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May 31, 2021

Sent by email to Tyree Mullaney tyree@mvlwb.com

Mackenzie Valley Land and Water Board (MVLWB)
P.O. Box 2130
4922 - 48th Street
7th Floor YK Centre Mall
Yellowknife, NT. X1A 2P6

Dear Tyree Mullaney,

RE: 2020 Jackfish Annual Report

Please see attached our submission as part of the requirements of Type A Water Licence
No.: MV2019L1-0001

Signed by:

A handwritten signature in black ink, appearing to read "Alexander Love", is written over a light grey horizontal line.

Alexander Love
Director, Hydro Operations
Northwest Territories Power Corporation

c.c.

Katherine Harris, kharris@mvlwb.com
David-Scott McQuinn, david-scott_McQuinn@gov.nt.ca



ANNUAL REPORT

2020

Northwest Territories Power Corporation

Jackfish Hydroelectric Facility Generating Station
Water License No. MV2019L1-0001

SUBMITTED TO:
MACKENZIE VALLEY LAND AND WATER BOARD

MAY 2021



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LIST OF ABBREVIATIONS

AEMP	Aquatic Effects Monitoring Program
ENR	Department of Environment and Natural Resources
GNWT	Government of Northwest Territories
MVLWB	Mackenzie Valley Land and Water Board
NTPC	Northwest Territories Power Corporation
NWT	Northwest Territories
OMS	Operations, Maintenance, and Surveillance
SNP	Surveillance Network Program
WMP	Waste Management Plan

TABLE OF CONCORDANCE

The following Table of Concordance has been provided for Northwest Territories Power Corporation (NTPC) to track conditions for Water License No.: MV2019L1-0001, how they have been addressed in 2020, and a reference report discussed.

Source* and Topic	Comment	2020 Addressed
Missing Reports*	Thermal Plume Delineation Study Design	NTPC submitted to the MVWLB the Thermal Plume Delineation Study Design on July 15, 2020. The MVLWB approved the submission on Oct. 9, 2020. NTPC was not able to meet the schedule in the approved study. An additional request for deferral of submission dates under MV2019L1-0001 was approved by the MVLWB on April 29, 2021. As per the updated Schedule in MV2019L1-0001 NTPC submitted the Thermal Plume Delineation Study Design V2.1 on May 28, 2021
Missing Reports*	Thermal Plume Delineation Study Report (to be submitted after the design)	NTPC requested deferral of the Thermal Plume Delineation Study report submission until Jan. 30, 2023. The MVLWB approved the deferral request on April 29, 2021.
Missing Reports*	Aquatic Effects Monitoring Program Design Plan	NTPC requested deferral of the AEMP Design Plan submission until Apr. 30, 2023. The MVLWB approved the deferral request on April 29, 2021.
Missing Reports*	Surveillance Network Program Monthly Monitoring Reports for: 2019: Nov., Dec. 2020: Jan. to Dec.	NTPC submitted to the MVLWB all outstanding SNP Monthly Reports on Jan. 29, 2021.
Missing Reports*	Surveillance Network Program Annual Report for 2019.	NTPC submitted to the MVLWB the outstanding SNP Annual Report for 2019 on Jan. 29, 2021.
Missing Reports*	Standard Operating Procedures and Quality Assurance and Quality Control Plan	NTPC submitted to the MVLWB the Operations, Maintenance, and Surveillance Manual on Feb. 26, 2021.
SNP Monitoring requirements**	Jackfish Lake Instrumentation Study to be completed to ensure instrumentation changes confirm to the specifications in MV2019L1-0001 Annex A, Part B	NTPC submitted to the MVLWB the completed Study on Apr. 24, 2020. NTPC will have updated monitoring equipment operational by August 31, 2021.
SNP Monitoring requirements**	Monitoring in 2020 at SNP stations JF01-06 and MW2 was	NTPC developed the Jackfish Lake 2021 Groundwater Monitoring Program Plan which outlines:

Source* and Topic	Comment	2020 Addressed
	non-compliant for the following reasons: 1. Not all required parameters were measured; 2. The collected water samples were not analyzed for all required analytes; and 3. The June 2020 monitoring event was not done.	1. Parameters for analysis. 2. Analytes specified for each SNP Station; 3. The monitoring schedule in accordance with the Licence; and 4. Guidance for conducting the monitoring in accordance with best practices.

* Email from Heather Beck, Water Resource Officer, ENR, provided to Matthew Miller, Senior Regulatory Specialist, NTPC, on January 12, 2021.

**Email from Heather Beck, Water Resource Officer, ENR, provided to Matthew Miller, Senior Regulatory Specialist, NTPC, on January 28, 2021.

1 INTRODUCTION

This 2020 Annual Report has been prepared for submission by Northwest Territories Power Corporation (NTPC) to Mackenzie Valley Land and Water Board (MVLWB) as part of the requirements of Type A Water License No.: MV2019L1-0001 (Water Licence). The previous water licence was renewed in 2019, and this Water Licence became effective October 18, 2019 and will expire on October 17, 2044. This Water Licence regulates the use of water and deposit of waste for industrial activities at Jackfish Hydroelectric Power Generating Station (Jackfish Facility), which includes withdrawal of water for the cooling of the power generators, depositing of waste and progressive reclamation and associated closure and reclamation activities.

The NTPC operates the Jackfish Facility on Jackfish Lake, near Yellowknife, Northwest Territories (NWT). The facility is a diesel-operated electricity generation station and through the Water Licence, NTPC uses water from Jackfish Lake to cool the facility generators.

There are four water intakes on Jackfish Lake (two intakes for K Plant cooling, and one each for EMD Plant and CAT Plant). After the water is used for cooling, it is returned to Jackfish Lake via three discharges. NTPC operated the Jackfish Facility for the purposes of standby and continuous power during the 2020 calendar year.

Figure 1-1 provides an overview of the Jackfish Facility location.



Figure 1 NWT Location map.mxd / 5/17/2021 / 11:44:59 AM



DATE: May 2021
 DRAWN BY: DA



FIGURE 1-1: JACKFISH HYDROELECTRIC POWER GENERATION FACILITY

2 PROJECT ACTIVITIES

NTPC operations and capital work was reduced to basic operations and maintenance until August 2020 due to the COVID-19 public health restrictions that started in mid-March of 2020. Despite the reduction in operations, two major projects were undertaken at the Jackfish Facility in 2020.

1. The inspection and upgrading of the floor of a 1.5 million litre fuel storage tank as part of the re-certification of the tank.
2. The installation of motorized valves and fuel sensors for the 90,000 litre tank that supplies the gensets. This upgrade of NTPC’s fuel systems for the modular gensets was intended to improve control, reliability, and safety.

3 SURVEILLANCE NETWORK PROGRAM

The Surveillance Network Program (SNP) for the Jackfish Facility is reflected in the following tables (Table 3-1, 3-2, 3-3, and 3,4), with tabulated data in Appendix A.

Table 3-1 SNP Station 00-1

Detail	SNP 00-1
Description	SNP 00-1 a,b,c,d – Intakes to the K (2 intakes), EMD (1 intake), and CAT (1 intake) plants
Location	<ul style="list-style-type: none"> • SNP 00-1a – K plant intake 1 • SNP 00-1b – K plant intake 2 • SNP 00-1c – EMD plant intake • SNP 00-1d – CAT plant intake
Sampling Frequency	Continuous <i>in-situ</i> measurements during discharge to Jackfish Lake
Sampling Parameters	Water temperature (°C) Flow (daily, monthly, and annual volumes in m ³)

Table 3-2 SNP Station 00-2

Detail	SNP 00-2
Description	SNP 00-2 a,b,c,d – Discharges from the K, EMD and CAT plants
Location	<ul style="list-style-type: none"> • 00-2a – K plant • 00-2b – EMD • 00-2c – CAT plant
Sampling Frequency	Continuous <i>in-situ</i> measurements during discharge to Jackfish Lake
Sampling Parameters	Water temperature (°C)

Table 3-3 SNP Station JF01-06

Detail	SNP JF01-06
Description	JF01-06 – Groundwater Monitoring Well
Location	Located at the Lease Boundary near the lake shore near the warehouse near K Plant
Sampling Frequency	Sampled twice a year during June and September
Sampling Parameters	<p>Field parameters: pH, electrical conductivity, temp (°C), dissolved oxygen.</p> <p>Lab parameters: Major ions, Total suspended solids (TSS), oil & grease (hexane extractable), pH, Total Petroleum Hydrocarbons (F1-F4 CCME Fractions), BTEX, Dissolved metals (Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Uranium, and Zinc)</p>

Table 3-4 SNP Station MW2

Detail	SNP MW2
Description	MW2 – Groundwater Monitoring Well
Location	Located at the Lease Boundary near the lake shore between the EMD Plant and the CAT Plant
Sampling Frequency	Sampled twice a year during June and September
Sampling Parameters	<p>Field parameters: pH, electrical conductivity, temp (°C), dissolved oxygen.</p> <p>Lab parameters: Major ions, Total suspended solids (TSS), oil & grease (hexane extractable), pH, Total Petroleum Hydrocarbons (F1-F4 CCME Fractions), BTEX, Dissolved metals (Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium,</p>

Detail	SNP MW2
	Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Uranium, and Zinc)

Tables 3-5 and 3-6 summarizes the results of the groundwater sampling analysis; the tabular data are appended in digital format (.xlsx file) and submitted to MVLWB on the Registry with this report.

Table 3-5 Groundwater Analysis at SNP Station JF01-06 on Oct 5, 2020

Parameter	Sample ID L2512806-1 Sample Concentration (mg/L)	Sample ID L2512806-2 Duplicate Sample Concentration (mg/L)
Benzene	<0.00050	<0.00050
Toluene	<0.00050	<0.00050
Ethylbenzene	<0.00050	<0.00050
Xylenes	<0.00071	<0.00071
PHC (F1) ¹	<0.10	<0.10
PHC (F2) ²	<0.10	<0.10
PHC (F3) ³	<0.25	<0.25
PHC (F4) ⁴	<0.25	<0.25

Notes:

¹ Petroleum hydrocarbons C₆ to C₁₀ does not include BTEX fractions.

² Petroleum hydrocarbons C_{>10} to C₁₆

³ Petroleum hydrocarbons C_{>16} to C₃₄

⁴ Petroleum hydrocarbons C_{>34} to C₅₀

Groundwater samples were collected at SNP Stations JF01-06 and MW2 on October 5, 2020. The samples were shipped to ALS Environmental (ALS) in Edmonton, AB, for laboratory analysis and were analyzed on October 10, 2020 under Lab Work Order # L2512806. ALS is a CALA-accredited analytical laboratory (CALA Member Number 1352). The water samples were analyzed for BTEX and F1 through F4. Refer to Section 12 for more information pertaining to the potential License non-compliance in sampling schedule and sampling parameter analysis.

Table 3-6 Groundwater Analysis at SNP Station MW2 on Oct 5, 2020

Parameter	Sample ID L2512806-14 Sample Concentration (mg/L)
Benzene	<0.00050
Toluene	<0.00050
Ethylbenzene	<0.00050
Xylenes	<0.00071
PHC (F1) ¹	<0.10
PHC (F2) ²	<0.10
PHC (F3) ³	<0.25
PHC (F4) ⁴	<0.25

Notes:

¹ Petroleum hydrocarbons C₆ to C₁₀ do not include BTEX fractions.

² Petroleum hydrocarbons C_{>10} to C₁₆

³ Petroleum hydrocarbons C_{>16} to C₃₄

⁴ Petroleum hydrocarbons C_{>34} to C₅₀

4 WATER USAGE RECORDS

In-situ water temperature (°C) data are continuously recorded by electronic dataloggers at 15-minute intervals at the following locations at the Jackfish Facility:

- K Plant Intake #1 – SNP Station 00-1a
- K Plant Intake #2 – SNP Station 00-1b
- EMD Plant Intake – SNP Station 00-1c
- CAT Plant Intake – SNP Station 00-1d
- K Plant Discharge – 00-2a
- EMD Plant Discharge – 00-2b
- CAT Plant Discharge – 00-2c

The mean daily water temperature records for the intakes and discharge from K Plant, EMD Plant, and CAT Plant are presented on Figure 4-1, Figure 4-2, and Figure 4-3, respectively. In December 2020, the datalogger was experiencing battery problems in cold weather and had some intermittent data loss. The battery was replaced. Tabulated data of the mean daily water temperature are provided in Appendix A and appended to this Annual Report in Microsoft Excel (.xlsx) digital format. The monthly, and annual water use by the Jackfish Facility are summarized in Table 4-1.

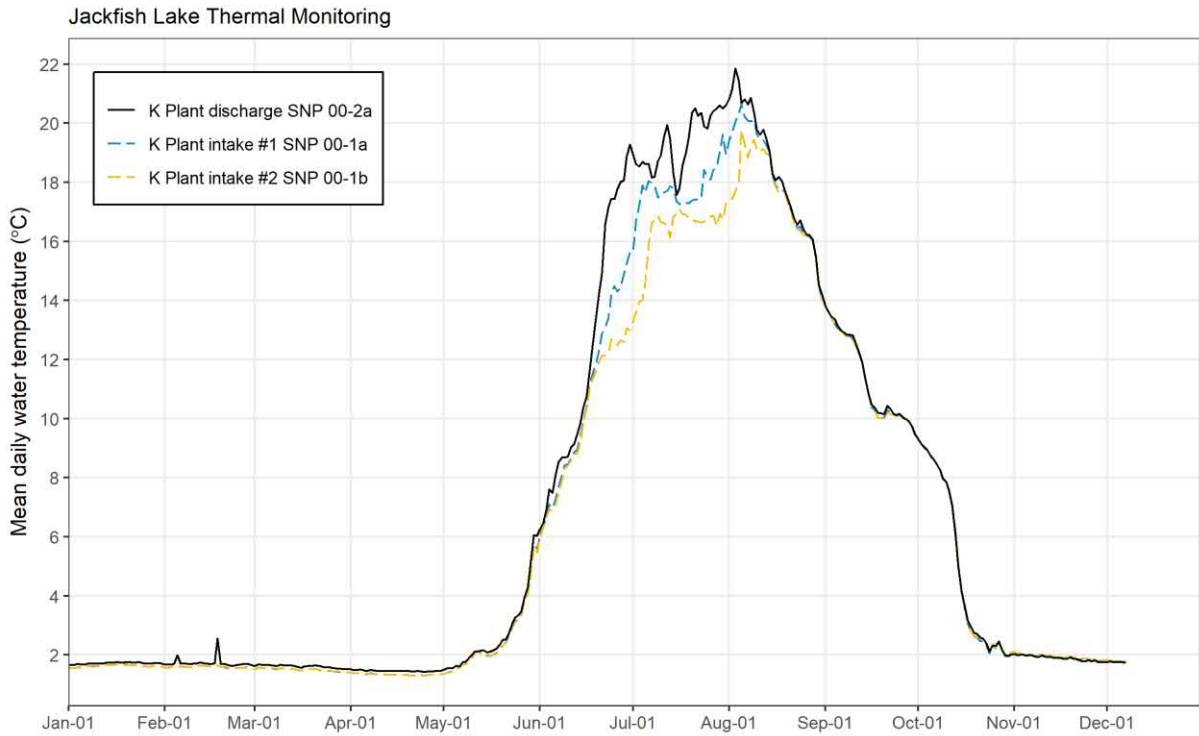


Figure 4-2 Mean Daily Water Temperature Recorded at the SNP Stations Monitoring K Plant

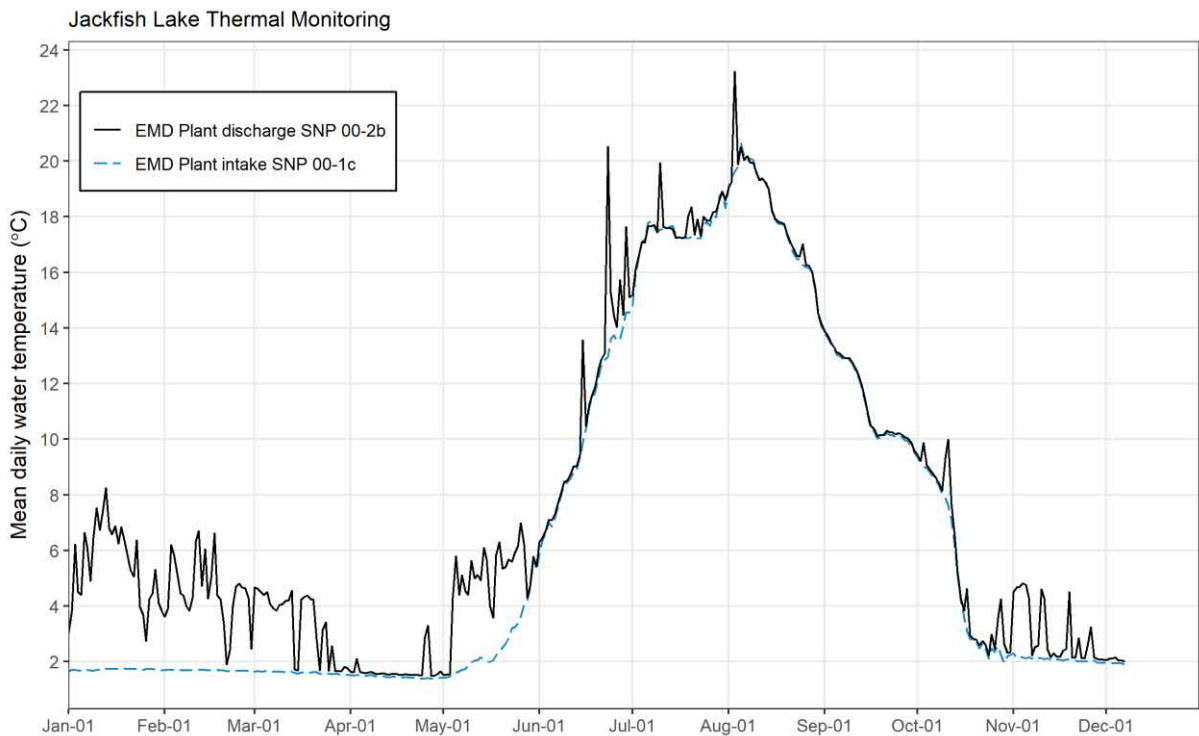


Figure 4-1 Mean Daily Water Temperatures Recorded at the SNP Stations Associated with EMD Plant

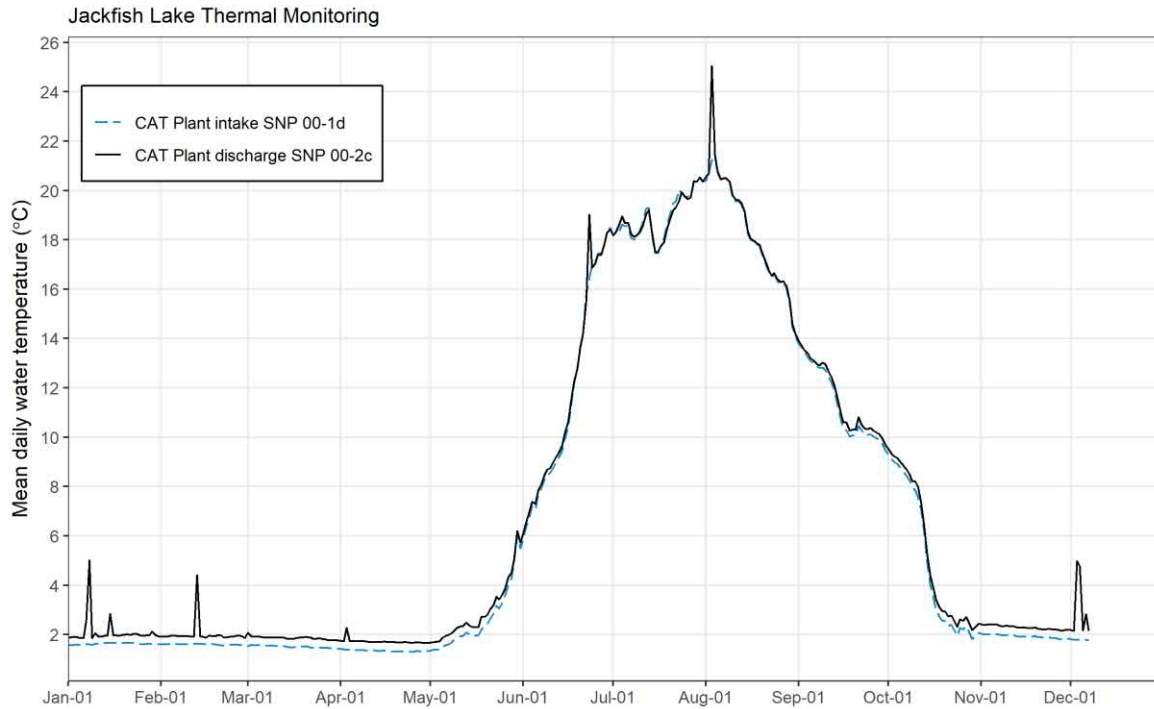


Figure 4-3 Mean Daily Water Temperatures Recorded at SNP Stations Associated with CAT Plant

Table 4-1 The 2020 Monthly, and Annual Water Use at the Jackfish Facility

Month	Mean Daily (m ³)	Monthly Total (m ³)
January	21,198	657,130
February	19,630	549,637
March	19,990	619,699
April	18,072	542,149
May	16,929	524,784
June	20,399	611,964
July	20,795	644,658
August	18,666	578,651
September	15,382	476,839
October	15,074	467,303
November	18,130	562,025

Month	Mean Daily (m ³)	Monthly Total (m ³)
December	20,696	641,563
Annual		6,876,400 m ³

5 CALIBRATION AND STATUS OF METERS AND DEVICES

Calibration and status of the water temperature dataloggers and flow meters will be provided in the 2021 Annual Report as the current schedule for installation of these instruments, per the Instrumentation Design Study and compliance deferral approval from the MVLWB is anticipated to be August 31, 2021.

