries
- GMSWORKS-20 WLL Dust Source Survey
- GMSWORKS-21 WLL Dust Control Trial
- GMSWORKS-22 WLL Debris Management
- GMSWORKS-23 WLL Erosion Control Trial
- GMSWORKS-24 WLL Finlay Reach Access
- GMSWORKS-25 WLL Reservoir Bathymetry
- GMSWORKS-26 WLL Communications/Safety
- GMSWORKS-27 WLL Finlay River Access Information Plan
- GMSWORKS-28 Industry Feasibility & Design Study
- GMSWORKS-28A District of Mackenzie Effluent Discharge Feasibility & Design Study
- GMSWORKS-31 Kwadacha Boat Launch Maintenance
- GMSWORKS-33 Boat Ramp Design Ingenika
- GMSWORKS-33 Ingenika Boat Launch Design
- GMSWORKS-34 Finlay Bay Boat Launch Design
- GMSWORKS-35 6 Mile Bay Boat Launch Design
- GMSWORKS-36 Cut Thumb Bay Boat Launch Design
- GMSWORKS-37 Mackenzie Landing Boat Launch Design
- GMSWORKS-43 Ingenika Boat Launch Construction
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- GMSWORKS-45 6 Mile Bay Boat Launch Construction
- GMSWORKS-46 Cut Thumb Bay Boat Launch Construction
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- GMSWORKS-57 Dunlevy Boat Launch Maintenance
- GMSWORKS-58 Mackenzie Landing Boat Launch Maintenance
- GMSWORKS-59 Ingenika Boat Launch Maintenance
- GMSWORKS-60 Finlay Bay Boat Launch Maintenance
- GMSWORKS-61 6 Mile Bay Boat Launch Maintenance
- GMSWORKS-62 Cut Thumb Bay Boat Launch Maintenance

For Water Licences 123018, 123019, 123020, 123021, 123025

May 31, 2019

BC Hydro Peace Water Use Plan
Williston Reservoir and Communications Management Plan
Annual Report: 2019

1 Introduction

This document represents a summary of the status and the results of the Peace Project Williston Reservoir and Communications Management Plan Water Use Plan (WUP) monitoring program and physical works projects to April 30, 2019, as per the Peace Order under the *Water Act,* dated August 9, 2007. This annual report includes GMSWORKS-26 as well as those projects in Schedule A of the Order. There are six monitoring programs and thirty-four physical works.

2 Status

The following table outlines the dates that Terms of Reference (TOR) for the Williston Reservoir and Communications Management Plan WUP monitoring programs and physical works were submitted to and approved by the Comptroller of Water Rights (CWR).

Table 2-1 Dates of Williston Reservoir and Communications Management Plan WUP TOR Submissions and Approvals by the Comptroller of Water Rights

Monitoring Program & Physical Works TOR	Order Clause	Original ToR Submission		Most Recent ToR Resubmission	
		Date Submitted	Date Approved	Date Submitted	Date Approved
GMSMON-15 WLL WETLAND HABITAT	Schedule A.6.b	Aug 08, 2008	Sep 15, 2008		
GMSMON-16 WLL DEBRIS TRENDS	Schedule A.3.c, Schedule A.5.a	Nov 26, 2008	Dec 17, 2008	Jun 29, 2018	Aug 27, 2018
GMSMON-17 WLL TRIBUTARY HABITAT	Schedule A.6.c	Aug 08, 2008	Sep 15, 2008	Dec 15, 2017	Jan 26, 2018
GMSMON-18 WLL DUST CONTROL	Schedule A.6.d	Apr 02, 2008	Apr 28, 2008	Mar 20, 2018	Apr 05, 2018
GMSMON-19 WLL EROSION CONTROL	Schedule A.6.e				
GMSMON-20 WLL RECREATION USE	Schedule A.6.f	Aug 08, 2008	Sep 15, 2008	Nov 05, 2015	Nov 24, 2015
GMSWORKS-14 WLL AIR PHOTOS & DEM	Schedule A.3.d	May 09, 2008	Jun 02, 2008		
GMSWORKS-16 WLL WETLAND INVENTORY	Schedule A.2.a	May 09, 2008	Jun 02, 2008	Aug 07, 2009	Jan 20, 2010
GMSWORKS-17 WLL TRIAL WETLANDS	Schedule A.2.a	May 09, 2008	Jun 02, 2008	Jun 30, 2017	Aug 17, 2017
GMSWORKS-18 WLL DEBRIS FIELD SURVEY	Schedule A.3.c	Nov 26, 2008	Dec 17, 2008	Jan 10, 2014	Feb 17, 2014
GMSWORKS-19 WLL TRIAL TRIBUTARY(S)	Schedule A.2.b	May 09, 2008	Jun 02, 2008	Jun 27, 2017	Aug 17, 2017
GMSWORKS-20 WLL DUST SOIL MAPPING	Schedule A.3.a	Apr 02, 2008	Apr 28, 2008	Apr 13, 2011	Jun 01, 2011
GMSWORKS-21 WLL DUST CONTROL TRIAL	Schedule A.3.a	Apr 02, 2008	Apr 28, 2008	Mar 04, 2014	Mar 13, 2014
GMSWORKS-22 WLL DEBRIS REMOVAL	Schedule A.3.c, Schedule A.5.a	Nov 26, 2008	Mar 23, 2009	May 09, 2019	Pending
GMSWORKS-23 WLL EROSION CONTROL TRIAL	Schedule A.3.b				
GMSWORKS-24 WLL BOAT ACCESS	Schedule A.4	May 09, 2008	Jun 02, 2008	Aug 07, 2009	Jan 20, 2010
GMSWORKS-25 WLL BATHYMETRIC MAPPING	Schedule A.3.d	May 09, 2008	Jun 02, 2008	Jun 08, 2011	Oct 12, 2011
GMSWORKS-26 WLL COMMUNICATIONS/SAFETY	Schedule A.5.b, Schedule A.5.c, Schedule B.2.b, Schedule C.3.a	May 09, 2008	Jun 02, 2008	Jun 29, 2017	Aug 17, 2017
GMSWORKS-27 WLL FINLAY RIVER ACCESS INFORMATION PLAN	Schedule A.6.a	Aug 08, 2008	Sep 15, 2008	Aug 07, 2009	Jan 20, 2010
GMSWORKS-28 INDUSTRY FEASIBILITY AND DESIGN STUDY	Schedule A.1	Nov 30, 2009	Jan 11, 2010	Dec 22, 2015	May 20, 2016
GMSWORKS-31 KWADACHA BOAT LAUNCH MAINTENANCE	Schedule A.4.b	Apr 16, 2010	May 07, 2010		
GMSWORKS-33 INGENIKA BOAT LAUNCH DESIGN	Schedule A.4.b	Apr 15, 2010	Jun 28, 2010	Apr 18, 2011	Apr 3, 2012 Deferred - pending further submissions
GMSWORKS-34 FINLAY BAY BOAT LAUNCH DESIGN	Schedule A.4.c	Apr 15, 2010	Jun 28, 2010	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward
GMSWORKS-35 6 MILE BAY BOAT LAUNCH DESIGN	Schedule A.4.c	Apr 15, 2010	Jun 28, 2010	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward
GMSWORKS-36 CUT THUMB BAY BOAT LAUNCH DESIGN	Schedule A.4.c	Apr 15, 2010	Jun 28, 2010	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward
GMSWORKS-37 MACKENZIE LANDING BOAT LAUNCH DESIGN	Schedule A.4.c	Apr 15, 2010	Jun 28, 2010	Aug 14, 2013	Aug 15, 2013
GMSWORKS-43 INGENIKA BOAT LAUNCH CONSTRUCTION	Schedule A.4.b	Apr 18, 2011	Apr 3, 2012 Deferred - TOR to be resubmitted		
GMSWORKS-44 FINLAY BAY BOAT LAUNCH CONSTRUCTION	Schedule A.4.c	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward		
GMSWORKS-45 6 MILE BAY BOAT LAUNCH CONSTRUCTION	Schedule A.4.c	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward		
GMSWORKS-46 CUT THUMB BAY BOAT LAUNCH CONSTRUCTION	Schedule A.4.c	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward		
GMSWORKS-47 MACKENZIE LANDING BOAT LAUNCH CONSTRUCTION	Schedule A.4.c	Apr 18, 2011	Apr 03, 2012	Apr 27, 2017	May 26, 2017
GMSWORKS-49 DUNLEVY BOAT LAUNCH CONSTRUCTION	Schedule A.4.a	Apr 18, 2011	Apr 3, 2012 Deferred	Nov 15, 2017	Dec 21, 2017
GMSWORKS-54 DUNLEVY BOAT LAUNCH DESIGN	Schedule A.4.a	Apr 15, 2010	May 07, 2010	Jul 12, 2013	Jul 16, 2013
GMSWORKS-57 DUNLEVY BOAT LAUNCH MAINTENANCE	Schedule A.4.a	Apr 18, 2011	Apr 3, 2012 Deferred	Feb 28, 2018	May 10, 2018
GMSWORKS-58 MACKENZIE LANDING BOAT LAUNCH MAINTENANCE	Schedule A.4.c	Apr 18, 2011	Apr 03, 2012	Feb 28, 2018	Apr 10, 2018
GMSWORKS-59 INGENIKA BOAT LAUNCH MAINTENANCE	Schedule A.4.b	Apr 18, 2011	Apr 3, 2012 Deferred TOR to be resubmitted		
GMSWORKS-60 FINLAY BAY BOAT LAUNCH MAINTENANCE	Schedule A.4.c	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward		
GMSWORKS-61 6 MILE BAY BOAT LAUNCH MAINTENANCE	Schedule A.4.c	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward		
GMSWORKS-62 CUT THUMB BAY BOAT LAUNCH MAINTENANCE	Schedule A.4.c	Apr 18, 2011	Apr 3, 2012 CWR does not approve moving forward		

