

Manitoba Hydro Churchill River Diversion Licence Implementation Guide

Prepared for:

Manitoba Environment, Climate and Parks
1007 Century Street
Winnipeg, Manitoba R3M 0W4

Prepared by:

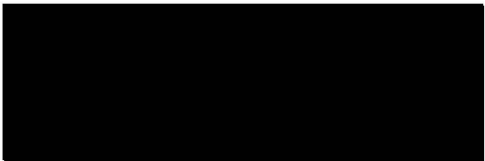
Waterway Approvals and Monitoring Department
Manitoba Hydro
360 Portage Avenue
Winnipeg, Manitoba R3C 0G8

May 2022

Manitoba Hydro
Churchill River Diversion
Licence Implementation Guide



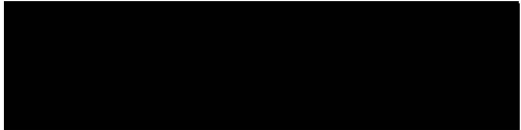
PREPARED BY:



REVIEWED BY:



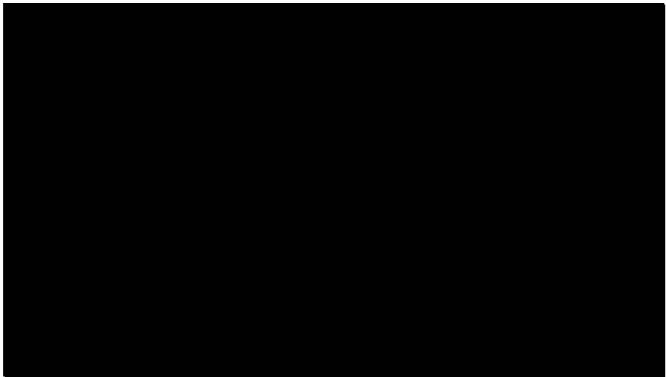
NOTED BY:



W.V. PENNER

DATE:

2022-05-10



Executive Summary

Introduction

Manitoba Hydro prepared this guideline to document a common understanding of compliance with the Churchill River Diversion licences. Environment Act Licence No. 2327 for the construction and operation of the Churchill Weir and the Water Power Act Final Licence for the Churchill River Diversion specify operating limits and other requirements that must be met for compliance with the licences. As such, this document sets out the mutually understood and agreed to:

- 1) Methodology to be used for determining critical water levels and flows;
- 2) Definition of licence compliance; and
- 3) Protocol for reporting.

Southern Indian Lake

Data from four water level gauges are used to determine the Southern Indian Lake water level. A set of averaging and weighting techniques are employed to remove the effects of wind and waves.

Notigi Control Structure

The total outflow from the Notigi control structure is calculated using a number of equations that take into account the elevation of the forebay, number of spillway gates open, and their level of operation.

Missi Falls Control Structure

The total outflow from Missi Falls control structure is calculated using a number of equations that take into account the elevation of the forebay, house unit flow, number of spillway gates open, and their level of operation.

Thompson

Water level gauges 05TG001 and 05TG702 at two locations near Thompson are used to ensure that licence limits are not exceeded.

Churchill Weir

Data from a water level gauge 06FD706 at the CR30 Pumping Station 10 km upstream of the weir is used for compliance according to the Environmental Act Licence.

Compliance

Compliance with the operating limits of the Churchill River Diversion Licences will be measured against hydraulic parameters specific to each portion of the project area as follows:

- Southern Indian Lake compliance with the Water Power Act Licence will be measured using a wind-eliminated water level.
- Notigi Control Structure compliance with the Water Power Act Licence will be measured against the weekly average outflow, the daily outflow rate of change and the daily average forebay water level.
- Missi Falls Control Structure compliance with the Water Power Act Licence will be measured against the daily outflow rate of change and daily average outflow.
- Missi Falls Control Structure compliance with the Environmental Act Licence will be measured against the daily average outflow.
- Thompson compliance with the Water Power Act Licence will be measured against daily average water levels recorded at two gauge locations near Thompson.
- Churchill Weir compliance with the Environmental Act Licence will be measured against the daily average water level as measured at the CR30 Pumphouse near Churchill, MB.

Reporting

In the event that the water levels, flows, or flow rates of change are not in compliance with the licence limits, Manitoba Hydro will notify Manitoba Environment, Climate and Parks within one week of the incident. A follow-up report on causes contributing to the event and changes to operations, if any are needed to prevent such an event in the future, will be provided to Manitoba Environment, Climate and Parks. A record of water levels and licence compliance will also be provided in the Annual Water Levels and Flows Compliance Report.

Ongoing and Other Requirements

The Water Power Act Final Licence and the associated cover letter from Manitoba specify a number of ongoing and other requirements that are not directly related to the day to day operation of the Churchill River Diversion. Manitoba Hydro will participate in and report on these additional requirements as directed.

Change Management

Proposed revisions to this Guide will be drafted by Manitoba Hydro as required or directed by Manitoba Environment, Climate and Parks. Following review and approval of revisions by Manitoba Environment, Climate and Parks, a revised copy of this Guide will be produced and distributed by Manitoba Hydro.

Contents

Executive Summary	1
1. Introduction	5
1.1 Definitions	6
1.2 Quality Control.....	7
1.2.1 Benchmarks.....	8
1.2.2 Direct Water Level Measurements	8
1.2.3 Gauge Readings	8
1.3 Quality Assurance Procedure for Water Level Data.....	8
2. Southern Indian Lake	10
2.1 Wind-Eliminated Water Level Calculation Procedure	10
3. Notigi Control Structure	12
3.1 Weekly Average Outflow Calculation Procedure	12
3.2 Rate of Change Calculation Procedure	13
3.3 Notigi Control Structure Forebay Level	13
4. Missi Falls Control Structure	14
4.1 Daily Average Outflow Calculation Procedure	14
4.2 Rate of Change Calculation Procedure	14
5. Thompson	16
5.1 Daily Average Water Level Calculation Procedure.....	16
6. Churchill Weir	17
6.1 Daily Average Water Level Calculation Procedure.....	17
7. Compliance	18
7.1 Southern Indian Lake.....	18
7.1.1 Licensing Requirements	18
7.2 Notigi Control Structure	20
7.2.1 Licensing Requirements	20
7.3 Missi Falls Control Structure.....	21
7.3.1 Licensing Requirements	21
7.4 Churchill Weir	23
7.4.1 Licensing Requirements	23
7.5 Reporting.....	24
7.5.1 Compliance Reporting.....	24
7.5.2 Maintenance and Emergencies.....	24
7.5.3 Regular Monthly Reporting.....	24
7.5.4 Regular Annual Reporting.....	25
8. Ongoing and Other Requirements	26

8.1 System-Wide Monitoring Program	26
8.2 Public Safety and Debris Management Program	27
8.3 Indigenous Engagement Report.....	28
8.4 Shoreline Erosion.....	29
8.5 Large Area Planning, Studies, and other Initiatives	29
8.6 Licence Modernization Processes	30
8.7 Environmental Studies.....	30
9. Change Management	31
Appendix A: Churchill River Diversion Site Map.....	32
Appendix B: Water Level Gauge Locations and Description Sheets	34

1. Introduction

The Churchill River Diversion (CRD) improves downstream hydropower generation by transferring the majority of water flow from the Churchill River to the Nelson River via the Rat River and the Burntwood River. The CRD began operation in 1977 and since that time several mitigation measures have also been implemented.

More particularly, the CRD project consists of the following components which are shown on the CRD site map provided in Appendix A:

- The Missi Falls Control Structure regulates the amount of water allowed to pass down the Churchill River and consists of six spillway bays as well as earth dams and dykes. The control structure is capable of discharging 3,200 m³/s (113,000 ft³/s) at a forebay level of 258.32 m (847.5 ft). Major components include the spillway control structure, south channel dam, north channel dam, main dam, and south dyke. The site is located in 13-96-5 WPM at the Southern Indian Lake outlet into the Churchill River. Electrical power required for the operation of this control structure is supplied by the house unit authorized under the Missi Falls Site Water Power Act licence.
- The South Bay Diversion Channel diverts water from the South Bay of Southern Indian Lake to Issett Lake. The channel is approximately 61 m wide at its base and 9.3 km long.
- The Notigi Control Structure regulates the amount of water diverted to the Nelson River. Major components consist of the spillway with three bays, an adjacent electrical service substation building, main dam and a saddle dam. The control structure is capable of discharging 1,869 m³/s (66,000 ft³/s) at a forebay elevation of 258.32 m (847.5 ft). The structure is located on the Rat River between Notigi Lake and Wapisu Lake in 19-79-12 WPM.
- The Manasan Falls Ice Control Structure is a passive control structure designed to reduce the risk of inundation due to ice in the City of Thompson. The project consists of an ice boom across the river upstream of a groin/gap structure, a by-pass channel with a concrete overflow weir and a flood channel protected with a fuse plug. The project is located in 36-77-4 WPM on the Burntwood River and was constructed in three stages between 1975 and 1988.
- The Churchill Weir is a mitigation measure constructed in 1999 to increase water levels on the Churchill River to ensure a potable water source and to enhance recreation and aquatic habitat. The structure was built 10 km south of the Town of Churchill, just upstream of Mosquito Point. The structure consists of an overflow section and two dyke sections. The overflow section is 2,300 m long with a 300 m

fishway segment at the lowest point of the weir. The west dyke is 140 m long and the east dyke is 1,170 m long. Incorporated into the east dyke are the Goose Creek fishway and an emergency flood relief section.

Manitoba Hydro obtained a Water Power Act Final Licence for the Churchill River Diversion in 2021 and it specifies operating limits and other requirements that must be met for compliance with the licence. As the Churchill Weir was constructed after 1987, when the Manitoba Environment Act was introduced, it required an Environment Act Licence for construction and operation. Environment Act Licence No. 2327 specifies additional operating limits that must be met for compliance with the licence.

1.1 Definitions

For the purposes of this guide, unless the context otherwise requires, the following terms shall have the respective meanings set out below and grammatical variations of such terms shall have corresponding meanings:

ASL means above sea level.

Controlling Benchmarks means:

- a) For elevations at the **Southern Indian Lake Gauges** and the Notigi forebay:
BM No. 2 – Brass cap in bedrock 1.5 m north and 3.4 m of the northeast corner of Manitoba Government Air Service Dock. CRD Construction Datum, 1973 Revision.
Note: BM No. 2 was inundated in 1976 with the raising of Southern Indian Lake. In 1981 the Surveys and Mapping Section of Manitoba Hydro located the submerged benchmark and using precise levelling methods, established an elevation on a brass cap, BM No. 8, on a nearby island. The description of BM No. 8 is as follows:
BM No. 8 – Brass cap in bedrock, 20 m northwest of recorder shelter, marked with a steel flag. CRD Construction Datum, 1973 Revision.
- b) For elevations at the **Thompson Gauges**:
89MH311 – Brass cap in bedrock on the right bank of the Burntwood River on the upstream side of the Thompson Bridge 8.7 metres North-West of the bridge approximately halfway between abutment and first pier. Elevation established by second-order levelling from Geodetic survey of Canada brass Cap BM 69M501 in September 1989.
- c) For elevations at the **Churchill Weir Gauge**:

546D – Canadian National Railway, iron pipe with brass cap, 3.2 km north of north switch and at third pole north of mile post 504 from The Pas, 5.5 m west of a blazed tree in an isolated clump of five spruce trees 21.3 m east of track, covered with a mound of moss and marked by a wooden tripod and concrete plaque. Geodetic Survey of Canada, 1978 Local Adjustment.