6 ENGAGEMENT

NTPC has been collaborating with GNWT Department of Environment and Natural Resources, Aurora College, University of Saskatchewan on various ongoing research projects that involve Jackfish Lake. In 2020 NTPC took part on scoping meetings, review of research proposals, planning for field programs and providing technical information and monitoring data for several projects including:

- Aurora College Project: Measuring the impact of changing ice conditions on metal and nutrient cycling in subarctic lakes
- ENR/ University of Saskatchewan project focusing on cyanobacteria blooms in Jackfish Lake

In 2018 and 2019 NTPC provided support to University of Ottawa research project on Jackfish Lake Paleolimnology. NTPC provided monitoring data and field support for researchers and completed a collaborative field sampling program which gathered NTPC data and to University of Ottawa data. The Jackfish Lake Paleolimnology research has resulted in three published research papers to date by Branaavan Sivarajah with the most recent focused on algal blooms.

In February 2021 NTPC also corresponded with ENR regarding the State of Environment Report for Jackfish Lake

7 MODIFICATIONS AND MAJOR MAINTENANCE

NTPC installed new monitoring equipment in 2020 to bring the Jackfish Facility water temperature and flow monitoring capabilities in compliance with the Water Licence requirements (Table 7-1). The installation of the equipment began in Fall 2020 to incorporate the Instrument Study Design completed by Golder Associates Inc.

A summary of the activities involved in the equipment installation is as follows:

- NTPC personnel lead the installation due to COVID-19 protocols;
- October 2020 installation of
 - Endress+Hauser flow meters;

- temperature transmitters; and
- datalogger panels.
- Endress+Hauser did not complete onsite commissioning due to COVID-19 isolation requirements;
- December 2020 remote commissioning attempted but was ultimately unsuccessful;

Due to the issues surrounding the commissioning of the flow meters, NTPC Operations and Engineering is currently investigating the following solutions:

- Reworking of piping to accommodate the Endress+Hauser Prosonic 93 flow meter;
- Mitigating lake debris concerns to accommodate in-flow meters; and
- Identifying alternative flow meters suitable for the Facility.

Table 7-1 Equipment Installed by Location in 2020 at the Jackfish Facility

Location	Thermowell TH13 RTD	Prosonic Flow 93	Datalogger Panel
K-Plant unit G1: pumps common discharge	x	x	
K-Plant unit G1: return	x		
Inside of K-Plant			x
EMD pumps common discharge	x	x	
EMD common return	x		
Inside of EMD Plant			x
CAT pumps common discharge	x	x	
CAT common return	x		
Inside of CAT Plant			x

8 WASTE MANAGEMENT

The Jackfish Facility Waste Management Plan (WMP) was updated in 2019 as part of the Water Licence renewal process. The plan updates ensured the WMP represents all infrastructure, potential waste sources, and standard NTPC waste management practices that are employed at the site.

The following activities were conducted at the Facility in 2020 in accordance with the plan:

- Onsite segregation of hazardous and non-hazardous waste;
- Non-hazardous wastes are collected in bins which are emptied twice per week by a local contractor and shipped to the local landfill for disposal;
- Hazardous wastes are stored in approved sealed waste containers:
 - Steel or plastic 205 L drums stored in a hazardous product storage berm (e.g., glycol, solvents, fuels, oil, absorbents, etc); or
 - 41,000 L steel above-ground storage tank (e.g., used lube oil) with berm
- Hazardous wastes are transported by a local contractor to their Hazardous Waste Transfer Facility;
- Hazardous waste storage areas are inspected and inventoried monthly;
- Sewage/grey water produced onsite is picked up by a local contractor once per month and hauled to the local lagoon for treatment;
- Site staff are trained in Hazardous Waste Management upon hire or when processes or procedures change; and
- NTPC maintains the waste generator, receiver, and carrier registration numbers with ENR.

There were no updates or changes in 2020 to the process or facilities required for the management of waste as outlined in the WMP.

9 AEMP MONITORING RESULTS

The current and approved timeline for the Aquatic Effects Monitoring Program (AEMP) is as follows:

- March 31, 2023: AEMP Design Plan
 - Incorporate results from the Thermal Plume Delineation Study
- March 31, 2024: AEMP Annual Report
- March 31, 2026: AEMP Re-evaluation Report
 - Additional Re-evaluation Reports are required every five years thereafter
- March 31, 2026: Revised AEMP Design Plan
 - Additional Revised Design Plans are required every five years thereafter;
 - Revised Design Plan must incorporate results from the AEMP Re-evaluation Report; and
 - If any Action Level of 'moderate' or 'high' status in the AEMP Design Plan is exceeded, an AEMP Response Plan is to be submitted to the MVLWB for approval.

A summary of results will be reported after the first AEMP Plan report is submitted to MVLWB in March 2023.

10 SPILLS

10.1 SPILL TRAINING EXERCISES

All new employees received training for the Spill Response Plan, Spill Response training, an introduction to the Hazardous Waste Management Plan and the Environmental Management System. Training in these systems is reviewed every three years. Spill procedures and contact numbers are posted in the plant control room, and spill kits are outside each facility. Spill response equipment was reviewed and

updated in 2019 with additional/replacement spill response kits placed at key locations throughout the site as identified in the Spill Response Plan.

Spill training is mandatory and is completed by all new operatives. The spill training is approximately 1.5 hours and covers the following topics:

- Facility Site specifics
- Health and safety
- Spill response
- General cleanup

In 2020, ten NTPC staff received spill training, on the following dates:

- **January 20:** J. Idehen, G. Penney, R. Brown, S. King, and M. Penney
- **January 27:** M. op der Heijde, R. Farnsworth, M. Mahussier, K. Bissel, and D. Bourke

10.2 SPILL COMMUNICATIONS

There was one spill communication which occurred during 2020 for the Jackfish Facility. Spill details are summarized in Section 10.3 and NTPC followed the Spill Communication Plan is outlined below:

- When a spill has been identified, the spill is reported to the Plant Operator. If the Plant Operations or Regional Manager cannot be reached, then the Central Control Room is to be contacted.
- In the event that the spill cannot be cleaned up internally, the Plant Operator/On-Scene Coordinator will contact the Director, Health, Safety and Environment and Plant Operations Manager, or the NTPC On-site Representative and The NWT 24-hour Spill Report Line.
- The President and CEO and the director of Finance and CFO will determine if an Emergency Response Team is required.
- The Director, Health, Safety and Environment is to contact the appropriate regulator (GNWT ENR or Fisheries and Oceans Canada) to report the spill incident.

10.3 UNAUTHORIZED DISCHARGES

Table 10-1 summarizes unauthorized discharges which occurred at the Jackfish Facility in 2020. Accompanying reports and communications are included in Appendix B.

Table 10-1 Unauthorized Discharges at the Jackfish Facility in 2020

Spill Number	Date of Spill	Spill Type & Volume	Location	Summary of circumstances & actions taken
2020008	January 9, 2020	Fuel oil (70 L)	Jackfish Hydroelectric Generating Facility	Fuel pump on fuel tank failed to stop. The spill was contained in a sea-can type building. No fuel reached the ground or the property. The fuel was collected and disposed of in a waste oil tank. Rags and absorbents used in spill clean up were put in waste rag and absorbent drums for recycling.

10.4 SPILL CONTINGENCY PLAN

No revisions were made in 2020 to the Spill Contingency Plan.

11 CLOSURE AND RECLAMATION

No revisions were made to the Closure and Reclamation Plan in 2020.

12 REGULATORY

12.1 SUBMISSIONS

12.1.1 Jackfish Licence Instrumentation Study

The Jackfish Water Licence Instrumentation Study was planned to support:

- Development of the Thermal Plume Delineation Study Design in accordance with Water Licence Condition E.4; and
- Implementation of continuous flow monitoring instrumentation in accordance with Annex A SNP, Part B.

On April 24, 2020, NTPC completed the Instrumentation Study and submitted it to the MVLWB.

12.1.2 Thermal Plume Delineation Study Design

Following the renewal of the Water Licence in 2019 several conditions were required to be submitted by NTPC. The key conditional submission required included:

- January 29, 2020: Condition E.4 – Thermal Plume Delineation Study Design;
- August 1, 2021: Condition E.5 – Thermal Plume Delineation Study Report;
- November 1, 2021: Condition F.2 – AEMP Design Plan; and
- March 31, 2023: AEMP – First Report.

On January 27, 2020, NTPC met with the MVLWB and requested an extension for the Thermal Plume Delineation Study Design submission until April 10, 2020 to allow time for the Jackfish Instrumentation Study to be completed.

During April and May 2020, a ransomware attack struck NTPC resulting in severe disruption to all NTPC systems. As with many organizations in the NWT, the COVID-19 pandemic restrictions reduced the available resources and required NTPC to divert the remaining resources to essential operational tasks during this period. NTPC submitted an extension request to the MVLWB to delay the implementation of the continuous flow monitoring requirements and the submissions that require this data (Appendix C). The extension will allow time for detailed policies to be developed to complete the requisite work while adhering to COVID-19 safety protocols. This request was approved by MVLWB on May 28, 2020 (Appendix C).

In April 2020, NTPC requested the following submission/completion dates:

- April 24, 2020: Jackfish Instrumentation Study;
- May 29, 2020: Condition E.4 – Thermal Plume Delineation Study Design;
- August 31, 2020: Continuous flow monitoring instrumentation installation;
- December 31, 2021: Condition E.5 – Thermal Plume Delineation Study Report;
- March 31, 2022: Condition F.2 – AEMP Design Plan; and
- March 31, 2023: First Annual AEMP Report (may not contain full year of data).

On June 11, 2020, the MVLWB inquired on the status of the Thermal Plume Delineation Study Design. NTPC informed the MVLWB of the ransomware attack and committed to submitting the Thermal Plume Delineation Study Design by June 30, 2020.

- July 15, 2020: NTPC submitted the Jackfish Lake Thermal Plume Delineation Study Design V2 to the MVLWB.
- October 9, 2020: The MVLWB approved the Thermal Plume Delineation Study Design after completing the Online Review Process and NTPC's response to stakeholder comments.

NTPC completed the installations for the updated instrumentation for the Jackfish Facility over the summer of 2020 and into the early autumn. On November 12, 2020 NTPC submitted a notification to the MVLWB that the Jackfish instrumentation updates required under water licence MV2019L1-0001 were further delayed due to issues commissioning the flow meters. The manufacturer would not complete the two-week isolation required to enter the Jackfish site and remote commissioning was proving to be unsuccessful. Throughout November and December 2020 and January 2021 NTPC corresponded with the MVLWB and had several meetings to discuss the Jackfish Instrumentation delays, corporate procedures for bringing in workers under exemption, alternative approaches to calculating flow for the Thermal Plume Delineation Study Design and potential impacts to submissions under the water licence. After several emails and meetings, it was determined that NTPC could not accurately or practically determine flow for the Thermal Plume Delineation Study Design with the existing monitoring equipment and that the manufacturer was not deemed essential by NTPC and would not be able to commission the monitoring equipment on site until isolation requirements were lifted.

On March 5, 2021 NTPC submitted the Jackfish Water Licence MV2019L1-0001- Submission Dates Extension Request- March 2021 (Appendix C). NTPC completed an investigation with Golder Associates Inc. (Golder) to determine if the Thermal Plume Delineation Study could be implemented without the

updated instrumentation by using existing pump readouts for the flow data. Golder determined that the pump read out data was insufficient to complete the Thermal Plume Delineation Study.

Given the August 31, 2021 date for the commissioning of the flow meters, NTPC proposed the following timelines for the Thermal Plume Delineation Study and AEMP:

- May 31, 2021: Condition E.4 – Thermal Plume Delineation Study Design
 - Design would not change only submission dates
- August 31, 2021: Commissioning of continuous flow monitoring instrumentation
- January 30, 2023: Condition E.5 – TPDS Report
- April 30, 2023: Condition F.2 – AEMP Design Plan
- March 31, 2024: 1st Annual AEMP Report

On April 29, 2021, the MVLWB approved the timelines detailed above and the deferral approval letter is attached in Appendix C.

12.1.3 In-Lake Water Quality and Temperature Monitoring

In 2018, in-lake water temperature and water quality monitoring were completed to support the Water Licence renewal application and to support subsequent monitoring under the water licence. In-lake monitoring stations were developed including continuous water temperature stations throughout the lake with multiple self-contained temperature dataloggers suspended vertically in the water column to record temperatures throughout. These locations were also used for water quality sampling parameters. In 2019 three additional water temperature and water quality monitoring locations were developed 100 m out from each of the three discharges in response to some requests from regulators throughout the Water Licence renewal process.

Although the formal Thermal Plume Delineation Study did not begin in 2020, NTPC continued to collect water temperature data throughout Jackfish Lake and sampled some water quality parameters. This monitoring was completed in addition to the temperature monitoring required under the SNP monitoring for the Water Licence. The loggers were left in place to gather information to build the dataset used in the Thermal Plume Delineation Study.

A winter field program was completed in March 2020 where all loggers were downloaded, and deficient loggers replaced. Water quality parameters were also gathered at each location in March 2020. In July 2020 the loggers were relocated to the proper locations as they had moved during spring break up, loggers were not downloaded. In August 2020 a summer field program was completed where the loggers were downloaded, and deficient loggers replaced. In-lake water temperature loggers will remain in place for 2021 and be used in the Thermal Plume Delineation Study.

The 2019 and 2020 (up to submission date) water quality and water temperature data were submitted to the MVLWB on September 18, 2020.

In-lake water temperature loggers will remain in place for 2021 and be used in the Thermal Plume Delineation Study

12.2 OUTSTANDING SUBMISSIONS AND NON-COMPLIANCE(S)

On January 28, 2021, the ENR Water Resource Officer Lead for the Jackfish Facility sent a notification stating that NTPC is not in compliance with Water Licence due to outstanding submissions (See Table of Concordance; Appendix C). NTPC responded that a plan would be developed for the outstanding submissions.

On March 5, 2021, NTPC submitted a request for submission dates extension.

A key factor resulting in some outstanding submissions is the sequence of delays associated with the upgrading of flow monitoring equipment at the Jackfish Facility; the flow monitoring equipment upgrade is required to bring the flow monitoring in compliance with the Water Licence requirements.

12.2.1 Continuous Flow Monitoring Instrumentation Installation

Part B 1) of the Annex A: Surveillance Network Program states “All volume and temperature measurements shall be measured and recorded continuously (i.e., using electronic data storage chips or equivalent) during periods of Discharges and reported on a monthly basis”

During summer and fall 2020, NTPC completed the installations for the updated instrumentation at the Jackfish Facility. Despite the installation of the instrumentation, the flow meters could not be commissioned because the manufacturer would not complete the two-week isolation (Covid-19 pandemic protocols) required to enter the Jackfish Facility. Remote commissioning was attempted but was unsuccessful.

On November 12, 2020, NTPC submitted a notification to the MVLWB that the Jackfish instrumentation updates required under the Water Licence were further delayed due to issues in commissioning the flow meters.

During November 2020 to January 2021, NTPC met with the MVLWB to discuss the following:

- Jackfish Instrumentation delays;
- Corporate procedures for bringing in workers under exemption;
- Alternative approaches to calculating flow for the Thermal Plume Delineation Study Design; and
- Potential impacts to submissions under the Water Licence.

The conclusion drawn from these meetings was that NTPC could not accurately or practically determine flow as required for the Thermal Plume Delineation Study Design with the existing monitoring equipment. Additionally, NTPC determined that an isolation exemption for the flow equipment manufacturer was not appropriate and as such the manufacturer would not be able to commission the monitoring equipment until isolation requirements were lifted and a contractor could support.

NTPC deemed the current design for the updated flow monitoring equipment to be deficient. Some reworking of the piping systems within the plants was required to accurately record flow measurements. This reworking of the piping required shutdowns which were not possible until the summer when power

demand is reduced. NTPC expects that the updated instrumentation will be operational and recording flow by August 31, 2021.

12.2.2 Outstanding Reports and Plans

In March 2020, NTPC contacted the MVLWB to inform them that NTPC had been subject to a ransomware attack and that the information required for the 2019 Annual WL Report was not available. At that time NTPC was uncertain when systems would be restored.

On July 10, 2020 the MVLWB contacted NTPC regarding when the 2019 Annual Jackfish Water Licence Report would be submitted. The following response was provided:

- 2019 and 2020 Annual Reports for Jackfish will be submitted to the MVLWB on or before August 28, 2020.

NTPC was not able to meet this commitment due delays from the 2020 ransomware attack, COVID-19 pandemic delays, and lack of capacity for regulatory items.

On January 12, 2021, ENR Water Resource Officer Heather Beck in conjunction with MVLWB sent NTPC a File Audit regarding missing submissions under the Licence. The missing submissions for included:

- SNP Monthly Reports:
 - 2019: Nov., Dec.
 - 2020: Jan. to Dec.
- Standard Operating Procedures and Quality Assurance and Quality Control Plan:
 - Due January 2020.

NTPC developed and executed a plan to complete and submit the missing files, and to meet with the inspectors and water licence file managers on January 20, 2021 to review the plan for timelines of submission of outstanding items (also see Table of Concordance).

NTPC submitted the following:

- January 22, 2021: NTPC submitted to ENR and MVLWB the submission plan for outstanding items.
- January 28, 2021: NTPC submitted the outstanding SNP Annual and Monthly Reports.
- February 26, 2021: NTPC submitted the Operations, Maintenance, and Surveillance (OMS) Manual.
 - NTPC will revise the OMS Manual to include the updated flow monitoring equipment once it is commissioned. The revised OMS Manual will be submitted by December 31, 2021.

