WATER POWER ACT LICENCES

POINTE DU BOIS GENERATING STATION SHORT-TERM EXTENSION LICENCE APPLICATION

SUPPORTING DOCUMENTATION

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Report No: PS&O - 16/06

HYDRAULIC OPERATIONS DEPARTMENT
POWER SALES & OPERATIONS DIVISION
POWER SUPPLY

WATER POWER ACT LICENCE
POINTE DU BOIS FALLS GENERATING STATION
SHORT-TERM EXTENSION LICENCE APPLICATION

SUPPORTING DOCUMENTATION

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APEGM
Certificate of Authorization
Manitoba Hydro
No. 38 Date: 2016 09 15

DATE: 2016 09 15

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1.0 INTRODUCTION

This report updates the supporting documentation previously provided to Manitoba Water Stewardship in November 2011. This report includes additional information about the new spillway at Pointe du Bois Generating Station.

Manitoba Hydro operates the Pointe du Bois Generating Station in accordance with a Short-Term Extension Licence (STEL) for the Development of Water Power at the Pointe du Bois site on the Winnipeg River. Manitoba Water Stewardship (now Manitoba Sustainable Development) issued this licence in accordance with the provisions of the Water Power Act on December 30, 2011. The STEL is for a term of 5 years that expires on January 1, 2017. Manitoba Hydro acquired the generating station from Winnipeg Hydro on September 3, 2002.

Manitoba Hydro submitted the application to renew the Fourth Renewal Licence on August 1, 2007. The intent to modernize the facility as outlined in that application changed and a January 21, 2010 letter to the province provided notification of a change in scope to build a new spillway, concrete and earth dams with upgrades to the existing powerhouse. The Pointe du Bois Spillway Replacement Project commenced in late 2011 and was completed in 2015.

2.0 PROJECT COMPONENTS

The Pointe du Bois Generating Station is located on the Winnipeg River approximately 160 km northeast of Winnipeg by road. The station is approximately 120 km (75 miles) upstream of Lake Winnipeg and about the 30 km from the Manitoba-Ontario border, as shown in Figure 1. The station is the most upstream generating station on the Winnipeg River in Manitoba. Figure 2 and 7 show the general arrangement of principal structures and aerial photo of the site.

The Pointe du Bois Generating Station is a run-of-river hydroelectric generating facility consisting of a powerhouse, west gravity dam, main and south earthfill dams, a spillway access bridge and a 7-bay spillway. The STEL states that the station has a nameplate capacity of 83 MW (112,000 horsepower). Pointe du Bois is the oldest station in the Manitoba Hydro system. Construction of the first phase of development began on or shortly after 1906 with the completion of double horizontal shaft Francis Turbines units one to four and unit seven in 1911/12. Additional units were added in 1914, 1919, 1921, 1922, 1925 and 1926 when the sixteenth and final unit became operational. In October 1995, Unit 11 was rerunnered and its capacity increased from 6,900 horsepower (HP) to 7,600 HP. Unit 1 was replaced with a Straflo turbine and commissioned on November 2, 1999 with a rating of 11,220 HP. Unit 15 in 2004 and Unit 16 in 2006 were also upgraded, each with increased capacity of 9,120 HP. All these upgrades

increased the total capacity of the generating station to 85 MW (113,960 HP). A spillway access bridge was constructed in 2010. In 2015, the Pointe du Bois Spillway Replacement Project was completed and involved the replacement of the east gravity dam, spillway bays and rockfill dam with a new 7-bay spillway as well as main and south earthfill dams.

Tables 1 and 2 summarize the operating parameters, and principal structures of the Pointe du Bois Generating Station. Figures 4 and 5 show the typical section plan of the powerhouse

Table 1: Pointe du Bois G.S. Construction Specifications and Operating Parameters

Construction Period	1909 to 1926
Licensed Capacity (Jan. 1, 1992- Jan. 1 2012)	78 MW (105,000 horsepower)
Licensed Capacity (Jan. 1, 2012- Jan. 1 2017)	83 MW (112,000 horsepower)
Current Capacity	85 MW (113,960 horsepower)
Average Annual Generation	526 million kW-h
Waterfall Drop (head)	14 m (46 ft)
Maximum Licence Forebay Elevation (measured at the inner forebay)	299.04 m (981.1 ft)
Normal Operating Maximum Forebay Elevation (measured at the outer forebay)	299.1 m (981.3 ft)

Table 2: Pointe du Bois G.S. Principal Structures

Powerhouse	Number of Units	15 double horizontal shaft Francis Turbines and one Straflo turbine
	Length	135 m (442.9 ft)
	Discharge Capacity (at full gate)	712 m^3/s (25,144 ft^3/s)
	Power Production Unit 1 Units 2-4, 7 Units 5, 6, 8 Units 9, 10 Unit 11 Units 12-14 Units 15, 16	 1 unit @ 11,220 HP 4 units @ 5,200 HP 3 units @ 6,800 HP 2 units @ 6,900 HP 1 unit @ 7,600 HP 3 units @ 7,300 HP 2 units @ 9,120 HP
Spillway	Number of Bays	7 bays
	Bay Opening	13 m (42.65 ft)
	Discharge Capacity (at full supply level*)	4,915 m^3/s (173,572 ft^3/s)