Churchill Weir Gauge means water level gauge 06FD706 established near the Churchill Weir for the purposes of collecting data used in determining the average daily water level at the CR30 Pumphouse.

Missi Falls Daily Average Outflow means the average outflow over a calendar day at the Missi Falls Control Structure; and

Missi Falls Outflow Rate of Change means the rate in change in outflow from one calendar day to the next at the Missi Falls Control Structure;

Notigi Average Weekly Outflow means the arithmetic mean of all hourly outflows recorded at the Notigi Control Structure for a calendar week (Monday to Sunday);

Notigi Outflow Rate of Change means the rate in change in outflow from one calendar day to the next at the Notigi Control Structure;

Southern Indian Lake Gauges means the water level gauges established on Southern Indian Lake for the purpose of collecting data used in calculating the **Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated)**;

Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated) means the average water level on Southern Indian Lake averaged over a seven day period to eliminate wind and wave effects;

Thompson Gauges means water level gauges 05TG001 and 05TG702 established near Thompson, MB for the purposes of collecting data used in determining the average daily water level at the Thompson Pumphouse and Thompson Seaplane Base.

1.2 Quality Control

Water Survey of Canada (WSC) operates and maintains each of their gauges according to the National Hydrometric Program (NHP) with a Quality Assurance Management System

(QAMS), which is in compliance with the international standard ISO 9001:2000. As a contributor, Manitoba Hydro, operates and analyses data according to the NHP processes and procedures.

1.2.1 Benchmarks

Vertical control surveys have been performed from **Controlling Benchmarks** to establish appropriate local benchmarks at hydrometric gauging stations.

1.2.2 Direct Water Level Measurements

Field staff will visit the **Southern Indian Lake Gauges, Thompson Gauges, and Churchill Weir Gauge** bi-monthly and as necessary to maintain gauge performance. Direct water level measurements are taken during these visits and compared to the level indicated by the water level sensor. Direct water level measurements for water bodies are typically accurate to within 3 mm.

1.2.3 Gauge Readings

WSC and Manitoba Hydro use pressure sensors to determine water levels at their existing hydrometric gauging stations. The error in the reading provided by the pressure sensor is about 5 to 7.5 mm depending on the type of sensor used. If the technician visiting the site determines that the sensor reading is more than 10 mm different from the direct water level measured in accordance with Subsection 1.2.2, the logger is reset to the direct water level measurement. If the sensor reading is less than 10 mm different from the direct water level measured in accordance with Subsection 1.2.2, no change is made to the logger.

The forebay level at Notigi is calculated by Manitoba Hydro from the absolute position of the float in the stilling well. The float is connected to a pulley which through a transducer transmits the level signal to a digital readout. This value is sent to an Energy Management System (EMS/SCADA) via a Remote Terminal Unit (RTU) which is then passed on to a data collection software (PI) and imported in a hydrometric database (HyDams/WISKI). A site map showing the location of the gauge is shown in Appendix B.

1.3 Quality Assurance Procedure for Water Level Data

Gauge Data

Water level data exists in three degrees of quality assurance – raw, provisional and final.

Raw data is real-time data that has been transmitted from the field. The only level of quality assurance is that built into the data collection system, described in Section 1.2. This level of data is used in the daily operation of the CRD.

Provisional data is data processed by a qualified data assurance technician who reviews the field data and corrects obvious errors. The data is compared to all available relevant data in the area to verify its accuracy.

Final data has been through two levels of review by qualified technicians and a final review by a professional engineer. This data is considered publishable and has met the quality assurance standards of the National Hydrometric Program of Environment Canada. This data will be used for annual reporting described in Subsection 7.5.4 of this guide.

Control Structure Data

Missi Falls and Notigi Control Structure gate settings, consisting of the number of spillway bays open and their level of operation, are provided by Manitoba Hydro's Energy Supply Planning Department. Field staff then travel to site to manually adjust the gate settings based on visual readings of gate openings from a scale fixed to each of the spillway bays. Forebay water level data is also transmitted to Energy Supply Planning, where it is corrected for outlying data by comparing other nearby gauge data as required. Once verified, the forebay data is combined with the Control Structure gate settings to calculate outflow.

2. Southern Indian Lake

Water Survey of Canada water level gauging sites at various locations on Southern Indian Lake are used for calculating the lake's elevation. Data is recorded at each of the following stations using data loggers with pressure transducers:

- 06EC001 - Southern Indian Lake elevations at South Indian Lake - The station is located on the west side of a small island south-west of the South Indian Lake community
- 06EC003 - Southern Indian Lake elevations at South Bay - The station is located in the south-west corner of South Bay near the mouth of the diversion channel
- 06EC006 - Southern Indian Lake elevations at Missi Falls - The station is located approximately 2 kilometres to the south-west of Missi Control Structure at the south end of the rock quarry and the north side of the old construction camp site
- 06EC007 - Southern Indian Lake Near Opachuanau Lake - The station is located in the south-west corner of Southern Indian Lake close to Opachuanau Lake

The elevations from the above locations are used to calculate a 7-day moving mean to determine the wind-effect eliminated water level on Southern Indian Lake. Site maps showing the locations of the four water level gauging sites are provided in Appendix B.

2.1 Wind-Eliminated Water Level Calculation Procedure

The Water Power Act Licence places limits on Southern Indian Lake water levels. Southern Indian Lake water levels will be influenced by the operations of the Notigi Control Structure and Missi Falls Control Structure. Water levels will also be affected by local meteorological events and non-project hydraulic effects. Significant local weather impacts can result from heavy precipitation, the movement of high and low pressure cells and release of water caused by changing ice conditions and rapid spring runoff. To properly evaluate the wind-eliminated water level, averaging techniques are used to remove these effects. Small, short-term weather and hydraulic events can be averaged out using multiple gauges and a daily average water level. Larger, long-term events require a longer duration averaging technique. For Southern Indian Lake, a seven-day centred moving mean is applied.

In order to ensure that the Licensee's operations remain within the constraints of its licence, compliance will be measured against the **Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated)**.

The first step is to calculate the average Southern Indian Lake hourly water level (ASHWL), which is the weighted average of the individual hourly gauge data measured at the top of the hour (HWL), averaged over a period of 73 hours (± 36 hours) to remove short term weather and hydraulic effects. Weights are currently equal between the four gauges. Average Southern Indian Lake Hourly Water Level is represented by equation 1.

$$ASHWL_j = \sum_{g=1}^4 W_g \left(\sum_{k=-36}^{36} HWL_{g,k} / 73 \right) / 4 \quad [1]$$

Where

$ASHWL_j$ = Average Southern Indian Lake Hourly Water Level

$HWL_{g,k}$ = Hourly water level at gauge, g , at time, k

W_g = Southern Indian Lake gauge, g , weighting factor

and

$$\sum_{g=1}^4 W_g = 1$$

The Southern Indian Lake daily average water level will be calculated as the arithmetic mean of the Average Hourly Water Levels as shown in equation 2.

$$ASDWL_l = \frac{\sum_{j=1}^m ASHWL_j}{m} \quad [2]$$

Where

$ASDWL$ = Average Daily Southern Indian Lake Water Level for day l

m = the number of available hourly readings for the calendar day

A centred seven-day moving mean as shown in equation 3, will be applied to the Southern Indian Lake Daily Average Water Level to produce the **Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated)**.

$$SWEWL_l = \frac{ASDWL_{l-3} + ASDWL_{l-2} + ASDWL_{l-1} + ASDWL_l + ASDWL_{l+1} + ASDWL_{l+2} + ASDWL_{l+3}}{7} \quad [3]$$

Where

$SWEWL_l$ = Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated) for day l

3. Notigi Control Structure

The Notigi Control Structure is not normally staffed, with personnel from Thompson traveling to operate the gates as required. The total outflow from Notigi is calculated using a number of equations that take into account the elevation of the forebay, number of spillway gates open, and their level of operation.

The Notigi Control Structure hydraulic parameters will be influenced by water levels on Southern Indian Lake, operations at Missi Falls Control Structure, operations at the Notigi Control Structure, local meteorological events and non-project hydraulic effects. Significant local weather impacts can result from heavy precipitation, the movement of high and low pressure cells and large wind effects. Non-project hydraulic impacts may result from upstream storage, release of water caused by changing ice conditions and rapid spring runoff.

3.1 Weekly Average Outflow Calculation Procedure

The Water Power Act Licence limits the maximum average weekly outflow at the Notigi Control Structure. The daily average outflow is calculated from all available hourly readings as follows

$$NDQ_i = \frac{\sum_{j=1}^n NHQ_j}{n} \quad [4]$$

Where

NDQ_i = Notigi Daily Average Outflow at CS on day i

NHQ_j = Notigi Hourly Outflow for hour j

n = the number of available hourly readings for that day

The weekly average outflow is reported for a calendar week ending Sunday. **Notigi Average Weekly Outflow** is calculated as follows

$$NWQ = \frac{\sum_{i=1}^7 NDQ_i}{7} \quad [5]$$

Where

NWQ = Notigi Average Weekly Outflow at CS for the week ending Sunday

3.2 Rate of Change Calculation Procedure

The Water Power Act Licence also restricts the rate of change in outflow through the Notigi Control Structure from one calendar day to the next. In order to ensure that the Licensee's operations remain within the constraints of its licence, compliance will be measured against the **Notigi Outflow Rate of Change** as calculated below.

$$NROC_i = NDQ_i - NDQ_{i-1} \quad [6]$$

Where

$NROC_i$ = Notigi Outflow Rate of Change on day i

NDQ_i = Notigi Daily Average Outflow at CS on day i

3.3 Notigi Control Structure Forebay Level

The Water Power Act Licence restricts the forebay water level of the Notigi Control Structure. In order to ensure that the Licensee's operations remain within the constraints of its licence, compliance will be measured against the **Daily Average Notigi Forebay Water Level** and will be calculated as shown below.

$$DNWL_i = \frac{\sum_{j=1}^m HNWL_j}{m} \quad [7]$$

Where

$DNWL_i$ = Daily Average Notigi Forebay Water Level for day i

$HNWL_j$ = Measured Hourly Notigi Forebay Water Level for hour j

m = the number of available hourly readings for the calendar day

4. Missi Falls Control Structure

The Missi Falls Control Structure is not normally staffed, with personnel travelling by air to operate the gates as required. In consideration of other waterway users and to ensure their safety, a reconnaissance of the area downstream is completed prior to major flow changes. The total outflow from Missi is calculated using a number of equations that take into account the upstream elevation (taken from SIL gauge 06EC006), house unit flow, number of spillway gates open, and their level of operation.

The Missi Falls Control Structure hydraulic parameters will be influenced by water levels on Southern Indian Lake, operations at Missi Falls CS, operations at the Notigi CS, local meteorological events and non-project hydraulic effects. Significant local weather impacts can result from heavy precipitation, the movement of high and low pressure cells and large wind effects. Non-project hydraulic impacts may result from upstream storage and release of water caused by changing ice conditions and rapid spring runoff.