12.2.3 Groundwater Monitoring

Groundwater sampling at Jackfish Facility is conducted to monitor impacts from a spill that occurred in 2004. Under water licence MV2019L1-0001, new groundwater monitoring requirements were included in the water licensing reporting.

In 2020, SNP JF01-06 and SNP MW2 samples were not analyzed for all analytes required by the Water License. Only BTEX, and F1 through F4 were analyzed. A 2021 Groundwater Monitoring Program Plan was developed by NTPC to ensure that the 2021 sampling program is conducted in compliance with the requirements in the Water Licence.

The 2021 Groundwater Monitoring Program Plan is attached in Appendix D.

Additionally, samples from the groundwater monitoring locations SNP JF01-06 and SNP MW2 were only collected once in 2020, in October, rather than twice annually, once each in June and September. The June sample collection was not possible due to COVID-19 safety considerations. The full sampling schedule is anticipated to be completed in 2021 as outlined in the 2021 Groundwater Monitoring Program Plan.

12.3 ANNUAL WATER LICENCE INSPECTION

The annual Water Licence inspection was completed for the Jackfish Facility on August 18, 2020 with ENR Water Resource Officers, Heather Beck and David-Scott McQuinn. No deficiencies were noted during the inspection.

CLOSURE

This 2020 Jackfish Annual Report was prepared by Associated Environmental Consultants Inc. on behalf of the Northwest Territories Power Corporation to meet the requirements of Water Licence MV2019L1-0001.

Respectfully submitted,

Alexander Love
Director, Hydro Operations
Northwest Territories Power Corporation

APPENDIX A – SURVEILLANCE NETWORK PROGRAM DATA

The SNP for the Jackfish Facility is summarized in the following Appendices with tabulated summaries of data generated in digital format (.xlsx files) attached to this report submission.

Table A-1 Surveillance Network Program Water Temperature Monitoring Data for the Jackfish Facility

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
Date	Water Temperature (°C)						
2020-01-01	1.56	1.56	1.68	1.66	3.05	1.56	1.88
2020-01-02	1.54	1.54	1.66	1.70	3.81	1.56	1.89
2020-01-03	1.57	1.57	1.68	1.71	6.22	1.58	1.91
2020-01-04	1.59	1.59	1.70	1.69	4.51	1.60	1.90
2020-01-05	1.57	1.57	1.67	1.67	4.40	1.57	1.86
2020-01-06	1.57	1.57	1.67	1.70	6.64	1.59	1.86
2020-01-07	1.62	1.62	1.70	1.70	6.11	1.61	2.58
2020-01-08	1.63	1.62	1.71	1.68	4.91	1.60	5.02
2020-01-09	1.61	1.62	1.71	1.67	6.44	1.58	1.86
2020-01-10	1.63	1.62	1.70	1.70	7.52	1.62	2.06
2020-01-11	1.64	1.65	1.72	1.71	6.74	1.62	1.92
2020-01-12	1.63	1.63	1.71	1.72	7.36	1.63	1.92
2020-01-13	1.66	1.66	1.73	1.74	8.25	1.65	1.95
2020-01-14	1.67	1.67	1.73	1.74	6.80	1.65	1.95
2020-01-15	1.66	1.66	1.73	1.73	6.59	1.65	2.85
2020-01-16	1.68	1.68	1.76	1.74	6.87	1.66	1.96
2020-01-17	1.67	1.68	1.75	1.73	6.25	1.66	1.97
2020-01-18	1.66	1.66	1.74	1.73	6.84	1.65	1.95
2020-01-19	1.67	1.66	1.75	1.75	6.34	1.66	1.98
2020-01-20	1.68	1.67	1.76	1.74	5.77	1.67	2.00

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-01-21	1.66	1.66	1.75	1.73	5.28	1.66	2.00
2020-01-22	1.64	1.64	1.74	1.73	5.06	1.66	1.99
2020-01-23	1.66	1.66	1.76	1.76	6.37	1.66	2.05
2020-01-24	1.66	1.66	1.76	1.73	3.97	1.65	2.03
2020-01-25	1.61	1.61	1.72	1.71	3.69	1.62	1.96
2020-01-26	1.61	1.61	1.71	1.73	2.74	1.61	1.95
2020-01-27	1.60	1.60	1.70	1.73	4.26	1.62	1.97
2020-01-28	1.62	1.62	1.72	1.73	4.45	1.62	1.97
2020-01-29	1.62	1.62	1.72	1.72	5.31	1.63	2.13
2020-01-30	1.64	1.64	1.74	1.72	4.11	1.63	1.98
2020-01-31	1.61	1.61	1.71	1.69	3.82	1.60	1.93
2020-02-01	1.57	1.57	1.68	1.69	3.62	1.60	1.91
2020-02-02	1.57	1.58	1.67	1.72	3.90	1.60	1.91
2020-02-03	1.59	1.59	1.68	1.71	6.20	1.61	1.92
2020-02-04	1.63	1.63	1.71	1.72	5.85	1.64	1.95
2020-02-05	1.62	1.62	1.99	1.73	5.16	1.64	1.95
2020-02-06	1.60	1.61	1.71	1.70	4.45	1.62	1.95
2020-02-07	1.60	1.59	1.70	1.69	4.39	1.60	1.93
2020-02-08	1.59	1.59	1.70	1.70	3.98	1.61	1.95
2020-02-09	1.58	1.58	1.69	1.69	3.83	1.60	1.94
2020-02-10	1.58	1.58	1.70	1.69	4.31	1.60	1.95
2020-02-11	1.60	1.60	1.70	1.71	6.33	1.61	1.91
2020-02-12	1.64	1.64	1.73	1.71	6.70	1.62	1.91
2020-02-13	1.64	1.64	1.73	1.70	4.73	1.63	4.41
2020-02-14	1.62	1.62	1.71	1.70	6.05	1.62	1.93
2020-02-15	1.62	1.62	1.71	1.69	4.27	1.62	1.91

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-02-16	1.60	1.60	1.69	1.69	5.02	1.60	1.87
2020-02-17	1.63	1.63	1.72	1.72	6.61	1.63	1.96
2020-02-18	1.64	1.64	2.56	1.71	4.39	1.63	1.94
2020-02-19	1.59	1.59	1.69	1.68	4.23	1.60	1.93
2020-02-20	1.59	1.59	1.70	1.68	3.36	1.58	1.98
2020-02-21	1.57	1.59	1.68	1.65	1.91	1.56	1.96
2020-02-22	1.53	1.53	1.64	1.65	2.41	1.54	1.88
2020-02-23	1.53	1.53	1.63	1.66	3.96	1.54	1.89
2020-02-24	1.55	1.55	1.65	1.67	4.71	1.58	1.92
2020-02-25	1.57	1.56	1.68	1.67	4.80	1.58	1.92
2020-02-26	1.57	1.57	1.69	1.67	4.68	1.58	1.95
2020-02-27	1.58	1.57	1.69	1.67	4.64	1.58	1.96
2020-02-28	1.58	1.57	1.69	1.68	4.28	1.57	1.94
2020-02-29	1.55	1.55	1.66	1.62	2.46	1.53	1.86
2020-03-01	1.52	1.52	1.62	1.63	4.67	1.53	2.07
2020-03-02	1.56	1.56	1.67	1.67	4.62	1.58	1.94
2020-03-03	1.56	1.56	1.67	1.64	4.50	1.56	1.92
2020-03-04	1.55	1.55	1.66	1.65	4.41	1.56	1.92
2020-03-05	1.55	1.56	1.66	1.66	4.51	1.56	1.91
2020-03-06	1.54	1.55	1.65	1.65	4.09	1.56	1.90
2020-03-07	1.53	1.54	1.64	1.64	3.91	1.55	1.88
2020-03-08	1.52	1.53	1.63	1.64	3.84	1.55	1.89
2020-03-09	1.54	1.55	1.66	1.65	4.03	1.55	1.88
2020-03-10	1.54	1.54	1.65	1.63	4.06	1.54	1.89
2020-03-11	1.53	1.53	1.64	1.62	4.19	1.53	1.88
2020-03-12	1.53	1.53	1.64	1.64	4.20	1.53	1.88

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-03-13	1.52	1.52	1.64	1.64	4.56	1.53	1.87
2020-03-14	1.51	1.51	1.62	1.61	1.72	1.52	1.84
2020-03-15	1.49	1.49	1.60	1.57	1.68	1.48	1.83
2020-03-16	1.47	1.47	1.57	1.62	4.24	1.47	1.82
2020-03-17	1.50	1.50	1.61	1.61	4.32	1.51	1.86
2020-03-18	1.52	1.52	1.63	1.61	4.39	1.52	1.87
2020-03-19	1.52	1.51	1.63	1.60	4.25	1.52	1.87
2020-03-20	1.51	1.51	1.64	1.63	4.23	1.53	1.92
2020-03-21	1.51	1.51	1.64	1.62	2.81	1.51	1.90
2020-03-22	1.49	1.49	1.62	1.57	1.68	1.48	1.87
2020-03-23	1.46	1.46	1.59	1.55	3.14	1.45	1.83
2020-03-24	1.46	1.47	1.58	1.59	3.41	1.49	1.84
2020-03-25	1.47	1.48	1.60	1.57	1.67	1.48	1.86
2020-03-26	1.45	1.45	1.57	1.56	2.55	1.46	1.83
2020-03-27	1.44	1.43	1.55	1.55	1.66	1.46	1.80
2020-03-28	1.42	1.43	1.53	1.55	1.67	1.45	1.77
2020-03-29	1.43	1.43	1.53	1.54	1.66	1.44	1.76
2020-03-30	1.42	1.42	1.52	1.53	1.82	1.43	1.77
2020-03-31	1.41	1.41	1.52	1.52	1.77	1.43	1.77
2020-04-01	1.40	1.41	1.52	1.52	1.64	1.42	1.75
2020-04-02	1.39	1.39	1.49	1.50	1.62	1.40	1.73
2020-04-03	1.37	1.37	1.48	1.51	2.10	1.39	2.28
2020-04-04	1.40	1.41	1.51	1.53	1.64	1.40	1.74
2020-04-05	1.38	1.38	1.49	1.49	1.60	1.38	1.75
2020-04-06	1.34	1.35	1.46	1.49	1.59	1.37	1.73
2020-04-07	1.37	1.38	1.49	1.52	1.62	1.37	1.74

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-04-08	1.37	1.36	1.49	1.51	1.62	1.37	1.75
2020-04-09	1.34	1.34	1.47	1.46	1.57	1.36	1.73
2020-04-10	1.34	1.34	1.46	1.46	1.56	1.34	1.71
2020-04-11	1.33	1.33	1.46	1.47	1.58	1.35	1.70
2020-04-12	1.34	1.34	1.46	1.47	1.57	1.36	1.70
2020-04-13	1.33	1.33	1.46	1.44	1.54	1.34	1.69
2020-04-14	1.32	1.32	1.45	1.45	1.55	1.33	1.70
2020-04-15	1.33	1.33	1.46	1.47	1.57	1.35	1.71
2020-04-16	1.33	1.33	1.46	1.45	1.56	1.34	1.71
2020-04-17	1.33	1.32	1.47	1.42	1.52	1.33	1.70
2020-04-18	1.31	1.31	1.45	1.43	1.53	1.32	1.69
2020-04-19	1.34	1.34	1.47	1.45	1.56	1.32	1.69
2020-04-20	1.31	1.31	1.45	1.41	1.51	1.31	1.68
2020-04-21	1.30	1.30	1.43	1.42	1.51	1.31	1.68
2020-04-22	1.32	1.31	1.46	1.43	1.53	1.32	1.69
2020-04-23	1.31	1.31	1.45	1.41	1.51	1.32	1.69
2020-04-24	1.31	1.30	1.44	1.39	1.50	1.31	1.67
2020-04-25	1.30	1.30	1.42	1.39	2.86	1.30	1.65
2020-04-26	1.34	1.34	1.45	1.42	3.29	1.33	1.70
2020-04-27	1.32	1.32	1.44	1.39	1.49	1.33	1.67
2020-04-28	1.33	1.33	1.45	1.39	1.49	1.32	1.67
2020-04-29	1.36	1.36	1.45	1.44	1.55	1.33	1.66
2020-04-30	1.34	1.34	1.47	1.42	1.66	1.33	1.65
2020-05-01	1.36	1.36	1.50	1.42	1.51	1.34	1.67
2020-05-02	1.41	1.40	1.55	1.44	1.54	1.38	1.69
2020-05-03	1.42	1.42	1.54	1.46	1.55	1.38	1.71

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-05-04	1.47	1.46	1.57	1.53	4.28	1.39	1.71
2020-05-05	1.55	1.55	1.64	1.60	5.79	1.51	1.87
2020-05-06	1.58	1.59	1.61	1.65	4.41	1.56	1.95
2020-05-07	1.69	1.68	1.76	1.71	5.10	1.61	1.98
2020-05-08	1.68	1.69	1.77	1.74	4.53	1.67	2.06
2020-05-09	1.74	1.74	1.88	1.84	4.41	1.78	2.15
2020-05-10	1.88	1.88	1.99	1.97	5.62	1.87	2.28
2020-05-11	2.05	2.05	2.13	2.03	4.99	1.94	2.34
2020-05-12	2.11	2.11	2.12	2.05	5.12	1.95	2.35
2020-05-13	2.05	2.04	2.15	2.15	4.92	2.09	2.47
2020-05-14	2.05	2.06	2.15	2.07	6.09	2.00	2.37
2020-05-15	1.97	1.96	2.08	2.02	5.66	1.93	2.30
2020-05-16	1.98	1.97	2.12	1.99	3.99	1.95	2.29
2020-05-17	2.03	2.02	2.16	2.06	3.58	1.99	2.32
2020-05-18	2.06	2.04	2.21	2.23	5.83	2.19	2.72
2020-05-19	2.18	2.17	2.35	2.35	6.30	2.32	2.71
2020-05-20	2.34	2.34	2.53	2.51	5.35	2.43	2.81
2020-05-21	2.40	2.41	2.51	2.65	5.39	2.65	3.02
2020-05-22	2.63	2.63	2.75	2.85	5.67	2.84	3.19
2020-05-23	2.96	2.98	3.07	3.22	5.59	3.18	3.53
2020-05-24	3.12	3.14	3.27	3.23	5.89	3.06	3.43
2020-05-25	3.21	3.22	3.34	3.38	6.16	3.30	3.63
2020-05-26	3.36	3.35	3.48	3.64	6.99	3.59	3.86
2020-05-27	3.82	3.82	3.95	4.03	6.23	4.02	4.33
2020-05-28	4.09	4.08	4.28	4.20	4.30	4.27	4.51
2020-05-29	4.77	4.66	5.08	4.63	4.72	4.89	5.06

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-05-30	5.77	5.67	6.07	5.68	5.78	6.03	6.20
2020-05-31	5.59	5.47	6.03	5.31	5.43	5.49	5.72
2020-06-01	6.05	5.98	6.26	5.86	6.30	5.88	6.10
2020-06-02	6.31	6.30	6.46	6.38	6.47	6.36	6.57
2020-06-03	6.70	6.67	6.93	6.65	6.74	6.76	6.98
2020-06-04	7.11	6.93	7.61	7.00	7.11	7.22	7.39
2020-06-05	6.96	6.87	7.49	6.86	7.09	7.08	7.30
2020-06-06	7.30	7.12	8.12	7.20	7.33	7.69	7.88
2020-06-07	7.67	7.46	8.53	7.57	7.70	7.93	8.06
2020-06-08	8.07	7.89	8.69	8.01	8.10	8.26	8.44
2020-06-09	8.42	8.32	8.69	8.38	8.46	8.47	8.68
2020-06-10	8.47	8.42	8.72	8.44	8.52	8.55	8.76
2020-06-11	8.65	8.59	9.05	8.59	8.74	8.78	9.00
2020-06-12	8.84	8.80	9.13	8.83	9.01	8.97	9.20
2020-06-13	8.95	8.82	9.48	8.92	9.03	9.19	9.39
2020-06-14	9.36	9.24	9.86	9.36	9.43	9.47	9.69
2020-06-15	9.92	9.83	10.4	9.88	13.6	9.97	10.2
2020-06-16	10.4	10.4	10.7	10.4	10.5	10.4	10.6
2020-06-17	11.2	11.1	11.7	11.1	11.2	11.3	11.5
2020-06-18	11.5	11.3	12.5	11.5	11.6	12.2	12.2
2020-06-19	11.8	11.6	13.4	11.7	11.9	12.7	12.7
2020-06-20	12.3	11.9	14.3	12.2	12.5	13.7	13.6
2020-06-21	12.9	12.1	14.9	12.7	12.9	14.2	14.2
2020-06-22	13.1	12.1	16.6	12.8	13.1	15.8	15.5
2020-06-23	13.4	12.2	17.2	13.0	20.5	16.4	19.0
2020-06-24	14.2	12.7	17.5	13.6	15.3	16.9	16.9

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-06-25	14.5	12.7	17.4	13.7	14.4	17.0	17.0
2020-06-26	14.3	12.5	17.8	13.6	14.0	17.4	17.4
2020-06-27	14.4	12.7	18.0	13.6	15.7	17.5	17.4
2020-06-28	14.9	12.6	18.1	14.1	14.5	17.8	17.8
2020-06-29	15.2	13.1	18.9	14.6	17.6	18.3	18.3
2020-06-30	15.6	13.0	19.3	14.6	15.1	18.5	18.4
2020-07-01	15.6	13.3	18.9	14.8	15.2	18.2	18.2
2020-07-02	16.7	13.6	18.6	15.9	16.1	18.3	18.3
2020-07-03	17.2	14.0	18.5	16.5	16.6	18.3	18.6
2020-07-04	17.9	14.0	18.7	17.1	17.1	18.6	19.0
2020-07-05	17.7	14.6	18.6	17.2	17.1	18.6	18.7
2020-07-06	18.0	15.9	18.6	17.8	17.7	18.6	18.7
2020-07-07	18.0	16.6	18.2	17.8	17.7	18.1	18.2
2020-07-08	17.9	16.7	18.2	17.8	17.7	18.0	18.1
2020-07-09	17.5	16.9	18.7	17.5	17.4	18.2	18.2
2020-07-10	17.6	16.7	18.9	17.5	19.9	18.4	18.3
2020-07-11	17.7	16.6	19.5	17.5	17.6	18.7	18.6
2020-07-12	17.7	16.5	19.9	17.6	17.6	19.3	19.0
2020-07-13	17.9	16.1	19.5	17.6	17.6	19.3	19.2
2020-07-14	17.8	16.8	18.3	17.7	17.6	18.2	18.3
2020-07-15	17.4	16.9	17.6	17.3	17.2	17.4	17.5
2020-07-16	17.3	17.1	17.8	17.3	17.3	17.5	17.5
2020-07-17	17.2	16.9	18.6	17.2	17.2	17.8	17.7
2020-07-18	17.3	16.9	19.0	17.3	17.3	18.1	17.9
2020-07-19	17.3	16.8	19.5	17.2	18.0	18.6	18.4
2020-07-20	17.4	16.8	20.4	17.3	18.3	19.0	18.8