Main and South Earthfill Dams	Material	Impervious core with granular and crushed rock filters and outer rockfill shells
	Crest Elevation	300.1 m (984.6 ft)
	Available Freeboard	1 m (3.5 ft)

*Full Supply Level is 299.1 m measured at the outer forebay

The forebay at Pointe du Bois consists of two parts: the inner forebay, located between the powerhouse and the spillway access bridge, and the outer forebay, extending upstream of the spillway access bridge to Lamprey Falls. The inner forebay elevation is subject to rapid changes due to wind, flow changes and operations. The outer forebay encompasses a larger area and does not experience the same rapid changes as the inner forebay. The forebay has a total area of 25.1 sq. km (9.7 sq. miles) and a fetch length of approximately 5 km (3.1 miles). The maximum operating level is 299.1 m (981.3 ft) measured at the outer forebay.

The Pointe du Bois Generating Station is operated from the control room on site and is continuously staffed. Maintenance and emergency staff are located at the station.

3.0 WATER POWER LICENSING REQUIREMENTS

3.1 Licence Terms

Condition #5 of the licence stipulates that:

> *"The Licensee shall not raise the headwater of the development, as measured at the powerhouse, to an elevation higher than 981.1 feet above mean sea level, Dominion Water Power Survey Datum (with wind effect eliminated). A higher elevation may be created only with written permission by the Director and in accordance with Section 72 of the Regulation."*

The maximum elevation of 981.1 ft as specified in the licence refers to the elevation measured at the inner forebay. An analysis performed for various flow conditions shows that operating the outer forebay to 299.1 m (981.3 ft) provides a sufficient buffer so that the licence limit is not exceeded. The average drawdown from the outer to the inner forebay under most flow conditions is 0.30 m (1.0 ft). During plant shut down, the residual flow through the plant maintains an average drawdown of 0.15 m (0.5 ft).

Historically the plant has been operated to maintain an outer forebay level of 299.1 m (981.3 ft).

3.2 Licence Area

The licence area extends downstream of Pointe du Bois Generating Station at around Eight Foot Falls to the upstream boundary at Lamprey Falls. The licence area is shown in Manitoba Sustainable Development file number 21-12-1018.

Manitoba Hydro is reviewing the licence area and will propose changes/refinements based on current cadastral information, updated geotechnical analysis of shoreline erodability and wind setup and wave uprush analysis. The updated licence area will be submitted as part of the licence renewal process.

4.0 MONITORING PROGRAMS

4.1 Water Levels

The forebay water levels at Pointe du Bois are measured and recorded using water level gauges located in the inner and outer forebays as indicated on Figure 3. Measurements are recorded using an ultrasonic transducer and a data logger. The components of the inner and outer forebay gauges are identical in construction. The transducer is installed in a stilling well at a depth of 2 m and is protected from the elements by a small shelter (outer forebay gauge). The data logger transmits a signal to the control room through a cable running to the spillway and across the pole line where it enters the powerhouse at the north-east side of the gateroom.

The outer forebay gauge is located upstream of the spillway access bridge. The inner forebay gauge is located in the north-east section of the gateroom in the powerhouse, upstream of the Unit 1 intake.

System Control Centre staff monitor the water level data and respond to alarms as required. The water level data is also recorded on Daily Hydraulic Reports that are forwarded to the Operating Supervisor. The report is reviewed, signed and electronically sent to the Energy Operations Planning (EOP) Department. The EOP department staff enters the data into a WISKI database that is accessible, with permission, to interested parties within Manitoba Hydro.

Manitoba Hydro prepares an annual report documenting water levels and flows within Water Power Act licence areas. The report contains analysis of water level and flow data related to the licence conditions for the calendar year. Information specific to Pointe du Bois includes the analysis of forebay level data, maps, photos, project description, and gauge and data collection description. In addition to the annual report, Manitoba Hydro performs weekly licence compliance checks for all Water Power Act licence conditions. Manitoba Hydro reports licence limit exceedances to Manitoba Sustainable Development upon occurrence.

4.2 Dam Safety

Manitoba Hydro's Dam Safety Program is based on the Canadian Dam Association Dam (CDA) Safety Guidelines. Both existing and newly constructed embankment and concrete dams at Pointe du Bois continue to be inspected at regular intervals for any anomalies or deficiencies. Routine inspections of Pointe du Bois' dams by Manitoba Hydro staff are performed weekly for the embankment dams and bi-monthly for the concrete dams, including the spillway. Intermediate inspections of all dams are performed by specialists from Manitoba Hydro's Engineering Services Division twice per year. Data from inspections, engineering analysis and instrumentation readings are used to assess the condition of the structures.