4.1 Daily Average Outflow Calculation Procedure

The Water Power Act Licence and Environmental Act Licence 2327 require a minimum daily average outflow through the Missi Falls Control Structure. In order to ensure that the Licensee's operations remain within the constraints of its licences, compliance will be measured against the **Missi Falls Daily Average Outflow** as calculated below.

$$MDQ_i = \frac{\sum_{j=1}^m MHQ_j}{m} \quad [8]$$

Where

MDQ_i = Missi Falls Daily Average Outflow for day i

MHQ_j = Missi Falls Hourly Outflow for hour j

m = the number of available hourly readings for the calendar day

4.2 Rate of Change Calculation Procedure

The Water Power Act Licence restricts the rate of change in outflow through the Missi Falls Control Structure from one calendar day to the next. In order to ensure that the Licensee's operations remain within the constraints of its Licence, compliance will be measured against the **Missi Falls Outflow Rate of Change** as calculated below.

$$MROC_i = MDQ_i - MDQ_{i-1} \quad [9]$$

Where

$MROC_i$ = Missi Falls Outflow Rate of Change on day i

MDQ_i = Missi Falls Daily Average Outflow for day i

5. Thompson

Thompson Pumphouse

The Water Survey of Canada water level gauge (05TG001) is located in a shelter near the Thompson Pumphouse. Records are obtained by using a data logger with a pressure transducer. A detailed gauge description is included in Appendix B.

Seaplane Base

The Manitoba Hydro water level gauge (05TG702) is located in a shelter at the Thompson seaplane base downstream of Miles Hart Bridge. Records are obtained by a data logger with a pressure transducer. A detailed gauge description is included in Appendix B.

5.1 Daily Average Water Level Calculation Procedure

The Water Power Act Licence places limits on water levels in Thompson on the Burntwood River. In order to ensure that the Licensee's operations remain within the constraints of its licence, compliance will be measured against the daily average water levels at the **Thompson Gauges** which will be calculated as follows.

$$TDWL = \frac{\sum_{j=1}^n TWL_j}{n} \quad [10]$$

Where

$TDWL$ = Thompson Pumphouse Daily Average Water Level

TWL = Thompson Pumphouse Continuous (e.g. 5 minute) Water Level

n = the number of available readings for the calendar day

$$SDWL = \frac{\sum_{j=1}^n SWL_j}{n} \quad [11]$$

Where

$SDWL$ = Seaplane Base Daily Average Water Level

SWL = Seaplane Base Continuous (e.g. 5 minute) Water Level

n = the number of available readings for the calendar day

6. Churchill Weir

CR30 Pumphouse

The Manitoba Hydro water level gauge (06FD706) is located in a shelter on the ring dyke surrounding CR30 Pumphouse. Records are obtained by using a data logger with a pressure transducer. A detailed gauge description is included in Appendix B.

6.1 Daily Average Water Level Calculation Procedure

Environmental Licence 2327 places a limit on the minimum water level measured at the CR30 Pumphouse. In order to ensure that the Licensee's operations remain within the constraints of its licence, compliance will be measured against the daily average water levels at the **Churchill Weir Gauge** which will be calculated as follows.

$$CDWL = \frac{\sum_{j=1}^n CWL_j}{n} \quad [12]$$

Where

CDWL = Churchill Weir Daily Average Water Level

CWL = Churchill Weir Continuous (e.g. 5 minute) Water Level

n = the number of available readings for that calendar day

7. Compliance

The following section specifies operating limits and reporting requirements that must be met for compliance with the Water Power Act Final Licence and Environment Act Licence No. 2327. In accordance with Section 7.2 of the Water Power Act Licence all water levels limits referred to in this document shall be understood to have wind and wave effects eliminated. In the event that the Licensee is requested by authorities to operate the structures for an emergency in such a way that causes a temporary exceedance of the licence limits, this event will not be considered a violation. Licence compliance is reported to Manitoba Environment, Climate and Parks as outlined in Section 7.5 below.

7.1 Southern Indian Lake

7.1.1 Licensing Requirements

Maximum Water Level

Section 3.2 of the Water Power Act Licence stipulates that:

“Subject to Section 3.4 of this Final Licence, and except as may be otherwise authorized by the Minister, the Licensee shall, during periods when the water level of Southern Indian Lake is above elevation 258.32 metres (847.5 feet) ASL, operate the Missi Falls and Notigi Control Structures in such a manner as to effect the maximum discharge possible under the circumstances then prevailing until the water level of Southern Indian Lake recedes to elevation 258.32 metres (847.5 feet) ASL.”

Compliance

The Southern Indian Lake water level shall be in compliance with the upper limit described above if:

1. The **Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated)** does not exceed 258.32 metres (847.5 feet) ASL, or
2. The **Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated)** exceeds 258.32 metres (847.5 feet) ASL but Missi Falls Control Structure outflow is increased in order to return the lake to elevation 258.32 metres (847.5 feet) ASL.

As the **Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated)** approaches 258.32 m (847.5 ft), Manitoba Hydro attempts to proactively increase Missi Falls discharge. Missi Falls flow increases consider Manitoba Hydro’s state of

the art physically based inflow forecasts and potential downstream impacts to the environment, ice conditions and resource users. Flow increases during these events must remain in compliance with the 280 cubic metres per second (10,000 cubic feet per second) **Missi Falls Outflow Rate of Change** limit described in Section 7.3.

Minimum Water Level

Section 3.3 of the Water Power Act Licence stipulates that:

“Subject to Section 3.5 of this Final Licence, and except as may be otherwise authorized by the Minister, the Licensee shall regulate the outflow from Southern Indian Lake so as to prevent the water level from receding below elevation 256.95 metres (843.0 feet) ASL.”

Compliance

The Southern Indian Lake water level shall be in compliance with the lower limit described above if the **Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated)** does not drop below 256.95 metres (843.0 feet) ASL,

Maximum Lake Drawdown

Section 3.6(b) of the Water Power Act Licence stipulates that:

“Subject to Sections 3.3 and 3.4 of this Final Licence, but notwithstanding any other terms or conditions of this Final Licence, the Licensee shall operate the Missi Falls and Notigi Control Structures in such a manner that:

(b) The maximum drawdown on Southern Indian Lake of 1.37 metres (4.5 feet) be staged over a period of time and in such a manner so as to minimize adverse impacts on Southern Indian Lake residents.”

Compliance

The Southern Indian Lake water level shall be in compliance with the maximum drawdown limit described above if **Southern Indian Lake Mean Daily Water Level (with wind and wave effects eliminated)** remains in compliance with the maximum and minimum water levels described above.

Since 1986, the average annual drawdown on Southern Indian Lake has been 0.94 metres (3.1 feet) and on average this drawdown has occurred over a period of 232 days. Manitoba Hydro will continue to report the annual drawdown and the number of days over which the drawdown took place in the Annual Water Levels and Flows Compliance Report described in Subsection 7.5.4 of this guide.

7.2 Notigi Control Structure

7.2.1 Licensing Requirements

Maximum Outflow

Section 3.4 of the Water Power Act Licence stipulates that:

“(a) Between May 16th and October 31st the Licensee shall not release more than an average weekly flow of 991 cubic metres per second (35,000 cubic feet per second) through the Notigi Control Structure and shall vary the magnitude of the release through that structure from time to time so that the flow in the Burntwood River does not cause the water level at the Thompson Sea Plane Base to rise above 188.67 metres (619.0 feet) ASL.

“(b) Between November 1st and May 15th the Licensee shall not release more than an average weekly flow of 963 cubic metres per second (34,000 cubic feet per second) through the Notigi Control Structure and shall vary the magnitude of the release through that structure from time to time so that the flow in the Burntwood River does not cause the water level at the Thompson Pumphouse to rise above 189.89 metres (623.0 feet) ASL.”

Compliance

The Notigi outflow shall be in compliance with the limits described above if:

1. **Notigi Average Weekly Outflow** remains below 991 cubic metres per second (35,000 cubic feet per second) and the **Seaplane Base Daily Average Water Level** does not exceed 188.67 metres (619.0 feet) ASL during the period from May 16th to October 31st.
2. **Notigi Average Weekly Outflow** remains below 963 cubic metres per second (34,000 cubic feet per second) and the **Thompson Pumphouse Daily Average Water Level** does not exceed 189.89 metres (623.0 feet) ASL during the period from November 1st to May 15th.

Maximum Daily Flow Change

Section 3.6(a) of the Water Power Act Licence stipulates that:

“Subject to Sections 3.3 and 3.4 of this Final Licence, but notwithstanding any other terms or conditions of this Final Licence, the Licensee shall operate the Missi Falls and Notigi Control Structures in such a manner that:

“(a) Any increase or decrease in the rate of outflow through either structure during any calendar day shall not exceed 280 cubic metres per second (10,000 cubic feet per second)”

Compliance

The Notigi outflow shall be in compliance with the maximum outflow rate of change limit described above if the **Notigi Outflow Rate of Change** does not exceed 280 cubic metres per second (10,000 cubic feet per second).

Minimum Forebay Level

Section 3.6(c) of the Water Power Act Licence stipulates that:

“Subject to Sections 3.3 and 3.4 of this Final Licence, but notwithstanding any other terms or conditions of this Final Licence, the Licensee shall operate the Missi Falls and Notigi Control Structures in such a manner that:

(c) The minimum water level immediately upstream of the Notigi Control Structure shall not be less than elevation 254.20 metres (834.0 feet) ASL”

Compliance

The Notigi forebay level shall be in compliance with the minimum water level limit described above if the **Daily Average Notigi Forebay Water Level** does not drop below 254.20 metres (834.0 feet) ASL.

7.3 Missi Falls Control Structure

7.3.1 Licensing Requirements

Minimum Outflow

Section 3.5 of the Water Power Act Licence stipulates that:

“Releases from Missi Falls Control Structure shall not be less than 14 cubic metres per second (500 cubic feet per second) during the open water period and 42 cubic metres per second (1,500 cubic feet per second) during the ice cover period. Such greater releases as may be required for the needs of downstream interests shall be released as ordered by the Minister.”

Clause 23 of Environmental Act Licence No. 2327 stipulates that:

“The Licensee shall, at all times following construction of the Development, maintain releases from the Missi Falls Control Structure on the Churchill River such that these flows are not less than those maintained under the existing Churchill River Diversion operation flow regime

for the period 1986 to the date of this Licence.” Environment Act Licence No. 2327 was issued on May 15, 1998.

As a result, the minimum outflows from Missi Falls are as shown in Figure 1.