3 Schedule

The following table outlines the current schedule for the monitoring programs and physical works being delivered for the Williston Reservoir and Communications Management Plan WUP.

Table 3-1: Monitoring Programs and Physical Works Schedule as of April 30, 2019

Monitoring Programs & Physical Works	2008 WLR YR1	2009 WLR YR2	2010 WLR YR3	2011 WLR YR4	2012 WLR YR5	2013 WLR YR6	2014 WLR YR7	2015 WLR YR8	2016 WLR YR9	2017 WLR YR10	2018 WLR YR11	2019 WLR YR12	2020 WLR YR13
GMSMON-15: WLL Wetland Habitat			Del	✓	✓	✓	✓	✓	✓	✓	✓	u/w	■
GMSMON-16: WLL Debris Trends			✓						Del	✓	✓		
GMSMON-17: WLL Tributary Habitat			Del	✓	✓	✓	✓	✓	✓	Del	✓	u/w	■
GMSMON-18: WLL Dust Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	u/w	
GMSMON-19: WLL Erosion Control[1]													
GMSMON-20: WLL Recreation Use		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓**F**		
GMSWORKS-14: WLL Air Photos & DEM		✓	✓	✓							✓		
GMSWORKS-16: WLL Wetland Inventory		✓	✓**F**										
GMSWORKS-17: WLL Trial Wetlands			✓	✓	✓	✓	✓	✓	✓	✓	✓	u/w*	■*
GMSWORKS-18: WLL Debris Field Survey		✓	✓	✓			✓**F**						
GMSWORKS-19: WLL Trial Tributaries	Del	✓			✓	✓	✓	✓	✓	✓	✓	u/w*	■*
GMSWORKS-20: WLL Dust Source Survey		✓	✓	✓	✓**F**								
GMSWORKS-21: WLL Dust Control Trial	✓	✓	✓	✓	✓	✓	✓						
GMSWORKS-22: WLL Debris Management		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	u/w	
GMSWORKS-23: WLL Erosion Control Trial[1]													
GMSWORKS-24: WLL Boat Access	Del	✓	✓**F**										
GMSWORKS-25: WLL Bathymetric Mapping			✓	✓	✓**F**								
GMSWORKS-26: WLL Communications/Safety	Del	✓	Del	✓	✓	✓	✓	✓	✓	✓	✓	u/w*	■*
GMSWORKS-27: WLL Finlay River Access Information Plan		✓	✓**F**										
GMSWORKS-28: Industry Feasibility & Design Study	Del	Del	Del	Del	✓	✓	✓	✓**F**					
GMSWORKS-28a: District of Mackenzie Effluent Discharge Feasibility & Design Study			✓	✓	✓				✓**F**				
GMSWORKS-31 Kwadacha Boat Launch Maintenance			✓	✓	✓	✓	✓					u/w*	■*
GMSWORKS-33 Ingenika Boat Launch Design[1]			✓	✓									
GMSWORKS-34 Finlay Bay Boat Launch Design			✓	✓									
GMSWORKS-35 6 Mile Bay Boat Launch Design			✓	✓									
GMSWORKS-36 Cut Thumb Bay Boat Launch Design			✓	✓									
GMSWORKS-37 Mackenzie Landing Boat Launch Design			✓	✓	✓	✓**F**							
GMSWORKS-43 Ingenika Boat Launch Construction[1]													
GMSWORKS-44 Finlay Bay Boat Launch Construction													
GMSWORKS-45 6 Mile Bay Boat Launch Construction													
GMSWORKS-46 Cut Thumb Bay Boat Launch Construction													
GMSWORKS-47 Mackenzie Landing Boat Launch Construction							✓**F**						
GMSWORKS-49 Dunlevy Boat Launch Construction							✓	✓**F**					
GMSWORKS-54 Dunlevy Boat Launch Design			✓	✓	✓	✓**F**							
GMSWORKS-57 Dunlevy Boat Launch Maintenance						✓		Del	✓	✓	✓	u/w*	■*
GMSWORKS-58 Mackenzie Landing Boat Launch Maintenance							Del	✓	✓	✓	✓	u/w*	■*
GMSWORKS-59 Ingenika Boat Launch Maintenance[1]													
GMSWORKS-60 Finlay Bay Boat Launch Maintenance													
GMSWORKS-61 6 Mile Bay Boat Launch Maintenance													
GMSWORKS-62 Cut Thumb Bay Boat Launch Maintenance													