The new seven-bay spillway at Pointe du Bois was completed in 2014 and is capable of passing the inflow design flood, in accordance to the CDA guidelines. The spillway and related equipment are inspected by site staff on a weekly basis with the electrical and mechanical components being maintained annually.

4.3 Aquatic Monitoring

Healthy fish populations exist above and below the Pointe du Bois Generating Station. Manitoba Hydro is aware that a healthy recreational fishery exists on the Winnipeg River above Pointe du Bois used by cottagers located in the forebay area as well as the commercial tourism industry (fishing lodges). Downstream of the Pointe du Bois GS, in addition to the regular assemblage of fish species and the associated recreational fishery, a healthy population of lake sturgeon exists.

Provincial Fisheries Branch and Manitoba Hydro are partners in the Coordinated Aquatic Monitoring Program (CAMP), which includes water quality, lower trophic levels and fish sampling on the Winnipeg River, including near the station. Manitoba Hydro is also undertaking aquatic monitoring for the Pointe du Bois Spillway Replacement Project. Monitoring of Lake Sturgeon spawning success and the juvenile population downstream of the station is occurring as well as fish community studies both upstream and downstream of the station.

5.0 SYSTEM UPGRADES AND AGREEMENTS

5.1 System Upgrades

Several repairs and upgrades have been made to the Pointe du Bois Generating Station over the years. Some of the major repairs and upgrades include the following:

- Unit 11 rerunnering was completed in October 1995, increasing the capacity of that unit from 6,900 HP to 7,600 HP
- Unit 1 was replaced with a Straflo unit and commissioned on November 2, 1999, with a new capacity of 11,220 HP, shown on Figure 6
- To address stability concerns in the East and West Gravity Dams, anchoring was completed in 1985 and 2002. In the 2002, the East Gravity Dam was also reinforced with concrete gravity blocks downstream of the structure
- Unit 16 (2004) and Unit 15 (2006) upgraded with increased capacity of 9,120 HP/unit.
- A vehicle access bridge was installed in 2010/11 to address dam safety concerns.
- New spillway completed and in-service in 2014
- Unit 12, 13 and 14 turbine rehabilitation completed in 2014/15
- Completed construction of new main and south earthfill dams in 2015

5.2 Agreements

Manitoba Hydro and Sagkeeng Nation signed an Agreement and Accord in March, 1997 to address issues arising from the effects of Manitoba Hydro works up to November, 2006. Negotiations are continuing on an extension/renewal of the Accord.

6.0 CLOSURE STATEMENT

Manitoba Hydro continues to operate the Pointe du Bois Generating Station in accordance with the first Short-term Extension Licence under *The Water Power Act* for the development of water power at the Pointe du Bois Site on the Winnipeg River. Manitoba Hydro operates and maintains the generating station and associated structures based on the Canadian Dam Association Guidelines.

