Manitoba Hydro
Long Spruce Generating Station
Licence Implementation Guide for Water Levels

Prepared for:
Water Power Act Licensing Section
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Original signed by, W.V. Penner

NOTED BY: W.V. PENNER

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ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
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Executive Summary

Introduction

Manitoba Hydro prepared this guide to document a common understanding of compliance with the water regime terms of the Long Spruce Water Power Act Licence. This document sets out the mutually understood and agreed to:

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

Long Spruce Forebay Water Level

The **Long Spruce Forebay Water Level** is directly measured at the beginning of each hour at the generating station.

Compliance

The forebay water level shall be in compliance if the hourly **Long Spruce Forebay Water Level:**

a) does not exceed 362.0 feet (110.3 m) by more than 0.1 feet (0.03 m); and
b) does not exceed 362.0 feet (110.3 m) more than one time in any 24-hour period

Reporting

In the event that the **Long Spruce Forebay Water Level** is not in compliance with the licence limit, Manitoba Hydro will notify Manitoba Sustainable Development 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 Sustainable Development. A record of water levels and licence compliance will also be provided in an annual report.

Change Management

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

Table of Contents

1. Introduction

The Long Spruce Generating Station is located approximately 745 km north of the City of Winnipeg and 27 km east of the town of Gillam. Long Spruce is situated on a stretch of the lower Nelson River known as the Long Spruce Rapids, located 16 km downstream from the Kettle Generating Station and 23 km upstream from the Limestone Generating Station. The site can be accessed by PR 280, which crosses the Nelson River at the generating station.

The Long Spruce Generating Station was built between 1971 and 1979 and was Manitoba Hydro's fourth generating station built on the Nelson River. Long Spruce was designed for run of river operation with outflow governed by the releases from Stephens Lake at the Kettle Generating Station. Long Spruce has a total licensed capacity of 1,350,000 horsepower (1,007 MW) through ten vertical turbine units each with a generating capacity of 135,000 horsepower (100.7 MW).

Manitoba Hydro operates the Long Spruce Generating Station in accordance with the Final Licence for the Development of Water Power at the Long Spruce Site on the Nelson River. This licence was issued in accordance with the provisions of The Water Power Act on July 19, 1990 and expires on April 28, 2028.

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 Benchmark means Geological Survey of Canada (GS of C) benchmark 526D located in the south abutment of the bridge over the Nelson River downstream of Kettle GS.

Long Spruce Gauge refers to a float attached to a steel tape that is draped over a pulley connected to a Selsyn (self-synchronous) system that measures the forebay water level.

Long Spruce Forebay Water Level means the hourly water level as measured by the **Long Station Gauge.**

1.2 Datum

In accordance with Section 12 of the Long Spruce Final Water Power Act Licence, water level information for the operation of the Long Spruce Project is measured in terms of elevations ASL, GS of C, Canadian Government Vertical Datum (CGVD) 1928, 1929 Local Adjustment.

1.3 Quality Control

1.3.1 Benchmarks

Vertical control surveys have been performed to establish appropriate local benchmarks around the Long Spruce Generating Station.

Long Spruce benchmarks were established by level transfer from Controlling Benchmarks using spirit levelling methods.

1.3.2 Direct Water Level Measurements

Staff monitor the Long Spruce Gauge equipment and take direct water level measurements to maintain gauge performance. If the direct measurements differ by more than 0.025 m from the gauge reading, staff will take corrective action including re-calibrating the gauge if required.

1.3.3 Gauge Readings

The forebay gauge consists of a float attached to a steel tape that is draped over a pulley connected to a Selsyn (self-synchronous) system. This system electronically transmits the angular position of the pulley to a receiving device in the control room. The position information is converted to a water level, indicated on a display and also output to the Remote Transmittal Unit for transmission to the System Control Centre. The system is generally capable of measuring water levels accurate to about 0.01 m.

1.4 Quality Assurance Procedure for Water Level Data

Plant Data

Data is collected on site and signed off by the operating supervisor. Data is then sent to the Energy Operations Planning & Technology Department of Manitoba Hydro, uploaded into a database and checked for errors. Data errors are then corrected or verified by plant operating staff with technical assistance from Energy Operations Planning & Technology staff as needed. Once data has been verified, it may be used for operations planning, studies, model development and reporting.

