

Manitoba Hydro Kelsey Generating Station Licence Implementation Guide for Water Levels

Prepared for:

Water Power Act Licensing Section
Manitoba Sustainable Development
1007 Century Street
Winnipeg, Manitoba R3M 0W4

Prepared by:

Hydraulic Operations Department
Manitoba Hydro
360 Portage Avenue
Winnipeg, Manitoba R3C 0G8

July 2018

Report No. PS&O 18/05

Manitoba Hydro
Kelsey Generating Station
Licence Implementation Guide for Water Levels

Original signed by, P.G. Chanel



PREPARED BY:

Original signed by, P.G. Chanel

P.G. CHANEL

REVIEWED BY:

Original signed by, B.W. Giesbrecht

B.W. GIESBRECHT

Original signed by, W.V. Penner

NOTED BY:

W.V. PENNER

DATE:

2018-07-11

REPORT NO:

PS&O 18/05



Executive Summary

Introduction

Manitoba Hydro prepared this guide to document a common understanding of compliance with the water regime terms of the Kelsey 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.

Kelsey Forebay Water Level

The **Kelsey Forebay Water Level** is directly measured at the beginning of each hour.

Compliance

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

- a) does not exceed 605.0 feet (184.4 m) by more than 0.1 feet (0.03 m); and
- b) does not exceed 605.0 feet (184.4 m) more than two times in any 24-hour period

Reporting

In the event that the **Kelsey 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

Executive Summary	i
1. Introduction	1
1.1 Definitions.....	1
1.2 Datum	2
1.3 Quality Control.....	2
1.3.1 Benchmarks.....	2
1.3.2 Direct Water Level Measurements	2
1.3.3 Gauge Readings	2
1.4 Quality Assurance Procedure for Water Level Data.....	2
2. Kelsey Forebay Water Level.....	3
3. Compliance.....	4
3.1 Kelsey Water Power Act Licensing Requirement.....	4
3.2 Reporting.....	4
3.2.1 Compliance Reporting.....	4
3.2.2 Maintenance and Emergencies	4
3.2.3 Regular Annual Reporting.....	5
4. Change Management.....	6
4.1 Regular Updates	6
Appendix A Site Map and Forebay Water Level Gauge Location.....	7

1. Introduction

Kelsey Generating Station is located on the Nelson River approximately 680 km north of the City of Winnipeg and approximately 137 km upstream of the Kettle Generating Station. The site can be accessed by air or by rail from Thompson.

The Kelsey Generating Station was built between 1957 and 1961 making it the first generating station to be built by Manitoba Hydro on the Nelson River. The station was originally built to supply both the City of Thompson and the International Nickel Company's (INCO) mining and smelting operations in the Moak Lake and Mystery Lake areas with electricity. Six years after completion the generating station was linked to the Province's electrical system. Kelsey currently has a total licensed capacity of 423,500 horsepower (315.8 MW) through seven vertical turbine units each with a generating capacity of 60,500 horsepower (45.1 MW).

Manitoba Hydro currently operates the Kelsey Generating Station with a Short-Term Extension of the Final Licence. The Short-Term Extension Licence (STEL) was issued in accordance with the provisions of The Water Power Act on December 12, 2014. The STEL is in effect from January 1, 2015 to and including January 1, 2020.

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 69M540. This benchmark is a brass cap in concrete at the west side of the powerhouse.

Kelsey 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.

Kelsey Forebay Water Level means the hourly water level as measured by the **Kelsey Gauge**.

1.2 Datum

In accordance with Article 4 of the Kelsey Final Water Power Act Licence, water level information for the operation of the Kelsey 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 Kelsey Generating Station.

Kelsey benchmarks were established by level transfer from **Controlling Benchmarks** using spirit levelling methods.

1.3.2 Direct Water Level Measurements

Staff monitor the **Kelsey Gauge** equipment and take direct water level measurements to maintain gauge performance. If the direct measurements differ by more than 0.02 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. Kelsey Forebay Water Level

Article 4 of the Final Water Power Act licence places a limit on the **Kelsey Forebay Water Level**. A map showing the location of the **Kelsey Gauge** is provided in Appendix A. Water levels are largely influenced by the operation of the Kelsey Generating Station and local meteorological events. Due to the size of the forebay and the location of the **Kelsey Gauge**, wind effects on the **Kelsey Forebay Water Level** are negligible.