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-07-21	17.4	16.7	20.5	17.3	17.3	19.5	19.2
2020-07-22	17.4	16.7	20.2	17.2	17.9	19.6	19.3
2020-07-23	17.4	16.7	20.3	17.2	17.3	20.0	19.6
2020-07-24	18.4	16.7	19.9	17.7	18.0	19.9	19.9
2020-07-25	18.2	16.7	19.8	17.8	17.9	19.7	19.7
2020-07-26	18.1	16.8	20.3	17.7	17.9	19.8	19.7
2020-07-27	18.4	16.9	20.4	18.0	18.1	19.8	19.7
2020-07-28	18.5	16.5	20.5	18.0	18.2	20.4	20.4
2020-07-29	19.0	16.9	20.6	18.8	18.6	20.4	20.3
2020-07-30	19.6	16.7	20.5	18.9	18.9	20.5	20.5
2020-07-31	18.9	17.3	20.6	18.3	18.6	20.4	20.4
2020-08-01	19.4	17.3	20.8	19.1	19.0	20.4	20.6
2020-08-02	19.7	17.4	21.1	19.4	19.2	20.7	20.7
2020-08-03	20.0	17.7	21.9	19.6	23.2	21.2	25.0
2020-08-04	20.3	18.0	21.5	19.8	19.9	21.4	21.4
2020-08-05	20.7	19.8	20.7	20.6	20.5	20.7	20.8
2020-08-06	20.2	19.3	20.8	20.2	20.0	20.4	20.5
2020-08-07	20.1	18.8	20.6	20.0	20.2	20.5	20.5
2020-08-08	20.1	19.2	20.9	20.1	19.9	20.5	20.5
2020-08-09	20.1	19.4	20.4	20.0	19.9	20.3	20.3
2020-08-10	19.6	19.1	19.8	19.6	19.6	19.7	19.8
2020-08-11	19.5	19.1	19.6	19.3	19.3	19.6	19.6
2020-08-12	19.4	19.1	19.8	19.4	19.4	19.6	19.6
2020-08-13	19.3	19.0	19.5	19.3	19.2	19.4	19.5
2020-08-14	19.0	18.9	19.1	19.0	19.0	19.1	19.1
2020-08-15	18.2	18.2	18.3	18.2	18.2	18.3	18.3

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-08-16	17.9	17.9	18.1	17.9	18.0	18.0	18.1
2020-08-17	17.8	17.7	18.2	17.8	17.8	18.0	18.0
2020-08-18	17.7	17.7	18.0	17.7	17.8	17.8	17.9
2020-08-19	17.7	17.6	17.7	17.7	17.7	17.7	17.8
2020-08-20	17.3	17.3	17.4	17.3	17.4	17.3	17.4
2020-08-21	17.0	17.0	17.1	17.0	17.1	17.0	17.1
2020-08-22	16.7	16.6	16.8	16.7	16.9	16.7	16.8
2020-08-23	16.4	16.4	16.6	16.5	16.6	16.5	16.5
2020-08-24	16.5	16.4	16.7	16.5	16.6	16.6	16.7
2020-08-25	16.3	16.2	16.4	16.3	17.0	16.3	16.4
2020-08-26	16.2	16.2	16.2	16.2	16.3	16.2	16.3
2020-08-27	16.2	16.2	16.2	16.2	16.2	16.2	16.3
2020-08-28	16.0	16.0	16.1	16.0	16.0	16.0	16.1
2020-08-29	15.4	15.3	15.4	15.4	15.4	15.4	15.5
2020-08-30	14.5	14.4	14.5	14.4	14.5	14.5	14.6
2020-08-31	14.1	14.1	14.2	14.1	14.2	14.1	14.2
2020-09-01	13.8	13.8	13.8	13.8	13.9	13.8	13.9
2020-09-02	13.6	13.6	13.7	13.7	13.7	13.6	13.7
2020-09-03	13.4	13.4	13.5	13.4	13.5	13.4	13.5
2020-09-04	13.2	13.2	13.4	13.2	13.3	13.2	13.4
2020-09-05	13.1	13.0	13.2	13.0	13.1	13.1	13.2
2020-09-06	13.0	13.0	13.0	13.0	13.1	13.0	13.1
2020-09-07	12.9	12.9	12.9	12.9	12.9	12.9	13.0
2020-09-08	12.8	12.8	12.8	12.8	12.9	12.8	12.9
2020-09-09	12.8	12.8	12.8	12.8	12.9	12.8	13.0
2020-09-10	12.7	12.7	12.8	12.7	12.8	12.7	13.0

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-09-11	12.5	12.4	12.5	12.5	12.5	12.5	12.7
2020-09-12	12.2	12.2	12.2	12.2	12.3	12.2	12.4
2020-09-13	11.9	11.9	11.9	11.9	12.0	11.9	12.1
2020-09-14	11.3	11.4	11.3	11.4	11.5	11.3	11.6
2020-09-15	10.8	10.8	10.8	10.8	10.9	10.8	11.0
2020-09-16	10.4	10.4	10.5	10.4	10.5	10.4	10.6
2020-09-17	10.3	10.3	10.4	10.3	10.4	10.3	10.6
2020-09-18	10.0	10.0	10.2	10.0	10.1	10.0	10.3
2020-09-19	10.0	10.0	10.2	10.1	10.1	10.1	10.3
2020-09-20	10.1	10.0	10.2	10.1	10.1	10.1	10.3
2020-09-21	10.3	10.2	10.4	10.2	10.3	10.5	10.8
2020-09-22	10.2	10.2	10.3	10.2	10.2	10.3	10.5
2020-09-23	10.1	10.1	10.2	10.1	10.2	10.1	10.4
2020-09-24	10.1	10.1	10.1	10.1	10.2	10.1	10.3
2020-09-25	10.1	10.1	10.2	10.1	10.2	10.1	10.4
2020-09-26	10.0	10.1	10.1	10.1	10.2	10.0	10.3
2020-09-27	9.97	9.98	9.99	9.98	10.1	9.95	10.2
2020-09-28	9.89	9.89	9.91	9.93	10.0	9.90	10.1
2020-09-29	9.74	9.74	9.72	9.77	9.87	9.72	9.94
2020-09-30	9.49	9.48	9.48	9.52	9.61	9.48	9.70
2020-10-01	9.30	9.31	9.31	9.33	9.43	9.30	9.52
2020-10-02	9.14	9.14	9.15	9.13	9.22	9.12	9.33
2020-10-03	9.02	9.02	9.04	9.04	9.87	9.00	9.23
2020-10-04	8.92	8.92	8.92	8.96	9.07	8.91	9.15
2020-10-05	8.76	8.76	8.73	8.80	8.90	8.75	9.00
2020-10-06	8.62	8.62	8.62	8.66	8.76	8.61	8.86

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-10-07	8.46	8.46	8.45	8.50	8.59	8.45	8.70
2020-10-08	8.27	8.27	8.26	8.29	8.40	8.25	8.50
2020-10-09	7.99	7.99	7.96	8.02	8.15	7.98	8.23
2020-10-10	7.86	7.87	7.87	7.90	9.34	7.85	8.21
2020-10-11	7.60	7.60	7.57	7.62	9.99	7.57	7.98
2020-10-12	7.08	7.09	7.02	7.10	7.66	7.04	7.31
2020-10-13	6.14	6.16	6.04	6.17	6.52	6.07	6.33
2020-10-14	5.05	5.08	4.98	5.12	5.23	4.96	5.28
2020-10-15	4.12	4.14	4.16	4.19	4.29	4.02	4.39
2020-10-16	3.56	3.57	3.63	3.59	3.83	3.49	3.88
2020-10-17	3.08	3.09	3.19	3.11	4.62	3.03	3.41
2020-10-18	2.79	2.80	2.97	2.83	2.94	2.73	3.12
2020-10-19	2.62	2.63	2.74	2.71	2.81	2.56	2.95
2020-10-20	2.59	2.60	2.71	2.69	2.80	2.55	2.93
2020-10-21	2.46	2.49	2.59	2.48	2.59	2.36	2.74
2020-10-22	2.49	2.52	2.54	2.66	2.75	2.41	2.78
2020-10-23	2.35	2.39	2.40	2.51	2.61	2.18	2.57
2020-10-24	2.06	2.10	2.12	2.11	2.22	1.95	2.31
2020-10-25	2.34	2.38	2.30	2.48	2.98	2.27	2.63
2020-10-26	2.23	2.24	2.30	2.34	2.45	2.20	2.55
2020-10-27	2.43	2.45	2.47	2.56	3.58	2.36	2.72
2020-10-28	2.18	2.22	2.19	2.24	4.26	2.12	2.48
2020-10-29	1.95	1.97	2.00	1.96	2.64	1.82	2.19
2020-10-30	1.95	2.00	1.96	2.21	2.32	1.94	2.30
2020-10-31	2.05	2.09	2.00	2.24	2.34	2.07	2.43
2020-11-01	2.08	2.12	2.04	2.30	4.50	2.05	2.42

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-11-02	2.04	2.05	1.99	2.14	4.67	2.00	2.38
2020-11-03	2.04	2.05	2.01	2.17	4.69	2.01	2.41
2020-11-04	2.01	2.02	2.00	2.15	4.83	2.02	2.40
2020-11-05	1.99	2.00	1.98	2.13	4.75	2.03	2.41
2020-11-06	2.00	2.01	2.01	2.16	4.30	2.03	2.42
2020-11-07	1.99	2.00	1.98	2.12	2.22	2.00	2.37
2020-11-08	1.95	1.95	1.94	2.08	2.53	1.96	2.33
2020-11-09	1.99	2.01	1.93	2.12	2.57	1.97	2.35
2020-11-10	2.01	2.02	1.99	2.12	4.60	1.97	2.35
2020-11-11	1.96	1.97	1.94	2.09	4.28	1.96	2.33
2020-11-12	1.94	1.97	1.93	2.12	2.44	1.96	2.34
2020-11-13	1.96	1.97	1.92	2.05	2.16	1.93	2.30
2020-11-14	1.92	1.93	1.89	2.06	2.31	1.91	2.28
2020-11-15	1.92	1.93	1.90	2.07	2.19	1.94	2.29
2020-11-16	1.91	1.93	1.90	2.07	2.18	1.92	2.27
2020-11-17	1.89	1.90	1.86	2.04	2.39	1.91	2.26
2020-11-18	1.91	1.93	1.86	2.07	2.45	1.92	2.26
2020-11-19	1.94	1.95	1.92	2.08	4.51	1.95	2.30
2020-11-20	1.91	1.92	1.88	2.03	2.14	1.90	2.24
2020-11-21	1.87	1.88	1.86	2.03	2.15	1.89	2.23
2020-11-22	1.85	1.88	1.82	2.00	2.85	1.87	2.20
2020-11-23	1.85	1.88	1.79	2.00	2.12	1.88	2.23
2020-11-24	1.85	1.88	1.79	2.01	2.12	1.88	2.24
2020-11-25	1.86	1.88	1.83	2.02	2.58	1.85	2.20
2020-11-26	1.81	1.82	1.78	1.98	3.25	1.86	2.20
2020-11-27	1.84	1.86	1.82	2.03	2.15	1.83	2.18

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-11-28	1.79	1.81	1.76	1.97	2.10	1.80	2.15
2020-11-29	1.79	1.81	1.76	1.96	2.08	1.82	2.18
2020-11-30	1.80	1.82	1.76	1.95	2.07	1.82	2.18
2020-12-01	1.79	1.81	1.76	1.96	2.06	1.83	2.18
2020-12-02	1.82	1.83	1.78	1.99	2.10	1.78	2.15
2020-12-03	1.77	1.79	1.75	1.93	2.12	1.79	4.97
2020-12-04	1.79	1.81	1.75	1.93	2.15	1.78	4.77
2020-12-05	1.78	1.80	1.77	1.93	2.04	1.80	2.17
2020-12-06	1.78	1.79	1.76	1.93	2.04	1.78	2.83
2020-12-07	1.76	1.77	1.73	1.89	2.00	1.77	2.15
2020-12-08	-	-	-	-	-	-	-
2020-12-09	-	-	-	-	-	-	-
2020-12-10	-	-	-	-	-	-	-
2020-12-11	-	-	-	-	-	-	-
2020-12-12	-	-	-	-	-	-	-
2020-12-13	-	-	-	-	-	-	-
2020-12-14	-	-	-	-	-	-	-
2020-12-15	-	-	-	-	-	-	-
2020-12-16	-	-	-	-	-	-	-
2020-12-17	-	-	-	-	-	-	-
2020-12-18	-	-	-	-	-	-	-
2020-12-19	-	-	-	-	-	-	-
2020-12-20	-	-	-	-	-	-	-
2020-12-21	-	-	-	-	-	-	-
2020-12-22	-	-	-	-	-	-	-
2020-12-23	-	-	-	-	-	-	-

SNP Station:	00-1a K-Plant Intake #1	00-1b K-Plant Intake #2	00-2a K-Plant Discharge	00-1c EMD Plant Intake	00-2b EMD Plant Discharge	00-1d CAT Plant Intake	00-2c CAT Plant Discharge
2020-12-24	-	-	-	-	-	-	-
2020-12-25	-	-	-	-	-	-	-
2020-12-26	-	-	-	-	-	-	-
2020-12-27	-	-	-	-	-	-	-
2020-12-28	-	-	-	-	-	-	-
2020-12-29	-	-	-	-	-	-	-
2020-12-30	-	-	-	-	-	-	-
2020-12-31	-	-	-	-	-	-	-

APPENDIX B – SPILL REPORTS AND OTHER SUBMISSIONS

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND
OTHER HAZARDOUS MATERIALS



NT-NU 24-HOUR SPILL REPORT LINE

Tel: (867) 920-8130 • Fax: (867) 873-6924 • Email: spills@gov.nt.ca

REPORT LINE USE ONLY

A	Report Date:	01	13	20	Report Time:	9:00 am	<input checked="" type="checkbox"/> Original Spill Report OR <input type="checkbox"/> Update # _____ to the Original Spill Report	Report Number:
	B	Occurrence Date:	01	09	20	Occurrence Time:		
C	Land Use Permit Number (if applicable):				Water Licence Number (if applicable):			
D	Geographic Place Name or Distance and Direction from the Named Location: Jackfish power plant					Region: <input checked="" type="checkbox"/> NT <input type="checkbox"/> Nunavut <input type="checkbox"/> Adjacent Jurisdiction or Ocean		
E	Latitude: _____ Degrees _____ Minutes _____ Seconds			Longitude: _____ Degrees _____ Minutes _____ Seconds				
F	Responsible Party or Vessel Name: NTPC			Responsible Party Address or Office Location: Yellowknife				
G	Any Contractor Involved: No			Contractor Address or Office Location: N/A				
H	Product Spilled: <input type="checkbox"/> Potential Spill Diesel			Quantity in Litres, Kilograms or Cubic Metres: 70 liters		U.N. Number:		
I	Spill Source: fuel tank			Spill Cause: pump failed to stop		Area of Contamination in Square Metres: 12 x 20		
J	Factors Affecting Spill or Recovery: None			Describe Any Assistance Required: None		Hazards to Persons, Property or Environment: None		
K	Additional Information, Comments, Actions Proposed or Taken to Contain, Recover or Dispose of Spilled Product and Contaminated Materials: Spill was contained in a sea can type building. No fuel on property or ground. Fuel was put into pails and disposed of in an NTPC waste oil tank. Rags and absorbents that were used to clean spill were put in waste rag and absorbent drums for recycling.							
L	Reported to Spill Line by: Joe ST.Croix		Position: Plant operator	Employer: NTPC		Location Calling From: Jackfish diesel plant	Telephone: 669-3341	
M	Any Alternate Contact: Eileen Henery		Position: Manager	Employer: NTPC		Alternate Contact Location: Jackfish diesel plant	Alternate Telephone: 669-3301	

REPORT LINE USE ONLY

N	Received at Spill Line by:		Position:	Employer:		Location Called:	Report Line Number:	
Lead Agency: <input type="checkbox"/> EC <input type="checkbox"/> CCG/TCMSS <input type="checkbox"/> GNWT <input type="checkbox"/> GN <input type="checkbox"/> ILA			Significance: <input type="checkbox"/> Minor			File Status: <input type="checkbox"/> Open		
<input type="checkbox"/> AANDC <input type="checkbox"/> NEB <input type="checkbox"/> Other: _____			<input type="checkbox"/> Major <input type="checkbox"/> Unknown			<input type="checkbox"/> Closed		
Agency:		Contact Name:		Contact Time:		Remarks:		
Lead Agency:								
First Support Agency:								
Second Support Agency:								
Third Support Agency:								

APPENDIX C – REGULATORY CORRESPONDENCE

1. Letter dated April 23, 2020 to Tyree Mullaney, Regulatory Officer MVLWB from Matthew Miller, Senior Environmental Licensing Specialist, NTPC. Re: Request for Extension of Submission Dates and Continuous Flow Monitoring for Water Licence MV2019L1-0001 Due to COVID-19.
2. Letter dated May 28, 2020 to Matthew Miller, NTPC, from Mavis Cli-Michaud, MVLWB Chair, Mackenzie Valley Land and Water Board. Re: Approval of Request to defer submission dates.
3. Email dated January 28, 2021 to Matthew Miller, NTPC, from Heather Beck, Water Resource Officer, GNWT Environment and Natural Resources. Re: Jackfish water licence outstanding submissions.
4. Letter dated March 2021 to Heather Beck, Water Resource Officer, GNWT Environment and Natural Resources, and Tyree Mullaney, Regulatory Officer MVLWB; from Matthew Miller, Senior Environmental Licensing Specialist, NTPC. Re: Jackfish Water Licence MV2019L1-0001 - Submission Dates Extension Request – March 2021
5. Letter dated April 28, 2021 to Matthew Miller, NTPC, from Mavis Cli-Michaud, MVLWB Chair, Mackenzie Valley Land and Water Board. Re: Approval of Request to defer submission dates.

April 23, 2020

MV2019L1-0001

Tyree Mullaney, EP
Regulatory Officer
Mackenzie Valley Land and Water Board
7th Floor, 4922 48th St, PO Box 2130
Yellowknife, NT | X1A 2P6
tyree@mvlwb.com

Request for Extension of Submission Dates and Continuous Flow Monitoring for Water Licence MV2019L1-0001 Due to COVID-19

Hello Tyree,

Throughout late 2018 and 2019 the Northwest Territories Power Corporation (NTPC) went through the water licence renewal process for the Jackfish Generating Facility in Yellowknife, Northwest Territories. The facility contributes power to the North Slave electrical system and has engine cooling systems that use water from Jackfish Lake. On October 18, 2019 Water Licence MV2019L1-0001 was issued for the Jackfish Facility. Water Licence MV2019L1-0001 includes conditions and requirements for various submissions under the new licence. Some key submissions and submission dates in the licence are:

- Part E, condition 4- Thermal Plume Delineation Study Design- January 29, 2020
- Part E, condition 5- Thermal Plume Delineation Study Report- August 1, 2021
- Part F, condition 2- AEMP Design Plan- November 1, 2021
- AEMP 1st year Report- March 31, 2023

MV2019L1-0001 also requires “All volume and temperature measurements shall be measured and recorded continuously (i.e., using electronic data storage chips or equivalent) during periods of Discharges and reported on a monthly basis (Part B- 1):”

As with many organizations in the NWT the COVID-19 pandemic has reduced available resources and diverted remaining resources to critical tasks during this period. NTPC declared a Level 2 Emergency on March 13, 2020 which was upgraded to a Level 3 Emergency on March 18, 2020. Since this time and in accordance with the Level 3 Emergency operating conditions NTPC has cancelled all non-essential work at all sites across the territory.

Before the pandemic NTPC was moving forward with instrumentation upgrades to meet the new requirements and complete the required submissions for MV2019L1-0001. Under

April 23, 2020

MV2019L1-0001

current operating conditions installation of the required instrumentation is not possible. A temporary system is in place to obtain the required temperature data but the existing flow monitoring system cannot provide continuous flow data.

