Rook I Project

Environmental Impact Statement

Annex V.2: Overwintering Fish Habitat Report

GOLDER
MEMBER OF WSP

OVERWINTERING FISH HABITAT FIELD PROGRAM RESULTS SUMMARY REPORT FOR THE ROOK I PROJECT

Prepared for:

NexGen Energy Ltd.

Prepared by:

Golder Associates Ltd.

March 2022

Executive Summary

The overwintering fish habitat field program is a component of a comprehensive environmental baseline study for the NexGen Energy Ltd. Rook I Project (Project), a proposed uranium mining and milling operation located in northwestern Saskatchewan. This field program provided the information necessary to support the assessment of potential Project effects on fish and fish habitat in the Environmental Impact Statement.

Overwintering habitat is often one of the most critical habitat types for fish, particularly in northern regions, which may experience extended periods of ice cover and limited flow. The availability of adequate winter habitat is often an important factor affecting the distribution and abundance of fish in an environment. Indigenous Peoples have expressed concerns about the potential for effects of industrial facilities on local fish populations, habitat for fish, and traditional and commercial fishing in the anticipated area of the Project.

Existing information on overwintering habitat utilization in the area of the Project is available for waterbodies; however, prior to this study, there was very little existing overwintering fish habitat information available for watercourses. In addition, specific information regarding winter habitat conditions in Patterson Lake, in the vicinity of the potential locations for the treated effluent diffuser and freshwater intake, was not available.

The objective of the 2019 winter field program was to perform an overwintering fish habitat assessment of watercourses potentially affected by the Project. A second objective was to collect winter fish habitat data in Patterson Lake in the vicinity of potential locations for the treated effluent diffuser and intakes.

Ten sites were assessed in 2019, which included three sites on Patterson Lake and seven sites on surrounding watercourses that have the potential to be affected by the Project. The sites on Patterson Lake were situated in the general area of the proposed water intakes and diffuser. Watercourse sites included five sites on the Clearwater River mainstem and two sites on tributaries of the Clearwater River.

Parameters measured at each waterbody and watercourse site included ice thickness, snow depth, and under-ice water depth. If sufficient water depth was present, standard water quality field parameters (i.e., pH, specific conductivity, temperature, and dissolved oxygen [DO]) were measured using a calibrated water quality multi-parameter meter. At watercourse sites, the under-ice stream discharge was measured using a flow meter. Distinguishing habitat features that may influence winter habitat utilization by fish were also noted.

The results of the overwintering habitat surveys at the proposed intake and diffuser locations in Patterson Lake indicate that these areas would provide suitable overwintering habitat for large-bodied fish and forage fish due to high DO concentrations and adequate under-ice water depths measured at the surveyed stations.

The surveyed sections of the Clearwater River mainstem were open and free of ice at the time of the field program, with exception of one site with slower flow, which was ice-covered. All mainstem sites were flowing and typically had water depths in the range of 0.5 m to 1 m. Water quality sampling indicated that DO was generally high at the sampled stations. The mainstem sites were generally considered to provide good quality overwintering habitat for large-bodied and forage fish populations.

Of the two Clearwater River tributaries sampled, one was frozen to the bottom throughout the surveyed section, and the overwintering habitat potential of the site was nil. The second had sufficient under-ice water depths and adequate DO concentrations to support overwintering fish populations; however, the quality of the habitat was lower for more sensitive species or life stages that require higher DO concentrations.

The overwintering fish habitat field program achieved the objective of providing information regarding the natural variability in winter habitat conditions in the aquatic study area for the Rook I Project. The results of this baseline field program provide context for the effects assessments completed for fish and fish habitat and land and resource use, and for future operational environmental effects monitoring for the Project.

If referencing this report, please use for the following citation:

Golder (Golder Associates Ltd.). 2022. Overwintering Fish Habitat Field Program Results Summary Report for the Rook I Project. Prepared for NexGen Energy Ltd.

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FIGURES

APPENDICES

Abbreviations and Units of Measure

Abbreviation	Definition
ASA	aquatic study area
CCME	Canadian Council of Ministers of the Environment
Project	Rook I Project
NexGen	NexGen Energy Ltd.
CanNorth	Canada North Environmental Services LP
DO	dissolved oxygen
EA	Environmental Assessment
EIS	Environmental Impact Statement

Unit	Definition
km	kilometre
m	metre
mg/L	milligrams per litre
°C	degrees Celsius
µS/cm	microsiemens per centimetre
m^3/s	cubic metres per second
m/s	metres per second

1.0 INTRODUCTION

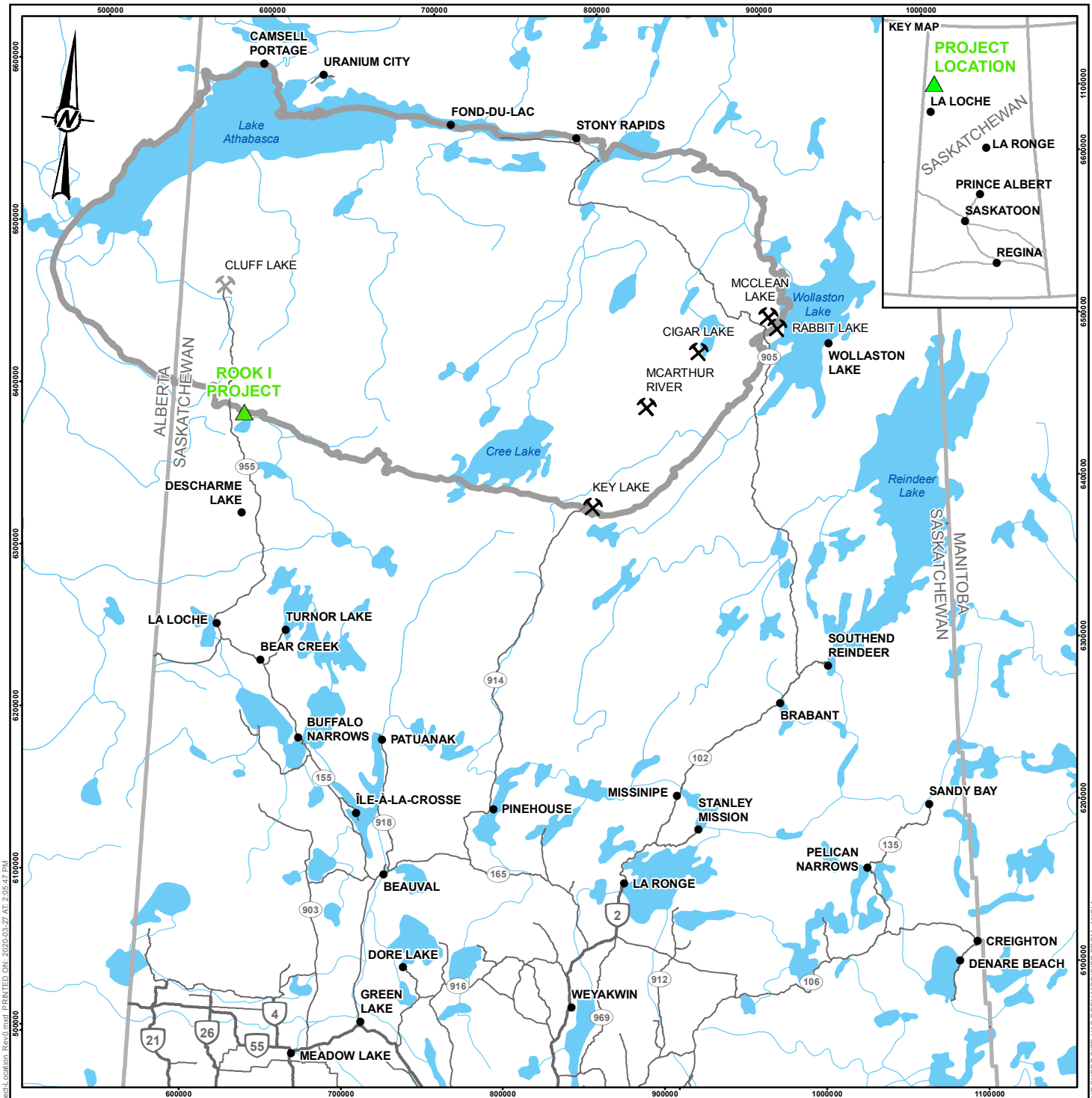
The Rook I Project (Project) is a proposed new uranium mining and milling operation that is 100% owned by NexGen Energy Ltd. (NexGen). The Project would be located in northwestern Saskatchewan, approximately 40 km east of the Saskatchewan-Alberta border, 130 km north of the town of La Loche, and 640 km northwest of the city of Saskatoon (Figure 1). The Project would reside within Treaty 8 territory and within the Métis Homeland. At a regional scale, the Project would be situated within the southern Athabasca Basin adjacent to Patterson Lake, and along the upper Clearwater River system (Figure 2). Access to the Project would be from an existing road off Highway 955. The Project would include underground and surface facilities to support the extraction and processing of uranium ore from the Arrow deposit, a land-based, basement-hosted, high-grade uranium deposit.