Kelsey 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 Kelsey Water Power Act Licensing Requirement

Maximum Water Level

Article 4 of the licence stipulates that:

“The Licensee shall not raise the headwater of its development to an elevation higher than 605.0 feet above mean sea level, Canadian Geodetic Datum, 1929 Adjustment. A higher elevation may be created only with prior written permission by the Director and in accordance with Section 72 of the Regulations.”

The forebay water level shall be in compliance with the limit described above if the hourly

Kelsey Forebay Water Level:

- a) does not exceed 605.0 feet (184.4 m) by more than 0.1 feet (0.03 m); and
- b) does not exceed 605.0 feet (184.4 m) more than two times in any 24-hour period

Based on the accuracy and location of the **Kelsey 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 **Kelsey 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.

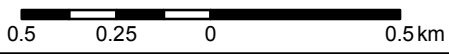
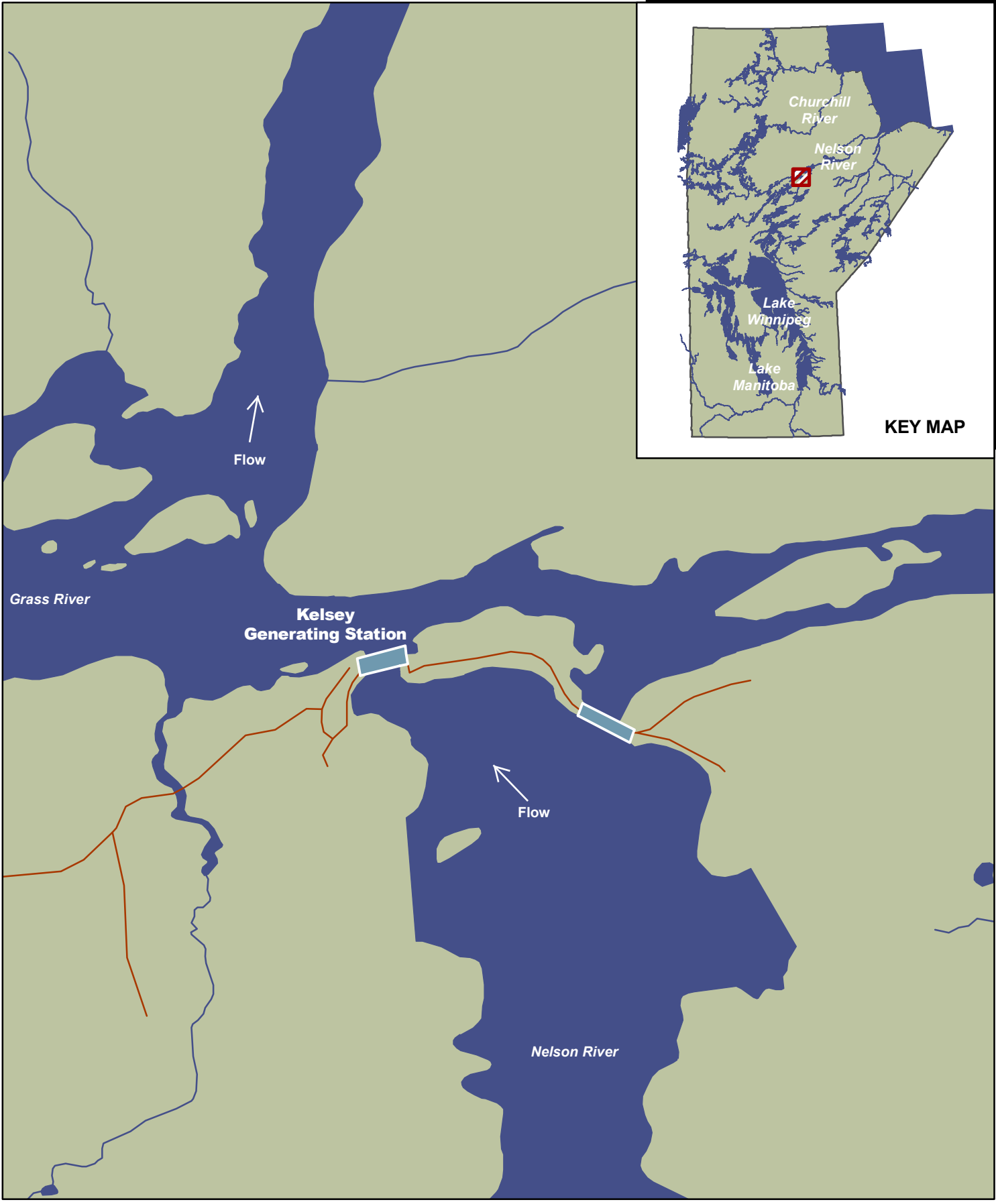
4. Change Management