Continuous flow data is required to complete the Thermal Effects Study to accurately characterize the potential impacts of the facilities operations on the thermal profiles within Jackfish Lake. Temperature data has been gathered in Jackfish Lake and at the outlets but without continuous flow data the relationships between generation, system flow and water temperature at the outlets and in the lake cannot be accurately investigated.

The results of the Thermal Effects Study will be required to complete the AEMP Design Plan.

In a January 27, 2020 meeting between NTPC and the MVLWB NTPC requested an extension for the Thermal Plume Delineation Study Design submission until April 10, 2020 to allow time for the Jackfish Instrumentation Study to completed. The Instrumentation Study and Thermal Plume Delineation Study Design were both delayed by COVID-19 impacts as outlined in a March 30, 2020 email to the MVLWB.

To account for COVID-19 delays and allow time for current operating conditions to pass and/or detailed policies to be developed to complete work under current conditions NTPC is requesting an extension for the implementation of the continuous flow monitoring requirements and the submissions that require this data.

The requested submission/completion dates are:

- Jackfish Instrumentation Study- April 24, 2020
- Part E, condition 4- Thermal Plume Delineation Study Design- May 29, 2020
- Installation of continuous flow monitoring instrumentation- August 31, 2020
- Part E, condition 5- Thermal Plume Delineation Study Report- December 31, 2021
- Part F, condition 2- AEMP Design Plan- March 31, 2022
- 1st Annual AEMP Report- March 31, 2023 (may not contain full year of data)

Please confirm if these dates are acceptable and if there is any other further information we can provide.

April 23, 2020

MV2019L1-0001

Thanks for your time,



Matthew Miller, M.Sc., P.Eng.
Senior Environmental Licensing Specialist
Northwest Territories Power Corporation
mmiller@ntpc.com



7th Floor - 4922 48th Street,
P.O. Box 2130, Yellowknife NT X1A 2P6

Tel: 867-669-0506 Fax: 867-873-6610
www.mvlwb.com

May 28, 2020

File: MV2019L1-0001

Matthew Miller
Northwest Territories Power Corporation
4 Capital Drive
HAY RIVER NT XOE 1G2

Sent via email

Dear Matthew Miller:

Re: Approval of Request to defer submission dates

The Mackenzie Valley Land and Water Board (MVLWB or the Board) met on May 28, 2020 and reviewed Northwest Territories Power Corporation (NTPC or Licensee) April 23, 2020 request to defer the submission dates of required reports and studies. Below as outlined in Table 1 are the new submission dates.

Table 1 - Updated Submission Dates for Licence MV2019L1-0001

Condition	Plan/Report/Study	Submission Date
Part E, condition 4	Thermal Plume Delineation Study Design	May 29, 2020
Part E, condition 5	Thermal Plume Delineation Study Report	December 31, 2021
Part F, condition 2	AEMP Design Plan	March 31, 2022

Attached is a copy of the updated Type A, Licence MV2019L1-0001, which shows the new submission dates. A copy of this Licence and all related correspondence and documents have been filed on MVLWB's [Public Registry](#).

If you have any questions or concerns, please contact Tyree Mullaney at (867) 766-7464 or by email to tyree@mvlwb.com

Yours sincerely,

A handwritten signature in blue ink, appearing to read "Mavis Cli-Michaud".

Mavis Cli-Michaud
MVLWB, Chair

Copied to: Distribution List

Attached: Water Licence MV2019L1-0001



Mackenzie Valley Land and Water Board
Water Licence

Pursuant to the *Mackenzie Valley Resource Management Act*, *Waters Act*, and Waters Regulations, the Mackenzie Valley Land and Water Board, hereinafter referred to as the Board, hereby grants to:

Northwest Territories Power Corporation
(Licensee)

of 4 Capital Drive, Hay River NT X0E 1G2
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert, or otherwise use water subject to the restrictions and conditions contained in the *Waters Act* and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence.

Licence Number:	MV2019L1-0001
Licence Type:	A
Water Management Area:	Northwest Territories 03
Location:	114° 23' 00" W - 62° 28' 10" N
Purpose:	To use water and dispose of waste and associated uses
Description:	Industrial
Quantity of Water not to be exceeded:	50,000 cubic metres (m ³)/day
Effective date of Licence:	October 18, 2019
Expiry date of Licence:	October 17, 2044

This Licence issued and recorded at Yellowknife includes and is subject to the annexed conditions.

Handwritten signature of Mavis Cli-Michaud in blue ink.

Mackenzie Valley Land and Water Board

Mavis Cli-Michaud, Chair

Handwritten signature of Amanda Gauthier in black ink.
Amanda Gauthier, Witness

Approved by

Handwritten signature of the Minister of Environment and Natural Resources in black ink.
Minister of Environment and Natural Resources

MV2019L1-0001
Northwest Territories Power Corporation - Jackfish Hydro Facility
Type A Water Licence

Part A: Scope and Definitions

Scope

1. This Licence entitles the Licensee to use Water, and deposit Waste for industrial activities at the Jackfish Power Generation Facility. **SCOPE**

The scope of this Licence includes the following:
 - a) Withdrawal of Water for the cooling of the power generators;
 - b) Depositing of Waste; and
 - c) Progressive Reclamation and associated Closure and Reclamation activities.

2. This Licence is issued subject to the conditions contained herein with respect to the use of Water and the deposit of Waste in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Commissioner in Executive Council under the *Waters Act*, or other statutes imposing more stringent conditions relating to the quantity or type of Waste that may be so deposited or under which any such Waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations. **REGULATIONS
SUBJECT TO
CHANGE**

3. Compliance with the defined terms and conditions of this Licence does not relieve the Licensee from responsibility for compliance with the requirements of any applicable federal, territorial or municipal legislation. **LEGISLATIVE
COMPLIANCE**

Definitions¹:

Defined Terms

Action Level – a predetermined qualitative or quantitative trigger which, if exceeded, requires the Licensee to take appropriate actions.

Analyst – an Analyst designated by the Minister under subsection 65(1) of the *Waters Act*.

Aquatic Effects Monitoring Program (AEMP) – a monitoring program developed for the Project in accordance with this Licence and the MVLWB/GNWT *Guidelines for Aquatic Effects Monitoring Programs*

Board – the Mackenzie Valley Land and Water Board established under subsection 99(1) of the *Mackenzie Valley Resource Management Act*.

Closure Criteria – has the same meaning as that in the MVLWB/AANDC *Guidelines for the Closure and Reclamation of Advance Mineral Exploration and Mine Sites in the Northwest Territories*.

¹ Defined terms are capitalized throughout the License, including when used in other definitions.
MV2019L1-0001 – Northwest Territories Power Corporation – Industrial

Defined Terms

Closure Objectives – has the same meaning as that in the MVLWB/AANDC *Guidelines for the Closure and Reclamation of Advance Mineral Exploration and Mine Sites in the Northwest Territories*.

Closure and Reclamation – the process and activities that facilitate the return of areas affected by the Project to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and human activities.

Closure and Reclamation Plan (CRP) – a document, developed in accordance with this Licence and the MVLWB/AANDC *Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories*, that clearly describes the Closure and Reclamation for the Project.

Discharge – a direct or indirect deposit or release of any Waters or Waste to the Receiving Environment.

Discharge Water – wastewater specifically used for the cooling of the pumps associated with the power generators.

Engagement Plan – a document, developed in accordance with the MVLWB *Engagement and Consultation Policy* and the *Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits*, that clearly describes how, when and which engagement activities will occur with an affected party during the life of the Project.

Inspector – an Inspector designated by the Minister under subsection 65(1) of the *Waters Act*.

Licensee – the holder of this Licence.

Minister – the Minister of the Government of the Northwest Territories (GNWT) – Environment and Natural Resources.

Modification - in respect of a structure, means a change, other than an expansion, that does not alter the purpose or function of a structure.

Professional Engineer – a person registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists to practice as a Professional Engineer in the Northwest Territories as per the territorial *Engineering and Geoscience Professions Act*, and whose professional field of specialization is appropriate to address the components of the Project at hand.

Project – the undertaking described in Part A, condition 1.

Receiving Environment – the natural environment that, directly or indirectly, receives any deposit of Waste from the Project.

Remediation – the removal, reduction or neutralization of substances, Wastes or hazardous materials from a site in order to prevent or minimize any adverse effects on the environment and public safety, now or in the future.

Response Framework – a systematic approach to responding to the results of a monitoring program through adaptive management actions.

Response Plan – a document describing the actions that will be taken by a Licensee in response to an Action Level exceedance.

Runoff – the overland flow of Water or Wastewater that occurs when precipitation, meltwater, or other Water is not absorbed by the land, and instead drains downslope towards a Watercourse.

Defined Terms

Seepage – any Water or Waste that drains, passes through, or escapes from any structure designed to contain, withhold, divert, or retain Water or Waste.

Spill Contingency Plan (SCP) – a document, developed in accordance with INAC's *Guidelines for Spill Contingency Planning*.

Temporary Closure – a state of care and maintenance, with the intent of resuming activities in the near future.

Waste – any substance defined as Waste by section 1 of the *Waters Act*.

Waste Management Plan (WMP) – a document, developed in accordance with the MVLWB *Guidelines for Developing a Waste Management Plan*, that describes the methods of Waste management from Waste generation to final disposal.

Wastewater – any Water that is generated by Project activities or originates on-site, and which contains Waste, and may include, but is not limited to, Runoff, Seepage, and Discharge Water.

Water – any Water as per section 1 of the *Waters Act*.

Watercourse – a natural watercourse, body of Water or Water supply, whether usually containing Water or not, and includes Groundwater, springs, swamps, and gulches.

Water Management Area – a geographical area of the Northwest Territories established by section 2 and Schedule A of the *Waters Regulations*.

Waters Regulations – the regulations proclaimed pursuant to section 63 of the *Waters Act*.

Water Use – a use of Water as per section 1 of the *Waters Act*.

Part B: General Conditions

	Condition	Title
1.	The Licensee shall ensure a copy of this Licence is maintained on site at all times.	COPY OF LICENCE
2.	The Licensee shall take every reasonable precaution to protect the environment.	PRECAUTION TO PROTECT ENVIRONMENT
3.	All references to policies, guidelines, codes of practice, statutes, regulations, or other authorities shall be read as a reference to the most recent versions, unless otherwise denoted.	USE UP-TO-DATE REFERENCES
4.	<p>The Licensee shall ensure all submissions to the Board:</p> <ul style="list-style-type: none"> a) Are in accordance with the MVLWB <i>Document Submission Standards</i>; b) Include a conformity table which identifies where the requirements of this Licence, or other directives from the Board, are addressed; and c) Include any additional information requested by the Board. 	SUBMISSION FORMAT AND CONFORMITY
5.	The Licensee shall ensure management plans are submitted to the Board in a format consistent with the MVLWB <i>Standard Outline for Management Plans</i> , unless otherwise specified.	MANAGEMENT PLAN FORMAT
6.	The Licensee shall comply with all plans, programs, manuals approved pursuant to the conditions of this Licence, including such revisions made as per the conditions of this Licence, and as approved by the Board.	COMPLY WITH SUBMISSIONS AND REVISIONS
7.	The Licensee shall conduct an annual review of all plans, programs, manuals, studies and make any revisions necessary to reflect changes in operations, contact information, or other details. No later than March 31 each year, the Licensee shall send a notification letter to the Board, listing the documents that have been reviewed and do not require revisions as well as the ones which do require revisions.	ANNUAL REVIEW
8.	The Licensee may propose changes at any time by submitting revised plans, programs, manuals, or studies to the Board, for approval, a minimum of 90 days prior to the proposed implementation date for the changes. The Licensee shall not implement the changes until approved by the Board.	REVISIONS
9.	The Licensee shall revise any submission and submit it as per the Board's directive.	REVISE AND SUBMIT
10.	If any date for any submission falls on a weekend or holiday, the Licensee may submit the item on the following business day.	SUBMISSION DATE
11.	The Licensee shall comply with the Schedules, which are annexed to and form part of this Licence, and any updates to the Schedules as may be made by the Board.	COMPLY WITH SCHEDULE(S)
12.	The Licensee shall comply with the Surveillance Network Program (SNP), which is annexed to and forms part of this Licence, and any updates to the SNP as may be made by the Board.	COMPLY WITH SNP
13.	The Schedules and any compliance dates specified in this Licence may be updated at the discretion of the Board.	UPDATES TO COMPLIANCE DATE(S)

Condition	Title
14. The Licensee shall install, operate, and maintain meters/measuring, devices, loggers or other such methods used for measuring/monitoring the volumes of Water used and Waste Discharged to the satisfaction of an Inspector and in accordance with the approved Standard Operating Procedures and Quality Assurance and Quality Control Plan .	MEASURE WATER USE AND WASTE DISCHARGED
15. Beginning March 31, 2020 and no later than every March 31 thereafter, the Licensee shall submit an Annual Water Licence Report to the Board and an Inspector. The Report shall be in accordance with the requirements of Schedule 1, condition 1.	ANNUAL WATER LICENCE REPORT
16. Within 90 days following the effective date of this Licence, the Licensee shall submit to the Board, for approval, a Standard Operating Procedures and Quality Assurance and Quality Control Plan .	STANDARD OPERATING PROCUDRES AND QUALITY ASSURANCE AND QUALITY CONTROL PLAN
17. The Licensee shall comply with the Engagement Plan , once approved.	ENGAGEMENT PLAN
18. The Licensee shall immediately provide written notification to the Board and an Inspector of any non-compliance with the conditions of this Licence or any direction from the Board pursuant to the conditions of this Licence.	NOTIFICATION – NON-COMPLIANCE

Part C: Conditions Applying to Water Use

	Condition	Title
1.	The Licensee shall only obtain fresh Water for the Project from Jackfish Lake. The Licensee may withdraw up to 50,000 m ³ /day of Water from this source.	WATER SOURCE AND MAXIMUM VOLUME
2.	The Licensee shall construct and maintain the Water intake(s) with a screen designed to prevent impingement or entrapment of fish.	WATER INTAKE SCREEN

Part D: Conditions Applying to Modifications

Condition	Title
<p>1. The Licensee may, without written approval from the Board, carry out a Modification to the existing or planned undertaking provided the following requirements are met:</p> <ul style="list-style-type: none"> a) The Licensee has notified the Board and an Inspector, in writing, of such proposed Modification at least 90 days prior to the beginning of the Modification; b) The Modification does not place the Licensee in contravention of either this Licence or the Act; c) The Board has not, during the 60 days following notification of the proposed Modification, informed the Licensee that further information is required or that a review of the proposal will require more than 60 days; d) An Inspector has authorized the proposed Modification and provided a letter of notification to the Board; and e) The Board has not rejected the proposed Modification. 	<p>MODIFICATION REQUIREMENTS</p>
<p>2. Modifications for which all of the conditions referred to in Part D, condition 1 have not been met, may only be carried out with written approval from the Board.</p>	<p>MODIFICATION – WRITTEN APPROVAL REQUIRED</p>
<p>3. Within 90 days of the completion of the Modification referred to in Part D, condition 1, the Licensee shall submit to the Board an As-built Report, stamped and signed by a Professional Engineer, which shall include final as-built drawings and specifications of the modified structure.</p>	<p>AS-BUILT REPORT – MODIFICATION</p>

Part E: Conditions Applying to Waste and Water Management

Condition	Title
1. The Licensee shall manage Waste and Water with the objective of minimizing the impacts of the Project on the quantity and quality of Water in the Receiving Environment through the use of appropriate mitigation measures, monitoring, and follow-up actions.	OBJECTIVE – WASTE AND WATER MANAGEMENT
2. The Licensee shall comply with the Waste Management Plan once approved.	WASTE MANAGEMENT PLAN
3. The Licensee shall direct all Discharge Water from the Jackfish Lake Power Generating Facility to Jackfish Lake as described in the approved Waste Management Plan.	DISCHARGE WATER – JACKFISH LAKE POWER GENERATING FACILITY
4. By May 29, 2020 the Licensee shall submit to the Board a Thermal Plume Delineation Study Design Plan . The Plan shall be in accordance with the requirements of Schedule 2, Condition 1 and shall be submitted to the Board for approval.	THERMAL PLUME DELINEATION STUDY DESIGN
5. The Licensee shall submit to the Board for approval, a Thermal Plume Delineation Study Report by December 31, 2020. The Plan shall be in accordance with the requirements of Schedule 2, condition 2.	THERMAL PLUME DELINEATION STUDY REPORT

Part F: Conditions Applying to Aquatic Effects Monitoring Program

Condition	Title
<p>1. The Licensee shall design and implement an Aquatic Effects Monitoring Program (AEMP) in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i> to meet the following objectives:</p> <ul style="list-style-type: none"> a) To determine the short- and long-term effects of the Project on the Receiving Environment; b) To assess the efficacy of mitigation that is used to minimize the effects of the Project on the Receiving Environment; c) To identify the need for additional mitigation measures to reduce or eliminate Project-related effects; and d) To provide an early warning system where the results of the AEMP are used to avoid adverse effects through the Response Framework and/or regular evaluation of the AEMP. 	<p>OBJECTIVE – AEMP</p>
<p>2. The Licensee shall submit to the Board, for approval, an AEMP Design Plan by March 31, 2022. The Plan shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i> and will incorporate the results from the Thermal Plume Delineation Study Report.</p>	<p>AEMP DESIGN PLAN</p>
<p>3. Three years following implementation of the AEMP Design Plan, and every five years thereafter, or as directed by the Board, the Licensee shall submit to the Board, for approval, an AEMP Re-Evaluation Report. The Report shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i> and shall evaluate the overall effectiveness of the AEMP to date.</p>	<p>AEMP RE-EVALUATION REPORT</p>
<p>4. Three years following implementation of the AEMP Design Plan and every five years thereafter, or as directed by the Board, the Licensee shall submit to the Board, for approval, a revised AEMP Design Plan, which incorporates the results from the AEMP Re-evaluation Report. The revised Plan shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i>.</p>	<p>AEMP DESIGN PLAN – REVISED</p>
<p>5. Beginning March 31, 2023, and no later than March 31 of each year thereafter, the Licensee shall submit to the Board, for approval, an AEMP Annual Report. The Report shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i> and the requirements of Schedule 3, condition 1.</p>	<p>AEMP ANNUAL REPORT</p>
<p>6. If any low Action Level established in the approved AEMP Design Plan is exceeded, the Licensee shall, at a minimum, implement the response actions described in the approved AEMP Design Plan, and report the exceedance in the AEMP Annual Report.</p>	<p>LOW ACTION LEVEL EXCEEDANCE</p>
<p>7. If any moderate or high Action Level established in the approved AEMP Design Plan is exceeded, the Licensee shall:</p> <ul style="list-style-type: none"> a) Within the timeframe identified in the approved AEMP Design Plan notify the Board and an Inspector; and b) Within the timeframe identified in the approved AEMP Design Plan or as otherwise directed by the Board, submit an AEMP Response Plan to the Board for approval. The Response Plan shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i>. 	<p>MODERATE OR HIGH ACTION LEVEL EXCEEDANCE</p>