The overwintering fish habitat baseline report represents a component of a comprehensive baseline program that documents the natural and socio-economic environments in the anticipated area of the Project. The overwintering fish habitat baseline program was undertaken to provide context from which Project environmental overwintering fish habitat effects could be assessed in the Environmental Impact Statement (EIS).

Since exploration at the Project commenced in 2013, NexGen has engaged regularly and established relationships with local First Nation and Métis Groups (collectively referred to as Indigenous Groups) and northern communities, specifically those closest and with greatest access to the proposed Project. NexGen engagement activities and mechanisms to date have included, but are not limited to: meetings with leadership, workshops and community information sessions, Project site tours, establishing joint working groups to support the gathering and incorporation of Indigenous and Local Knowledge throughout the Environmental Assessment (EA) process, and providing funding for Traditional Land Use Studies[1] to understand how the proposed Project may interact with the Indigenous communities' traditional use of the anticipated area of the Project.

Feedback received during engagement activities was documented for contribution to the EIS for the Project; examples of feedback received include discussion of concerns, interests, potential adverse effects, mitigation, and design alternatives. Many baseline studies were initiated in advance of formal engagement on the EA for the Project; however, engagement during the execution of baseline studies has helped inform the understanding of baseline conditions and confirmed components of the natural and socio-economic environments that required study. A summary of feedback related to the overwintering fish habitat baseline program is presented in Appendix A of the Aquatic Baseline Road Map (Annex V).

[1] Traditional Land Use (TLU) Studies include all land use studies developed by the Project's affected Indigenous Groups, including Traditional Land Use and Occupancy studies, Traditional Knowledge and Use studies, and Indigenous Rights and Knowledge studies, henceforth referred collectively as TLU Studies.



LEGEND

- POPULATED PLACE
- URANIUM MINING FACILITY (ACTIVE)
- URANIUM MINING FACILITY (DECOMMISSIONED)
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- WATERCOURSE
- WATERBODY
- ATHABASCA BASIN BOUNDARY
- PROJECT LOCATION

0 100 200

1:3,500,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

NexGen Energy Ltd.

PROJECT

ROOK I PROJECT

TITLE

LOCATION OF THE ROOK I PROJECT, SASKATCHEWAN

CONSULTANT

GOLDER

YYYY-MM-DD	2020-03-27
DESIGNED	SS
PREPARED	NO/AK
REVIEWED	JMC
APPROVED	MM

PROJECT NO.	PHASE	REV.	FIGURE
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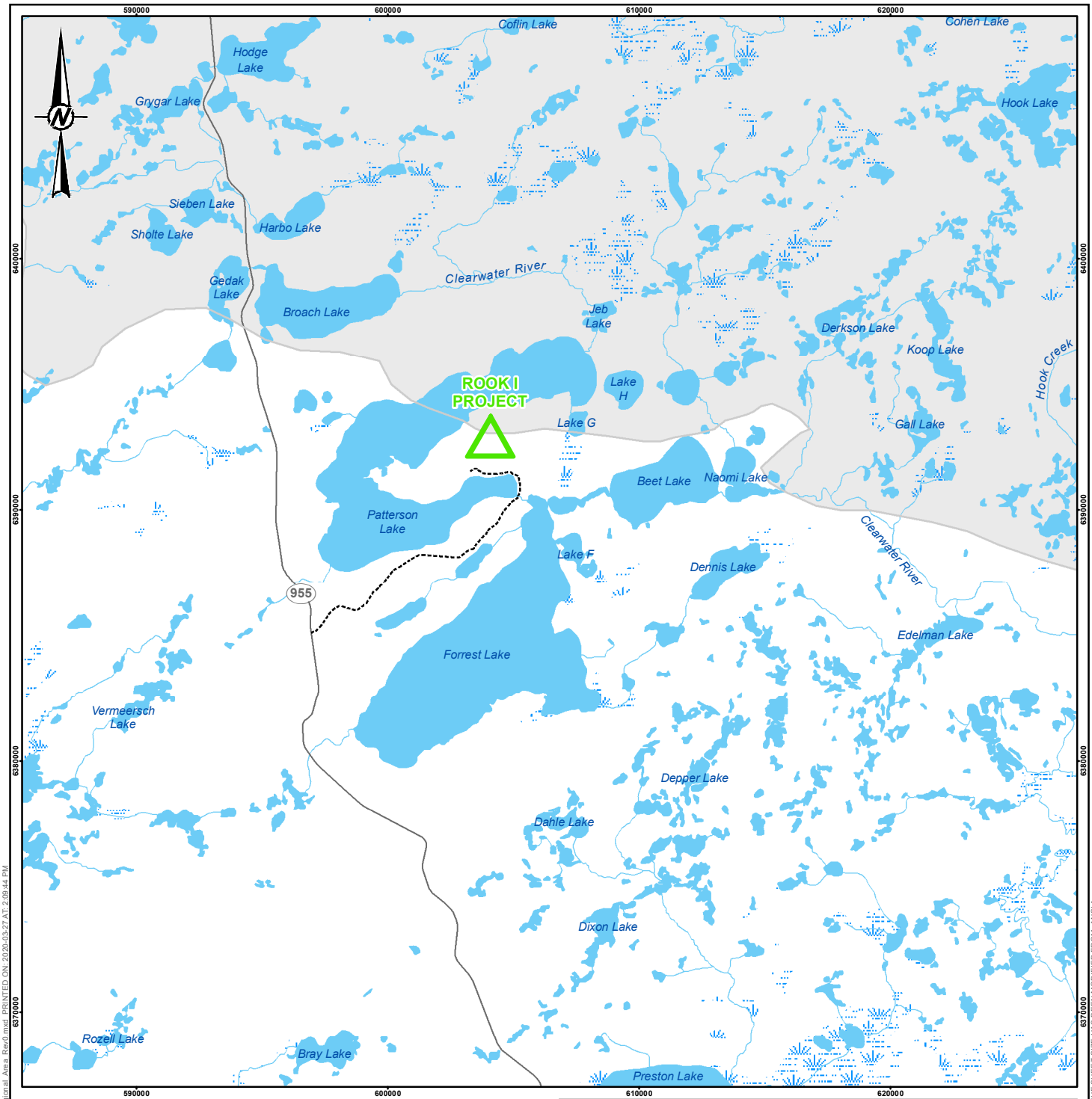

LEGEND

- SECONDARY HIGHWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- ATHABASCA BASIN
- PROJECT LOCATION
- EXISTING ACCESS ROAD

0 5,000 10,000

1:225,000 METRES

REFERENCE(S)

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PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

NexGen Energy Ltd.