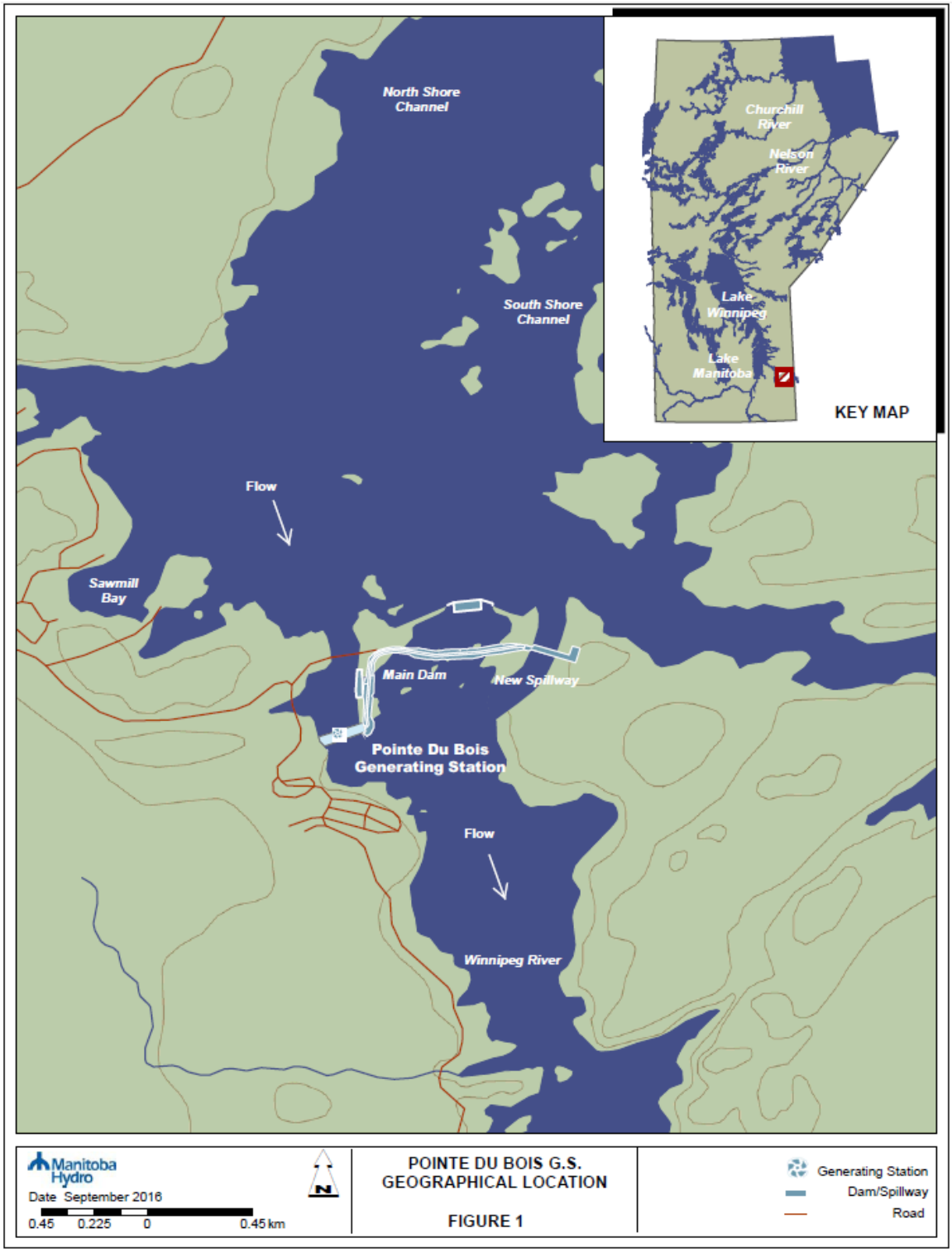
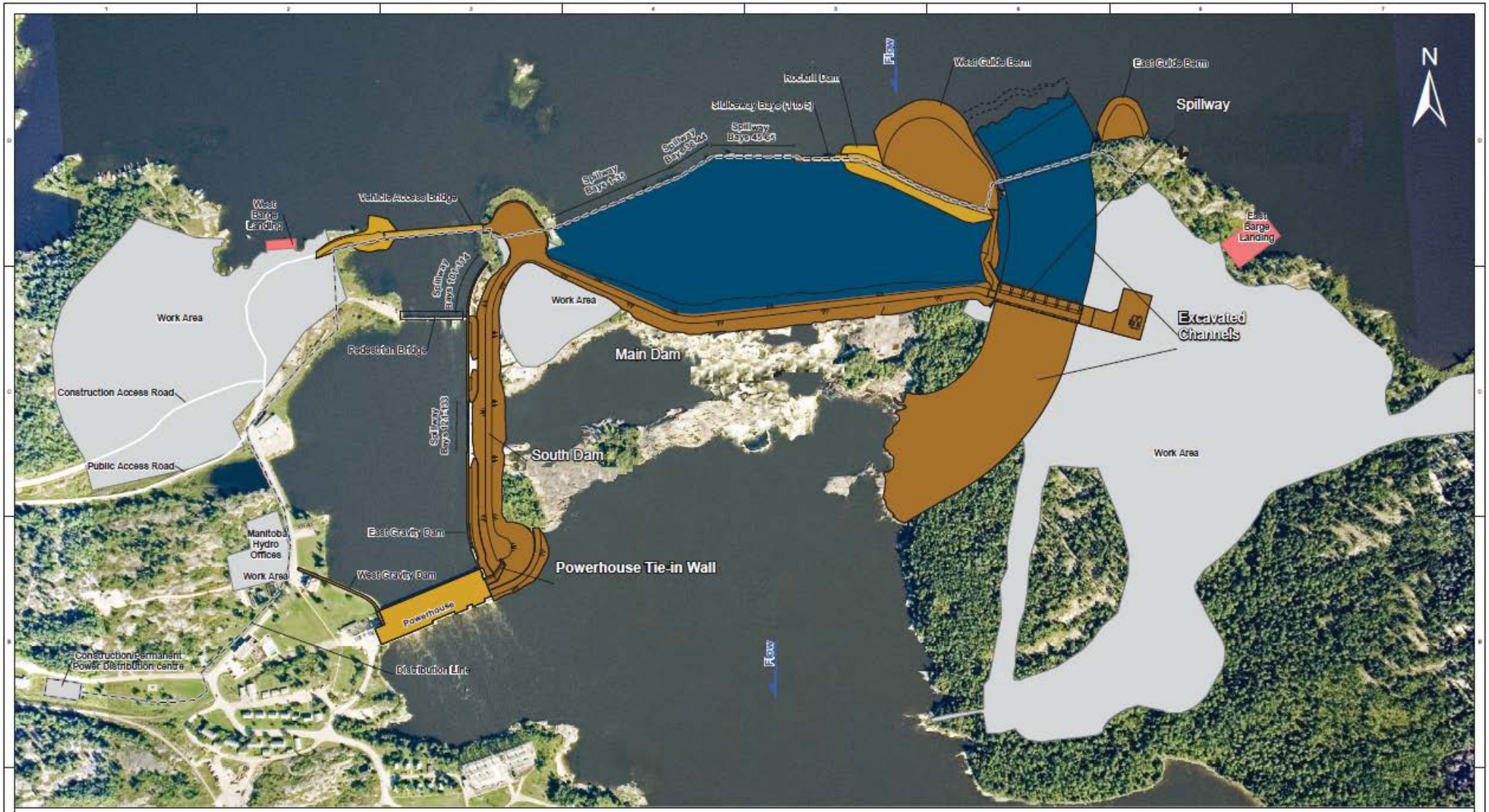