2. Long Spruce Forebay Water Level

Section 5 of the Final Water Power Act Licence places a limit on the **Long Spruce Forebay Water Level**. A map showing the location of the **Long Spruce Gauge** is provided in Appendix A. Water levels are largely influenced by the operation of the Kettle Generating Station, Long Spruce Generating Station, and local meteorological events. Due to the location of the **Long Spruce Gauge** and the size of the forebay, wind effects on the **Long Spruce Forebay Water Level** are negligible.

Long Spruce Forebay Water Level measurements are taken continuously and recorded at the beginning of each hour and reported to Manitoba Hydro's System Control Centre.

3. Compliance

3.1 Long Spruce Water Power Act Licensing Requirement

Maximum Water Level

Section of the licence stipulates that:

> *"The Licensee shall not raise the headwater of the development, as measured at the powerhouse, higher than 362.0 feet above mean sea level, Canadian Geodetic Datum. A higher elevation may be created only with written permission by the Director and in accordance with Section 72 of the Regulation."*

The forebay water level shall be in compliance with the limit described above if the hourly **Long Spruce Forebay Water Level:**

c) does not exceed 362.0 feet (110.3 m) by more than 0.1 feet (0.03 m); and
d) does not exceed 362.0 feet (110.3 m) more than one time in any 24-hour period

Based on the accuracy and location of the **Long Spruce Gauge**, Manitoba Hydro defines instances where the licence limit is exceeded by 0.1 feet (0.03 m) as reportable events.

3.2 Reporting

3.2.1 Compliance Reporting

In the event that the **Long Spruce Forebay Water Level** is not in compliance with the licence limit as described in Section 3.1, notification shall be made to Manitoba Sustainable Development 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 Sustainable Development.

3.2.2 Maintenance and Emergencies

During maintenance and emergencies there may be times when Manitoba Hydro is required to deviate from 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 Sustainable Development 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; and
3. Following the deviation, notification by letter is provided to Manitoba Sustainable Development on the details of the operation(s).

3.2.3 Regular Annual Reporting

Water levels and licence compliance will be reported annually to Manitoba Sustainable Development.