PROJECT

ROOK I PROJECT

TITLE

REGIONAL AREA OF THE ROOK I PROJECT

CONSULTANT

GOLDER

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DESIGNED	JMC
PREPARED	NO/AK
REVIEWED	JMC
APPROVED	MM

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2.0 STUDY OBJECTIVE

Overwintering habitat is often one of the most critical habitat types for fish, particularly in northern regions, which may experience extended periods of ice cover and limited flow. Adequate winter habitat is limiting in many systems and is often an important factor affecting the distribution and abundance of fish in an environment.

Under-ice water depth, flow, and dissolved oxygen (DO) are important aspects of overwintering habitat that are considered when evaluating the winter habitat potential of a waterbody or watercourse. Under-ice DO levels, in particular, can be a major limiting factor to providing overwintering habitat for fish (Shuter and Post 1990; Nurnberg 1995). Tolerance limits for low DO levels can vary by fish species, life stage, water temperature, and duration of exposure (Scott and Crossman 1973). Good quality overwintering habitat for fish is typically found in areas with adequate DO concentrations and sufficient under-ice water depth.

The objective of the 2019 winter field program was to perform overwintering fish habitat surveys of watercourses potentially affected by the Project and to provide information necessary to support assessment of potential effects of the Project on fish and fish habitat in the EIS. A second objective was to collect winter fish habitat data in Patterson Lake in the vicinity of the expected locations for the treated effluent diffuser (referred to herein as the diffuser) and freshwater intake proposed for the Project. A second intake location was also surveyed but is no longer part of the Project design.

Indigenous Peoples have expressed concerns about the potential for effects of industrial facilities on local fish populations, habitat for fish, and traditional and commercial fishing in the area of the Project (Birch Narrows Dene Nation [TSD II: BNDN]; Buffalo River Dene Nation [TSD III: BRDN]; Clearwater River Dene Nation [TSD V.1: CRDN]; Ya'thi Néné Lands and Resources Office [TSD VI: YNLRO]; Métis Nation – Saskatchewan [TSD IV: MN-S]). This feedback reinforces the importance of collecting seasonal fish habitat information to support the assessment of the potential effects of the Project on fish and fish habitat in the EIS.

3.0 STUDY AREAS

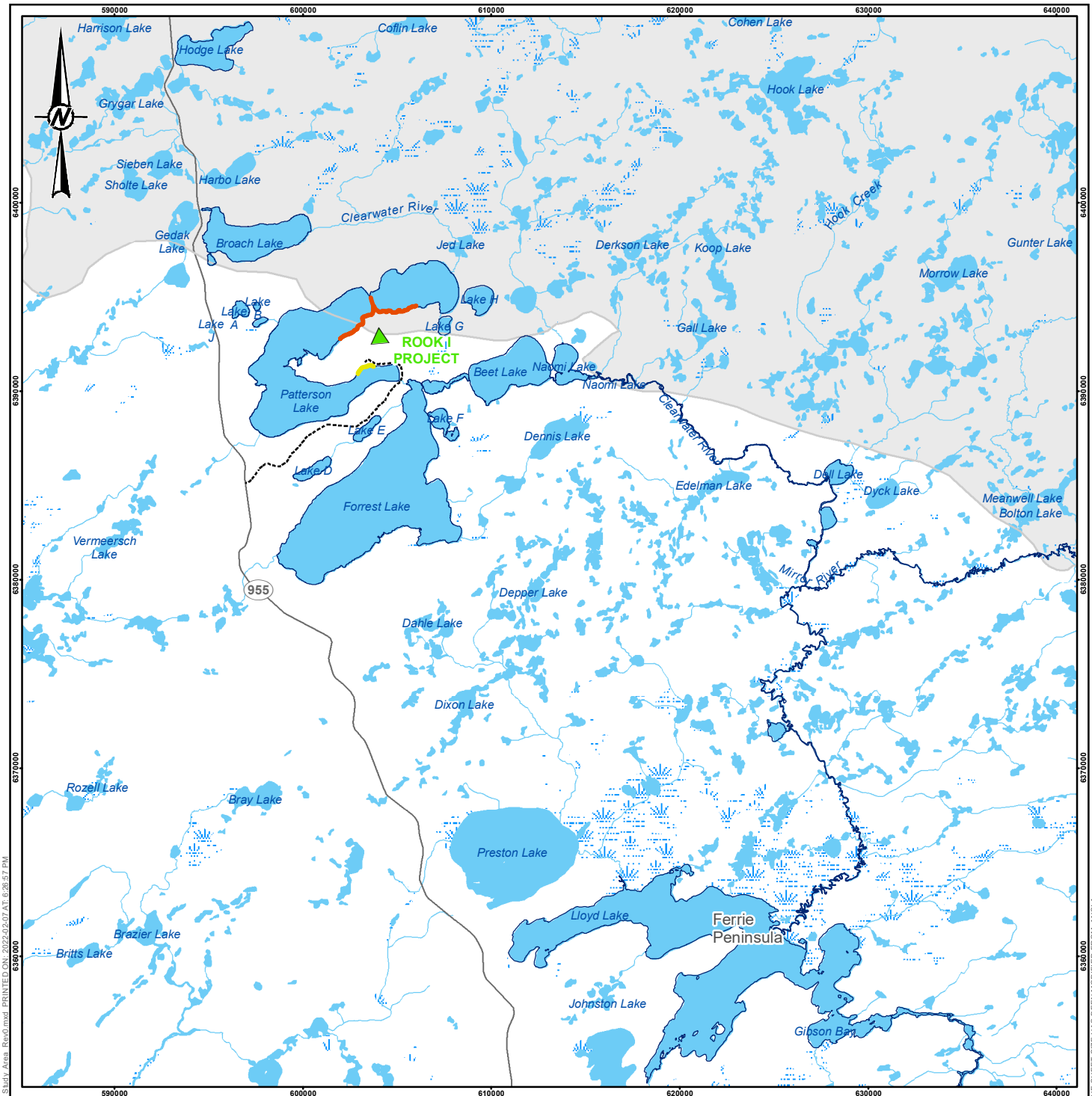
The proposed Project would be located adjacent to Patterson Lake near the headwaters of the Clearwater River system at Broach Lake. The upper reach of the Clearwater River flows from Broach Lake through a series of lakes including (in order from upstream to downstream) Patterson, Forrest, Beet, and Naomi lakes. From Naomi Lake, the Clearwater River flows another 20 km southeast before the Mirror River confluence, where the river deepens with higher flow volumes from the Mirror River. Farther downstream, the Clearwater River flows through Lloyd Lake, which is just upstream of the Clearwater River Provincial Park.

The study area used for the overwintering fish habitat field program includes the Clearwater River from its headwaters at Broach Lake and extends approximately 8 km downstream of Lloyd Lake. This study area aligns with the aquatic study area (ASA) established by Canada North Environmental Services LP (CanNorth) for the Rook I Project aquatic environmental baseline study (Annex V.1, Aquatic Environment Baseline Report; Figure 3). As described in Annex V.1:

> The ASA was selected based on the watershed designated for treated effluent release, knowledge of information needed for an Environmental Impact Assessment and long-term monitoring for similar developments, and consideration of potential cumulative impacts.

Waterbodies that are present along the Clearwater River flow path are included in the ASA (Figure 3).

The sites selected for the overwintering fish habitat surveys were located in a subset of the waterbodies and watercourses included in the ASA defined by CanNorth; however, the same study area was applied because the overwintering habitat survey is a component of the overall aquatic baseline study.