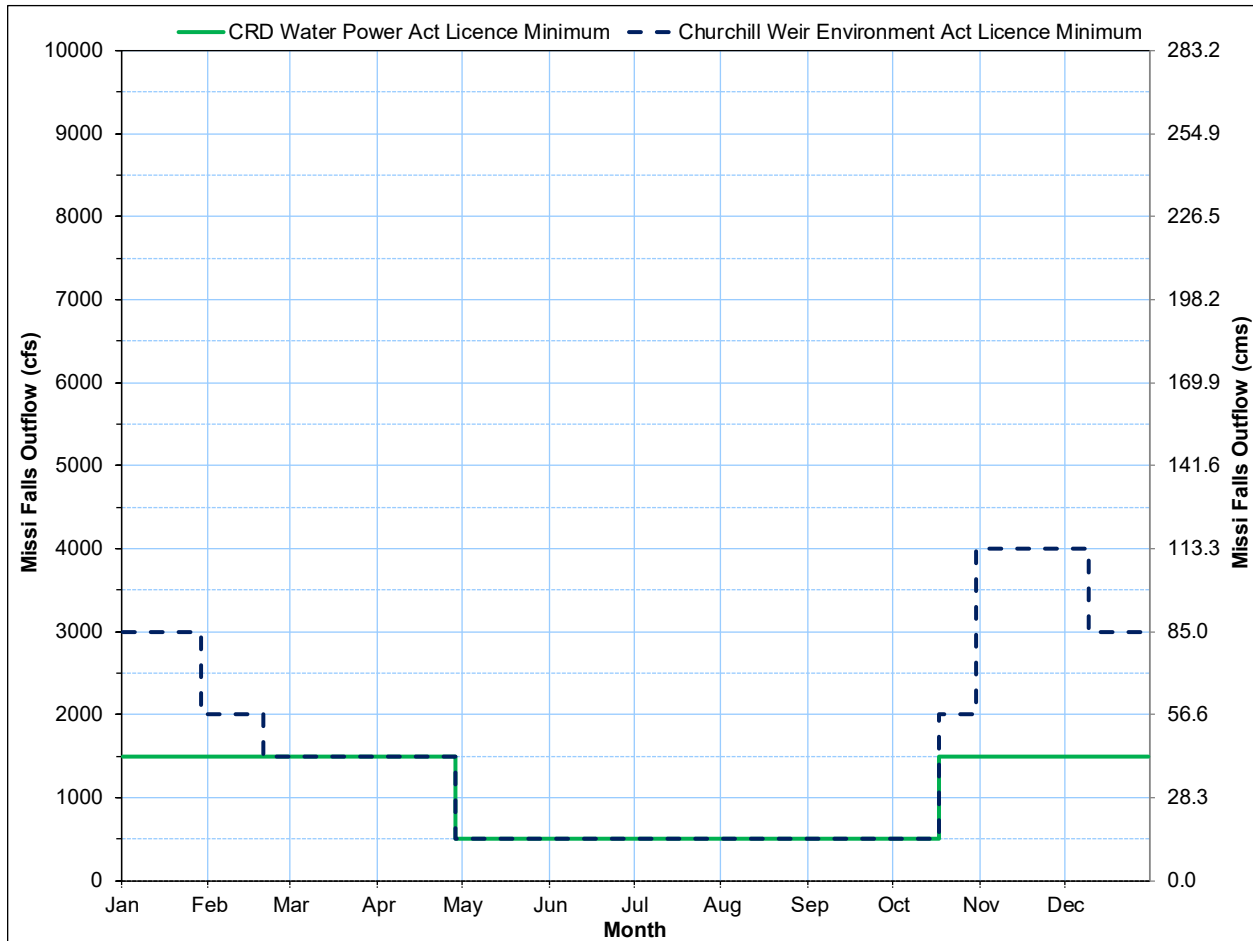


Figure 1: Missi Falls Licence Minimum Outflow

Compliance

The Missi Falls outflow shall be in compliance with the minimum outflow limits described above if the **Missi Falls Daily Average Outflow** does not drop below the following limits during the specified date ranges:

- October 18 to October 30 – 57 cms (2000 cfs)
- October 31 to December 9 – 114 cms (4000 cfs)
- December 10 to January 29 – 85 cms (3000 cfs)
- January 30 to February 20 – 57 cms (2000 cfs)
- February 21 to April 28 – 42 cms (1500 cfs)
- April 29* to October 17 – 14 cms (500 cfs)

*Rather than consistently using April 29, the flow reduction to 500 cfs can occur whenever conditions transfer from ice covered to open water as denoted by a persistent rise in local tributary inflows to the Churchill River. However, this flow reduction must not occur prior to April 29.

Maximum Daily Flow Change

Section 3.6(a) of the Water Power Act Licence stipulates that:

“Subject to Sections 3.3 and 3.4 of this Final Licence, but notwithstanding any other terms or conditions of this Final Licence, the Licensee shall operate the Missi Falls and Notigi Control Structures in such a manner that:

(a) Any increase or decrease in the rate of outflow through either structure during any calendar day shall not exceed 280 cubic metres per second (10,000 cubic feet per second)”

Compliance

The Missi Falls outflow shall be in compliance with the maximum outflow rate of change limit described above if the **Missi Falls Outflow Rate of Change** does not exceed 280 cubic metres per second (10,000 cubic feet per second).

7.4 Churchill Weir

7.4.1 Licensing Requirements

Clause 22 of Environmental Act Licence No. 2327 states that the Licensee shall operate the Development within the following parameters:

“maintain a minimum daily water level of 4.7 metres above sea level, as measured by a water level gauge at the CR30 pumping station immediately upstream of the weir, and based on the Geodetic Survey of Canada, 1978 local adjustment.”

Compliance

The water level above the **Churchill Weir Gauge** shall be in compliance with the minimum water level limit described above if the **Churchill Weir Daily Average Water Level** does not drop below 4.7 metres ASL.

7.5 Reporting

7.5.1 Compliance Reporting

In the event that the operation of the Churchill River Diversion is not in compliance (using raw data) with the licence limits as described in Sections 7.1-7.4, notification shall be made to Manitoba Environment, Climate and Parks within one week of the incident. A follow-up report on causes contributing to the event and changes to operations, if any are required to prevent such an event in the future, will be provided to Manitoba Environment, Climate and Parks. Copies of all notifications and reports will be included in the Annual Water Levels and Flows Compliance Report.

7.5.2 Maintenance and Emergencies

During maintenance activities, such as routine gate inspections and annual safety boom installation/removal, and emergencies there may be times when Manitoba Hydro is required to violate a licence condition for safety or other purposes. Manitoba Hydro will be considered compliant with the licence as long as:

1. Advanced notification is provided to Manitoba Environment, Climate and Parks of the upcoming licence deviation together with the reason. This will include a description of the operating plan, details of the expected licence deviation, a summary of anticipated impacts to stakeholders, and confirmation that stakeholders will also be notified; and
2. Advanced notification is provided to stakeholders of pertinent impacts to flow and water levels.
3. Following the deviation, notification by letter is provided to Manitoba Environment, Climate and Parks on the details of the operation(s).

Copies of all notifications provided to Manitoba Environment, Climate and Parks will be included in the Annual Water Levels and Flows Compliance Report.

7.5.3 Regular Monthly Reporting

Section 7.4 of the Water Power Act Licence stipulates that:

“The Licensee shall, to the satisfaction of the Director, provide a monthly forecast of water levels and flows in connection with the operation of the Undertaking.”

Manitoba Hydro will continue to provide monthly forecasts of water levels and flows at several locations along the Churchill River Diversion route to Manitoba Environment, Climate and Parks.

Section 7.5 of the Water Power Act Licence stipulates that:

“The Licensee shall provide monthly written reports on the operations of the Undertaking to the Director. The Licensee must also forward these reports to affected communities.”

Manitoba Hydro will continue to provide a Churchill River Diversion Monthly Report to Manitoba Environment, Climate and Parks and affected communities that includes water levels and flows at several locations along the diversion route.

7.5.4 Regular Annual Reporting

Section 7.6 of the Water Power Act Licence stipulates that:

“As provided for in Section 65 of the Water Power Regulation, the Licensee shall submit all information and data on water levels and flows necessary to enable the Director to determine compliance with this Final Licence and other approvals pertaining to water levels and flows in connection with the operation of the Undertaking.”

Compliance with the CRD Water Power Act Licence and Environment Act Licence 2327 will be reported within the Annual Water Levels and Flows Compliance Report provided to Manitoba Environment, Climate and Parks. This report is intended to fulfill the requirements of Section 7.6 of the Water Power Act Licence and contains information on data collection, verification, and reporting related to Water Power Act licences, as well as charts of recorded data and licence limits to demonstrate licence compliance during the year. It includes copies of correspondence between Manitoba Hydro and Manitoba Environment, Climate and Parks regarding compliance issues or maintenance and emergency operations.

8. Ongoing and Other Requirements

8.1 System-Wide Monitoring Program

Section 7.9 of the Water Power Act Licence stipulates that:

“The Licensee shall, to the satisfaction of the Minister, continue to participate in a system-wide monitoring program in the lands and waters that are affected by the Undertaking, including Indigenous community participation and Indigenous traditional knowledge.”

The Water Power Act Licence cover letter from the Province of Manitoba also instructs Manitoba Hydro to:

“Work with Manitoba to expand the Coordinated Aquatic Monitoring Program to other areas including shoreline erosion, shoreline wetland issues (such as traditional plants, medicines and waterfowl) and monitoring of terrestrial and riparian components and shoreline health with the inclusion of Indigenous community participation and Indigenous traditional knowledge.”

“Continue to monitor and evaluate water quality, including toxicology and methylmercury (MeHg) in fish.”

Manitoba Hydro and Manitoba signed a Memorandum of Understanding in 2006 as partners in the Coordinated Aquatic Monitoring Program (CAMP). The Program was created based on existing monitoring activities of Manitoba and Manitoba Hydro. CAMP standardized methods and sampling sites, ensuring that the resulting long-term, large-scale data set would be fully comparable over time and between sites. Since 2008, CAMP has been monitoring the aquatic environment of waterways affected by hydroelectric development and operations. CAMP monitoring includes hydrology, water quality, sediment quality, benthic macroinvertebrates, fish community and mercury in fish. As mentioned in the CRD Final Licence transmittal letter, water quality and mercury in fish will continue to be monitored in the existing program.

When CAMP was first designed it was recognized that the program would evolve and include future monitoring of the physical environment; especially shorelines. CAMP is currently in the process of developing the shoreline monitoring program. This will be the first CAMP component to be created “from scratch”, as no comparable existing shoreline monitoring programs exist. With the challenge of designing a new component comes an opportunity to incorporate the knowledge and experience of those who live on the system. In collaboration with the CAMP partners, Indigenous community participation and Indigenous traditional knowledge will be used in developing the shoreline monitoring component.

The initial step of shoreline monitoring is preparation and organization. CAMP is in the process of developing a scope, project management plan, Terms of Reference and engagement plan for this new endeavor. Some of the specific components to be included (as identified in the final licence letter from Manitoba) are: erosion, shoreline wetland issues, riparian components and shoreline health.

The goal of CAMP (and now shoreline monitoring) is to increase the understanding of hydroelectric effects and track change over time. The results of the monitoring data will be shared in the existing CAMP reporting framework, as well as any newly identified reporting mechanisms developed with communities. As per the MOU, CAMP currently prepares annual activity reports for the Minister of Environment, Climate and Parks, Minister of Natural Resources and Northern Development and the President/CEO of Manitoba Hydro. CAMP information (results, progress, and future plans) will continue to be shared with Manitoba, communities, and the public through workshops, meetings, and CAMP reporting. Manitoba has representatives participating in all aspects of CAMP and will continue to be included in the Program's progress, shoreline monitoring work, results, and future plans.

8.2 Public Safety and Debris Management Program

Section 7.10 of the Water Power Act Licence stipulates that:

“The Licensee shall, to the satisfaction of the Minister, continue to implement a public safety and debris management program in lands and waters within the Severance Line, and report annually to the Director.”

Manitoba Hydro has a Waterways Management Program (WMP) in place to support and promote the safety of people travelling on waterways affected by Hydro's operations. The WMP includes boat patrols, debris management and safe ice trails. Manitoba Hydro works with Indigenous communities annually to implement the WMP throughout the affected waterways.