PART G: Conditions Applying to Spill Contingency Planning

Condition	Title
1. The Licensee shall ensure that Unauthorized Discharges associated with the Project do not enter any Waters.	OBJECTIVE – PREVENT WASTE INTO WATER
2. The Licensee shall comply with the Spill Contingency Plan , once approved.	SPILL CONTINGENCY PLAN
3. During the period of this Licence, if a spill or an Unauthorized Discharge occurs or is foreseeable, the Licensee shall: <ol style="list-style-type: none"> a) Implement the approved Spill Contingency Plan referred to in Part G, Condition 2; b) Report it immediately using the NU-NT Spill Report Form by one of the following methods: <ul style="list-style-type: none"> • Telephone: (867) 920-8130 • Fax: (867) 873-6924 • E-mail: spills@gov.nt.ca • Online: Spill Reporting and Tracking Database c) Within 24 hours, notify the Board and an Inspector; and d) Within 30 days of initially reporting the incident, submit a detailed report to the Board and an Inspector, including descriptions of causes, response actions, and any changes to procedures to prevent similar occurrences in the future. Written notification shall be provided to the Board and an Inspector if any changes occur. 	REPORT SPILLS
4. The Licensee shall ensure that spill prevention infrastructure and spill response equipment is in place prior to commencement of the Project.	SPILL PREVENTION AND RESPONSE EQUIPMENT
5. The Licensee shall restore all areas affected by spills and Unauthorized Discharges to the satisfaction of an Inspector.	CLEAN UP SPILLS

PART H: Conditions Applying to Closure and Reclamation

	Condition	Title
1.	Within 24 months following the effective date of this Licence, the Licensee shall submit to the Board, for approval, an Interim Closure and Reclamation Plan . The Plan shall be in accordance with the requirements of Schedule 4, condition 1.	CLOSURE AND RECLAMATION PLAN
2.	Two years prior to the expiration of this Licence, the Licensee shall submit to the Board, for approval, an updated Interim Closure and Reclamation Plan .	CLOSURE AND RECLAMATION PLAN – UPDATE

Signed on behalf of the Mackenzie Valley Land and Water Board



Mavis Cli-Michaud, Chair



Amanda Gauthier, Witness

Schedule 1: Annual Water Licence Report

Condition

1. The **Annual Water Licence Report** referred to in Part B, condition 15 of this Licence shall include, but not be limited to, the following information about activities conducted during the previous calendar year:
 - a) A brief summary of Project activities;
 - b) The monthly and annual quantities in cubic metres of fresh Water obtained from all sources and thermal data from intake and Discharge data loggers, as required in Part B, condition 14 and Part C, condition 1 of this Licence;
 - c) A summary of the calibration and status of the meters and devices referred to in Part B, condition 14 of this Licence;
 - d) A summary of engagement activities conducted in accordance with the approved **Engagement Plan**, referred to in Part B, condition 17 of this Licence;
 - e) A summary of Modification activities conducted in accordance with Part D of this Licence;
 - f) A summary of major maintenance activities conducted in accordance with this Licence;
 - g) A summary of activities conducted in accordance with the approved **Waste Management Plan**, referred to in Part E, condition 2 of this Licence, including:
 - i. A summary of approved updates or changes to the process or facilities required for the management of Waste;
 - ii. A summary of approved updates or changes to the process or facilities required for the management of Waste
 - h) A summary of monitoring results and any Action Level exceedances as per the approved AEMP, required in Part F, condition 7 of this Licence;
 - i) A summary of activities conducted in accordance with the approved Spill Contingency Plan, required in Part G, condition 2 of this Licence, including:
 - i. A list and description for all Unauthorized Discharges, including the date, NWT spill number, volume, location, summary of the circumstances and follow-up actions taken, and status (i.e. open or closed), in accordance with the reporting requirements in Part G, condition 4 of this Licence; and
 - ii. An outline of any spill training carried out.
 - j) A summary of any Closure and Reclamation work completed.
 - k) Tabular summaries of all data and information generated under the monthly SNP annexed to this Licence, in Excel format.
 - l) A list of any non-compliance(s) with the conditions of this Licence or any directive from the Board pursuant to the conditions of this Licence;
 - m) A summary of actions taken to address concerns, non-conformances, or deficiencies in any reports filed by an Inspector;
 - n) Any other details requested by the Board by November 1 of the year being reported.

Schedule 2: Thermal Plume Delineation

Condition

1. The **Thermal Plume Delineation Study Design Plan** referred to in Part E, condition 6 of this Licence shall include, but not be limited to, the following:
 - a) Seasonal delineation (spring freshet, late summer, late fall, and late under ice) of the thermal plume, include a calculation of maximum extent of plume as a percentage of lake area;
 - b) Temperature, dissolved oxygen profiles and any other parameters deemed relevant to the understanding of the thermal plume and the lake stratification;
 - c) An assessment of aquatic habitat within the thermal plume zone(s); and
 - d) Seasonal chemical characterization² at a minimum of one station located outside of the potential plume but situated such that potential influence of inflow(s) can be characterized and one station located at or near the outflow of Jackfish Lake. Station locations and rational to be included.
2. The **Thermal Plume Delineation Study Report** referred to in Part E, condition 7 of this Licence shall include, but not be limited to, the following:
 - a) Maps illustrating the extent of the thermal plume and any seasonal changes documented;
 - b) Graphical representation of the thermal profile and applicable water quality data;
 - c) Identification of the worse case thermal plume scenario of the four seasonal conditions identified in Schedule 1, item 1a;
 - d) Discussion of results and potential impacts to the aquatic ecosystem in Jackfish Lake and recommendations to inform the Aquatic Effects Design Report; and
 - e) Tabular summaries of all data and information generated under the Thermal Plume Delineation Study, in Excel format.

² Chemical characterization shall include, but not be limited to the following parameters:

- Field parameters (pH, Electrical Conductivity [EC], Temperature, Dissolved Oxygen [DO])
- Major Ions
- Total Suspended Solids (TSS)
- pH
- Oil and Grease (Hexane Extractable)
- Total Petroleum Hydrocarbons (F1, F2, F3, F4 CCME Fractions)
- Benzene, Toluene, Ethylbenzene, Xylene (BTEX)
- Total and Dissolved Metals (Metals shall include but not be limited to analysis of the following parameters: Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Uranium, and Zinc)

Schedule 3: Aquatic Effects Monitoring Program

Condition

1. The **AEMP Annual Report** referred to in Part F, condition 5 of this Licence shall include, but not be limited to, the following:
 - a) A plain language summary and interpretation of the major results obtained in the preceding calendar year;
 - b) A summary of activities conducted under the AEMP;
 - c) A summary of any spills, activities, or other considerations within the report time frame that could influence the results of the AEMP;
 - d) Tabular summaries of all data and information generated under the AEMP, in Excel format;
 - e) A comparison of monitoring results from the annual AEMP and results from the Thermal Plume Delineation Study Report including an interpretation of the results, including an evaluation of any identified environmental effects and their potential ecological significance that occurred as a result of the Project;
 - f) A comparison of monitoring results to Action Levels as defined in the approved **AEMP Design Plan**;
 - g) For any low Action Level exceedances, a summary of the nature and extent of the exceedance, as well as a description of actions in response to the exceedance;
 - h) An evaluation of any adaptive management response actions implemented;
 - i) Recommendations, with rationale, for changes to any aspect of the **AEMP Design Plan**; and
 - j) Any other information specified in the approved **AEMP Design Plan**.

Schedule 4: Closure and Reclamation

Condition

1. The **Interim Closure and Reclamation Plan** referred to in Part H, condition 1 of this Licence shall include, but not be limited to the following information:
 - a) A plain language summary of the Plan;
 - b) A description of the overall goals for Closure and Reclamation of the Project, including expected future land use;
 - c) A description of the Closure and Reclamation planning team;
 - d) A description of engagement related to Closure and Reclamation planning, including a summary of completed and planned engagement, and links to the **Engagement Plan** referred to in Part B, Condition 17 for the Project;
 - e) A list of any other regulatory instruments required for Closure and Reclamation of the Project;
 - f) A description of the pre-existing and current Project environment, including, but not limited to:
 - i. climatic conditions;
 - ii. physical conditions;
 - iii. chemical conditions;
 - iv. biological conditions; and
 - v. any physical or chemical assessments of soil, water, and permafrost.
 - g) A description of the Project, including, but not limited to:
 - i. site history;
 - ii. Project development;
 - iii. current status of the Project;
 - iv. maps delineating all disturbed areas, borrow material locations, site facilities, hydrological features, and elevation contours; and
 - v. photographs.
 - h) A description of each Project component, including, but not limited to:
 - i. areas affected by spills or Unauthorized Discharges; and
 - ii. other areas affected by Project activities.
 - i) For the Project site, a description of Closure and Reclamation plans, including, but not limited to:
 - i. Closure Objectives and Criteria;
 - ii. preferred Closure and Reclamation option and method for each Project component identified in condition (h) above;
 - iii. design drawings, signed and stamped by a Professional Engineer, for any Engineered structures if applicable;
 - iv. Water management and restoration of natural drainage;
 - v. predicted environmental effects during and after Closure and Reclamation activities;
 - vi. post-closure monitoring, maintenance, and reporting;
 - vii. uncertainties and contingencies;
 - viii. climate change considerations; and
 - ix. Closure and Reclamation Research plans.

Condition

- j) A description of any planned Progressive Reclamation;
- k) A plan for Temporary Closure, including, but not limited to the following information:
 - i. Temporary Closure goals and objectives;
 - ii. a description of activities and methods;
 - iii. a description of monitoring, maintenance, and reporting;
 - iv. contingencies; and
 - v. an implementation schedule.
- l) An implementation schedule that includes Progressive Reclamation and final Closure and Reclamation activities.

ANNEX A: SURVEILLANCE NETWORK PROGRAM - annexed to Water Licence MV2019L1-0001

LICENSEE: Northwest Territories Power Corporation

LICENCE NUMBER: MV2019L1-0001

EFFECTIVE DATE OF LICENCE: October 18, 2019

EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM (SNP): October 18, 2019

Part A – Surveillance Network Program Description and Monitoring Requirements

1) The location of sampling sites and specific monitoring requirements are as follows:

a) **Surveillance Network Program (SNP) 00-1:**

Description:	SNP 00-1a,b,c,d – Intakes to the K (2 intakes), EMD (1 intake), and CAT (1 intake) plants
Location:	SNP 00-1a - K plant intake 1 SNP 00-1b - K plant intake 2 SNP 00-1c - EMD plant intake SNP 00-1d - CAT plant intake
Sampling Frequency:	Continuous in-situ measurements during periods of discharge to Jackfish Lake
Sampling Parameters:	Water Temperature Flow

b) **Surveillance Network Program (SNP) 00-2:**

Description:	SNP 00-2a,b,c - Discharges from the K, EMD and CAT plants, respectively
Location:	SNP 00-2a - K plant SNP 00-2b - EMD SNP 00-2c - CAT plant
Sampling Frequency:	Continuous in-situ measurements during periods of Discharge to Jackfish Lake
Sampling Parameters:	Water Temperature

c) **Surveillance Network Program (SNP) JF01-06**

Description:	JF01-06 – Groundwater Monitoring Well
Location:	Located at the Lease Boundary near the lake shore near the warehouse near K Plant
Sampling Frequency:	Twice a year during June and September
Sampling Parameters	<ul style="list-style-type: none"> • Field parameters (pH, Electrical Conductivity [EC], Temperature, Dissolved Oxygen [DO]) • Major Ions • Total Suspended Solids (TSS) • Oil and Grease (Hexane Extractable) • pH • Total Petroleum Hydrocarbons (F1, F2, F3, F4 CCME Fractions) • Benzene, Toluene, Ethylbenzene, Xylene (BTEX) • Dissolved Metals (Metals shall include but not be limited to analysis of the following parameters: Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Uranium, and Zinc)

d) **Surveillance Network Program (SNP) MW2**

Description:	MW2 – Groundwater Monitoring Well
Location:	Located at the Lease Boundary near the lake shore between the EMD Plant and the Cat Plant
Sampling Frequency:	Twice a year during June and September
Sampling Parameters	<ul style="list-style-type: none"> • Field parameters (pH, Electrical Conductivity [EC], Temperature, Dissolved Oxygen [DO]) • Major Ions • Total Suspended Solids (TSS) • Oil and Grease (Hexane Extractable) • pH • Total Petroleum Hydrocarbons (F1, F2, F3, F4 CCME Fractions) • Benzene, Toluene, Ethylbenzene, Xylene (BTEX) • Dissolved Metals (Metals shall include but not be limited to analysis of the following parameters: Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Uranium, and Zinc)

2. The location of sampling sites is subject to approval of the Inspector.
3. More frequent sample collection may be required at the request of an Inspector.

4. All sampling, sample preservation, and analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater" at the time of analysis, or by such other methods approved by an Analyst.
5. All analyses shall be performed in a laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA) or equivalent for the specific analyses to be performed or as approved by an Analyst.
6. The Licensee shall annually review the approved QA/QC Plan and modify the Plan as necessary. Proposed modifications shall be submitted to an Analyst for approval.
7. The QA/QC Plan referred to in SNP Section A, Item 6 shall be implemented as approved by an Analyst.

Part B – Volume and Temperature Measurement Requirements

- 1) All volume and temperature measurements shall be measured and recorded continuously (i.e., using electronic data storage chips or equivalent) during periods of Discharges and reported on a monthly basis:
 - a) The daily, monthly, and annual quantities of cooling water circulated from Surveillance Network Program Station Numbers 00-1a, 00-1b, 00-1c, and 00-1d shall be measured and recorded in cubic metres; and
 - b) The water temperature at Surveillance Network Program Station Numbers 00-1a, 00-1b, 00-1c, 00-1d, 00-2a, 00-2b, and 00-2c shall be measured and recorded in degrees Celsius.

ANNEX B: Concordance Table of items Requiring Submission – annexed to Water Licence MV2019L1-0001

This table summarizes the information the Licensee is required to submit as per the Water Licence conditions.

Part of Licence	Item	Date
Annex A	Monthly SNP Report	Within 30 days of the end of the reporting month
Part B, condition 15	Annual Water Licence Report	March 31, 2020 and every March 31 thereafter.
Part B, condition 16	Standard Operating Procedures and Quality Assurance and Quality Control Plan	Within 90 days following issuance of this Licence
Part E, condition 4	Thermal Plume Delineation Study Design	A minimum of 90 days following the effective date of this Licence.
Part E, condition 5	Thermal Plume Delineation Study Report	August 1, 2021
Part F, condition 2	AEMP Design Plan	November 1, 2021
Part F, condition 3	Aquatic Effects Re-evaluation Report	Three years following implementation of the AEMP Design Plan and every five years thereafter, or as directed by the Board.
Part F, condition 4	AEMP Design Plan – Revised	Three years following implementation of the AEMP Design Plan and every five years thereafter, or as directed by the Board.
Part F, condition 5	AEMP Annual Report	March 31, 2023 and every year thereafter.
Part H, condition 1	Closure and Reclamation Plan	Within 24 months following the effective date of this Licence
Part H, condition 2	Closure and Reclamation Plan - Update	Three years prior to the expiration of this Licence

ANNEX C: Table of Revision History – annexed to Water Licence MV2019L1-0001

Date	Location of change	Description of change
May 28, 2020	Part E, condition 4 Part E, condition 5 Part F, condition 2	- Compliance date change
		-

From: Heather E. Beck <Heather_Beck@gov.nt.ca>
Sent: Thursday, January 28, 2021 8:45 AM
To: Matthew Miller
Cc: David-Scott McQuinn; Bruno Croft
Subject: Jackfish water licence outstanding submissions

Email originated outside NTPC.

Good morning,

As discussed, please be advised that the following submissions are outstanding and as a result NTPC is not in compliance with water licence MV2019L1-0001:

- Thermal Plume Delineation Study Design
- Thermal Plume Delineation Study Design Report (to be submitted after the design)
- AEMP Design Plan

The thermal plume delineation has been outstanding going on 2 years, the plume itself is considered a waste and is why these studies are a requirement in the licence. This can no longer be put off and as such we need a firm commitment for completion of these submissions.

Heather Beck

Water Resource Officer
Water Division, North Slave Region
Environment and Natural Resources
Government of the Northwest Territories

2nd Floor, ENR Main Building
PO Box 2668
3803 Bretzlaff Drive
Yellowknife, NT X1A 2P9

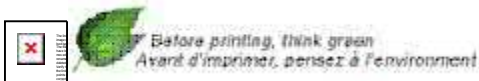
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March, 2021

MV2019L1-0001

Tyree Mullaney, EP
Regulatory Officer
Mackenzie Valley Land and Water Board
7th Floor, 4922 48th St, PO Box 2130
Yellowknife, NT | X1A 2P6
tyree@mvlwb.com

Heather Beck
Water Resource Officer
Water Division, North Slave Region
Environment and Natural Resources
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Yellowknife, NT X1A 2P9
heather_beck@gov.nt.ca

Jackfish Water Licence MV2019L1-0001- Submission Dates Extension Request- March 2021

Hello Tyree and Heather,

The Jackfish Lake Generating Facility- Operations Maintenance and Surveillance Manual is attached. NTPC committed to the MVLWB to submit this on February 26, 2021. Initially this updated version was meant to incorporate the updated monitoring equipment but given that this equipment is not fully installed and/or commissioned this is the same version of the OMS Manual that was submitted and revised as part of the water licence renewal process. NTPC will resubmit an updated version by December 31, 2021 that will have the updated equipment present once it has been successfully commissioned.

NTPC operations has deemed the current design for the updated flow monitoring equipment to be deficient. Some reworking of the piping systems within the plants is required to accurately record flow measurements. This reworking of the piping will require shutdowns which will not be possible until the late spring/summer when demand is reduced. NTPC expects that the updated instrumentation will be operational and recording flow by the end of August 2021.

NTPC and Golder also completed an investigation to determine if the Thermal Plume Study could proceed without the updated instrumentation and use pump readouts for the flow data. Golder determined that the pump read out data was not sufficient to complete the Thermal Plume Study and required thermal modelling.

Given the August 31, 2021 date for the flow meter data the new proposed timelines for the Thermal Plume and AEMP are provided below.

	From WL	New Submission Date
Thermal Plume Delineation Study Design (TPD SD)	A minimum of 90 days following the effective date of this Licence.	May 31, 2021
Thermal Plume Delineation Study Report	August 1, 2021	January 30, 2023
AEMP Design Plan	November 1, 2021	April 30, 2023
Aquatic Effects Re-evaluation Report	Three years following implementation of the AEMP Design Plan and every five years thereafter, or as directed by the Board.	No change
AEMP Design Plan – Revised	Three years following implementation of the AEMP Design Plan and every five years thereafter, or as directed by the Board.	No change
AEMP Annual Report	March 31, 2023 and every year thereafter.	March 31, 2024 and every year thereafter

Thanks for your time and please let us know if there is any other information we can provide or if you would like to set up a meeting to discuss.

Thanks for your time,



Matthew Miller, M.Sc., P.Eng.
Senior Environmental Licensing Specialist
Northwest Territories Power Corporation
mmiller@ntpc.com



7th Floor - 4922 48th Street,
P.O. Box 2130, Yellowknife NT X1A 2P6

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April 28, 2021

File: MV2019L1-0001

Matthew Miller
Northwest Territories Power Corporation
4 Capital Drive
HAY RIVER NT X0E 1G2

Sent via email

Dear Matthew Miller:

Re: Approval of Request to defer submission dates

The Mackenzie Valley Land and Water Board (MVLWB or the Board) met on April 22, 2021 and reviewed Northwest Territories Power Corporation (NTPC or Licensee) March 5, 2021 request to defer the submission dates of required reports and studies. As outlined below in Table 1 are the new submission dates.

Table 1 - Updated Submission Dates for Licence MV2019L1-0001

Condition	Plan/Report/Study	Submission Date
Part E, condition 4	Thermal Plume Delineation Study Design	May 31, 2021
Part E, condition 5	Thermal Plume Delineation Study Report	January 30, 2023
Part F, condition 2	AEMP Design Plan	April 30, 2023
Part F, condition 5	AEMP Annual Report	March 31, 2024

Attached is a copy of the updated Type A, Licence MV2019L1-0001, which shows the new submission dates. A copy of this Licence and all related correspondence and documents have been filed on MVLWB's [Public Registry](#).