LEGEND

- SECONDARY HIGHWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- ATHABASCA BASIN
- EXISTING ACCESS ROAD
- PROJECT LOCATION

BASELINE AQUATIC STUDY AREA

- CAMP STUDY AREA
- DETAILED STUDY AREA
- AQUATIC SAMPLED WATERBODY

0 5,000 10,000

1:300,000 METRES

NOTE(S)

THE STUDY AREA USED FOR THE OVERWINTERING FISH HABITAT FIELD PROGRAM ALIGNS WITH THE AQUATIC STUDY AREA ESTABLISHED BY CANADA NORTH ENVIRONMENTAL SERVICES (CANNORTH) FOR THE ROOK I PROJECT AQUATIC ENVIRONMENTAL BASELINE STUDY (CANADA NORTH 2020). NOT ALL WATERBODIES AND WATERCOURSES INCLUDED IN THE AQUATIC STUDY AREA WERE SURVEYED AS PART OF THE OVERWINTERING FISH HABITAT FIELD PROGRAM.

REFERENCE(S)

CANNORTH (CANADA NORTH ENVIRONMENTAL SERVICES). 2020. ROOK I PROJECT AQUATIC AND TERRESTRIAL ENVIRONMENT BASELINE REPORT. PREPARED FOR NEXGEN ENERGY LTD. SASKATOON, SASKATCHEWAN.

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

NexGen Energy Ltd.

PROJECT

ROOK I PROJECT

TITLE

ROOK I PROJECT BASELINE AQUATIC STUDY AREA

CONSULTANT

GOLDER

YYYY-MM-DD	2022-02-07
DESIGNED	LJ
PREPARED	NO
REVIEWED	LJ
APPROVED	KM

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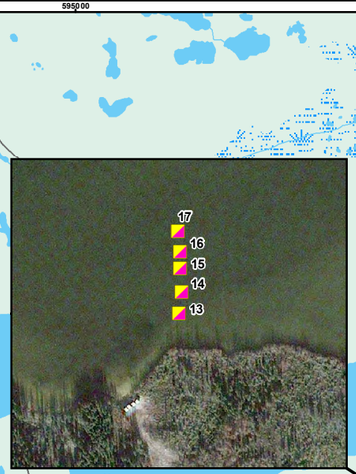

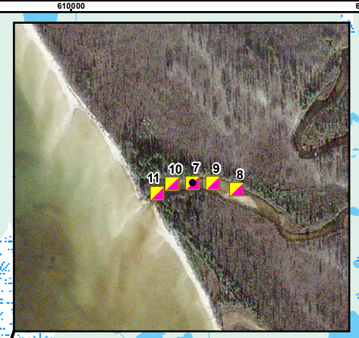

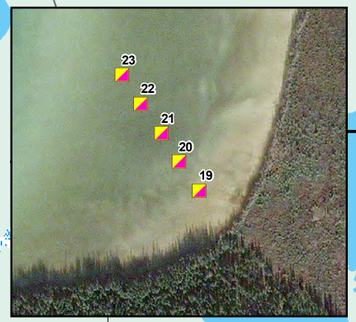

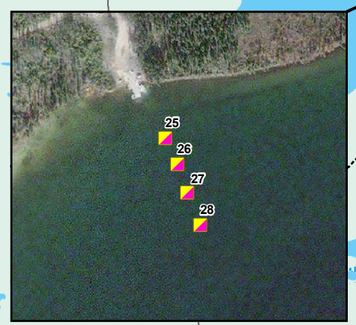

Clearwater River
Gedak Lake
Jed Lake
Jed Creek
Clearwater River above Patterson Lake
Treated Effluent Discharge
Fresh Water Intake
Tributary Inflow to Patterson Lake from Lake G
Lake H
Lake G
Patterson Lake
ROOK I PROJECT
Gall Lake
Tributary Inflow to Naomi Lake
Naomi Lake
Beet Lake
Clearwater River below Beet Lake
Downstream of Naomi Lake
Camp Water Intake
Clearwater River above Beet Lake
Clearwater River below Patterson Lake
E Creek
Lake E
Lake F
Forrest Lake
Dennis Lake
Edelman Lake

LEGEND

- SECONDARY HIGHWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- WOODED AREA

PROJECT FEATURES

- EXISTING ACCESS ROAD
- PROJECT LOCATION

SAMPLING LOCATIONS

- DISCHARGE
- OVERWINTERING HABITAT ASSESSMENT
- WATER QUALITY MEASUREMENT

0 2,000 4,000

1:100,000 METRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. IMAGERY OBTAINED FROM THE CLIENT, DATED: 2015.
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
NexGen Energy Ltd.

PROJECT
ROOK I PROJECT

TITLE
OVERWINTERING FISH HABITAT SAMPLING LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2021-02-02
DESIGNED	CH
PREPARED	LMS
REVIEWED	LJ
APPROVED	KM

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4.0 METHODS

The baseline assessment of overwintering fish habitat in the ASA involved a review of existing information and overwintering habitat surveys in Patterson Lake and watercourse sites.

4.1 Review of Existing Information

Existing information on winter fish habitat conditions was available for waterbodies in the ASA, including Patterson Lake, Forrest Lake, Beet Lake, Naomi Lake, and Lloyd Lake, and a few small lakes (Annex V.1); however, specific information regarding overwintering habitat utilization in the immediate vicinity of the potential water intakes and diffuser was not available. In addition, there was very little existing overwintering fish habitat information available for watercourses in the ASA.

The information on winter habitat conditions in waterbodies (Annex V.1) provides a general understanding of overwintering fish habitat conditions in lentic environments. The results of the CanNorth sampling indicate that the surveyed waterbodies were generally well oxygenated with sufficient under-ice water depths and provided high quality overwintering habitat. The collection of additional information regarding winter habitat utilization in the vicinity of the diffuser and two freshwater intakes was recommended to support the assessment of effects associated with these developments in the EIS.

CanNorth completed fish habitat surveys in several watercourses during open-water conditions in 2018 and 2019. These surveys evaluated the habitat for overwintering potential; however, no winter sampling occurred. Golder recommended that additional information regarding winter habitat utilization be collected to provide a detailed understanding of overwintering conditions in the ASA and to support the EIS.

4.2 Approach

The approach taken to conduct the overwintering fish habitat surveys is discussed below. There are no standardized survey methods in Saskatchewan or in Canada for conducting overwintering fish habitat surveys; however, where applicable, sampling activities followed Golder's standard technical procedures for aquatic sampling, which were developed based on accepted protocols and sampling guidance documents available in Canada and the United States (e.g., RIC 2001; Stanfield 2017).

4.2.1 Survey Timing and Locations

The timing of the field program targeted the late-winter low flow period, which represents the most severe habitat conditions for fish in this region. To satisfy this objective, the overwintering fish habitat surveys were conducted from 25 March 2019 to 27 March 2019. This timing coincided with the winter hydrometric and snow survey sampling.

Overwintering fish habitat surveys were completed at locations in the ASA that were identified as being potentially affected by the proposed Project based on the expected development footprint and activities. In particular, the potential locations of the water intake and diffuser, and the potential for effects from treated effluent discharge were considered when selecting sites. Site access conditions during winter were also taken into consideration when selecting sites.

Ten sites were surveyed in 2019, which included three sites on Patterson Lake and seven sites on surrounding watercourses that could be potentially affected by the Project (Table 1; Figure 4). Each of the sites surveyed overlapped with habitat transects assessed by CanNorth during the 2018 and 2019 open-water fish and fish habitat baseline sampling (Annex V.1).