Legend:
- ■ = Program to be undertaken/initiated in identified year
- ✓ = Program completed for the year
- × = Project not undertaken as planned for this year
- * = Maintenance only in identified year
- ✓**F** = All field work for this project is complete. No further field work is planned.
- u/w = Project is under way
- Del = Project is delayed for the year

4 Monitoring Programs and Physical Works Terms of Reference

The monitoring programs and physical works being implemented under the Williston Reservoir and Communications Management Plan WUP are described in TOR. These TOR and the reports for work completed to date can be found here:

https://www.bchydro.com/about/sustainability/conservation/water_use_planning/northern_interior/peace_river/williston_reservoir.html

5 Status of Monitoring Programs

5.1 GMSMON-15 Williston Wetland Habitat

The objective of this 10-year monitoring project is to assess the biological effectiveness of two wetland enhancement trials intended to improve foreshore habitat for fisheries, wildlife, and riparian areas.

Pre-construction monitoring work began in April 2011 and continued after the construction of trial wetlands (under GMSWORKS-17 Williston Trial Wetlands) was completed at Airport Lagoon in 2013 and Beaver Pond in 2014.

Monitoring will continue until 2020. The Year 8 (2018) report is attached. The Year 7 (2017) report is still outstanding but 2017 data has been collected and will be submitted with the 2020 annual report.

5.2 GMSMON-16 Williston Debris Trends

The objective of this monitoring project is to assess the effectiveness of GMSWORKS-22 (Williston Targeted Debris Management).

A reservoir debris survey was completed in 2010 (Year 1 of the project) using aerial photography from 2009 completed under GMSWORKS-14 (Williston Air Photo and DEM). The debris survey is a joint deliverable of both GMSMON-16 and GMSWORKS-18 (Williston Debris Field Survey) and established a baseline inventory of wood debris in Williston Reservoir.

As per the TOR for this monitoring project, analysis of debris trends was required at the beginning, middle and end of the WUP period. The Year 2 report is attached and includes a trend analysis of low water aerial photography taken in 2011 compared to the 2009 aerial photography. The Year 3 work has been completed, using updated aerial photography from GMSWORKS-14 captured in May 2018. The Year 3 work assessed the changing patterns of woody debris, identified trends for the whole reservoir, and compared results with the baseline (the 2009 aerial photography). Year 3 is the final year for this monitoring project, and the report presents the analysis of woody debris for the whole reservoir between 2009 and 2018. The Year 3 report will be used to inform the future direction of the Williston Debris Removal project (GMSWORKS-22) and will be submitted with the 2020 annual report.

5.3 GMSMON-17 Tributary Habitat Review

The objective of this effectiveness monitoring program is to determine the response of fish and selected indicator groups to the tributary enhancements undertaken by the GMSWORKS-19 (Williston Trial Tributaries) project. This 10-year monitoring program began with pre-construction monitoring April 2011 and continued following

construction of the trial enhancement work at Ole Creek and Six Mile Creek in 2014. Monitoring will continue to 2020.

No report was completed for Year 7 (2017), as the program was paused to assess study design and complete a TOR resubmission that was approved by the CWR in January 2018. The Year 8 (2018) report is in draft and will be submitted with the 2020 Annual Report.

5.4 GMSMON-18 Williston Dust Control

The objective of this monitoring project is to provide data on airborne particulate matter concentrations in the upper Finlay Arm air shed and to evaluate the effectiveness of dust mitigation treatments in the drawdown zone of Finlay Arm.

The 10-year monitoring program began in April 2008 and is scheduled for completion in 2020.

The Year 9 (2016) and Year 10 (2017) reports are attached. The Year 11 (2018) report is in draft and will be submitted with the 2020 Annual Report.

5.5 GMSMON-19 Williston Erosion Control

The objective of this project is to monitor the effectiveness of any constructed erosion works under GMSWORKS-23 (Williston Erosion Control Trials). No erosion works have been constructed. On December 5, 2014, the CWR approved a delay in this project pending further discussions between Tsay Keh Dene First Nation and BC Hydro. There is no change in status at this time.

5.6 GMSMON-20 Reservoir Recreation Use

The objective of the monitoring project is to assess boat ramp usage on the Williston Reservoir. This work was initiated in May 2009 and the final year of field work was completed in 2018.

The Year 9 (2017) and Year 10 (2018) reports are in draft and will be submitted with the 2020 Annual Report.

6 Status of Physical Works

6.1 GMSWORKS-14 Williston Air Photos and DEM

The objectives of this project are to:

1. Conduct a mapping inventory to compile a bibliography of all existing maps of the Williston Reservoir;
2. Acquire aerial photos of Williston Reservoir at low pool in 2009 and develop a bare earth digital elevation model (DEM); and
3. Acquire aerial photos of the Williston Reservoir in 2013 and 2018 and re-compile the DEM based on new data.

Year 1 work was initiated in April 2009 and completed in December 2010. Year 2 air photos were scheduled for 2013, but were taken in 2011 to take advantage of the very low reservoir level. Year 3 photos were captured in May 2018. There are no report submission requirements for this project. The project provides the information required for reporting completed under GMSMON-16 Williston Debris Trends.

6.2 GMSWORKS-16 Williston Wetland Inventory

The objective of this project is to identify a list of candidate sites within the Williston Reservoir for trial wetland habitat creation as the conceptual feasibility stage to prepare for GMSWORKS-17 Williston Trial Wetlands project. The work was undertaken in 2009 and 2010 and summarized in a 2010 report.

The GMSWORKS-16 report identified 42 potential sites, and a recommendation of five candidate sites. The basis for shortlisting to the five sites included consideration of: 1) benefits to fish and wildlife; 2) likelihood of success (engineering); 3) regulatory requirements; 4) land ownership; and 5) estimated costs.

This project is complete.

6.3 GMSWORKS-17 Williston Trial Wetlands

The objective of this project is to create trial wetland habitats in areas that may be dewatered for long periods to improve reservoir habitat and increase the utility of the drawdown zone for fish species. The feasibility study was undertaken as part of GMSWORKS-16 Williston Wetland Inventory project.

From the five sites recommended under GMSWORKS-16, BC Hydro selected two sites (Beaver Pond and Airport Lagoon) to take forward to detailed design.

Detailed design occurred in 2011 with permitting and planning continuing through 2012. The Airport Lagoon site was constructed in May and June 2013. The Beaver Pond works were installed in May 2014.