If you have any questions or concerns, please contact Tyree Mullaney by email at tyree@mvlwb.com

Yours sincerely,

A handwritten signature in blue ink, appearing to read "Mavis Cli-Michaud".

Mavis Cli-Michaud
MVLWB, Chair

BCC'd: Distribution List

Attached: Water Licence MV2019L1-0001



Mackenzie Valley Land and Water Board
Water Licence

Pursuant to the *Mackenzie Valley Resource Management Act*, *Waters Act*, and Waters Regulations, the Mackenzie Valley Land and Water Board, hereinafter referred to as the Board, hereby grants to:

Northwest Territories Power Corporation
(Licensee)

of 4 Capital Drive, Hay River NT X0E 1G2
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert, or otherwise use water subject to the restrictions and conditions contained in the *Waters Act* and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence.

Licence Number:	MV2019L1-0001
Licence Type:	A
Water Management Area:	Northwest Territories 03
Location:	114° 23' 00" W - 62° 28' 10" N
Purpose:	To use water and dispose of waste and associated uses
Description:	Industrial
Quantity of Water not to be exceeded:	50,000 cubic metres (m ³)/day
Effective date of Licence:	October 18, 2019
Expiry date of Licence:	October 17, 2044

This Licence issued and recorded at Yellowknife includes and is subject to the annexed conditions.

Handwritten signature of Mavis Cli-Michaud in blue ink.

Mackenzie Valley Land and Water Board

Mavis Cli-Michaud, Chair

Handwritten signature of Amanda Gauthier in black ink.
Amanda Gauthier, Witness

Approved by

Handwritten signature of the Minister of Environment and Natural Resources in black ink.
Minister of Environment and Natural Resources

MV2019L1-0001
Northwest Territories Power Corporation - Jackfish Hydro Facility
Type A Water Licence

Part A: Scope and Definitions

Scope

1. This Licence entitles the Licensee to use Water, and deposit Waste for industrial activities at the Jackfish Power Generation Facility. **SCOPE**

The scope of this Licence includes the following:
 - a) Withdrawal of Water for the cooling of the power generators;
 - b) Depositing of Waste; and
 - c) Progressive Reclamation and associated Closure and Reclamation activities.

2. This Licence is issued subject to the conditions contained herein with respect to the use of Water and the deposit of Waste in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Commissioner in Executive Council under the *Waters Act*, or other statutes imposing more stringent conditions relating to the quantity or type of Waste that may be so deposited or under which any such Waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations. **REGULATIONS
SUBJECT TO
CHANGE**

3. Compliance with the defined terms and conditions of this Licence does not relieve the Licensee from responsibility for compliance with the requirements of any applicable federal, territorial or municipal legislation. **LEGISLATIVE
COMPLIANCE**

Definitions¹:

Defined Terms

Action Level – a predetermined qualitative or quantitative trigger which, if exceeded, requires the Licensee to take appropriate actions.

Analyst – an Analyst designated by the Minister under subsection 65(1) of the *Waters Act*.

Aquatic Effects Monitoring Program (AEMP) – a monitoring program developed for the Project in accordance with this Licence and the MVLWB/GNWT *Guidelines for Aquatic Effects Monitoring Programs*

Board – the Mackenzie Valley Land and Water Board established under subsection 99(1) of the *Mackenzie Valley Resource Management Act*.

Closure Criteria – has the same meaning as that in the MVLWB/AANDC *Guidelines for the Closure and Reclamation of Advance Mineral Exploration and Mine Sites in the Northwest Territories*.

¹ Defined terms are capitalized throughout the License, including when used in other definitions.
MV2019L1-0001 – Northwest Territories Power Corporation – Industrial

Defined Terms

Closure Objectives – has the same meaning as that in the MVLWB/AANDC *Guidelines for the Closure and Reclamation of Advance Mineral Exploration and Mine Sites in the Northwest Territories*.

Closure and Reclamation – the process and activities that facilitate the return of areas affected by the Project to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and human activities.

Closure and Reclamation Plan (CRP) – a document, developed in accordance with this Licence and the MVLWB/AANDC *Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories*, that clearly describes the Closure and Reclamation for the Project.

Discharge – a direct or indirect deposit or release of any Waters or Waste to the Receiving Environment.

Discharge Water – wastewater specifically used for the cooling of the pumps associated with the power generators.

Engagement Plan – a document, developed in accordance with the MVLWB *Engagement and Consultation Policy* and the *Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits*, that clearly describes how, when and which engagement activities will occur with an affected party during the life of the Project.

Inspector – an Inspector designated by the Minister under subsection 65(1) of the *Waters Act*.

Licensee – the holder of this Licence.

Minister – the Minister of the Government of the Northwest Territories (GNWT) – Environment and Natural Resources.

Modification - in respect of a structure, means a change, other than an expansion, that does not alter the purpose or function of a structure.

Professional Engineer – a person registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists to practice as a Professional Engineer in the Northwest Territories as per the territorial *Engineering and Geoscience Professions Act*, and whose professional field of specialization is appropriate to address the components of the Project at hand.

Project – the undertaking described in Part A, condition 1.

Receiving Environment – the natural environment that, directly or indirectly, receives any deposit of Waste from the Project.

Remediation – the removal, reduction or neutralization of substances, Wastes or hazardous materials from a site in order to prevent or minimize any adverse effects on the environment and public safety, now or in the future.

Response Framework – a systematic approach to responding to the results of a monitoring program through adaptive management actions.

Response Plan – a document describing the actions that will be taken by a Licensee in response to an Action Level exceedance.

Runoff – the overland flow of Water or Wastewater that occurs when precipitation, meltwater, or other Water is not absorbed by the land, and instead drains downslope towards a Watercourse.

Defined Terms

Seepage – any Water or Waste that drains, passes through, or escapes from any structure designed to contain, withhold, divert, or retain Water or Waste.

Spill Contingency Plan (SCP) – a document, developed in accordance with INAC's *Guidelines for Spill Contingency Planning*.

Temporary Closure – a state of care and maintenance, with the intent of resuming activities in the near future.

Waste – any substance defined as Waste by section 1 of the *Waters Act*.

Waste Management Plan (WMP) – a document, developed in accordance with the MVLWB *Guidelines for Developing a Waste Management Plan*, that describes the methods of Waste management from Waste generation to final disposal.

Wastewater – any Water that is generated by Project activities or originates on-site, and which contains Waste, and may include, but is not limited to, Runoff, Seepage, and Discharge Water.

Water – any Water as per section 1 of the *Waters Act*.

Watercourse – a natural watercourse, body of Water or Water supply, whether usually containing Water or not, and includes Groundwater, springs, swamps, and gulches.

Water Management Area – a geographical area of the Northwest Territories established by section 2 and Schedule A of the *Waters Regulations*.

Waters Regulations – the regulations proclaimed pursuant to section 63 of the *Waters Act*.

Water Use – a use of Water as per section 1 of the *Waters Act*.

Part B: General Conditions

Condition	Title
1. The Licensee shall ensure a copy of this Licence is maintained on site at all times.	COPY OF LICENCE
2. The Licensee shall take every reasonable precaution to protect the environment.	PRECAUTION TO PROTECT ENVIRONMENT
3. All references to policies, guidelines, codes of practice, statutes, regulations, or other authorities shall be read as a reference to the most recent versions, unless otherwise denoted.	USE UP-TO-DATE REFERENCES
4. The Licensee shall ensure all submissions to the Board: a) Are in accordance with the MVLWB <i>Document Submission Standards</i> ; b) Include a conformity table which identifies where the requirements of this Licence, or other directives from the Board, are addressed; and c) Include any additional information requested by the Board.	SUBMISSION FORMAT AND CONFORMITY
5. The Licensee shall ensure management plans are submitted to the Board in a format consistent with the MVLWB <i>Standard Outline for Management Plans</i> , unless otherwise specified.	MANAGEMENT PLAN FORMAT
6. The Licensee shall comply with all plans, programs, manuals approved pursuant to the conditions of this Licence, including such revisions made as per the conditions of this Licence, and as approved by the Board.	COMPLY WITH SUBMISSIONS AND REVISIONS
7. The Licensee shall conduct an annual review of all plans, programs, manuals, studies and make any revisions necessary to reflect changes in operations, contact information, or other details. No later than March 31 each year, the Licensee shall send a notification letter to the Board, listing the documents that have been reviewed and do not require revisions as well as the ones which do require revisions.	ANNUAL REVIEW
8. The Licensee may propose changes at any time by submitting revised plans, programs, manuals, or studies to the Board, for approval, a minimum of 90 days prior to the proposed implementation date for the changes. The Licensee shall not implement the changes until approved by the Board.	REVISIONS
9. The Licensee shall revise any submission and submit it as per the Board's directive.	REVISE AND SUBMIT
10. If any date for any submission falls on a weekend or holiday, the Licensee may submit the item on the following business day.	SUBMISSION DATE
11. The Licensee shall comply with the Schedules, which are annexed to and form part of this Licence, and any updates to the Schedules as may be made by the Board.	COMPLY WITH SCHEDULE(S)
12. The Licensee shall comply with the Surveillance Network Program (SNP), which is annexed to and forms part of this Licence, and any updates to the SNP as may be made by the Board.	COMPLY WITH SNP
13. The Schedules and any compliance dates specified in this Licence may be updated at the discretion of the Board.	UPDATES TO COMPLIANCE DATE(S)

Condition	Title
14. The Licensee shall install, operate, and maintain meters/measuring, devices, loggers or other such methods used for measuring/monitoring the volumes of Water used and Waste Discharged to the satisfaction of an Inspector and in accordance with the approved Standard Operating Procedures and Quality Assurance and Quality Control Plan .	MEASURE WATER USE AND WASTE DISCHARGED
15. Beginning March 31, 2020 and no later than every March 31 thereafter, the Licensee shall submit an Annual Water Licence Report to the Board and an Inspector. The Report shall be in accordance with the requirements of Schedule 1, condition 1.	ANNUAL WATER LICENCE REPORT
16. Within 90 days following the effective date of this Licence, the Licensee shall submit to the Board, for approval, a Standard Operating Procedures and Quality Assurance and Quality Control Plan .	STANDARD OPERATING PROCUDRES AND QUALITY ASSURANCE AND QUALITY CONTROL PLAN
17. The Licensee shall comply with the Engagement Plan , once approved.	ENGAGEMENT PLAN
18. The Licensee shall immediately provide written notification to the Board and an Inspector of any non-compliance with the conditions of this Licence or any direction from the Board pursuant to the conditions of this Licence.	NOTIFICATION – NON-COMPLIANCE

Part C: Conditions Applying to Water Use

Condition	Title
1. The Licensee shall only obtain fresh Water for the Project from Jackfish Lake. The Licensee may withdraw up to 50,000 m ³ /day of Water from this source.	WATER SOURCE AND MAXIMUM VOLUME
2. The Licensee shall construct and maintain the Water intake(s) with a screen designed to prevent impingement or entrapment of fish.	WATER INTAKE SCREEN

Part D: Conditions Applying to Modifications

Condition	Title
<p>1. The Licensee may, without written approval from the Board, carry out a Modification to the existing or planned undertaking provided the following requirements are met:</p> <ul style="list-style-type: none">a) The Licensee has notified the Board and an Inspector, in writing, of such proposed Modification at least 90 days prior to the beginning of the Modification;b) The Modification does not place the Licensee in contravention of either this Licence or the Act;c) The Board has not, during the 60 days following notification of the proposed Modification, informed the Licensee that further information is required or that a review of the proposal will require more than 60 days;d) An Inspector has authorized the proposed Modification and provided a letter of notification to the Board; ande) The Board has not rejected the proposed Modification.	MODIFICATION REQUIREMENTS
<p>2. Modifications for which all of the conditions referred to in Part D, condition 1 have not been met, may only be carried out with written approval from the Board.</p>	MODIFICATION – WRITTEN APPROVAL REQUIRED
<p>3. Within 90 days of the completion of the Modification referred to in Part D, condition 1, the Licensee shall submit to the Board an As-built Report, stamped and signed by a Professional Engineer, which shall include final as-built drawings and specifications of the modified structure.</p>	AS-BUILT REPORT – MODIFICATION

Part E: Conditions Applying to Waste and Water Management

Condition	Title
1. The Licensee shall manage Waste and Water with the objective of minimizing the impacts of the Project on the quantity and quality of Water in the Receiving Environment through the use of appropriate mitigation measures, monitoring, and follow-up actions.	OBJECTIVE – WASTE AND WATER MANAGEMENT
2. The Licensee shall comply with the Waste Management Plan once approved.	WASTE MANAGEMENT PLAN
3. The Licensee shall direct all Discharge Water from the Jackfish Lake Power Generating Facility to Jackfish Lake as described in the approved Waste Management Plan.	DISCHARGE WATER – JACKFISH LAKE POWER GENERATING FACILITY
4. By May 31, 2021 the Licensee shall submit to the Board a Thermal Plume Delineation Study Design Plan . The Plan shall be in accordance with the requirements of Schedule 2, Condition 1 and shall be submitted to the Board for approval.	THERMAL PLUME DELINEATION STUDY DESIGN
5. The Licensee shall submit to the Board for approval, a Thermal Plume Delineation Study Report by January 30, 2023. The Plan shall be in accordance with the requirements of Schedule 2, condition 2.	THERMAL PLUME DELINEATION STUDY REPORT

Part F: Conditions Applying to Aquatic Effects Monitoring Program

Condition	Title
<p>1. The Licensee shall design and implement an Aquatic Effects Monitoring Program (AEMP) in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i> to meet the following objectives:</p> <ul style="list-style-type: none"> a) To determine the short- and long-term effects of the Project on the Receiving Environment; b) To assess the efficacy of mitigation that is used to minimize the effects of the Project on the Receiving Environment; c) To identify the need for additional mitigation measures to reduce or eliminate Project-related effects; and d) To provide an early warning system where the results of the AEMP are used to avoid adverse effects through the Response Framework and/or regular evaluation of the AEMP. 	<p>OBJECTIVE – AEMP</p>
<p>2. The Licensee shall submit to the Board, for approval, an AEMP Design Plan by April 30, 2023. The Plan shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i> and will incorporate the results from the Thermal Plume Delineation Study Report.</p>	<p>AEMP DESIGN PLAN</p>
<p>3. Three years following implementation of the AEMP Design Plan, and every five years thereafter, or as directed by the Board, the Licensee shall submit to the Board, for approval, an AEMP Re-Evaluation Report. The Report shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i> and shall evaluate the overall effectiveness of the AEMP to date.</p>	<p>AEMP RE-EVALUATION REPORT</p>
<p>4. Three years following implementation of the AEMP Design Plan and every five years thereafter, or as directed by the Board, the Licensee shall submit to the Board, for approval, a revised AEMP Design Plan, which incorporates the results from the AEMP Re-evaluation Report. The revised Plan shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i>.</p>	<p>AEMP DESIGN PLAN – REVISED</p>
<p>5. Beginning March 31, 2024, and no later than March 31 of each year thereafter, the Licensee shall submit to the Board, for approval, an AEMP Annual Report. The Report shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i> and the requirements of Schedule 3, condition 1.</p>	<p>AEMP ANNUAL REPORT</p>
<p>6. If any low Action Level established in the approved AEMP Design Plan is exceeded, the Licensee shall, at a minimum, implement the response actions described in the approved AEMP Design Plan, and report the exceedance in the AEMP Annual Report.</p>	<p>LOW ACTION LEVEL EXCEEDANCE</p>
<p>7. If any moderate or high Action Level established in the approved AEMP Design Plan is exceeded, the Licensee shall:</p> <ul style="list-style-type: none"> a) Within the timeframe identified in the approved AEMP Design Plan notify the Board and an Inspector; and b) Within the timeframe identified in the approved AEMP Design Plan or as otherwise directed by the Board, submit an AEMP Response Plan to the Board for approval. The Response Plan shall be in accordance with the MVLWB/GNWT <i>Guidelines for Aquatic Effects Monitoring Programs</i>. 	<p>MODERATE OR HIGH ACTION LEVEL EXCEEDANCE</p>

PART G: Conditions Applying to Spill Contingency Planning

Condition	Title
1. The Licensee shall ensure that Unauthorized Discharges associated with the Project do not enter any Waters.	OBJECTIVE – PREVENT WASTE INTO WATER
2. The Licensee shall comply with the Spill Contingency Plan , once approved.	SPILL CONTINGENCY PLAN
3. During the period of this Licence, if a spill or an Unauthorized Discharge occurs or is foreseeable, the Licensee shall: <ol style="list-style-type: none"> a) Implement the approved Spill Contingency Plan referred to in Part G, Condition 2; b) Report it immediately using the NU-NT Spill Report Form by one of the following methods: <ul style="list-style-type: none"> • Telephone: (867) 920-8130 • Fax: (867) 873-6924 • E-mail: spills@gov.nt.ca • Online: Spill Reporting and Tracking Database c) Within 24 hours, notify the Board and an Inspector; and d) Within 30 days of initially reporting the incident, submit a detailed report to the Board and an Inspector, including descriptions of causes, response actions, and any changes to procedures to prevent similar occurrences in the future. Written notification shall be provided to the Board and an Inspector if any changes occur. 	REPORT SPILLS
4. The Licensee shall ensure that spill prevention infrastructure and spill response equipment is in place prior to commencement of the Project.	SPILL PREVENTION AND RESPONSE EQUIPMENT
5. The Licensee shall restore all areas affected by spills and Unauthorized Discharges to the satisfaction of an Inspector.	CLEAN UP SPILLS

PART H: Conditions Applying to Closure and Reclamation

	Condition	Title
1.	Within 24 months following the effective date of this Licence, the Licensee shall submit to the Board, for approval, an Interim Closure and Reclamation Plan . The Plan shall be in accordance with the requirements of Schedule 4, condition 1.	CLOSURE AND RECLAMATION PLAN
2.	Two years prior to the expiration of this Licence, the Licensee shall submit to the Board, for approval, an updated Interim Closure and Reclamation Plan .	CLOSURE AND RECLAMATION PLAN – UPDATE

Signed on behalf of the Mackenzie Valley Land and Water Board



Mavis Cli-Michaud, Chair



Amanda Gauthier, Witness

Schedule 1: Annual Water Licence Report

Condition

1. The **Annual Water Licence Report** referred to in Part B, condition 15 of this Licence shall include, but not be limited to, the following information about activities conducted during the previous calendar year:
 - a) A brief summary of Project activities;
 - b) The monthly and annual quantities in cubic metres of fresh Water obtained from all sources and thermal data from intake and Discharge data loggers, as required in Part B, condition 14 and Part C, condition 1 of this Licence;
 - c) A summary of the calibration and status of the meters and devices referred to in Part B, condition 14 of this Licence;
 - d) A summary of engagement activities conducted in accordance with the approved **Engagement Plan**, referred to in Part B, condition 17 of this Licence;
 - e) A summary of Modification activities conducted in accordance with Part D of this Licence;
 - f) A summary of major maintenance activities conducted in accordance with this Licence;
 - g) A summary of activities conducted in accordance with the approved **Waste Management Plan**, referred to in Part E, condition 2 of this Licence, including:
 - i. A summary of approved updates or changes to the process or facilities required for the management of Waste;
 - ii. A summary of approved updates or changes to the process or facilities required for the management of Waste
 - h) A summary of monitoring results and any Action Level exceedances as per the approved AEMP, required in Part F, condition 7 of this Licence;
 - i) A summary of activities conducted in accordance with the approved Spill Contingency Plan, required in Part G, condition 2 of this Licence, including:
 - i. A list and description for all Unauthorized Discharges, including the date, NWT spill number, volume, location, summary of the circumstances and follow-up actions taken, and status (i.e. open or closed), in accordance with the reporting requirements in Part G, condition 4 of this Licence; and
 - ii. An outline of any spill training carried out.
 - j) A summary of any Closure and Reclamation work completed.
 - k) Tabular summaries of all data and information generated under the monthly SNP annexed to this Licence, in Excel format.
 - l) A list of any non-compliance(s) with the conditions of this Licence or any directive from the Board pursuant to the conditions of this Licence;
 - m) A summary of actions taken to address concerns, non-conformances, or deficiencies in any reports filed by an Inspector;
 - n) Any other details requested by the Board by November 1 of the year being reported.