The survey locations in Patterson Lake included sites at the potential locations of the freshwater intake for the mine and mill and the treated effluent discharge. The location of a second intake (referred to herein as the camp freshwater intake) was also surveyed; however, this intake is no longer proposed as part of the Project design. At the time of the field program, the planning and design process for the water intake and diffuser in Patterson Lake were at an early stage, and a detailed investigation of the proposed locations for these structures had not yet occurred. Therefore, the surveyed sites were considered as conceptual locations for these developments. At the time of writing this report, the planned locations for the freshwater intake and diffuser were in the same general area as the sites surveyed in Patterson Lake. The final locations of these developments will be determined during detailed design. The data collected at the sampled locations are considered suitable for a baseline study, because winter habitat information at the sites would be generally representative of conditions at the final intake and diffuser locations.

The watercourse sites included five sites on the Clearwater River mainstem and two sites on tributaries of the Clearwater River (Table 1). Watercourse sites were selected based on a desktop review of satellite imagery, and to overlap with fish habitat sampling transects completed by CanNorth (Annex V.1). Specific sampling locations were determined in the field based on the approach described in Section 4.2.2.2.

Winter conditions prevented the field crew from safely accessing one of the transects sampled by CanNorth (referred to as “Clearwater Creek” in Annex V.1). Consequently, the site was moved to the outlet of Naomi Lake. In addition, three watercourse sites assessed for fish habitat by CanNorth during open-water conditions (Clearwater Creek, Clearwater River Midfield, and Lloyd Lake Inlet) were excluded from the overwintering sampling program because accessing and surveying these sites during winter by snowmobile was considered a safety risk. The Clearwater River Midfield and Lloyd Lake Inlet locations were not considered critical to survey because overwintering habitat is unlikely to be limiting at these locations where the riverine environment is wider, deeper, and faster flowing. Likewise, the Clearwater Creek site was also not essential for the program, as other tributary habitats sampled as part of the field program provided adequate representation of overwintering fish habitat conditions in tributary environments.

Table 1: Overwintering Fish Habitat Sampling Locations, March 2019

Type	Name	Site[a]	UTM Coordinates NAD83 12V	
			Easting	Northing
Waterbody	Patterson Lake	Camp Freshwater Intake	603254	6391271
		Treated Effluent Discharge	603649	6394120
		Freshwater Intake for Mine/Mill	604528	6394290
Watercourse	Clearwater River	Clearwater River above Patterson Lake (Jed Creek)	607828	6396398
		Clearwater River below Patterson Lake (Patterson Creek)	605167	6390536
		Clearwater River above Beet Lake (Beet Channel)	608141	6390688
		Clearwater River below Beet Lake (Beet Creek)	613296	6390648
		Downstream of Naomi Lake[b]	615128	6390832
	Clearwater River Tributaries	Tributary Inflow to Patterson Lake from Lake G (G Creek)	607275	6394155
		Tributary Inflow to Naomi Lake (Naomi Creek)	613699	6392732

a) Watercourse site names are defined in terms of their location on the Clearwater River. The corresponding watercourse naming convention used in Annex V.1 is shown in parentheses.
b) Winter conditions prevented the field crew from safely accessing the site Tributary Inflow Downstream of Naomi Lake (referred to as "Clearwater Creek" in Annex V.1). Therefore, the site was moved to the outlet of Naomi Lake.
UTM = Universal Transverse Mercator; NAD = North American Datum.

4.2.2 Overwintering Habitat Assessments

4.2.2.1 Patterson Lake

At each of the surveyed sites in Patterson Lake, five holes (stations) were drilled using an ice auger, extending outwards from the shore. One of the holes was drilled at the coordinates listed in Table 1, while the remaining four holes were drilled approximately 20 m apart, extending into the lake. The specific orientation and placement of the holes was determined in the field, based on the best judgment of the field crew. If frozen to bottom conditions were encountered at any of the holes, a deeper location was selected, as the diffuser and freshwater intake structures would need to be installed at a sufficient depth to be submerged below the ice. Parameters measured at each station included ice thickness, snow depth, and under-ice water depth. Photos were taken at each site to document the general area and fish winter habitat conditions (Appendix A).

Standard water quality field parameters (i.e., pH, specific conductivity [conductivity], temperature, and DO) were measured using a calibrated water quality multi-parameter meter (i.e., Aqua TROLL 500 multi sonde unit) at all stations. In-situ water quality sampling followed Golder's technical procedure for freshwater water quality sampling which is based on standard methods (Environment Canada 1993; Clesceri et al. 1989; Wetzel 1983). Care was taken to avoid disturbing the lake bottom with the ice auger at locations where the under-ice water depth was limited, as this could potentially affect the water quality measurements. If sufficient water depth was present, a water quality profile (i.e., measurements taken at 0.5 m depth intervals throughout the water column) was completed at the deepest station. A point measurement (i.e., a single measurement taken at the water surface) was recorded at the remaining four stations at approximately 0.2 m below the ice-water interface. The depth profile consisted of water quality measurements at intervals of 0.5 m starting just below the ice and ending just above the substrate.

Measured DO concentrations were compared to the Canadian Council of Ministers of the Environment (CCME) water quality guidelines for the protection of aquatic life (CCME 1999), which consist of guideline values for the protection of aquatic life for both "early" life stages of fish (i.e., embryo/alevin) (9.5 mg/L) and other life stages of fish (6.5 mg/L).

4.2.2.2 Watercourses

At each site, a suitable section of the watercourse (approximately 100 m in length [longitudinally]), was selected for detailed assessment and to determine if the watercourse was frozen to the bottom. Survey sections were selected in the field, based on their representativeness of habitat conditions in the local area. A minimum of five holes were drilled at each site, approximately 20 m apart, in an attempt to locate flowing water. Parameters measured at each station included ice thickness, snow depth, and under-ice water depth. Information on bottom substrate composition was also collected. Photos were taken at each site. Any distinguishing habitat features that may influence winter habitat utilization by fish were noted, including possible areas of groundwater upwelling, and any open leads (i.e., areas without full ice cover). Standard water quality field parameters were measured at all stations as point measurements, as described in Section 4.2.2.1.

If flowing water was present at a site, the under-ice stream discharge was measured using a flow meter (i.e., Flow Tracker unit). Measurements of stream discharge followed Golder's standard technical procedure for stream discharge measurement, which is based on accepted hydrometric methods (Environment Canada 1981; Stanfield 2017).

Acquiring discharge measurements was not possible at two sites: the Clearwater River above Beet Lake site and the Downstream of Naomi Lake site. At the Clearwater River above Beet Lake site, discharge could not be effectively measured because the depth of the water and wetted width of the river within the surveyed section were not deep or wide enough, respectively. Discharge could not be measured at the Downstream of Naomi Lake site because of safety concerns related to inadequate ice thickness. In cases where a discharge measurement could not be obtained, water depth and velocity measurements were collected at one or more point locations where flowing water and safe, wadeable conditions were present. In the absence of discharge data, depth and velocity measurements provide some information on flow characteristics. The lack of discharge measurements at two sites was not considered a concern for the field program because 1) representative discharge measurements were collected at most sites; 2) discharge measurements were also collected during open-water conditions as part of the aquatic and hydrometric baseline sampling; and 3) discharge was modelled for the winter low-flow period as part of the hydrology baseline study.

5.0 RESULTS

The results of the overwintering fish habitat surveys at the three Patterson Lake sites and seven watercourse sites are presented in this section.

5.1 Patterson Lake

Descriptions of overwintering fish habitat conditions at the surveyed sites in Patterson Lake are provided below. In general, the ice thickness at the surveyed sites ranged from 0.35 m to 0.80 m, which was within the expected range for Patterson Lake during the late ice-cover season (Annex IV.2, Hydrometric Characterization Report). Under-ice water depths varied among stations, reflecting the location of each station relative to shore. The water was generally well oxygenated; however, slightly lower DO values were occasionally measured at stations closer to shore, reflecting shallower under-ice water depths encountered at these stations.