Inspections of the sites are completed regularly. Any significant maintenance identified will be reviewed on a case-by-case basis.

6.4 GMSWORKS-18 Williston Debris Field Survey

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, and to assess the feasibility of alternative means of debris management compared to pile and burn.

The project consists of two components; 1) a debris field survey (shared deliverable with GMSMON-16 Williston Debris Trends); and 2) a debris management strategy. The debris survey was completed in June 2010 using the aerial photography from GMSWORKS-14 (Williston Air Photos & DEM) in April 2009.

A debris management strategy was prepared in 2011 but did not reflect the moratorium on burning due to localized air quality concerns with burning that existed at the time. Following a TOR addendum approval in February 17, 2014, a second report in 2015 expanded the strategy to include alternative debris management methods.

This project is complete.

6.5 GMSWORKS-19 Williston Reservoir Trial Tributaries

The overall objective of the physical works is to improve or restore the access to rivers that are tributary to Williston Reservoir in cases where fish access to the mouth of tributaries has been impeded by a build-up of debris and/or by the seasonal fluctuations in water levels in the reservoir.

Following feasibility, detailed design, permitting, and constructability reviews, the tributary improvements were constructed at Ole Creek and Six Mile Creek in early 2014. As Ole Creek was impeded by unconfined channel flow and large woody debris, restoration efforts included the installation of low-level gravel berms and the installation of debris catchers using on-site woody debris. Approximately 1500 m^3 of debris was removed from the creek channel.

The works at Six Mile Creek consisted of the creation of a single deep channel by the placement of a series of geogrid soil wrap berms, which would cut off flow bifurcations, and concentrate and confine creek flow to within a single main channel. It also included the installation of similar debris catchers made from on-site large woody debris.

Inspections of the sites are completed regularly. Any significant maintenance will be reviewed on a case-by-case basis.

6.6 GMSWORKS-20 Williston Dust Mapping

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 four objectives of the study are to:

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.

This work was initiated in May 2009 and the final season of field data was collected in 2012. This project is complete.

6.7 GMSWORKS-21 Williston Dust Control Trials

Aerial movement of fine particles of silts and clays (“dust”) from the exposed drawdown zone in the Finlay Reach of the Williston Reservoir are a concern of Tsay Keh Dene and Kwadacha First Nations. An adaptive management program of dust mitigation was implemented on a beach-by-beach basis. Seven years of dust control trials were completed (from 2008-2014) which included assessments of several different dust methodologies including:

- Various tillage techniques;
- Irrigation, using gravity-fed distribution in 2011 and a high output pump in 2014;
- Native vegetation;
- Vegetation protection using protective debris berm; and
- Engineering roughness.

The Williston Dust Control Trials are complete.

6.8 GMSWORKS-22 Williston Targeted Debris Management

The Williston Targeted Debris Management project provides debris management in the reservoir over a 10-year period. Debris is managed to: (i) minimize damage to Peace Water Use Plan (WUP) study sites; (ii) improve navigation; (iii) improve fish access to tributaries; and (iv) reduce shoreline erosion and destruction to riparian vegetation.

The project entails conducting an annual aerial debris reconnaissance survey, collecting debris (on land or water) at selected sites, and managing debris to prevent negative impacts to WUP projects, navigational safety, fisheries, and shorelines.

Work was initiated in May 2009 and was scheduled to be completed in 2018. A TOR resubmission to extend the program to August 2019 in order to utilize the remaining approved budget was approved by the CWR on August 3, 2018. The Year 10 report (2018) is in draft and will be submitted with the 2020 annual report.

A review of the overall debris management program has been completed. A TOR resubmission regarding additional years of debris management on Williston Reservoir was submitted to the CWR on May 9, 2019.

6.9 GMSWORKS-23 Williston Erosion Control Trial

The objective of this project is to investigate the feasibility of erosion controls at Tsay Keh Dene village site and implement any chosen solution on a trial basis. On December 5, 2014, the CWR approved a delay in this project pending further discussions between Tsay Keh Dene First Nation and BC Hydro. There is no change in status at this time.

6.10 GMSWORKS-24 Finlay Reach Access

The objectives of this project were to complete feasibility studies on options for recreational access to the Williston Reservoir or for improvements to the existing access points to the reservoir, and to make recommendations.

Two feasibility studies were completed in March 2010 for seven sites on the Parsnip Reach of the Williston Reservoir (GMSWORKS-24B) and two sites at Finlay Reach (GMSWORKS-24A).

The seven sites on Parsnip Reach were as follows:

- One existing boat launch site located in the BC Hydro campsite (Alexander Mackenzie's Landing Recreation Area);
- Two existing boat launch sites located at Forest Service campsites (Cut Thumb Bay and Finlay Bay); and
- Four locations with, at most, informal gravel ramps (Six Mile Bay, Strandberg, Manson Dump, and Black Water).

The sites on Finlay Reach included potential boat launch ramp locations at the following locations:

- Ingenika; and
- In the vicinity of Tsay Keh Village, including the existing barge landing.

The feasibility studies included engineering technical feasibility, archaeological feasibility, and environmental criteria, and cost in their evaluations.

This project is complete.

6.11 GMSWORKS-25 Williston Reservoir Bathymetry

The objective of this project was to map the reservoir between full pool and El. 652.27 m.

Between 2010 and 2012, twenty-five bathymetric charts of the reservoir were created. This project is complete.

6.12 GMSWORKS-26 Williston Communication and Safety

The objective of this project is to enhance safe navigational access of Williston reservoirs and the Peace River by the installation of a marine radio repeater systems and related information signage.

Feasibility work was initiated in 2009 with an inventory and assessment of existing radio resource in the area, and options for developing a marine communication network. As a result, based on a further review by BC Hydro Telecommunications engineering, between 2011 and 2013, BC Hydro:

- modified three existing repeater sites to accommodate marine VHF (Deception Cone, Wolverine and Carbon Creek sites);
- added two new repeaters to existing microwave sites (Morfee and Bullhead); and
- constructed one new site (Portage Mountain).

With the five VHF repeaters, two marine VHF channels are available that provide area-dependent reservoir coverage. Simplified signage referring to the two channels was installed at identified boat launches prior to the 2017 recreation season.

In order to meet the outstanding Peace River radio repeater requirements (as per Schedule C, clause 3(a) of the Peace Order), an additional marine radio will be installed at a Site C microwave tower during 2019. Once this final installation is finished, the project will be complete.

6.13 GMSWORKS-27 Finlay River Access Information Plan

The objective of this project was to conduct an investigation into sedimentation problems in the lower Finlay River that were potentially associated with fluctuating levels of the Williston Reservoir. This project is complete.

6.14 GMSWORKS-28 Mackenzie Industry Feasibility & Design Study

The objective of this engineering feasibility and design study was to determine practical and cost-effective solutions associated with lower reservoir levels at Mackenzie's three industrial plants for water supply, effluent disposal, and log supply.