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

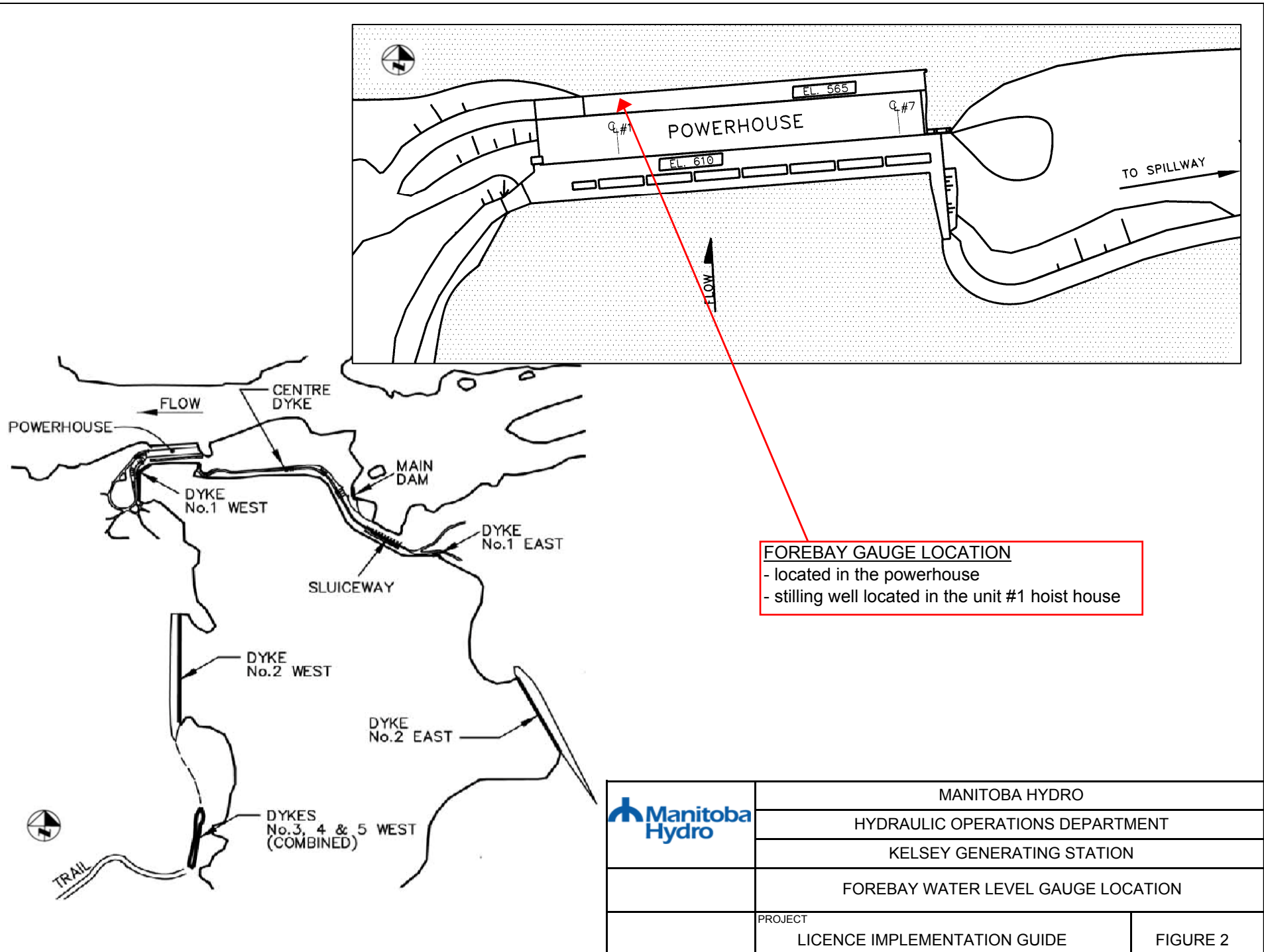


**KELSEY G.S.
GEOGRAPHICAL LOCATION**

FIGURE 1

- Generating Station and Dam
- Road

G-7



FOREBAY GAUGE LOCATION
 - located in the powerhouse
 - stilling well located in the unit #1 hoist house

	MANITOBA HYDRO	
	HYDRAULIC OPERATIONS DEPARTMENT	
	KELSEY GENERATING STATION	
	FOREBAY WATER LEVEL GAUGE LOCATION	
	PROJECT	
	LICENCE IMPLEMENTATION GUIDE	FIGURE 2