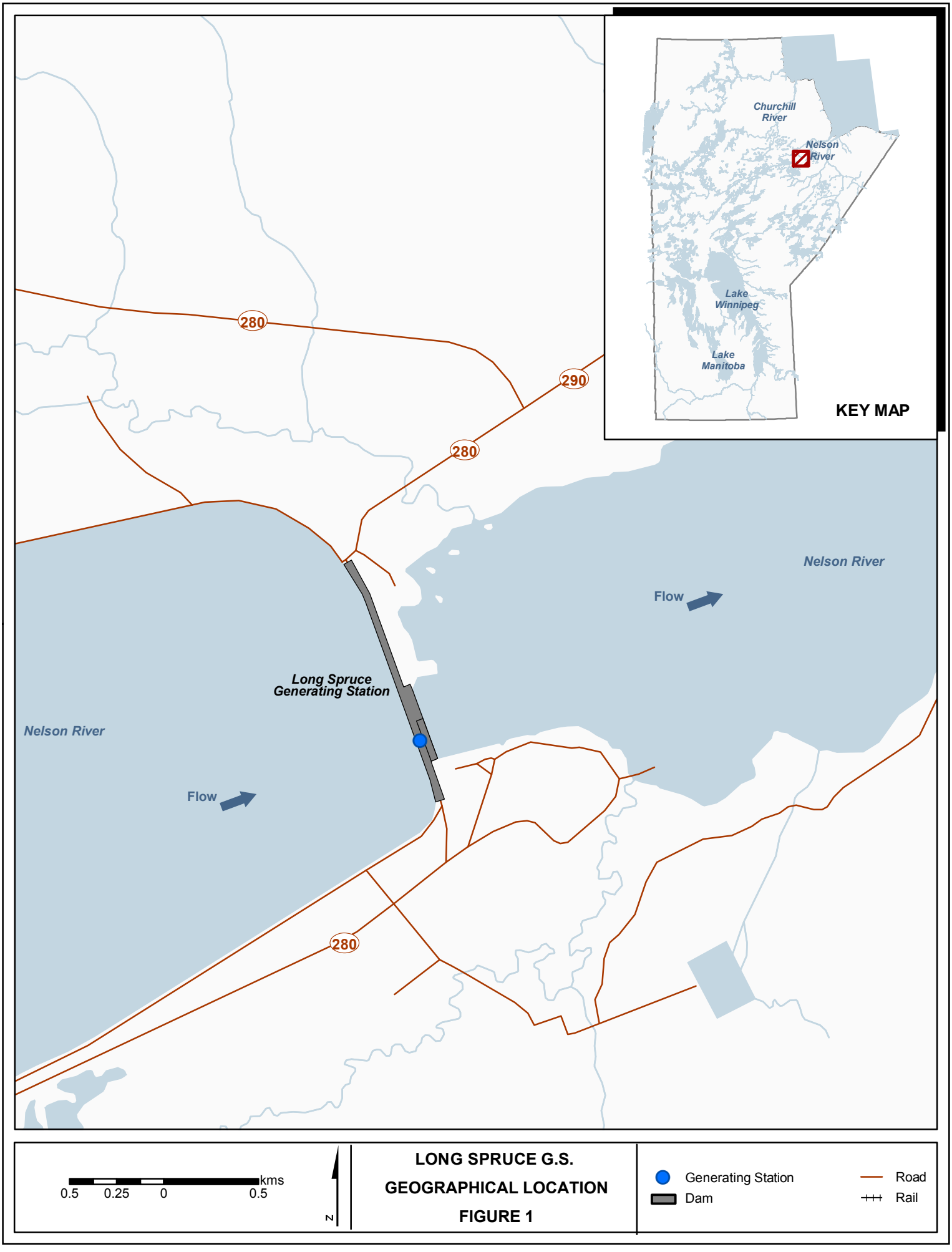
4. Change Management

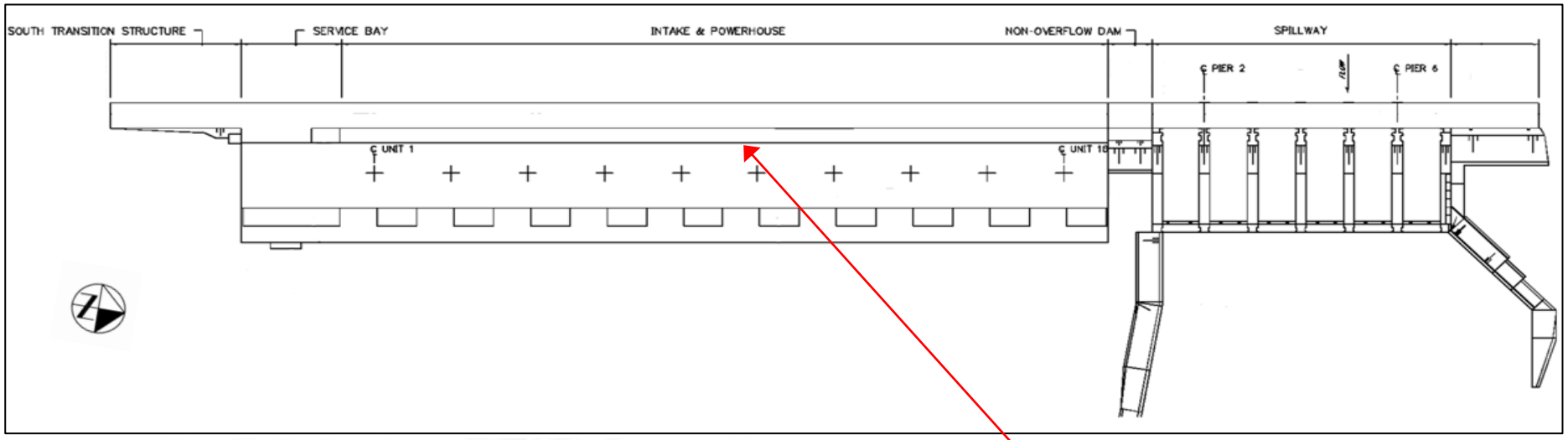
4.1 Regular Updates

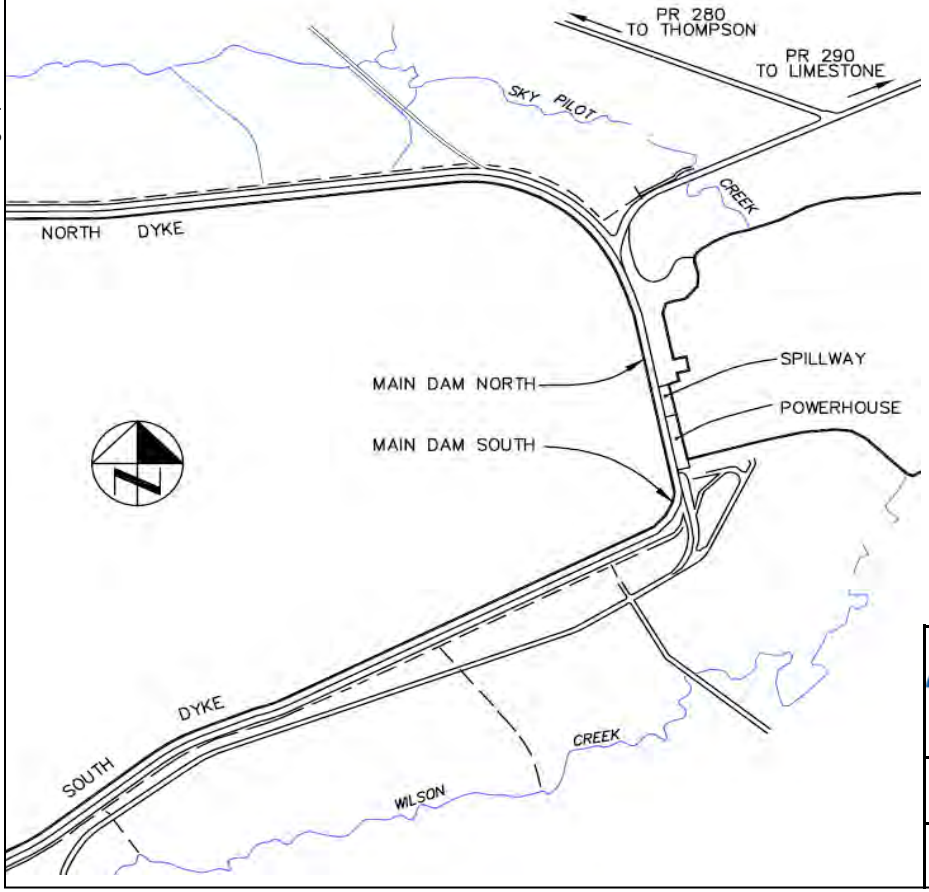
Proposed revisions to this Guide will be drafted by Manitoba Hydro as required or directed by Manitoba Sustainable Development. Following review and approval of revisions by Manitoba Sustainable Development, a revised copy of this Guide will be produced and distributed by Manitoba Hydro.

Appendix A

Site Map and Forebay Water Level Gauge Location


Churchill River
Nelson River
Lake Winnipeg
Lake Manitoba
KEY MAP
280
290
280
280
Nelson River
Flow
Long Spruce Generating Station
Nelson River
Flow
0.5 0.25 0 0.5 kms
N
LONG SPRUCE G.S.
GEOGRAPHICAL LOCATION
FIGURE 1
Generating Station
Dam
Road
Rail





FOREBAY GAUGE LOCATION
- located in the powerhouse
- stilling well is located on the fifth floor in the stairwell

Manitoba Hydro	MANITOBA HYDRO	
	HYDRAULIC OPERATIONS DEPARTMENT	
	LONG SPRUCE GENERATING STATION	
	LOCATION OF FOREBAY WATER LEVEL GAUGE	
	PROJECT LICENCE IMPLEMENATION GUIDE	FIGURE 2