5.1.1 Camp Freshwater Intake

At the time of the survey, the camp freshwater intake was part of the Project design; however, at the time of writing this report, this intake is not proposed. The survey results for this site are reported herein to archive the information in case the Project design changes during the EIS and permitting review stages and because the results provide additional baseline information regarding fish habitat conditions in Patterson Lake.

Under-ice water depths at the Camp Freshwater Intake site (Appendix A) ranged from 0.20 m to 0.80 m across the five sampled stations (Table 2). Ice thickness was similar at the five stations, averaging 0.73 m. The water temperature at the ice-water interface averaged 0.8°C. The water was well oxygenated, with surface DO concentrations ranging from 13.2 mg/L to 14.4 mg/L (Table 2); all measurements were within guideline values. The pH of the water was slightly acidic to neutral. The conductivity of the water at the ice-water interface was highest at the station nearest to shore (60.7 microsiemens per centimetre [µS/cm]) and generally decreased with distance from shore. At the profile station, water temperature and DO were lower at the ice-water interface (0.6°C and 13.7 mg/L, respectively) and higher near the lake bottom (1.1°C and 13.9 mg/L, respectively). Overall, the surveyed area of Patterson Lake in the vicinity of the camp water intake location would provide suitable overwintering habitat for large-bodied fish and forage fish.

5.1.2 Treated Effluent Discharge

The Treated Effluent Discharge survey site (Appendix A) was situated in a shallow, sandy area. Under-ice water depths and ice thickness ranged from 0.01 m to 0.65 m and from 0.35 m to 0.55 m, respectively, across the five sampled stations (Table 2). The water temperature at the ice-water interface was generally similar across the five stations, averaging 0.5°C. Dissolved oxygen and conductivity levels at the ice-water interface were variable among the five stations and ranged from 6.8 mg/L to 12.8 mg/L and 52.1 µS/cm to 192.3 µS/cm, respectively. One DO measurement (6.8 mg/L) was below the CCME water quality guideline of 9.5 mg/L for the protection of aquatic life for early life stages but was above the guideline of 6.5 mg/L for other life stages (CCME 1999). The relatively lower DO levels recorded at this site were likely attributable to the shallower under-ice water depths at this site relative to other sites in Patterson Lake. The pH across all the stations ranged from slightly acidic to neutral. A depth profile was not taken at the Treated Effluent Discharge site due to the limited under-ice water depth. Overall, the results of the survey indicated that the area of Patterson Lake in the vicinity of the treated effluent discharge location would provide suitable overwintering habitat for large-bodied fish and forage fish at locations where under-ice water depths are adequate.

5.1.3 Freshwater Intake for Mine/Mill

Under-ice water depths at the Freshwater Intake for Mine/Mill site (Appendix A) ranged from 1.75 m to 3.60 m across the five sampled stations (Table 2). Ice thickness was similar across the five stations, averaging 0.68 m. The water temperatures at the ice-water interface averaged 1.0°C. Surface DO concentrations were high and ranged from 12.7 mg/L to 14.7 mg/L; all measurements were above both CCME guideline values. The pH of the water at the ice-water interface was slightly basic, and surface conductivity levels were similar among stations, averaging 45.3 µS/cm. At the profile station, water temperature varied slightly throughout the water column, with cooler temperatures measured near the surface (0.6°C) compared to the bottom (1.7°C). Dissolved oxygen and conductivity levels were highest (14.7 mg/L and 47.6 µS/cm, respectively) at the surface and lowest (12.7 mg/L and 41.4 µS/cm, respectively) near the bottom. Overall, the surveyed area of Patterson Lake in the vicinity of the proposed freshwater intake for the mine and mill would provide suitable overwintering habitat for large-bodied fish and forage fish.

Table 2: In Situ Waterbody Water Quality Measurements at Patterson Lake, 2019

Date	Site	Station	Frozen to Bottom (Y/N)	Point or Profile	UTM NAD83 Zone 12V		Effective Water Depth[a] (m)	Sample Depth (m)	Water Temp (°C)	DO (mg/L)	DO (%)	pH	Conductivity (µS/cm)	Ice Thickness (m)	Snow Depth (m)
					Easting	Northing									
25 March 2019	Camp Freshwater Intake	13	N	Point	604528	6394290	0.20	0.8	0.6	13.2	97.2	6.6	60.7	0.70	0
		14	N	Point	604530	6394308	0.40	0.9	0.4	13.7	100.6	6.5	53.9	0.70	0
		15	N	Point	604529	6394328	0.50	1.1	0.6	13.7	100.3	6.6	55.8	0.80	0.21
		16	N	Point	604529	6394342	0.80	1.1	1.3	14.4	107.0	7.0	39.1	0.70	0.12
		17	N	Profile	604527	6394359	0.75	1.0	0.6	13.7	101.2	7.0	38.7	0.75	0.18
		17	N		604527	6394359	0.75	1.3	1.1	13.9	103.9	6.9	41.6	0.75	0.18
26 March 2019	Treated Effluent Discharge[b]	19	Y	Point	603649	6394120	0.01	0.3	1.2	12.4	93.4	[c]	133.2	0.40	0.20
		20	Y	Point	603632	6394144	0.02	0.2	0.6	12.8	95.2	7.7	192.3	0.35	0.18
		21	N	Point	603617	6394168	0.01	0.3	0.1	6.8	48.7	6.7	70.0	0.49	0.20
		22	N	Point	603600	6394193	0.05	0.4	0.3	9.7	71.3	6.7	70.1	0.49	0.03
		23	N	Point	603584	6394217	0.65	0.5	0.1	10.9	79.7	6.6	52.1	0.55	0.15
26 March 2019	Freshwater Intake at Mine/Mill	Camp Intake	N	Point	603254	6391271	1.75	1.2	1.1	14.7	110.8	7.3	47.6	0.65	0
		25	N	Point	603263	6391242	2.75	1.7	1.2	13.8	104.0	7.3	44.7	0.65	0.01
		26	N	Point	603273	6391220	3.00	1.9	1.1	13.8	104.1	7.3	44.2	0.70	0.08
		27	N	Point	603281	6391196	3.30	2.0	1.2	13.7	103.1	7.3	43.7	0.70	0.03
		28	N	Profile	603292	6391169	3.60	1.0	0.6	14.2	105.1	7.5	46.3	0.70	0.01
		28	N		603292	6391169	3.60	1.5	0.9	14.1	105.7	7.3	44.6	0.70	0.01
		28	N		603292	6391169	3.60	2.0	1.2	13.8	103.7	7.3	43.9	0.70	0.01
		28	N		603292	6391169	3.60	2.5	1.4	13.3	100.8	7.2	42.6	0.70	0.01
		28	N		603292	6391169	3.60	3.0	1.6	13.0	98.8	7.2	42.0	0.70	0.01
		28	N		603292	6391169	3.60	3.5	1.7	12.7	97.2	7.2	41.4	0.70	0.01

Note: Point measurements were taken at a single depth. Profile measurements are taken from a series of depths at the same location.
a) Effective water depth is the depth of water below the bottom of the ice. Also referred to as “under-ice water depth.”
b) Auger hit substrate while drilling; water quality measurements may be compromised due to substrate disruption.
c) The pH value recorded at this station was 4.4. This value was deemed likely to be an error.
Y = Yes; N = No, UTM = Universal Transverse Mercator; NAD = North American Datum; DO = dissolved oxygen; µS/cm = microsiemens per centimetre.