The Phase Two report was accepted by the CWR on May 20, 2016.

This project is complete.

6.15 GMSWORKS-28A District of Mackenzie Effluent Discharge Feasibility & Design Study

This project objective was to conduct an engineering feasibility and design study to determine practical and cost-effective solutions to the issues associated with lower

reservoir levels at Mackenzie and effluent disposal at the District of Mackenzie. The study was undertaken in 2010 through 2012, with the report finalized in 2015.

This project is complete.

6.16 GMSWORKS-31 Kwadacha Boat Launch Maintenance

This project is for the ongoing maintenance costs associated with the boat launch facility at Kwadacha, across from the village of Fort Ware, on the Finlay River.

This project arises from a requirement under Clause (j) of the Final Water Licence 123021 which requires BC Hydro to provide reservoir access on the Williston Reservoir. Additionally, the Peace WUP Order (dated August 9, 2007) included the direction to undertake a feasibility study for a ramp at Kwadacha (Fort Ware) Schedule A, Clause 4(b)).

However, during the WUP discussions, BC Hydro agreed to advance construction of the ramp ahead of the WUP order. Consequently, feasibility studies as required by the Order were deemed unnecessary and were not undertaken during the WUP period. The ramp was completed in December 2007.

6.17 GMSWORKS-33 Ingenika Boat Launch Design

This project is for the design of boat launch facilities on the Ingenika Arm of Finlay Reach in the north end of the Williston Reservoir. The feasibility study was completed in March 2010, under GMSWORKS-24A (Finlay Reach Access) which considered two sites – one at Billy's Bay at the entrance of the Ingenika Arm, and the other at Thomas Trail further west along the Ingenika Arm and a more sheltered location than at Billy's Bay. There is an existing informal ramp on the gravel beach at Thomas Trail. Both were accessible by forest service roads.

In April 2012, BC Hydro indicated that the proposed options in the GMSWORKS-24 report did not meet the needs of the Tsay Keh Dene community and the CWR agreed to defer the project to allow for ongoing conversations with the community. There is no change in the status.

6.18 GMSWORKS-34 Finlay Bay Boat Launch Design

This project is for a design of boat launch facilities at Finlay Bay. The feasibility study was undertaken in March 2010, under GMSWORKS-24B (Parsnip Reach Access).

The Finlay Bay boat launch is adjacent to the Finlay Bay Forest Service Campsite. The campsite and boat launch ramp are reached via 75 km of the rough gravel West Parsnip Forest Service Road. The boat launch ramp is reached along a gravel track that passes through a relatively wide, open area. There is an existing outhouse as well as picnic tables on the upland grassy area, but there are no other significant facilities there.

The feasibility study identified challenging design options that required dredging of a channel approximately 90 m long to provide access to relatively low water (e.g., El. 659 m), which will add to the expense of the project and the ongoing maintenance costs thereafter.

Following an assessment under GMSMON-20 (Williston Recreation Use) for Williston Reservoir, the CWR did not approve further implementation at the Finlay Bay site. If future recreation demand proves that greater reservoir access is needed, then this

ramp development may be reconsidered as per letter from the CWR dated April 3, 2012.

6.19 GMSWORKS-35 6 Mile Bay Boat Launch Design

This project is for a design of boat launch facilities at 6 Mile Bay. The feasibility study was undertaken in March 2010, under GMSWORKS-24B (Parsnip Reach Access).

The 6 Mile Bay site has an existing gravel ramp with the lower part of the boat launch cut into the side of a bank and the upper portion angled around this bank. A design was prepared for a pre-cast concrete ramp accessible at water elevations of El. 657 m. Lower water access was not feasible due to the bathymetry of the reservoir at this location.

Following an assessment under GMSMON-20 (Williston Recreation Use) for Williston Reservoir, the CWR did not approve further design (GMSWORKS-35) or implementation (GMSWORKS-45) at the 6 Mile Bay site. If future recreation demand proves that greater reservoir access is needed, then this ramp development may be reconsidered as per letter from the CWR dated April 3, 2012.

6.20 GMSWORKS-36 Cut Thumb Bay Boat Launch Design

This project is for a design of boat launch facilities at Cut Thumb Bay. The feasibility study was undertaken in March 2010, under GMSWORKS-24B (Parsnip Reach Access).

Cut Thumb Bay is accessed from the Parsnip West Forest Service Road. This is a well-used site for launches into the Williston Reservoir at low water. There is a large area available for parking and turnaround. While there is a visible gravel track to the best launching spots, the entire area of the bay provides a driveable gravel surface.

BC Hydro began developing designs and estimates for upgrades to Cut Thumb Bay boat launch in early 2011. However, an assessment under GMSMON-20 (Williston Recreation Use) for Williston Reservoir indicated that upgrades to Mackenzie Landing would provide adequate reservoir access for local communities. The CWR did not approve further design (GMSWORKS-36) or implementation (GMSWORKS-46) at the Cut Thumb Bay. If future recreation demand proves that greater reservoir access is needed, then this ramp development may be reconsidered as per letter from the CWR dated April 3, 2012.

6.21 GMSWORKS-37 Mackenzie Landing Boat Launch Design

This project was for the design phase of the boat launch at Alexander Mackenzie's Landing Recreation Site ("Mackenzie Landing"). Mackenzie Landing is located 8 km from Mackenzie on the West Parsnip forest service road off Highway 39 on the east side of the Williston Reservoir.

Under Clause (j) of Final Water Licence 123021, BC Hydro is required to provide reservoir access at areas as directed by the Comptroller of Water Rights (CWR). "Mackenzie Landing" was identified as a site for access as part of the WUP.

On April 3, 2012, the CWR approved designs and construction for the improvements at the Mackenzie Landing boat launch. Due to concerns associated with design complexity and constructability, BC Hydro investigated other design and construction options. The final design for a two-stage ramp connected by an access road (upper concrete ramp to El. 662 m and lower gravel ramp to El. 658 m) was submitted in

November 2013 following a community meeting. The CWR approved construction (as part of GMSWORKS-47) on November 29, 2013. Construction at the site occurred between February and May 2014.

The maintenance is undertaken as part of GMSWORKS-58 Mackenzie Landing Boat Launch Maintenance.

This project is complete.

6.22 GMSWORKS-43 Ingenika Boat Launch Construction

This project is for the construction of a boat launch facility on the Ingenika Arm of Finlay Reach. As described in GMSWORKS-33 Ingenika Boat Launch Design above, this project has not been approved for implementation.

6.23 GMSWORKS-44 Finlay Bay Boat Launch Construction

This project is for the construction of the Finlay Bay boat ramp. As described in GMSWORKS-34 Finlay Bay Boat Launch Design above, this project has not been approved for implementation.

If future recreation demand proves that greater reservoir access is needed, then this ramp development may be reconsidered as per letter from the CWR dated April 3, 2012.