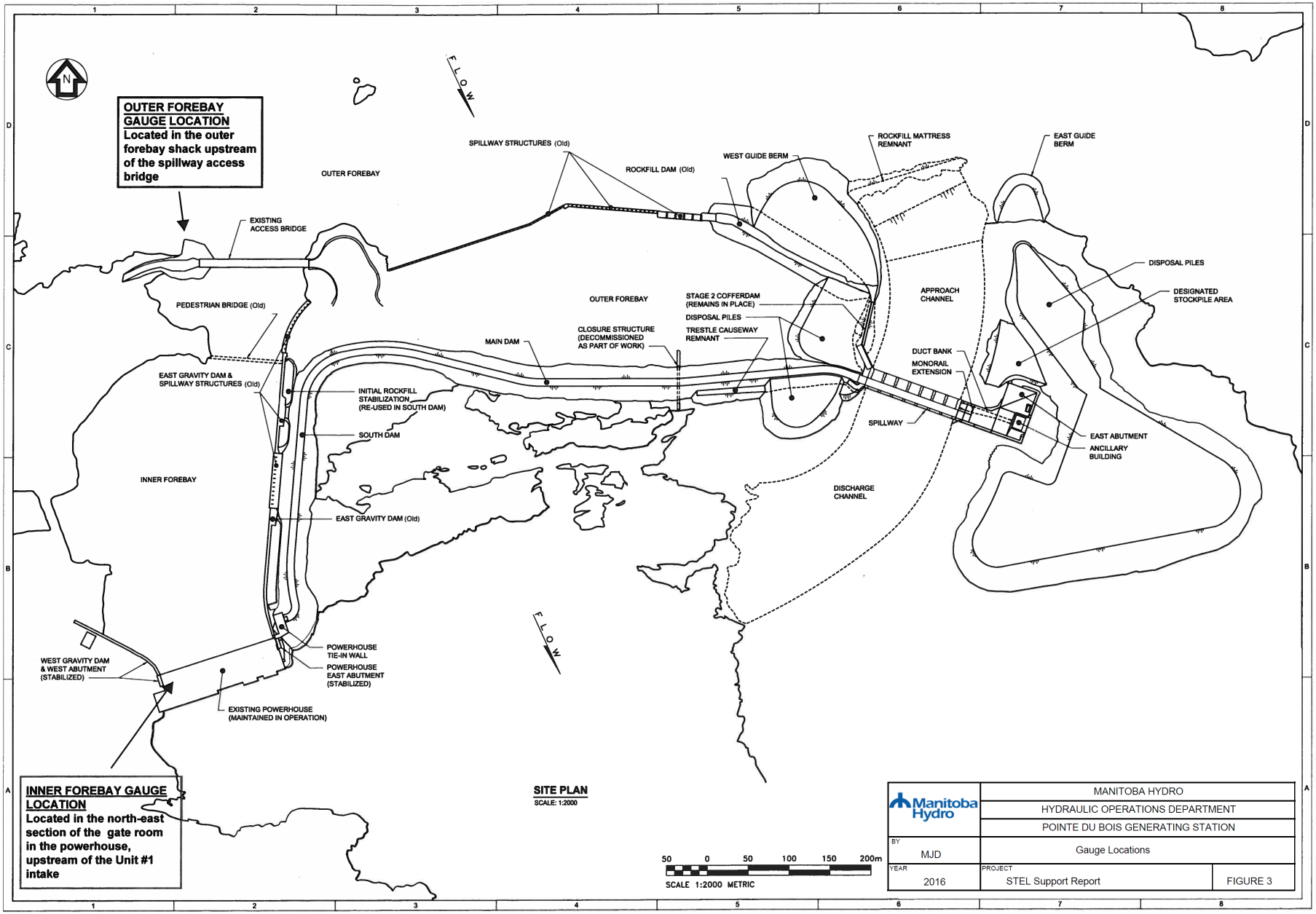