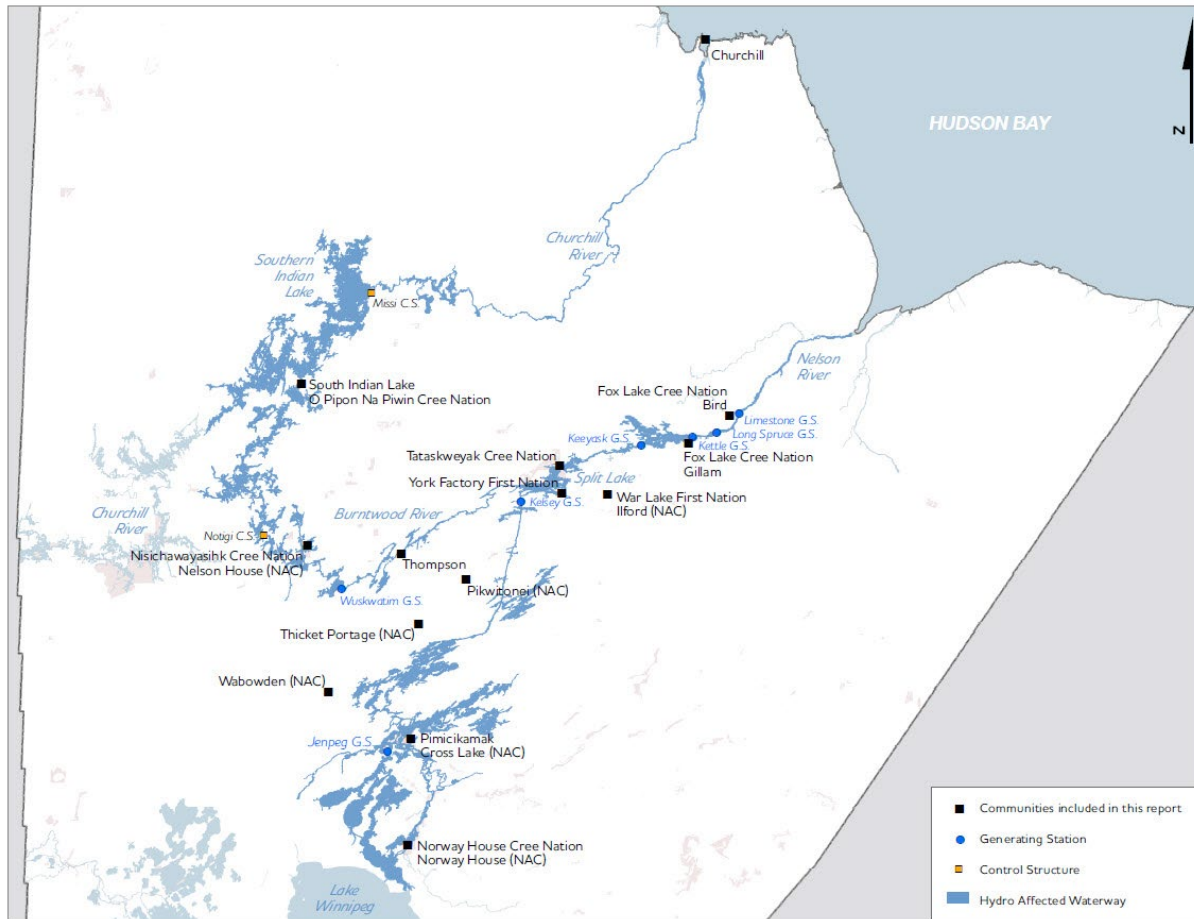
Manitoba Hydro will report on the WMP annually to the Director by providing an overview of the program as part of the information included with the Indigenous Engagement Report (see Section 8.3 below). Manitoba Hydro will also report on other access improvement and safety measures such as shoreline protection, portages and docks.

8.3 Indigenous Engagement Report

Section 7.11 of the Water Power Act Licence stipulates that:

“The Licensee shall submit an annual report to the Director documenting the Licensee’s engagement with Indigenous communities on the continued operation of the Undertaking.”

Manitoba Hydro will submit an annual report by June 1 each year that provides an overview of the forums, programs and activities through which it has engaged with Indigenous communities on the continued operation of CRD, LWR and the Jenpeg Generating Station. Map 1 shows the communities located along waterways affected by the continued operation of the noted projects, and that will be included in the annual report.



Map 1: Communities located along waterways affected by CRD, LWR and Jenpeg Generating Station

8.4 Shoreline Erosion

Section 7.12 of the Water Power Act Licence stipulates that:

“The Licensee shall, to the satisfaction of the Minister, continue to evaluate, report, and implement options for mitigating shoreline erosion due to the Undertaking consistent with existing and future settlement agreements.”

Manitoba Hydro evaluates and implements options for mitigating shoreline erosion issues in accordance with existing settlement agreements. Manitoba Hydro will report on the measures to address shoreline erosion issues in communities as they occur. This information will be included with the Indigenous Engagement Report that will be submitted annually to the Director.

8.5 Large Area Planning, Studies, and other Initiatives

The Water Power Act Licence cover letter from the Province of Manitoba instructs Manitoba Hydro to:

“Participate in any future large area planning initiative that may include studies in areas impacted by hydroelectric development, along with affected communities with other stakeholders.”

Section 7.8 of the Water Power Act Licence stipulates that:

“The Licensee shall participate in future planning, studies and other initiatives as instructed by the Minister, in areas impacted by the Undertaking along with affected communities and other stakeholders.”

Manitoba Hydro will participate in any future large area planning or other studies and initiatives as directed by the Minister. Progress updates will be provided as required in the Annual Water Levels and Flows Compliance Report.

8.6 Licence Modernization Processes

The Water Power Act Licence cover letter from the Province of Manitoba instructs Manitoba Hydro to:

“Participate in the future licence modernization processes directed by the Province of Manitoba. The Province intends to evaluate the Water Power Act and Regulation to determine what amendments may be required for modernization”

Manitoba Hydro will participate in any future licence modernization processes as directed by Manitoba. Progress updates will be provided as required in the Annual Water Levels and Flows Compliance Report.

8.7 Environmental Studies

The Water Power Act Licence cover letter from the Province of Manitoba instructs Manitoba Hydro to:

“Manitoba acknowledges the traditional importance of the fishery to Indigenous resource users, has heard their concerns about the ongoing impacts of the project, and recognizes the activities and Agreements that Manitoba Hydro has undertaken to address these impacts. In preparation for renewal of the Final Licence and participation in large area planning, it is expected that Manitoba Hydro will work with Manitoba to undertake studies that may be employed to improve the environment for fish downstream of Missi control structure. These may include habitat studies, investigating flow regime scenarios, and any associated analysis.”

Manitoba Hydro will work with Manitoba to undertake studies downstream from Missi control structure. Progress updates will be provided as required in the Annual Water Levels and Flows Compliance Report.

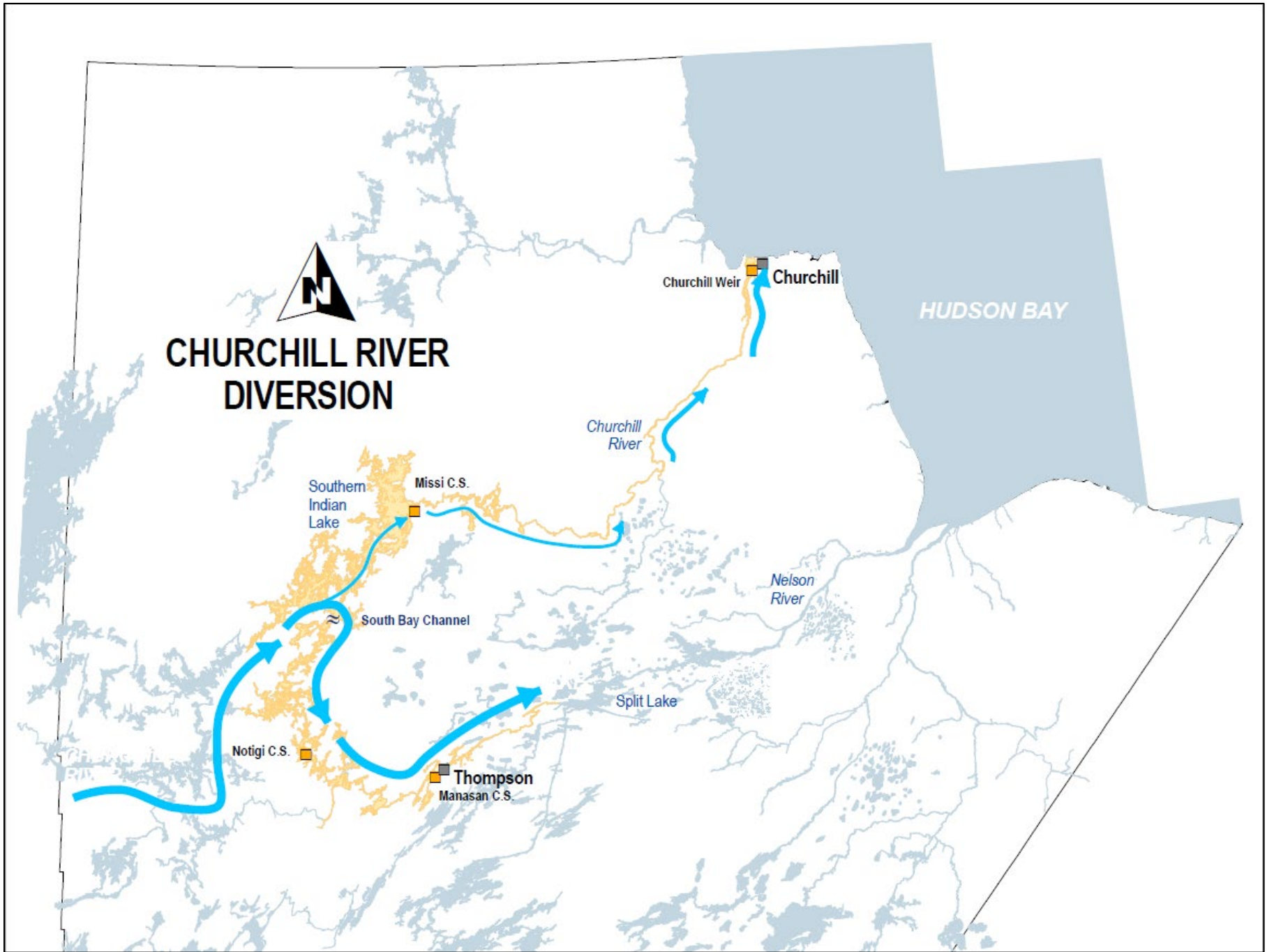
9. Change Management

Section 7.13 of the Water Power Act Licence stipulates that:

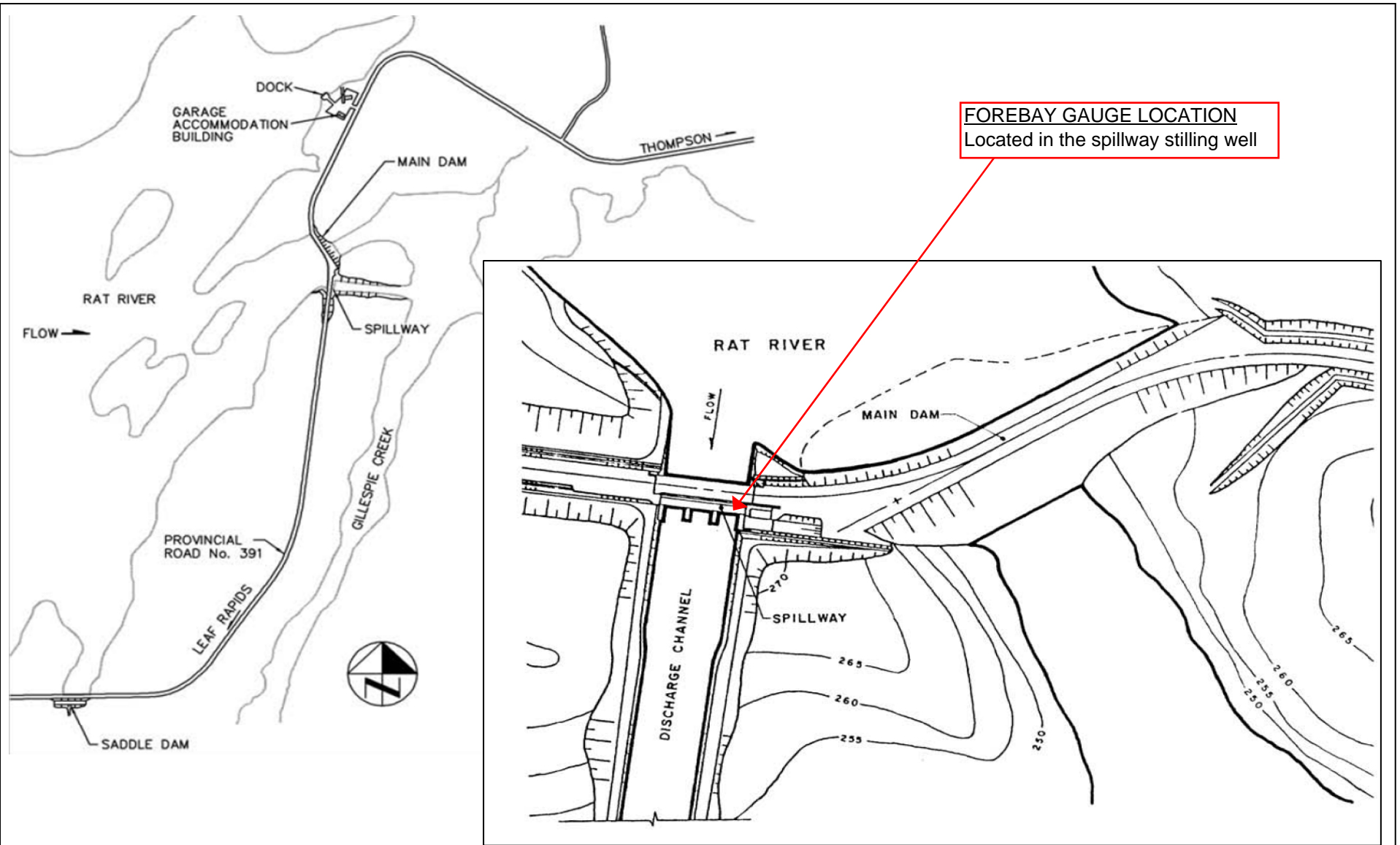
“The Licensee shall, to the satisfaction of the Minister, prepare a licence implementation guide, within one year of the date of this Final Licence.”

The first version of this Guide initially fulfils this requirement. Proposed revisions to this Guide will be drafted by Manitoba Hydro as required or directed by Manitoba Environment, Climate and Parks. Following review and approval of revisions by Manitoba Environment, Climate and Parks, a revised copy of this Guide will be produced and distributed by Manitoba Hydro.


Appendix A: Churchill River Diversion Site Map

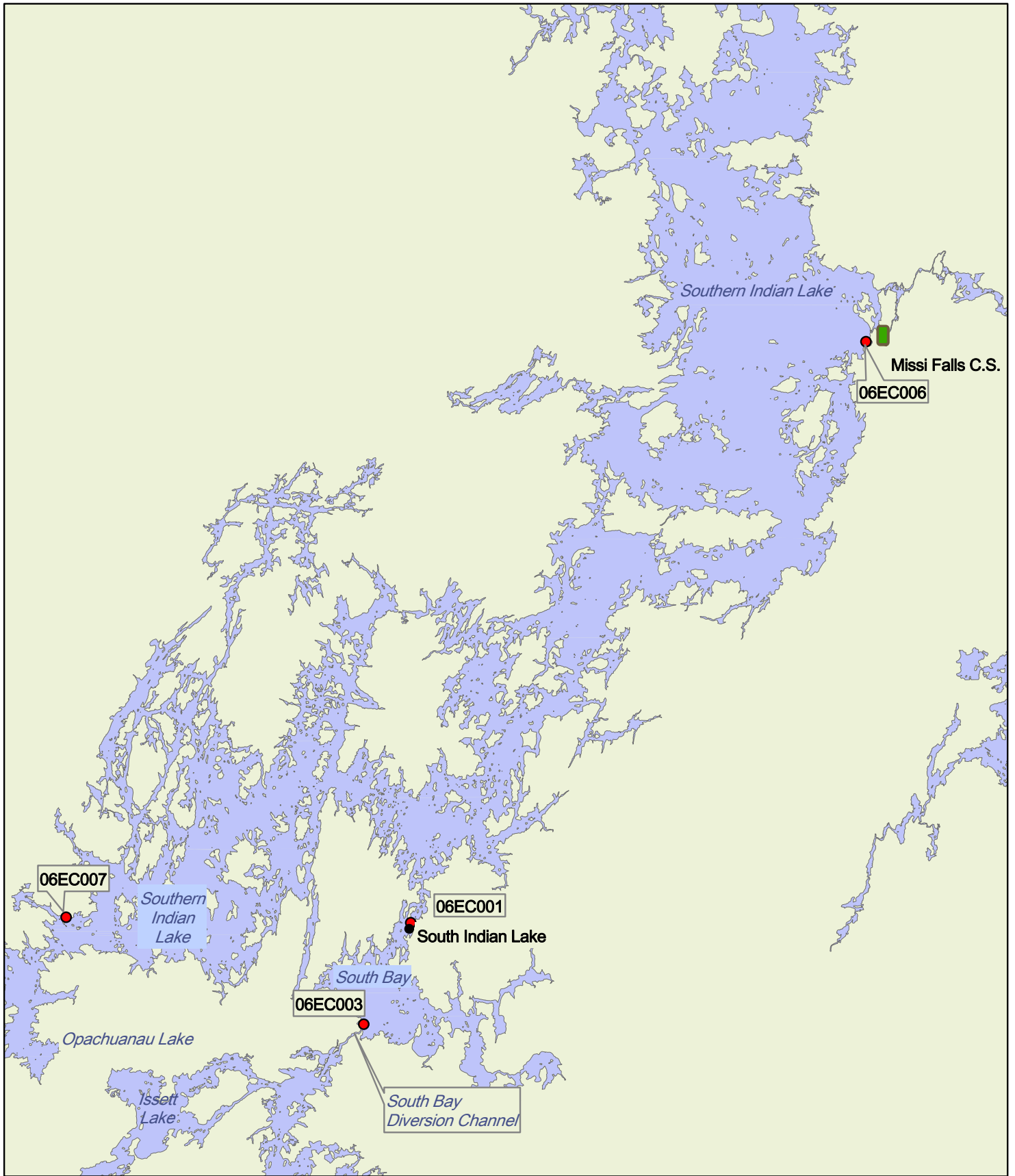


Appendix B: Water Level Gauge Locations and Description Sheets



FOREBAY GAUGE LOCATION
 Located in the spillway stilling well

	MANITOBA HYDRO	
	WATERWAY APPROVALS AND MONITORING	
	NOTIGI CONTROL STRUCTURE	
	FOREBAY GAUGE LOCATION	
	PROJECT	
	CRD LICENCE IMPLEMENTATION GUIDE	



Southern Indian Lake Gauges



**Waterway Monitoring and Approvals
Manitoba Hydro**

For reference purposes only



Water Survey of Canada - Full Station Description Report - 06EC001

SOUTHERN INDIAN LAKE NEAR SOUTH INDIAN LAKE

Technician Effective Date: 2020-04-21

Description as of: February 17, 2021

Province: MANITOBA

Station Status: ACTIVE

Operating Office: THOMPSON

Office Remark:

Latest operating record: Between 1970-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

Associated WSC Station:

Associated WSC Station Remark:

General Remarks:

INSTALLATIONS INCLUDE A RAIN GAUGE AND TEMPERATURE SENSOR INTERFACED WITH THE DCP

Location

Lat/Long 56°46'42.6" N, 98°56'28.8" W

[Link to google maps](#)

Decimal Degrees (56.77850, -98.94136)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Time Zone: CST

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Remark:

Travel and Access

Travel Description: Located on west side of small island, southwest of South Indian Lake community, across from boat launch. SIL community is located approx. 100 km northeast of Leaf Rapids, MB. Head north on PR391 and turn east on Mine Road(Ferry Road) and head towards O-Pipon-Na-Piwin Cree Nation (South Indian Lake community)Ferry crossing is located 93km towards community, once across channel, drive South thru SIL. Boat launch located at southwest corner of community across from Northern Store.

Remote Access: YES

Access Method: AIRCRAFT, BOAT

Access Remarks: Boat is required to access the gauge during the summer. Helicopter should only land on the landing pad next to the gauge. Caution the ice is thin during the winter.

Legal Land Designation: SW-2-90-10-W1

Datum Information

Gauge Datum: GEODETIC SURVEY OF CANADA DATUM (MAN. GOVT. EXT.)

Gauge Datum Remark:



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
STEEL WALK-IN	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2018-05-29 08:55:51	Set to inactive as per WSC MB directive
DRY CELL	INSTALLATION TYPE	INACTIVE	2018-05-29 08:55:45	Set to inactive as per WSC MB directive
CHARGING SYSTEM	INSTALLATION TYPE	INACTIVE	2018-05-29 08:55:40	Set to inactive as per WSC MB directive

Devices

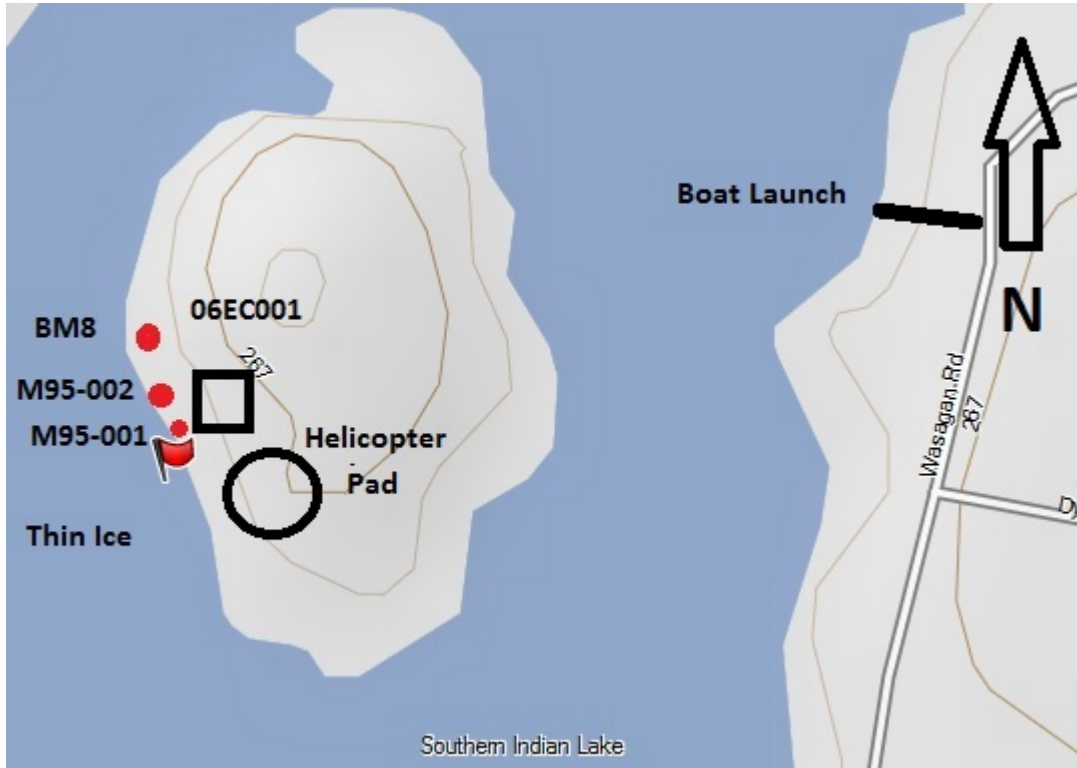
Serial No.	Category	Make	Model	Status	Firmware	IP or PDT Address	Logging Frequency	Effective Date
1810069	LOGGER	SUTRON	SL3-SDI-1	ACTIVE				2019-02-15 12:15:01
420431	PRESSURE SENSOR	OTT HYDROMET	PLS	ACTIVE				2018-08-21 10:41:33
?2907	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A	ACTIVE		4A0025DE		2008-08-07 10:30:01
?0010067	PRECIPITATION GAUGE	UNSPECIFIED	UNSPECIFIED	INACTIVE				2019-02-15 12:15:01