6.24 GMSWORKS-45 6 Mile Bay Boat Launch Construction

This project is for the construction of the 6 Mile Bay boat launch. As described in GMSWORKS-35 6 Mile Bay Boat Launch Design above, this project has not been approved for implementation.

If future recreation demand proves that greater reservoir access is needed, then this ramp development may be reconsidered as per letter from the CWR dated April 3, 2012.

6.25 GMSWORKS-46 Cut Thumb Bay Boat Launch Construction

This project is for the construction of the Cut Thumb Bay boat ramp. As described in GMSWORKS-36 Cut Thumb Bay Boat Launch Design above, this project has not been approved for implementation.

If future recreation demand proves that greater reservoir access is needed, then this ramp development may be reconsidered as per letter from the CWR dated April 3, 2012.

6.26 GMSWORKS-47 Mackenzie Landing Boat Launch Construction

As described in GMSWORKS-37 Mackenzie Landing Boat Launch Design above, the CWR approved the first design on April 3, 2012. Work commenced on the upland area, upper portions of the ramp, and procurement of the concrete ramp panels in spring 2013.

Following approval of the revised design for the lower ramp in November 2013, construction work on site started in March 2014, and was completed in May 2014. The construction team was able to take advantage of a natural ice coffer dam that arose during construction to complete the project under the approved budget.

Maintenance at Mackenzie Landing is completed under GMSWORKS-58 Mackenzie Landing Boat Launch Maintenance as described below.

This project is complete.

6.27 GMSWORKS-49 Dunlevy Boat Launch Construction

This project is for the construction of the boat launch at Dunlevy as designed under GMSWORKS-54 Dunlevy Boat Launch Design below. The Dunlevy location is on the east shore of the Dunlevy Inlet approximately 30 km northwest of Hudson's Hope. It is located within Butler Ridge Provincial Park.

Under Clause (j) of Final Water Licence 123021, BC Hydro is required to provide reservoir access at areas as directed by the Comptroller of Water Rights (CWR). Dunlevy was identified as a site for access as part of the WUP.

The current elevation of 660.9 m provides access to the ramp 99.8% of the time from June 15 to September 15 and 91.8% of the time from May 15 to October 31 based on historical records. In the letter dated December 21, 2017, the CWR accepted that the current toe elevation meets the requirements to provide access, at this time.

Maintenance for Dunlevy is completed under GMSWORKS-57 Dunlevy Boat Launch Maintenance described below.

This project is complete.

6.28 GMSWORKS-54 Dunlevy Boat Launch Design

This project was for the design phase of the boat launch at Dunlevy. Dunlevy is located on the east shore of the Dunlevy Inlet approximately 30 km northwest of Hudson's Hope, within Butler Ridge Provincial Park.

Under Clause (j) of Final Water Licence 123021, BC Hydro is required to provide reservoir access at areas as directed by the Comptroller of Water Rights (CWR). Dunlevy was identified as a site for access as part of the WUP.

The profile along the centerline of the existing boat ramp is comprised of two main gradients:

- From the top of the ramp towards the bottom of the ramp, the gradient is approximately 14% (1 in 7.2) between El. 674 m to El. 664 m; and
- From lake bed contour at El. 664 m, the gradient of the shoreline steepens sharply to 53.4% (1 in 1.9) to El. 631 m offshore.

While the upper portion of the ramp is at the preferred gradient for boat launch operations, the lower section of the ramp was too steep to function as a boat ramp without significant fill. As a result all design options in the 2013 report reviewed options at elevations El. 654 m plus options with higher elevations. The options with toe elevations below El. 664 m became increasingly more expensive, the lower the toe.

On July 16, 2013 the CWR accepted a design to elevation El. 658 m, and work proceeded to develop the design specifications and issue for construction drawings. The CWR approved construction as part of GMSWORKS-49.

Maintenance for Dunlevy is completed under GMSWORKS-57 Dunlevy Boat Launch Maintenance.

This project is complete.

6.29 GMSWORKS-57 Dunlevy Boat Launch Maintenance

The proposed scope for ongoing maintenance at Dunlevy is based on an inspection schedule and access-related maintenance consistent with other boat launches on BC Hydro reservoirs. Maintenance is completed during the spring shoulder, peak, and fall shoulder recreation periods (June 1 to October 31, inclusive). A TOR for maintenance was approved by the CWR on May 10, 2018. Williston Reservoir had lower water elevations than normal in 2018, causing a closure of Dunlvey for safety reasons until the water returned to an elevation suitable for use of the launch. Dunlevy was re-opened in time for the recreation season.

6.30 GMSWORKS-58 Mackenzie Landing Boat Launch Maintenance

The proposed scope for ongoing maintenance at Mackenzie is based on an inspection schedule and access-related maintenance consistent with other boat launches on BC Hydro reservoirs. Maintenance is completed during the spring shoulder, peak, and fall shoulder recreation periods (June 1 to October 31, inclusive). A TOR for maintenance was approved by the CWR on April 10, 2018.

6.31 GMSWORKS-59 Ingenika Boat Launch Maintenance

No maintenance is required at Ingenika as no ramp has been constructed as discussed in GMSWORKS-33 and 43 above.

6.32 GMSWORKS-60 Finlay Bay Boat Launch Maintenance

No maintenance is required for Finlay Bay, as no ramp upgrades have been constructed, as discussed in GMSWORKS-34 and 44 above.

6.33 GMSWORKS-61 6 Mile Bay Boat Launch Maintenance

No maintenance is required for 6 Mile Bay, as no ramp upgrades have been constructed, as mentioned in GMSWORKS-35 and 45 above.

6.34 GMSWORKS-62 Cut Thumb Bay Boat Launch Maintenance

No maintenance is required for Cut Thumb Bay, as no ramp upgrades have been constructed, as mentioned in GMSWORKS-36 and 46 above.

7 Monitoring Programs and Physical Works Costs

The following table summarizes the Williston Reservoir and Communications Management Plan WUP monitoring programs and physical works costs approved by the Comptroller and the Actual Costs to April 30, 2019.