Figure 1: Pointe du Bois Geographical Location



Legend
- Existing Structures
- Flooded Areas of New Arrangement
- New Arrangement (2012)

Manitoba Hydro	MANITOBA HYDRO	
	HYDRAULIC OPERATIONS DEPARTMENT	
	POINTE DU BOIS GENERATING STATION	
BY: MJD	General Arrangement of Principal Structures	
YEAR: 2016	PROJECT: STEL Support Report	FIGURE 2


OUTER FOREBAY GAUGE LOCATION
Located in the outer forebay shack upstream of the spillway access bridge
INNER FOREBAY GAUGE LOCATION
Located in the north-east section of the gate room in the powerhouse, upstream of the Unit #1 intake
N
F L O W
F L O W
SPILLWAY STRUCTURES (Old)
ROCKFILL DAM (Old)
WEST GUIDE BERM
ROCKFILL MATTRESS REMNANT
EAST GUIDE BERM
OUTER FOREBAY
EXISTING ACCESS BRIDGE
PEDESTRIAN BRIDGE (Old)
OUTER FOREBAY
STAGE 2 COFFERDAM (REMAINS IN PLACE)
DISPOSAL PILES
TRESTLE CAUSEWAY REMNANT
CLOSURE STRUCTURE (DECOMMISSIONED AS PART OF WORK)
MAIN DAM
APPROACH CHANNEL
DISPOSAL PILES
DESIGNATED STOCKPILE AREA
DUCT BANK
MONORAIL EXTENSION
EAST GRAVITY DAM & SPILLWAY STRUCTURES (Old)
INITIAL ROCKFILL STABILIZATION (RE-USED IN SOUTH DAM)
SOUTH DAM
SPILLWAY
EAST ABUTMENT
ANCILLARY BUILDING
INNER FOREBAY
DISCHARGE CHANNEL
EAST GRAVITY DAM (Old)
POWERHOUSE TIE-IN WALL
POWERHOUSE EAST ABUTMENT (STABILIZED)
WEST GRAVITY DAM & WEST ABUTMENT (STABILIZED)
EXISTING POWERHOUSE (MAINTAINED IN OPERATION)
SITE PLAN
SCALE: 1:2000
50 0 50 100 150 200m
SCALE 1:2000 METRIC
Manitoba Hydro
MANITOBA HYDRO
HYDRAULIC OPERATIONS DEPARTMENT
POINTE DU BOIS GENERATING STATION
BY MJD
Gauge Locations
YEAR 2016
PROJECT STEL Support Report
FIGURE 3