5.2 Watercourses

Descriptions of overwintering fish habitat conditions at the surveyed sites on the Clearwater River mainstem and tributaries are provided below. In general, these watercourses tend not to have ice-coverage during the entire winter and may be open most of the winter, particularly in faster-flowing sections (Annex IV.2). Open-water conditions are maintained by groundwater inflow to the Clearwater River, which provides a source of warmer water through the winter months. The exception is the very small watercourses that do not support sufficient flow through the winter to maintain open channels and freeze to the bottom (e.g., Tributary Inflow to Patterson Lake from Lake G). Further information on winter ice formation and hydraulic conditions for the surveyed watercourse sites is provided in Golder (2021).

5.2.1 Clearwater River above Patterson Lake

The surveyed section of the Clearwater River above Patterson Lake (Appendix A) had a wetted width ranging from 12 m to 15 m. The area surveyed was predominantly ice-free and the water depth was 0.65 m at all five sampled stations (Table 3). The river bottom substrate was mainly composed of sand interspersed with areas of silt and organic material. Overhanging vegetation and ice ledges were the primary sources of overhead cover for fish. Water temperature averaged 1.4°C. Dissolved oxygen levels were high at all stations, averaging 11.3 mg/L; all measurements were within guideline values. The pH and conductivity of the water were similar across the five stations, averaging 6.3 and 33.9 µS/cm, respectively. The stream discharge was 0.60 m^3/s. The site was considered to provide good quality overwintering habitat for all life stages and species of fish because of the high DO concentrations, the abundant overhead cover, and the ice-free, flowing water conditions.

5.2.2 Clearwater River below Patterson Lake

The surveyed section of the Clearwater River below Patterson Lake (Appendix A) had a wetted width of 10 m. The site was predominantly ice-free and relatively shallow with water depths ranging from 0.40 m to 1.00 m (Table 3). The substrate was dominated by sand, silt, and organic material, with limited sections of boulder at the upstream and downstream ends of the surveyed section, which provided a source of instream cover for fish. Other sources of cover for fish included submergent vegetation, large and small woody debris, overhanging vegetation, and ice ledges. Water temperature averaged 1.0°C. Dissolved oxygen concentrations were high at all stations, averaging 13.6 mg/L (Table 3); all measurements were within guideline values. The pH and conductivity of the water averaged 7.3 and 44.4 µS/cm, respectively. The stream discharge was 0.98 m^3/s. The site was considered to provide good quality overwintering habitat for all life stages and species of fish because of the high DO concentrations and presence of ice-free, flowing water conditions.

5.2.3 Clearwater River above Beet Lake

The surveyed section of the Clearwater River above Beet Lake (Appendix A) was characterized by a slow-moving, ice-covered channel within a wetland area, with an approximate wetted width of 220 m. The river bottom substrate was dominated by silt and sand. Ice thickness was 0.5 m at all stations, and under-ice water depths ranged from 1.1 m to 1.3 m (Table 3). Water temperature averaged 1.4°C. Dissolved oxygen concentrations were high and ranged from 11.5 mg/L to 13.3 mg/L; all measurements were within guideline values. pH and conductivity were similar among stations, averaging 7.1 and 47.9 µS/cm, respectively. A discharge could not be measured at this location because water depth and wetted width at the station were too deep and wide to measure discharge safely and effectively. The site was considered to provide good quality overwintering habitat for all life stages and species of fish as there was sufficient under-ice water depth and DO concentrations were high at all stations.

5.2.4 Clearwater River below Beet Lake

The surveyed section of the Clearwater River below Beet Lake (Appendix A) had a wetted width of 25 m. The site was predominantly ice-free, and water depths ranged from 0.7 m to 1.3 m across the five stations (Table 3). The river bottom substrate was dominated by sand and organics. The maximum water depth of 1.3 m occurred in a pool located at the side of the channel. The water temperature was 0.5°C at each of the five sampled stations. Dissolved oxygen concentrations were high and ranged from 11.6 mg/L to 12.2 mg/L; all measurements were within guideline values. pH and conductivity values were similar among the stations, averaging 7.1 and 48.5 µS/cm respectively. The stream discharge was 2.14 m^3/s. Frequent water depths greater than 1 m and high DO concentrations at this site indicate the presence of good quality overwintering habitat for all life stages and species of fish within the surveyed section.

Table 3: In Situ Water Quality and Discharge Measurements at Watercourse Stations, 2019

Date	Site	Station	Frozen to Bottom (Y/N)	UTM NAD83 12V		Effective Water Depth[a] (m)	Sample Depth (m)	Water Temp (°C)	DO (mg/L)	DO (%)	pH	Conductivity (µS/cm)	Ice Thickness (m)	Snow Depth (m)	Discharge (m^3/s)
				Easting	Northing										
25 March 2019	Clearwater River above Patterson Lake	7	N	607828	6396398	0.65	0.25	1.4	11.2	84.6	6.3	33.9	0	0	0.60
		8	N	607866	6396386	0.65	0.38	1.3	11.2	83.8	6.4	34.3	0	0	-
		9	N	607847	6396394	0.65	0.17	1.4	11.5	86.5	6.3	33.9	0	0	-
		10	N	607809	6396394	0.65	0.32	1.5	11.3	84.8	6.3	33.8	0	0	-
		11	N	607796	6396386	0.65	0.43	1.6	11.3	85.3	6.4	33.7	0	0	-
26 March 2019	Clearwater River below Patterson Lake	32	N	605116	6390539	0.60	0.30	1.0	13.6	101.8	7.3	44.5	0	0	-
		31	N	605142	6390538	0.40	0.30	0.9	13.5	101.1	7.3	44.4	0	0	-
		CWR1	N	605167	6390536	0.50	0.30	0.9	13.6	101.4	7.3	44.4	0	0	0.98
		29	N	605186	6390551	1.00	0.30	1.1	13.7	102.7	7.3	44.2	0	0	-
		30	N	605203	6390570	0.60	0.30	1.1	13.7	103.1	7.4	44.8	0	0	-
27 March 2019	Clearwater River above Beet Lake	53	N	608182	6390711	1.10	0.80	1.8	11.5	87.1	7.1	47.7	0.5	0	[b]
		54	N	608160	6390698	1.10	0.80	1.5	13.2	99.2	7.1	47.9	0.5	0	
		CWR4	N	608141	6390688	1.10	0.80	1.5	13.3	100.2	7.1	47.8	0.5	0	
		55	N	608115	6390676	1.30	0.80	1.2	13.1	98.4	7.2	47.9	0.5	0	
		56	N	608094	6390664	1.30	0.80	1.2	13.2	99.1	7.2	48.3	0.5	0	
27 March 2019	Clearwater River below Beet Lake	48	N	613296	6390648	0.70	0.30	0.5	11.6	84.8	7.2	47.9	0	0	-
		49	N	613302	6390673	0.95	0.30	0.5	11.8	86.3	7.1	48.0	0	0	-
		50	N	613305	6390698	1.30	0.30	0.5	11.7	85.8	7.1	48.4	0	0	2.14
		51	N	613296	6390723	1.15	0.30	0.5	11.9	87.0	7.0	48.5	0	0	-
		52	N	613279	6390741	0.80	0.30	0.5	12.2	89.5	7.0	49.5	0	0	-
27 March 2019	Downstream of Naomi Lake	38	N	615128	6390832	0.50	0.30	0.8	7.4	54.3	6.3	36.6	0	0	[c]
		39	N	615152	6390840	0.50	0.30	0.7	7.8	57.5	6.3	32.2	0	0	
		40	N	615178	6390844	0.50	0.30	0.7	7.9	57.6	6.3	31.5	0	0	
		41	N	615204	6390830	0.55	0.30	0.7	7.9	58.3	6.3	31.2	0	0	
		42	N	615227	6390819	0.55	0.30	0.7	8.3	60.9	6.3	31.7	0	0	
25 March 2019	Tributary Inflow to Patterson Lake from Lake G	12	Y	607275	6394155	0	0.78	0.2	1.6	11.2	6.4	63.9	0.8	0	[d]