Table 7-1: Williston Reservoir and Communications Management Plan WUP Monitoring Programs and Physical Works Costs

Monitoring Programs & Physical Works	Costs approved by CWR	Life to Date Actuals (LTD)	Estimated to Complete (Forecast)	Total Forecast (LTD and Forecast)	Variance Total to Approved	Explanation	Corrective Action
Peace River WUP Annual Report	$56,321	$46,419	$4,587	$51,005	$5,316		
GMSM15A WLL Wetland Habitat	$981,420	$718,788	$222,538	$941,326	$40,094	Efficiencies found during project implementation.	
GMSM15A WLL Wetland Habitat - OR DM	$157,922	$71,196	$26,567	$97,764	$60,158		
GMSM15A WLL Wetland Habitat - OR Imp	$823,498	$647,592	$195,971	$843,563	($20,065)		
GMSM16A WLL Debris Trends	$258,514	$238,771	$16,720	$255,491	$3,023		
GMSM16A WLL Debris Trends - OR DM	$31,686	$29,613	$4,222	$33,835	($2,149)		
GMSM16A WLL Debris Trends - OR Imp	$226,828	$209,158	$12,498	$221,655	$5,173		
GMSM17A WLL Tributary Habita	$1,467,158	$997,371	$140,618	$1,137,989	$329,169	Forecast reflects narrowed scope as per approved TOR resubmission	
GMSM17A WLL Tributary Habita - OR DM	$75,898	$106,196	$15,981	$122,177	($46,279)		
GMSM17A WLL Tributary Habita - OR Imp	$1,391,260	$891,175	$124,637	$1,015,812	$375,448		
GMSM18A WLL Dust Control	$5,806,148	$4,751,480	$221,254	$4,972,734	$833,414	Forecast reflects narrowed scope as per approved TOR resubmission	
GMSM18A WLL Dust Control - OR DM	$184,905	$107,953	$3,169	$111,122	$73,783		
GMSM18A WLL Dust Control - OR Imp	$5,621,243	$4,643,527	$218,086	$4,861,613	$759,630		
GMSM19A WLL Erosion Control	$0	$3,423		$3,423	($3,423)	Project not yet approved	
GMSM19A WLL Erosion Control - OR DM	$0	$3,423		$3,423	($3,423)		
GMSM19A WLL Erosion Control - OR Imp	$0				$0		
GMSM20A WLL Recreation Use	$384,270	$361,778	$16,016	$377,794	$6,476		
GMSM20A WLL Recreation Use - OR DM	$64,182	$52,567		$52,567	$11,615		
GMSM20A WLL Recreation Use - OR Imp	$320,088	$309,210	$16,016	$325,226	($5,138)		
GMSW14A WLL Air Photos & Dem	$2,804,180	$2,045,002		$2,045,002	$759,178	Forecast reflects cost savings associated with aerial photography method	
GMSW14A WLL Air Photos & Dem - OR DM	$30,295	$30,497		$30,497	($202)		
GMSW14A WLL Air Photos & Dem - OR Imp	$2,773,885	$2,014,504		$2,014,504	$759,381		
GMSW16A WLL Wetland Invent - OR	$143,076	$143,076		$143,076	$0	Project complete	
GMSW16A WLL Wetland Invent - OR DM	$12,656	$12,656		$12,656	$0		
GMSW16A WLL Wetland Invent - OR Imp	$130,420	$130,420		$130,420	$0		
GMSW17A WLL Trial Wetlands	$2,653,060	$2,081,898	$333,981	$2,415,879	$237,181	Forecast reflects maintenance costs as per approved TOR resubmission	
GMSW17A WLL Trial Wetlands - OR DM	$60,399	$43,409	$8,766	$52,176	$8,223		
GMSW17A WLL Trial Wetlands - OR Imp	$2,592,661	$2,038,489	$325,215	$2,363,704	$228,957		
GMSW18A WLL Debris Field - OR	$342,368	$342,368		$342,368	$0	Project complete	
GMSW18A WLL Debris Field - OR DM	$20,735	$18,417		$18,417	$2,318		
GMSW18A WLL Debris Field - OR Imp	$321,633	$323,951		$323,951	($2,318)		
GMSW19A WLL Trial Tributar	$2,552,026	$2,064,431	$414,472	$2,478,903	$73,123	Forecast reflects maintenance costs as per approved TOR resubmission	
GMSW19A WLL Trial Tributar - OR DM	$40,649	$50,315	$7,904	$58,219	($17,570)		
GMSW19A WLL Trial Tributar - OR Imp	$2,511,377	$2,014,117	$406,568	$2,420,684	$90,693		
GMSW20A Dust Source Survey	$733,672	$714,406		$714,406	$19,266	Project complete	
GMSW20A Dust Source Survey - OR DM	$35,587	$37,537		$37,537	($1,950)		
GMSW20A Dust Source Survey - OR Imp	$698,085	$676,869		$676,869	$21,216		
GMSW21A WLL Dust CtrlTrial	$3,361,598	$2,981,518		$2,981,518	$380,080	Efficiencies found during project implementation.	
GMSW21A WLL Dust CtrlTrial - OR DM	$140,246	$121,916		$121,916	$18,330		
GMSW21A WLL Dust CtrlTrial - OR Imp	$3,221,352	$2,859,602		$2,859,602	$361,750		
GMSW22A WLL Debris Removal - ONR	$5,470,099	$5,023,081	$351,957	$5,375,038	$95,061	Efficiencies found during project implementation.	
GMSW22A WLL Debris Removal - ONR DM	$75,919	$123,681	$17,957	$141,638	($65,719)		
GMSW22A WLL Debris Removal - ONR Imp	$5,394,180	$4,899,401	$334,000	$5,233,401	$160,779		
GMSW22A WLL Debris Removal - OR	$5,470,099	$5,012,001	$352,107	$5,364,108	$105,991	Efficiencies found during project implementation.	
GMSW22A WLL Debris Removal - OR DM	$75,919	$114,920	$18,107	$133,026	($57,107)		
GMSW22A WLL Debris Removal - OR Imp	$5,394,180	$4,897,081	$334,000	$5,231,081	$163,099		
GMSW23A Erosion Ctrl Trial	$0	$106		$106	($106)	Project not yet approved	
GMSW23A Erosion Ctrl Trial - OR DM	$0	$106		$106	($106)		
GMSW23A Erosion Ctrl Trial - OR Imp	$0				$0		
GMSW24A WLL Boat Access	$891,306	$212,865		$212,865	$678,441	Project complete	
GMSW24A WLL Boat Access - OR DM	$427,592	$42,110		$42,110	$385,482		
GMSW24A WLL Boat Access - OR Imp	$463,714	$170,755		$170,755	$292,959		
GMSW25A WLL Bathymetric Ma	$1,379,386	$1,379,386		$1,379,386	$0	Project complete	
GMSW25A WLL Bathymetric Ma - OR DM	$50,979	$50,979		$50,979			
GMSW25A WLL Bathymetric Ma - OR Imp	$1,328,407	$1,328,407		$1,328,407			

* Red values in parentheses denote overage.