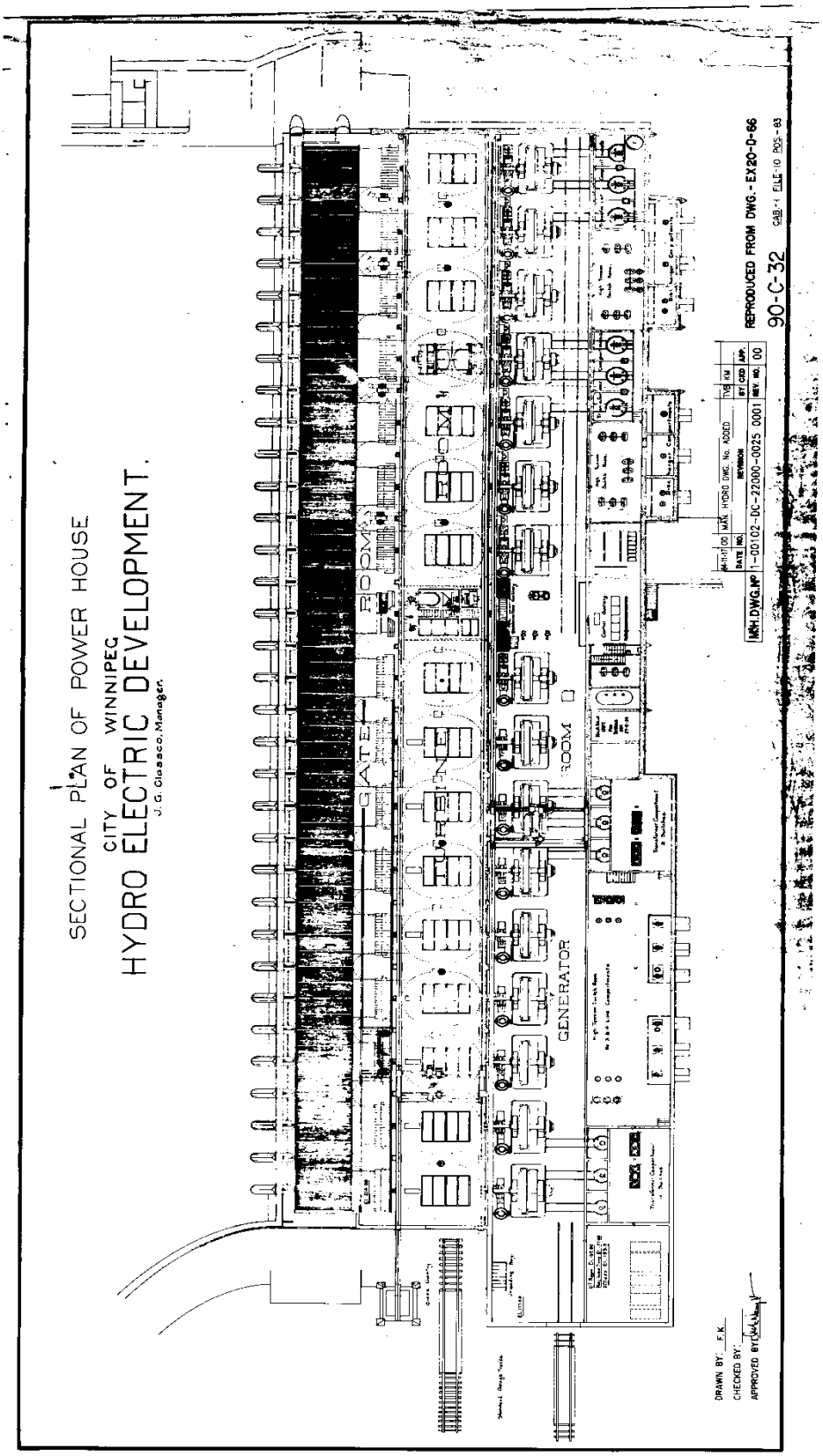


Figure 4: Powerhouse

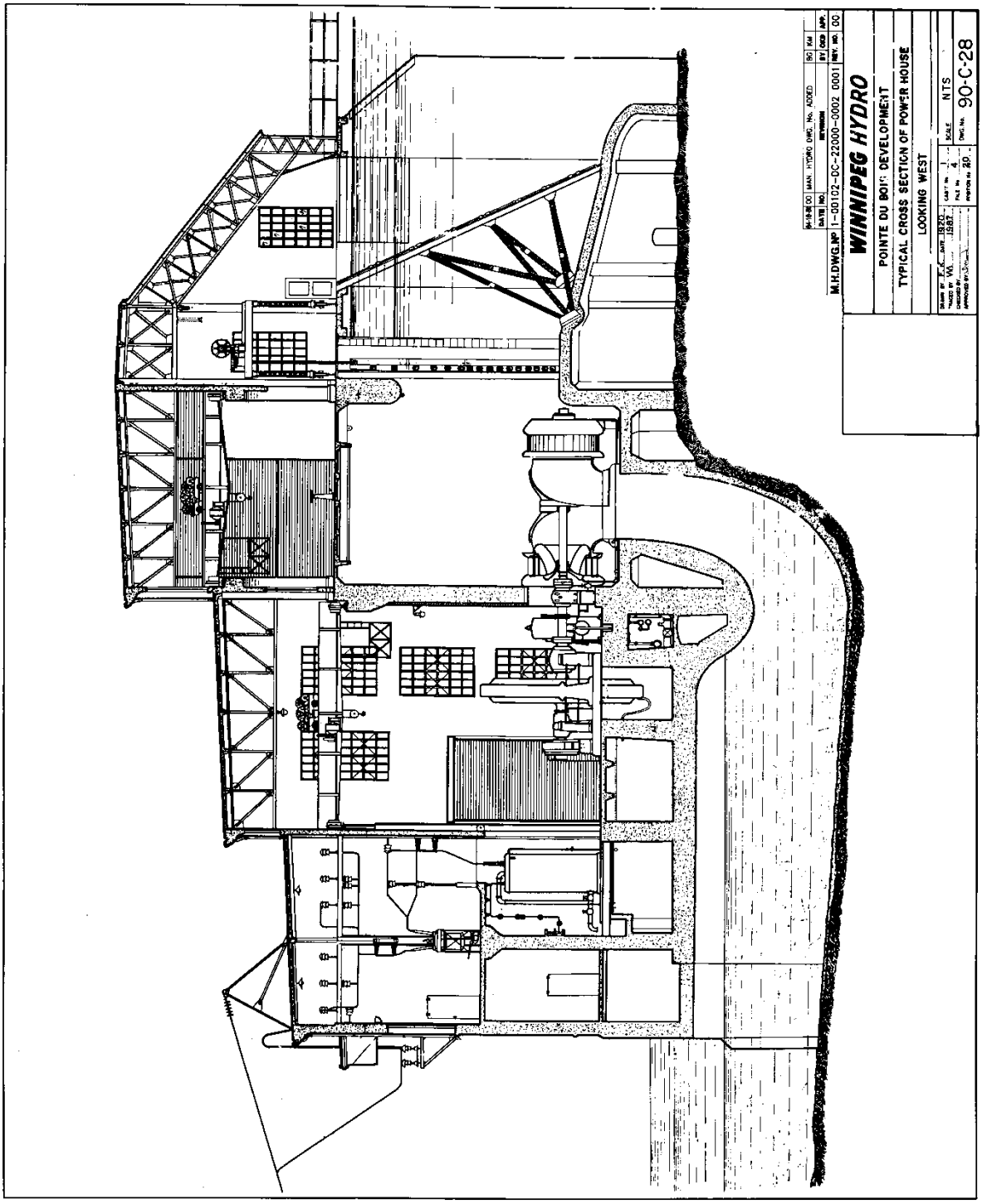


Figure 5: Typical Cross Section of Powerhouse

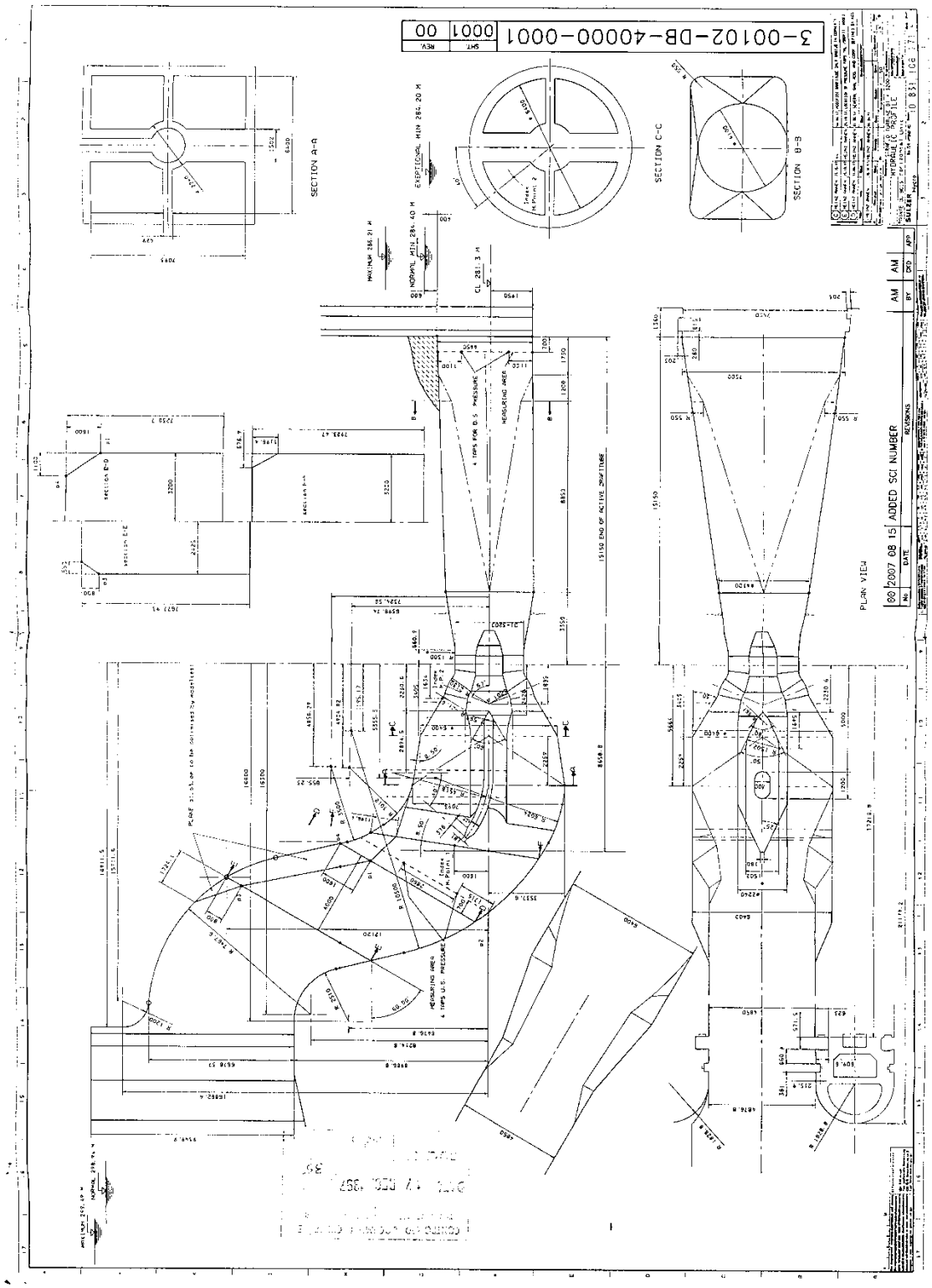


Figure 6: Straflo Unit #1

Manitoba Hydro	MANITOBA HYDRO
	HYDRAULIC OPERATIONS DEPARTMENT
	POINTE DU BOIS GENERATING STATION
DRAWN BY: MJD	PHOTOGRAPH OF GENERATING STATION
YEAR: 2016	PROJECT: STEL Support Report — FIGURE 7