Serial No.	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Remark
1810069	647	647	647				LCM
420431	647	647	647				updated serial number
?2907	647	647	647				
?0010067	647	647	647				disconnected

Appendix - Agency IDs and Names

Agency ID	Agency Name
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map





Water Survey of Canada - Full Station Description Report - 06EC003

SOUTHERN INDIAN LAKE AT SOUTH BAY

Technician Effective Date: 2020-04-21

Description as of: February 17, 2021

Province: MANITOBA

Station Status: ACTIVE

Operating Office: THOMPSON

Office Remark:

Latest operating record: Between 1977-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

Associated WSC Station:

Associated WSC Station Remark:

General Remarks:

Location

Lat/Long 56°41'14.1" N, 99°01'24.5" W

[Link to google maps](#)

Decimal Degrees (56.68727, -99.02348)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Time Zone: CST

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Remark:

Travel and Access

Travel Description: Located approx. 76 km northeast of Leaf Rapids, MB. Head north on PR391 and turn east on Mine Road and head towards O-Pipon-Na-Piwin Cree Nation (South Indian Lake community) turn right approx. 70km off Mine Road. Drive east 2km and continue east(straight) at the 4 way. Road is not plowed in the winter and a snowmachine is required.

Remote Access: NO

Access Method: ROAD, SNOWMOBILE

Access Remarks: Can be accessed by vehicle, road is not maintained and caution should be used. Can land on the water or ice with aircraft.

Legal Land Designation: SW-5-89-10-W1

Datum Information

Gauge Datum: CHURCHILL RIVER DATUM (MANITOBA HYDRO)

Gauge Datum Remark:



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
STEEL WALK-IN	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2017-06-19 11:59:36	Set to inactive as per WSC directive
DRY CELL	INSTALLATION TYPE	INACTIVE	2017-06-19 11:59:00	Set to inactive as per WSC directive
CHARGING SYSTEM	INSTALLATION TYPE	INACTIVE	2017-06-19 11:58:19	Set to inactive as per WSC directive

Devices

Serial No.	Category	Make	Model	Status	Firmware	IP or PDT Address	Logging Frequency	Effective Date
1803073	LOGGER	SUTRON	SL3-SDI-1	ACTIVE				2019-02-15 14:20:01
420436	PRESSURE SENSOR	OTT HYDROMET	PLS	ACTIVE				2018-07-17 10:00:00
?2909	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A	ACTIVE		4564F312		2010-05-20 12:00:01

Serial No.	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Remark
1803073	647	647	647				LCM
420436	647	647	647				installed
?2909	647	647	647				

Appendix - Agency IDs and Names

Agency ID	Agency Name
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map





Water Survey of Canada - Full Station Description Report - 06EC006

SOUTHERN INDIAN LAKE AT MISSI FALLS

Technician Effective Date: 2020-04-21

Description as of: February 17, 2021

Province: MANITOBA

Station Status: ACTIVE

Operating Office: THOMPSON

Office Remark:

Latest operating record: Between 1985-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

Associated WSC Station:

Associated WSC Station Remark:

General Remarks:

OTHER INSTALLATIONS INCLUDE A RAIN GAUGE AND TEMPERATURE SENSOR

Location

Lat/Long 57°18'47.0" N, 98°09'40.0" W

[Link to google maps](#)

Decimal Degrees (57.31306, -98.16111)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Time Zone: CST

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Remark:

Travel and Access

Travel Description: LOCATED APPROX. 2.0 KM TO THE SW OF MISSI CONTROL STRUCTURE AT THE SOUTH END OF THE ROCK QUARRY AND NORTH SIDE OF THE OLD CAMPSITE ROAD.

Remote Access: YES

Access Method: AIRCRAFT

Access Remarks: Aircraft can land on the water or ice. Helicopter can also land on the bedrock next to the gauge. Caution should be used because there are large rebar rods on the bedrock ledge that should be marked.

Legal Land Designation: SW-11-96-5-W1

Datum Information

Gauge Datum: CHURCHILL RIVER DATUM (MANITOBA HYDRO)

Gauge Datum Remark:



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
BALLEY, REFRIGERATION UNIT	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2017-06-15 09:57:55	Set to inactive as per WSC MB directive
DRY CELL	INSTALLATION TYPE	INACTIVE	2017-06-15 09:57:40	Set to inactive as per WSC MB directive
CHARGING SYSTEM	INSTALLATION TYPE	INACTIVE	2017-06-15 09:57:09	Set to inactive as per WSC MB directive

Devices

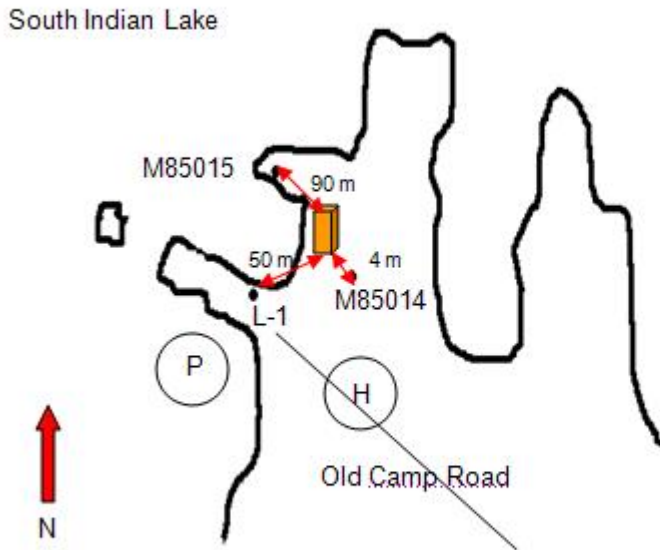
Serial No.	Category	Make	Model	Status	Firmware	IP or PDT Address	Logging Frequency	Effective Date
1111180	LOGGER	SUTRON	SL2-G312-2	ACTIVE	7.49			2019-11-20 11:00:00
1608182	COMPRESSORS	SUTRON	5600-0131	ACTIVE				2018-05-28 12:00:00
?2910	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A	ACTIVE		4A00A3CA		2008-08-25 10:00:01
?0010077	PRECIPITATION GAUGE	UNSPECIFIED	UNSPECIFIED	ACTIVE				1900-01-01 00:00:01
14010407	PRESSURE SENSOR	CAMPBELL SCIENTIFIC	CS450	INACTIVE				2019-11-20 11:00:00

Serial No.	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Remark
1111180	647	385	385				REPLACED, THOUGHT OLD LOGGER WAS PROBLEM
1608182	647	647	647				Auto bubbler
?2910	647	647	647				
?0010077	647	647	647				
14010407	647	385	385				UNIT FAILED UNPLUGGED

Appendix - Agency IDs and Names

Agency ID	Agency Name
385	MANITOBA HYDRO
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map





Water Survey of Canada - Full Station Description Report - 06EC007

SOUTHERN INDIAN LAKE NEAR OPACHUANAU LAKE

Technician Effective Date: 2020-04-21

Description as of: February 17, 2021

Province: MANITOBA

Station Status: ACTIVE

Operating Office: THOMPSON

Office Remark:

Latest operating record: Between 1985-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

Associated WSC Station:

Associated WSC Station Remark:

General Remarks:

Location

Lat/Long 56°46'59.5" N, 99°31'31.0" W

[Link to google maps](#)

Decimal Degrees (56.78322, -99.52528)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Time Zone: CST

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Remark:

Travel and Access

Travel Description: Located 47km northeast of Leaf Rapids community on South Indian Lake or the exit of Opachuanau Lake.

Remote Access: YES

Access Method: AIRCRAFT

Access Remarks: Dock float plane at gauge. Helicopter pad located approx. 150m SW of gauge.

Legal Land Designation: NW-6-90-13-W1

Datum Information

Gauge Datum: CHURCHILL RIVER DATUM (MANITOBA HYDRO)

Gauge Datum Remark:



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
BALLEY, REFRIGERATION UNIT	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2017-06-19 10:03:51	Set to inactive as per WSC MB directive
DRY CELL	INSTALLATION TYPE	INACTIVE	2017-06-19 10:03:35	Set to inactive as per WSC MB directive
CHARGING SYSTEM	INSTALLATION TYPE	INACTIVE	2017-06-19 10:03:15	Set to inactive as per WSC MB directive

Devices

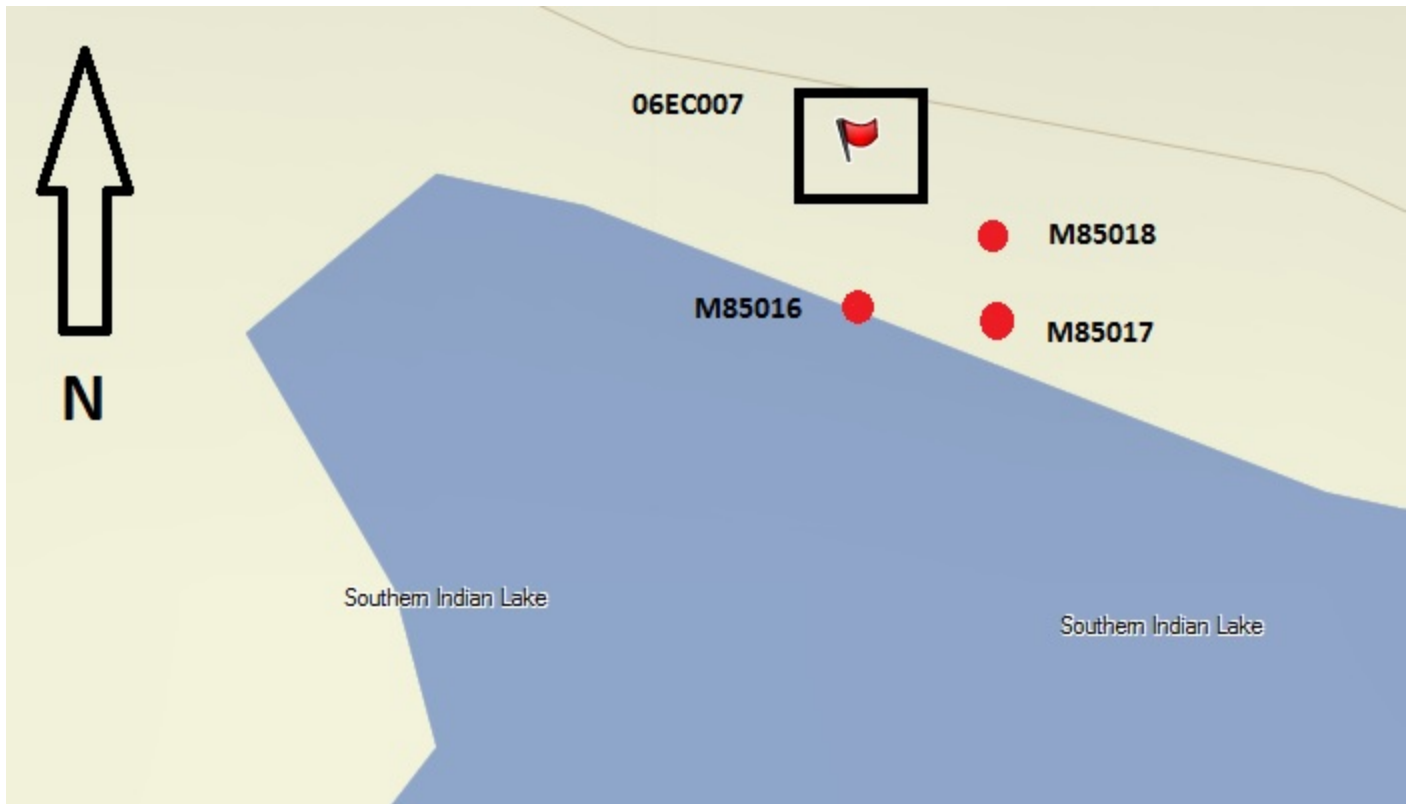
Serial No.	Category	Make	Model	Status	Firmware	IP or PDT Address	Logging Frequency	Effective Date
1803059	LOGGER	SUTRON	SL3-SDI-1	ACTIVE				2019-02-15 11:00:01
70010115	PRESSURE SENSOR	CAMPBELL SCIENTIFIC	CS451	ACTIVE				2015-09-03 12:00:00
?2911	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A	ACTIVE		4A001044		2008-07-09 14:45:00