Schedule 2: Thermal Plume Delineation

Condition

1. The **Thermal Plume Delineation Study Design Plan** referred to in Part E, condition 6 of this Licence shall include, but not be limited to, the following:
 - a) Seasonal delineation (spring freshet, late summer, late fall, and late under ice) of the thermal plume, include a calculation of maximum extent of plume as a percentage of lake area;
 - b) Temperature, dissolved oxygen profiles and any other parameters deemed relevant to the understanding of the thermal plume and the lake stratification;
 - c) An assessment of aquatic habitat within the thermal plume zone(s); and
 - d) Seasonal chemical characterization² at a minimum of one station located outside of the potential plume but situated such that potential influence of inflow(s) can be characterized and one station located at or near the outflow of Jackfish Lake. Station locations and rational to be included.
2. The **Thermal Plume Delineation Study Report** referred to in Part E, condition 7 of this Licence shall include, but not be limited to, the following:
 - a) Maps illustrating the extent of the thermal plume and any seasonal changes documented;
 - b) Graphical representation of the thermal profile and applicable water quality data;
 - c) Identification of the worse case thermal plume scenario of the four seasonal conditions identified in Schedule 1, item 1a;
 - d) Discussion of results and potential impacts to the aquatic ecosystem in Jackfish Lake and recommendations to inform the Aquatic Effects Design Report; and
 - e) Tabular summaries of all data and information generated under the Thermal Plume Delineation Study, in Excel format.

² Chemical characterization shall include, but not be limited to the following parameters:

- Field parameters (pH, Electrical Conductivity [EC], Temperature, Dissolved Oxygen [DO])
- Major Ions
- Total Suspended Solids (TSS)
- pH
- Oil and Grease (Hexane Extractable)
- Total Petroleum Hydrocarbons (F1, F2, F3, F4 CCME Fractions)
- Benzene, Toluene, Ethylbenzene, Xylene (BTEX)
- Total and Dissolved Metals (Metals shall include but not be limited to analysis of the following parameters: Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Uranium, and Zinc)

Schedule 3: Aquatic Effects Monitoring Program

Condition

1. The **AEMP Annual Report** referred to in Part F, condition 5 of this Licence shall include, but not be limited to, the following:
 - a) A plain language summary and interpretation of the major results obtained in the preceding calendar year;
 - b) A summary of activities conducted under the AEMP;
 - c) A summary of any spills, activities, or other considerations within the report time frame that could influence the results of the AEMP;
 - d) Tabular summaries of all data and information generated under the AEMP, in Excel format;
 - e) A comparison of monitoring results from the annual AEMP and results from the Thermal Plume Delineation Study Report including an interpretation of the results, including an evaluation of any identified environmental effects and their potential ecological significance that occurred as a result of the Project;
 - f) A comparison of monitoring results to Action Levels as defined in the approved **AEMP Design Plan**;
 - g) For any low Action Level exceedances, a summary of the nature and extent of the exceedance, as well as a description of actions in response to the exceedance;
 - h) An evaluation of any adaptive management response actions implemented;
 - i) Recommendations, with rationale, for changes to any aspect of the **AEMP Design Plan**; and
 - j) Any other information specified in the approved **AEMP Design Plan**.

Schedule 4: Closure and Reclamation

Condition

1. The **Interim Closure and Reclamation Plan** referred to in Part H, condition 1 of this Licence shall include, but not be limited to the following information:
 - a) A plain language summary of the Plan;
 - b) A description of the overall goals for Closure and Reclamation of the Project, including expected future land use;
 - c) A description of the Closure and Reclamation planning team;
 - d) A description of engagement related to Closure and Reclamation planning, including a summary of completed and planned engagement, and links to the **Engagement Plan** referred to in Part B, Condition 17 for the Project;
 - e) A list of any other regulatory instruments required for Closure and Reclamation of the Project;
 - f) A description of the pre-existing and current Project environment, including, but not limited to:
 - i. climatic conditions;
 - ii. physical conditions;
 - iii. chemical conditions;
 - iv. biological conditions; and
 - v. any physical or chemical assessments of soil, water, and permafrost.
 - g) A description of the Project, including, but not limited to:
 - i. site history;
 - ii. Project development;
 - iii. current status of the Project;
 - iv. maps delineating all disturbed areas, borrow material locations, site facilities, hydrological features, and elevation contours; and
 - v. photographs.
 - h) A description of each Project component, including, but not limited to:
 - i. areas affected by spills or Unauthorized Discharges; and
 - ii. other areas affected by Project activities.
 - i) For the Project site, a description of Closure and Reclamation plans, including, but not limited to:
 - i. Closure Objectives and Criteria;
 - ii. preferred Closure and Reclamation option and method for each Project component identified in condition (h) above;
 - iii. design drawings, signed and stamped by a Professional Engineer, for any Engineered structures if applicable;
 - iv. Water management and restoration of natural drainage;
 - v. predicted environmental effects during and after Closure and Reclamation activities;
 - vi. post-closure monitoring, maintenance, and reporting;
 - vii. uncertainties and contingencies;
 - viii. climate change considerations; and
 - ix. Closure and Reclamation Research plans.

Condition

- j) A description of any planned Progressive Reclamation;
- k) A plan for Temporary Closure, including, but not limited to the following information:
 - i. Temporary Closure goals and objectives;
 - ii. a description of activities and methods;
 - iii. a description of monitoring, maintenance, and reporting;
 - iv. contingencies; and
 - v. an implementation schedule.
- l) An implementation schedule that includes Progressive Reclamation and final Closure and Reclamation activities.

ANNEX A: SURVEILLANCE NETWORK PROGRAM - annexed to Water Licence MV2019L1-0001

LICENSEE: Northwest Territories Power Corporation

LICENCE NUMBER: MV2019L1-0001

EFFECTIVE DATE OF LICENCE: October 18, 2019

EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM (SNP): October 18, 2019

Part A – Surveillance Network Program Description and Monitoring Requirements

1) The location of sampling sites and specific monitoring requirements are as follows:

a) **Surveillance Network Program (SNP) 00-1:**

Description:	SNP 00-1a,b,c,d – Intakes to the K (2 intakes), EMD (1 intake), and CAT (1 intake) plants
Location:	SNP 00-1a - K plant intake 1 SNP 00-1b - K plant intake 2 SNP 00-1c - EMD plant intake SNP 00-1d - CAT plant intake
Sampling Frequency:	Continuous in-situ measurements during periods of discharge to Jackfish Lake
Sampling Parameters:	Water Temperature Flow

b) **Surveillance Network Program (SNP) 00-2:**

Description:	SNP 00-2a,b,c - Discharges from the K, EMD and CAT plants, respectively
Location:	SNP 00-2a - K plant SNP 00-2b - EMD SNP 00-2c - CAT plant
Sampling Frequency:	Continuous in-situ measurements during periods of Discharge to Jackfish Lake
Sampling Parameters:	Water Temperature

c) **Surveillance Network Program (SNP) JF01-06**

Description:	JF01-06 – Groundwater Monitoring Well
Location:	Located at the Lease Boundary near the lake shore near the warehouse near K Plant
Sampling Frequency:	Twice a year during June and September
Sampling Parameters	<ul style="list-style-type: none"> • Field parameters (pH, Electrical Conductivity [EC], Temperature, Dissolved Oxygen [DO]) • Major Ions • Total Suspended Solids (TSS) • Oil and Grease (Hexane Extractable) • pH • Total Petroleum Hydrocarbons (F1, F2, F3, F4 CCME Fractions) • Benzene, Toluene, Ethylbenzene, Xylene (BTEX) • Dissolved Metals (Metals shall include but not be limited to analysis of the following parameters: Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Uranium, and Zinc)

d) **Surveillance Network Program (SNP) MW2**

Description:	MW2 – Groundwater Monitoring Well
Location:	Located at the Lease Boundary near the lake shore between the EMD Plant and the Cat Plant
Sampling Frequency:	Twice a year during June and September
Sampling Parameters	<ul style="list-style-type: none"> • Field parameters (pH, Electrical Conductivity [EC], Temperature, Dissolved Oxygen [DO]) • Major Ions • Total Suspended Solids (TSS) • Oil and Grease (Hexane Extractable) • pH • Total Petroleum Hydrocarbons (F1, F2, F3, F4 CCME Fractions) • Benzene, Toluene, Ethylbenzene, Xylene (BTEX) • Dissolved Metals (Metals shall include but not be limited to analysis of the following parameters: Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Uranium, and Zinc)

2. The location of sampling sites is subject to approval of the Inspector.
3. More frequent sample collection may be required at the request of an Inspector.

4. All sampling, sample preservation, and analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater" at the time of analysis, or by such other methods approved by an Analyst.
5. All analyses shall be performed in a laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA) or equivalent for the specific analyses to be performed or as approved by an Analyst.
6. The Licensee shall annually review the approved QA/QC Plan and modify the Plan as necessary. Proposed modifications shall be submitted to an Analyst for approval.
7. The QA/QC Plan referred to in SNP Section A, Item 6 shall be implemented as approved by an Analyst.

Part B – Volume and Temperature Measurement Requirements

- 1) All volume and temperature measurements shall be measured and recorded continuously (i.e., using electronic data storage chips or equivalent) during periods of Discharges and reported on a monthly basis:
 - a) The daily, monthly, and annual quantities of cooling water circulated from Surveillance Network Program Station Numbers 00-1a, 00-1b, 00-1c, and 00-1d shall be measured and recorded in cubic metres; and
 - b) The water temperature at Surveillance Network Program Station Numbers 00-1a, 00-1b, 00-1c, 00-1d, 00-2a, 00-2b, and 00-2c shall be measured and recorded in degrees Celsius.

ANNEX B: Concordance Table of items Requiring Submission – annexed to Water Licence MV2019L1-0001

This table summarizes the information the Licensee is required to submit as per the Water Licence conditions.

Part of Licence	Item	Date
Annex A	Monthly SNP Report	Within 30 days of the end of the reporting month
Part B, condition 15	Annual Water Licence Report	March 31, 2020 and every March 31 thereafter.
Part B, condition 16	Standard Operating Procedures and Quality Assurance and Quality Control Plan	Within 90 days following issuance of this Licence
Part E, condition 4	Thermal Plume Delineation Study Design	A minimum of 90 days following the effective date of this Licence.
Part E, condition 5	Thermal Plume Delineation Study Report	August 1, 2021
Part F, condition 2	AEMP Design Plan	November 1, 2021
Part F, condition 3	Aquatic Effects Re-evaluation Report	Three years following implementation of the AEMP Design Plan and every five years thereafter, or as directed by the Board.
Part F, condition 4	AEMP Design Plan – Revised	Three years following implementation of the AEMP Design Plan and every five years thereafter, or as directed by the Board.
Part F, condition 5	AEMP Annual Report	March 31, 2023 and every year thereafter.
Part H, condition 1	Closure and Reclamation Plan	Within 24 months following the effective date of this Licence
Part H, condition 2	Closure and Reclamation Plan - Update	Three years prior to the expiration of this Licence

ANNEX C: Table of Revision History – annexed to Water Licence MV2019L1-0001

Date	Location of change	Description of change
May 28, 2020	Part E, condition 4 Part E, condition 5 Part F, condition 2	- Compliance date change
	Part E, condition 4 Part E, condition 5 Part F, condition 2 Part F, condition 5	- Compliance date change

APPENDIX D – JACKFISH LAKE 2021 GROUNDWATER MONITORING PROGRAM PLAN

MW3	X	X						
MW4	X	X						
MW5	X	X						
MW6	X	X						
MW7	X	X						
MW9	X	X						
MW10	X	X						

**Note: Some wells may be dry*

Table 2. 2021 Jackfish Lake JF01-06 Sampling Set (June and September)

Test	Container	Preservative
Routine: pH, EC, major ions, temperature	250 mL Plastic	None
Total Suspended Solids	250 mL Plastic	None
Oil and Grease	2x100 mL Amber Glass bottle	(1:1) HCL
BTEX F1-F4	2x40mL Glass Vials + 2x100mL Amber Glass Vial	Sodium Bisulfate (precharged)
Metals	80 mL HDPE	Nitric Acid (red)
Mercury	40 mL Glass Vial	Hydrochloric Acid
Dissolved Oxygen	250 mL Amber Glass Bottle	None

**Note: if JF01-06 is dry, select sampling location along lakeshore with adequate water*

Sampling and Reporting Requirements:

NTPC will follow industry best practices for the collection of the water samples, including but not limited to: purging 3-10x the well volume or up to 19L consistent with shallow groundwater monitoring wells prior to sampling, collecting field and trip blanks, wearing appropriate PPE, and handling samples using appropriate methods. Detailed field notes will be collected in order to ensure reporting consistency with the *2020 Standards for Reporting Water Quality Information in the NWT* (Appendix A). A summary of the calibration and status of the meters and devices referred to in Part B, condition 14 of the water license MV2019L1-001.

Appendix A

Standards for Reporting Water Quality Information in the NWT



Standards for Reporting Water Quality Information in the NWT

December 2020

1.0 INTRODUCTION

In the Northwest Territories (NWT), project proponents are typically required to collect and report water quality monitoring information under the conditions of water licences. However, guidance concerning the specific information that should be presented when reporting has not been established. As a result, the specifics of water quality information posted to the Public Registries of the Land and Water Boards of the Mackenzie Valley (the Boards) may vary by proponent. This has resulted in challenges when attempting to combine information collected by different proponents, such as when trying to use this information to conduct regional assessments of water quality.

In recognition of these challenges, Environment and Natural Resources (ENR), Government of the Northwest Territories, initiated a project in 2016 to develop guidance for the reporting of water quality data. The goal of this project was to address the inconsistencies in water quality information submitted to the Boards and provide clear expectations to project proponents.

This project culminated in the development of these standards, which were subject to public review by government, industry and regulatory reviewers. These standards reflect reviewers' input and are intended to provide the Boards with consistency in water quality monitoring information submitted to them.

These standards will be applied by the following Boards:

- Mackenzie Valley Land and Water Board
- Gwich'in Land and Water Board
- Sahtu Land and Water Board
- Wek'èezhii Land and Water Board

1.1 The Need for Comparable Water Quality Data

Information on the water quality of lakes and rivers in the NWT is collected on a regular basis by industry, communities, academics and government researchers. This information represents a large source of potential knowledge that could inform decision makers about trends and natural variation in water quality.

The first step in being able to use this information to tell a story about the state and trend of water quality conditions in the NWT is to ensure that key aspects of how the data were collected and analyzed are reported. This information is known as metadata.

These standards are linked with other initiatives that are currently being undertaken to standardize northern water quality monitoring, such as the development of guidance regarding Aquatic Effects Monitoring Programs and Baseline Water Quality by ENR and the Boards.

2.0 REPORTING STANDARDS

These reporting standards have been developed based on existing metadata standards for the Mackenzie DataStream¹ and the Polar Data Catalogue², as well as guidance provided by ENR scientists and comments from government, industry and regulators.

The standards are split into two parts. The first part deals with the required metadata for the dataset— in other words, general information on the dataset as a whole. This information should be provided in a manner that avoids the risk of the metadata and dataset being separated. For example, the required metadata could be provided in the first tab of the dataset spreadsheet (see Appendix A for an example).

The second part of these standards identifies the minimum information required for each water quality sample collected. This information is required to assess the comparability and suitability of water quality datasets to address supplementary research and monitoring questions.

A specific format is not being prescribed when reporting water quality information, as long as all required information is present. However, it is imperative that all data should be presented in an accessible file type (i.e. csv or xls). Appendix A provides an example of how the information may be formatted in a spreadsheet and can be used by proponents if desired.

¹ www.mackenziedatastream.ca

² www.polardata.ca

Part 1: Required metadata for each dataset

To be provided with the dataset, ideally in the first tab of the dataset spreadsheet

Required metadata	Notes
Program Name	Provide the name of the monitoring program through which data was collected.
Program Description	Provide a short (1-3 sentences) description of the monitoring program, including the date of initiation, program purpose and location.
Keywords	Provide several keywords for the monitoring program, such as the location of the program and/or the type of activity.
Citation	Indicate how you would like the data to be cited if it is used by others. <i>Example format: Organization Name (Publication Year). Dataset Title. (Type of resource, i.e. "dataset").</i>
Contact information (Name, phone number, email)	Provide contact information that people can use to get in contact if they have questions about using or understanding the data.
Data Collection Organization	Provide the name of the organization and/or other parties responsible for collecting the data (community, Indigenous organization, proponent, government agency, academia).
Data Collection Information	Provide a summary of how data were collected, such as sampling methods, equipment, calibration, QA/QC protocols. <i>Example: A YSI probe (EXO2 Multiparameter Sonde) is used to collect data on physio-chemical parameters at all sampling locations (n=28). To assess additional chemical parameters, a 1-litre grab sample of water is collected from locations in each of two key wetland macro-habitats (open water, emergent vegetation). A small subsample is transferred immediately to a scintillation vial for isotope ($\delta^{18}O$ and δ^2H) analyses, with the remainder reserved for analyses of nutrients, major ions, and trace metals. Monitoring activities follow the Healthy Waters Quality Assurance (QA) Project Plan.¹</i>
Data Disclaimer	Provide any data disclaimer statements regarding the use of the dataset.

¹ Example taken from Mackenzie DataStream guidelines

Part 2: Reporting requirements for each sample

Sampling Reporting Requirements	Notes
Sample ID / Unique identifier	A code which identifies the sample that was collected. No other sample should share this code.
Sample Location	Site name (if used)
Geographic coordinates	Provided in decimal degrees (dd.dddddd)
Geodetic datum	Provided in NAD83
Sample date	Provided in YYYY-MM-DD format
Sample method	Select from: grab sample, composite sample, or depth integrated.
Sample matrix	Select from: river, groundwater, lake water, pond water, mine water, seepage water, treated water, snow, sediment, suspended sediment, leachate, blank water, or other. If other, explain in Comments.
Sample type	Select from: discrete, replicate, field blank, travel blank, equipment blank, field spike, lab blank, filter blank, split sample, or unspecified.
Sample depth	Provided in meters.
Lab used	Laboratory that undertook analysis
Lab analysis date	Provided in YYYY-MM-DD format.
Lab analytical method	
Comments <i>(Optional)</i>	Note anything unusual about the location or the sampling procedure (e.g. hit bottom with sampler and disturbed sediments).
Parameter names	
Detection limit	For each parameter tested
Units	For each parameter tested

APPENDIX A: Example of Water Quality Sample Metadata Template

Part 1 - Dataset Metadata Sample Template	
Program Name	
Program Description	
Keywords	
Citation	
Contact information	
Data Collection Organization	
Data Collection Information	
Data Disclaimer	

Part 2 - Dataset Sample Template (to be used in a spreadsheet)			
Sample ID			
Sample Location			
Latitude			
Longitude			
Geodetic Datum			
Sample Date			
Sampling Method			
Matrix			
Sample Type			
Sample Depth (m)			
Parameter Name			
Detection Limit			
Units			
Lab Used			
Lab Analysis Date			
Lab Analytical Method			
Comments			

**Add rows and columns as needed*