Monitoring Programs & Physical Works	Costs approved by CWR	Life to Date Actuals (LTD)	Estimated to Complete (Forecast)	Total Forecast (LTD and Forecast)	Variance Total to Approved	Explanation	Corrective Action
GMSW26A WLL Comm Safety	$1,610,081	$938,512	$450,650	$1,389,163	$220,918	Forecast reflects maintenance costs as per approved TOR resubmission	
GMSW26A WLL Comm Safety - OR DM	$425,173	$133,409	$3,535	$136,943	$288,230		
GMSW26A WLL Comm Safety-OR Imp	$1,184,908	$805,104	$447,116	$1,252,219	($67,311)		
GMSW27A WLL Finlay River A	$82,146	$73,699		$73,699	$8,447	Project complete	
GMSW27A WLL Finlay River A - OR DM	$21,284	$12,198		$12,198	$9,086		
GMSW27A WLL Finlay River A - OR Imp	$60,862	$61,501		$61,501	($639)		
GMSW28A Industry Feasibili	$1,594,520	$1,103,671		$1,103,671	$490,849	Efficiencies found during project implementation.	
GMSW28A Industry Feasibili - OR DM	$114,520	$147,208		$147,208	($32,688)		
GMSW28A Industry Feasibili - OR Imp	$1,480,000	$956,463		$956,463	$523,537		
GMSW31A Kwadacha	$354,136	$134,996	$12,000	$146,996	$207,140		
GMSW31A Kwadacha - ONR DM	$165,469	$12,291		$12,291	$153,178		
GMSW31A Kwadacha - ONR Imp	$188,667	$122,705	$12,000	$134,705	$53,962		
GMSW33A BRD Ingenika	$0	$63,477	$540,000	$603,477	($603,477)	Project deferred. Costs associated with design prior to deferral.	
GMSW33A BRD Ingenika - ONR DM	$0	$5,479		$5,479	($5,479)		
GMSW33A BRD Ingenika - ONR Imp	$0	$57,998	$540,000	$597,998	($597,998)		
GMSW34A BRD Finlay Bay	$0	$62,736		$62,736	($62,736)	Project deferred. Costs associated with design prior to deferral.	
GMSW34A BRD Finlay Bay - ONR DM	$0	$5,854		$5,854	($5,854)		
GMSW34A BRD Finlay Bay - ONR Imp	$0	$56,882		$56,882	($56,882)		
GMSW35A BRD Six Mile Bay	$0	$55,535		$55,535	($55,535)	Project deferred. Costs associated with design prior to deferral.	
GMSW35A BRD Six Mile Bay - ONR DM	$0	$4,666		$4,666	($4,666)		
GMSW35A BRD Six Mile Bay - ONR Imp	$0	$50,869		$50,869	($50,869)		
GMSW36A BRD Cut Thumb Bay	$0	$59,186		$59,186	($59,186)	Project deferred. Costs associated with design prior to deferral.	
GMSW36A BRD Cut Thumb Bay - ONR DM	$0	$6,193		$6,193	($6,193)		
GMSW36A BRD Cut Thumb Bay - ONR Imp	$0	$52,993		$52,993	($52,993)		
GMSW37A BRD Mackenzie Landing	$743,878	$533,565		$533,565	$210,313	Project complete	
GMSW37A BRD Mackenzie Landing - ONR DM	$24,396	$17,142		$17,142	$7,254		
GMSW37A BRD Mackenzie Landing - ONR Imp	$719,482	$516,422		$516,422	$203,060		
GMSW43A BRC Ingenika	$0	$113	$4,262,282	$4,262,395	($4,262,395)	Project deferred. Costs associated with design prior to deferral.	
GMSW43A BRC Ingenika - ONR DM	$0	$113	$2,282	$2,395	($2,395)		
GMSW43A BRC Ingenika - ONR Imp	$0		$4,260,000	$4,260,000	($4,260,000)		
GMSW44A BRC Finlay Bay	$0	$113		$113	($113)	Project deferred. Costs associated with design prior to deferral.	
GMSW44A BRC Finlay Bay - ONR DM	$0	$113		$113	($113)		
GMSW44A BRC Finlay Bay - ONR Imp	$0				$0		
GMSW45A BRC Six Mile Bay	$0			$0	$0	Project deferred.	
GMSW45A BRC Six Mile Bay - ONR DM	$0				$0		
GMSW45A BRC Six Mile Bay - ONR Imp	$0				$0		
GMSW46A BRC Cut Thumb Bay	$0	$113		$113	($113)	Project deferred. Costs associated with design prior to deferral.	
GMSW46A BRC Cut Thumb Bay - ONR DM	$0	$113		$113	($113)		
GMSW46A BRC Cut Thumb Bay - ONR Imp	$0				$0		
GMSW47A BRC Mackenzie Landing	$4,242,756	$2,566,702		$2,566,702	$1,676,054	Project complete. TOR included costs for in-water construction, which was not required.	
GMSW47A BRC Mackenzie Landing - ONR DM	$55,854	$49,021		$49,021	$6,833		
GMSW47A BRC Mackenzie Landing - ONR Imp	$4,186,902	$2,517,681		$2,517,681	$1,669,221		
GMSW49A BRC Dunlevy	$5,065,450	$4,579,942		$4,579,942	$485,508	Project complete	
GMSW49A BRC Dunlevy - ONR DM	$15,000	$18,542		$18,542	($3,542)		
GMSW49A BRC Dunlevy - ONR Imp	$5,050,450	$4,561,401		$4,561,401	$489,049		
GMSW54A BRD Dunlevy	$1,247,610	$903,425		$903,425	$344,185	Project complete	
GMSW54A BRD Dunlevy - ONR DM	$46,765	$29,283		$29,283	$17,482		
GMSW54A BRD Dunlevy - ONR Imp	$1,200,845	$874,143		$874,143	$326,702		
GMSW57A Dunlevy Maintenance	$332,541	$134,955	$96,733	$231,688	$100,853	Forecast reflects maintenance costs as per approved TOR resubmission	
GMSW57A Dunlevy Maintenance - ONR DM	$29,953	$15,971	$6,389	$22,360	$7,593		
GMSW57A Dunlevy Maintenance - ONR Imp	$302,588	$118,984	$90,344	$209,328	$93,260		
GMSW58A Mackenzie Maintenance	$414,477	$38,792	$118,008	$156,800	$257,678	Forecast includes contingency for structural maintenance	
GMSW58A Mackenzie Maintenance - ONR DM	$29,694	$14,646	$19,888	$34,534	($4,840)		
GMSW58A Mackenzie Maintenance - ONR Imp	$384,783	$24,145	$98,120	$122,265	$262,518		
GMSW59A Ingenika Maintenance	$0			$0	$0	Project not yet approved	
GMSW59A Ingenika Maintenance - ONR DM	$0				$0		
GMSW59A Ingenika Maintenance - ONR Imp	$0				$0		
GMSW60A Finlay Maintenance	$0			$0	$0	Project not yet approved	
GMSW60A Finlay Maintenance - ONR DM	$0				$0		
GMSW60A Finlay Maintenance - ONR Imp	$0				$0		
GMSW61A 6 Mile Maintenance	$0			$0	$0	Project not yet approved	
GMSW61A 6 Mile Maintenance - ONR DM	$0				$0		
GMSW61A 6 Mile Maintenance - ONR Imp	$0				$0		
GMSW62A CutThumb Maintenance	$0			$0	$0	Project not yet approved	
GMSW62A CutThumb Maintenance - ONR DM	$0				$0		
GMSW62A CutThumb Maintenance - ONR Imp	$0				$0		

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.