Serial No.	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Remark
1803059	647	385	385				LCM
70010115	647	385	385				New
?2911	647	647	647				

Appendix - Agency IDs and Names

Agency ID	Agency Name
385	MANITOBA HYDRO
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map





Water Survey of Canada - Full Station Description Report - 05TG001

BURNTWOOD RIVER NEAR THOMPSON

Technician Effective Date: 2020-04-21

Description as of: February 16, 2021

Province: MANITOBA

Station Status: ACTIVE

Operating Office: THOMPSON

Office Remark:

Latest operating record: Between 2002-Current, BOTH - WATER LEVELS AND DISCHARGES, RECORDING, CONTINUOUS

Associated WSC Station:

Associated WSC Station Remark:

General Remarks:

Location

Lat/Long 55°44'31.8" N, 97°53'44.4" W

[Link to google maps](#)

Decimal Degrees (55.74217, -97.89567)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Time Zone: CST

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Remark:

Travel and Access

Travel Description: Gauge is located in the Thompson pump house grounds. A key is required to access the pump house. WSC Thompson has a key.

Remote Access: NO

Access Method: ROAD, SNOWMOBILE, ALL TERRAIN VEHICLE

Access Remarks: Vale key is required to access the pump house.

Legal Land Designation: SW-8-78-3-W1

Datum Information

Gauge Datum: GEODETIC SURVEY OF CANADA DATUM (LOCAL 1969 ADJ.)

Gauge Datum Remark:



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
BALLEY, REFRIGERATION UNIT	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
A.C. POWER	INSTALLATION TYPE	ACTIVE	1900-01-01 00:00:00	
ELECTRIC HEAT	INSTALLATION TYPE	INACTIVE	2020-12-18 11:47:00	Leave off
CHARGING SYSTEM	INSTALLATION TYPE	INACTIVE	2017-01-26 15:22:47	Set to inactive as per MB WSC directive
WET CELL	INSTALLATION TYPE	INACTIVE	2017-01-26 15:21:37	Set to inactive as per MB WSC directive
TELEPHONE	INSTALLATION TYPE	INACTIVE	2014-05-21 09:33:09	GOES telemetry only

Devices

Serial No.	Category	Make	Model	Status	Firmware	IP or PDT Address	Logging Frequency	Effective Date
1108206	LOGGER	SUTRON	SL2-G312-1	ACTIVE	7.49			2020-12-18 12:27:09
111436	PRESSURE SENSOR	FTS	Bubbler	ACTIVE				2019-11-22 00:00:00
?2925	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A	ACTIVE		4564409C		2008-09-09 11:05:00

Serial No.	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Remark
1108206	647	390	390				added firmware
111436	647	647	647				LCM
?2925	647	647	647				

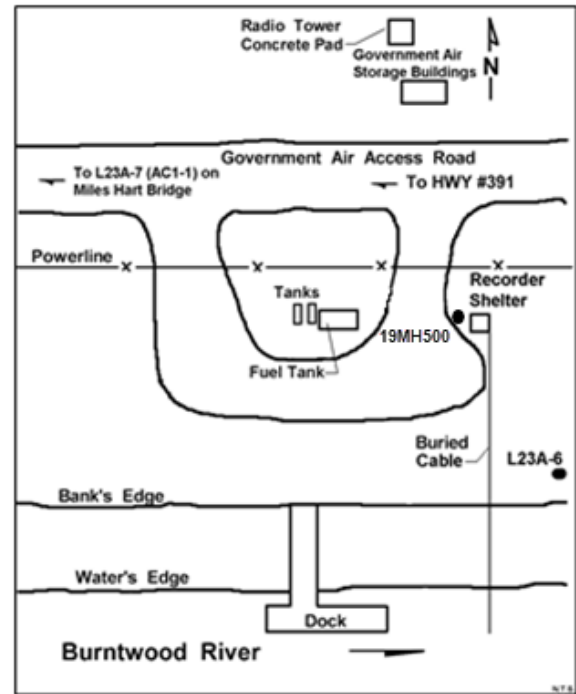
Appendix - Agency IDs and Names

Agency ID	Agency Name
390	MANITOBA WATER STEWARDSHIP
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map
2020



Burntwood River 0.2 km below Miles Hart Bridge



Number: **05TG702**

Name: **Burntwood River 0.2 km below Miles Hart Bridge**

Latitude: 55° 45' 14.7" Longitude: -97° 49' 57.9"

UTM: 6179336.4 N 573256.6 E Zone: 14

Coordinate Source: NAD83

Operator: Manitoba Hydro, Thompson

Established: February 1, 1989

Location: On the N shore of the Burntwood River approximately 0.2 km below the Miles Hart Bridge just above the float plane base.

Equipment: Sutron Satlink 2, firmware version 7.49, with an KPSI pressure transducer, a YSI air temperature sensor and a RM Young atmospheric pressure sensor powered by a 12 V battery connected to a solar panel with a SunSaver charge controller in a metal clad shelter with a GOES antenna.

Metering: N/A

Access: Road/boat from seaplane base. No helicopter access.

Period of Operations: 12HC

Station Status: Active

Date: **2020-06-10**

Datum: GS of C CGVD28, 1969 MH Local Adjustment

Benchmarks:

L23A-7 (AC1-1) – Master – Elevation 195.919 m. A Manitoba Hydro brass cap set in the sidewalk close to the road, on the N end and on the NW side of the Miles Hart Bridge over the Burntwood River at Thompson.

L23A-6 – Elevation 188.855 m. A 4 m long threaded ground rod, screwed into the ground until refusal located approximately 16.4 m SSE of the recorder shelter.

19MH500 – Elevation 190.124 m. Brass cap on ground rod driven to refusal, 1.75 m W of DCP's SW corner, stamped 19MH500.

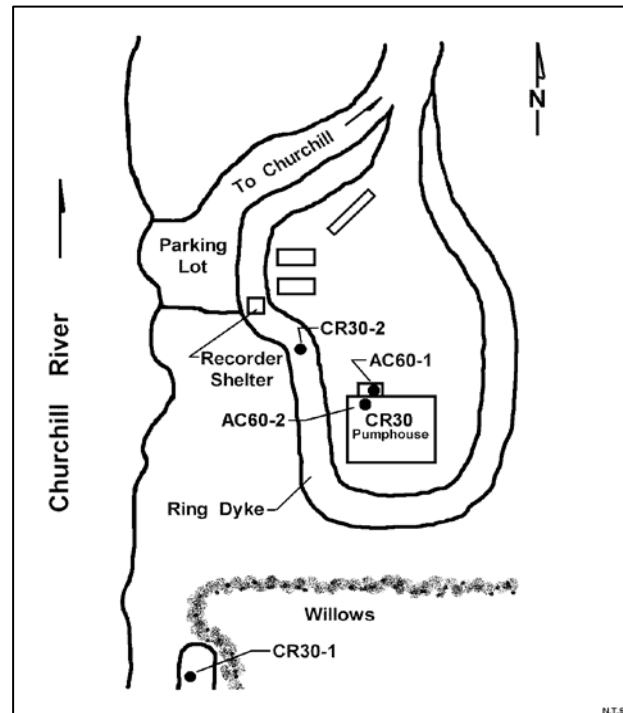
Additional Information:

Time Slot	00:00:00	Transmit Window	00:00:10
Transmitter	HDR	Baud Rate	300
Channel	143 East	Satellite Azimuth	156°
Archive Transmit	01:00:00	Antenna Angle	20°

Shelf Codes: HG, TW, TA, PA, VB, ZT

OSH Concerns: **General site safety.**

Churchill River at the CR30 Pumphouse



Number: **06FD706**

Name: **Churchill River at the CR30 Pumphouse**

Latitude: 58° 37' 34.0" Longitude: -94° 13' 45.0"

UTM: 6499074.2 N 428620.0 E Zone: 15

Coordinate Source: NAD83

Operator: Manitoba Hydro, Thompson

Established: May 16, 1999

Location: On the Churchill River at the CR30 pumphouse on the right bank of the Churchill River approximately 20 km upstream of Churchill.

Equipment: A Satlink 2 DCP, firmware version 7.49, with a Keller gas pressure sensor, Sutron Accubar and Safe Purge gas system powered by a 12 V battery connected to a solar panel all housed in a Hanover metal clad shelter with a GOES antenna with a Spypoint trail camera on the mast.

Metering: N/A

Access: Road or helicopter.

Station Status: Active

Period of Operation: 12HC

Date: **2020-03-04**

Datum: GS of C CGVD28, 1978 Local Adjustment

Benchmarks:

AC60-1 - Master - Elevation 7.298 m. A Manitoba Hydro brass cap set in the concrete step at the N entrance to CR30 Pumphouse, on the left of the door, close to the building wall.

AC60-2 - Elevation 7.288 m. An X-mark on the CR30 Pumphouse floor 0.6 m inside the pumphouse from the NW door. Marked 'BM CR30' on the floor.

CR30-1 - Elevation 5.563 m. A Manitoba Hydro brass cap in a large boulder on the right bank of the Churchill River approximately 30 m above the CR30 Pumphouse. The benchmark is marked by a 0.3 m x 2.4 m high iron pipe.

CR30-2 - Elevation 8.938 m. An iron pin bolted onto a DBM buried on top of the CR30 pumphouse W dyke 15 m E of recorder shelter and 25 m W of pumphouse building. It is marked with a 1.0 m high angle iron and is 0.2 m below the surface of the dyke.

Note: CR30-2 is un-accessible. It is buried under large sand bags placed on the dike in May to protect the pumphouse during the flood.

Additional Information:

Time Slot	00:01:15	Transmit Window	00:00:10
Transmitter	HDR	Baud Rate	300
Channel	167 East	Satellite Azimuth	156°
Report Rate	01:00:00	Antenna Angle	18.5°

Shef Codes: HG, WN, VB, ZT

OSH Concerns: **General site safety.**