Table 3: In Situ Water Quality and Discharge Measurements at Watercourse Stations, 2019

Date	Site	Station	Frozen to Bottom (Y/N)	UTM NAD83 12V		Effective Water Depth[(a)] (m)	Sample Depth (m)	Water Temp (°C)	DO (mg/L)	DO (%)	pH	Conductivity (µS/cm)	Ice Thickness (m)	Snow Depth (m)	Discharge (m^3/s)
				Easting	Northing										
27 March 2019	Tributary Inflow to Naomi Lake	47	N	613699	6392732	0.70	0.70	0.1	9.4	67.6	6.2	24.6	0.4	0	-
		46	N	613720	6392719	0.50	0.70	0.1	8.0	64.1	6.2	23.1	0.4	0	-
		45	N	613745	6392715	0.50	0.80	0.1	8.9	64.0	6.2	16.2	0.5	0	-
		44	N	613753	6392691	0.60	0.80	0.1	8.8	63.0	6.2	21.9	0.5	0	-
		43	N	613763	6392668	0.60	0.80	0.1	9.1	65.4	6.2	16.6	0.5	0	0.56

a) Effective water depth is the depth of water below the bottom of the ice. It is also referred to as “under-ice water depth.”
b) Water depth and wetted width at the station were too deep and wide to measure discharge safely and effectively.
c) Discharge measurement not taken due to safety concerns related to inadequate ice thickness.
d) The watercourse was frozen to bottom, except at one station with over-ice flow. Water quality measurements and a spot velocity measurement (0.01 m/s) were taken from over-ice water flow.
Y = Yes; N = No, UTM = Universal Transverse Mercator; NAD = North American Datum; DO = dissolved oxygen; µS/cm = microsiemens per centimetre; m^3/s = cubic metres per second; “-” = not collected or not applicable.

5.2.5 Downstream of Naomi Lake

The surveyed section of the Clearwater River downstream of Naomi Lake (Appendix A, Photo 8) was ice-free at the time of the survey and had a wetted width of approximately 40 m. The river bottom substrate was dominated by organics and silt. Water depths were similar across the five sampled stations, averaging 0.52 m (Table 3). The average water temperature was 0.7°C, and DO concentrations ranged from 7.4 mg/L to 8.3 mg/L. All DO measurements were below the CCME guideline for the protection of early life stages of fish but remained above the guideline for other life stages. The lower DO concentrations measured at the outlet of Naomi Lake may have been influenced by lower overall DO concentrations in the lake body during ice cover, combined with the shallow depth of the lake (8.35 m). Lower flow conditions at the lake outlet, compared to at other Clearwater River sampling locations, may also have influenced the DO concentrations. The pH and conductivity of the water was similar among stations, averaging 6.3 and 32.6 µS/cm, respectively. Overall, the overwintering habitat potential was good for species and life stages of fish that are tolerant of the DO concentrations encountered at this site. The suitability of the habitat was lower, overall, for more sensitive species or life stages that require higher DO concentrations.

5.2.6 Tributary Inflow to Patterson Lake from Lake G

The surveyed section of the Clearwater River to Patterson Lake from Lake G (Appendix A) was characterized by a braided channel flowing through an open bog. The channel was frozen to the bottom throughout the surveyed section; however, there was some over-ice flow present (Appendix A), which allowed water quality measurements to be collected at a single station. The ice thickness at this station measured 0.8 m and the stream bottom substrate consisted of organic matter. There was no snow present on the ice surface at the time of the survey. Water temperature was 0.2°C. The DO measured in the over-ice flow was low (1.6 mg/L; Table 3) and below the CCME guideline for the protection of aquatic life for both early life stages and other life stages. The pH and conductivity of the water were 6.4 and 63.9 µS/cm, respectively. A discharge measurement was not possible due to frozen to bottom conditions encountered at the site; however, a spot velocity measurement of 0.01 m/s was recorded for the over-ice flow. Overall, the overwintering habitat potential of the site was nil, as the watercourse was frozen to bottom.

5.2.7 Tributary Inflow to Naomi Lake

The surveyed section of the Clearwater River Tributary Inflow to Naomi Lake (Appendix A) was characterized by a well-defined, sinuous channel with a wetted width of 7 m. The bottom substrate was dominated by fines. The average ice thickness measured 0.5 m and under-ice water depths ranged from 0.5 m to 0.7 m across the five stations. There was no snow present on the ice surface at the time of the survey. The water temperature was 0.1°C at each station. Dissolved oxygen concentrations averaged 8.8 mg/L. All DO measurements were below the CCME guideline of 9.5 mg/L for the protection of aquatic life for early life stages but remained above the guideline of 6.5 mg/L for other life stages. The average pH was 6.2. The conductivity of the water varied slightly among the five sampled stations, ranging from 16.2 µS/cm to 24.6 µS/cm. The under-ice stream discharge recorded for the site was 0.56 m^3/s. The site was considered to provide suitable habitat for forage species and non-early life stages of fish, which are tolerant of the DO conditions encountered at the site. The overwintering habitat potential for species and life stages of fish that require higher DO levels was lower overall.

6.0 SUMMARY

Overwintering habitat is often one of the most critical habitat types for fish, particularly in northern regions, which may experience extended periods of ice cover and limited flow. The availability of adequate winter habitat is often an important factor affecting the distribution and abundance of fish in an environment; potential changes to this habitat can create adverse affects on fish populations. During community engagement meetings for the Rook I Project (Project), Indigenous community members expressed concerns about the potential for effects on fish and fish habitat, and corresponding changes to cultural practices, and subsistence and commercial fishing (TSD II: BNDN; TSD III: BRDN; TSD IV: MN-S; TSD V.1: CRDN; TSD VI: YNLRO; Appendix A). Results of the overwintering fish habitat field program provide a baseline for winter habitat conditions within watercourses potentially affected by the Project, and in Patterson Lake in the vicinity of the expected locations for the treated effluent discharge and potential freshwater intakes.

Overall, the results of the winter habitat surveys completed at the proposed locations of the freshwater intakes and treated effluent discharge in Patterson Lake indicate that these areas would provide suitable overwintering habitat for both large-bodied and forage fish populations. This finding is based primarily on high dissolved oxygen (DO) concentrations measured at the surveyed stations and adequate under-ice water depths.

The surveyed sections of the Clearwater River mainstem were predominantly ice-free and open at the time of the field program, with exception of the section above Beet Lake, which was slower moving compared with other mainstem sites and had approximately 0.5 m of ice-coverage. All of the mainstem sites were flowing and typically had water depths in the range of 0.5 m to 1 m. Water quality sampling indicated that DO concentrations were high at all the sampled stations, with the exception of the site downstream of Naomi Lake, where DO values were slightly lower. In general, the mainstem sites were considered to provide suitable overwintering habitat for both large-bodied and forage fish populations. The overwintering habitat potential at the site downstream of Naomi Lake was lower overall, for species and life stages that require higher DO concentrations (i.e., greater than 9.5 mg/L).

Both of the Clearwater River tributary sites were ice covered at the time of the field program. The tributary inflow to Patterson Lake from Lake G was frozen to the bottom throughout the surveyed section, and thus, the overwintering habitat potential of the site was nil. The tributary flowing into Naomi Lake had sufficient under-ice water depths and adequate DO concentrations to support overwintering fish populations; however, the quality of the habitat was lower for more sensitive species or life stages that require higher DO concentrations.

The baseline overwintering habitat data obtained as a result of this survey provide information regarding the natural variability in winter habitat conditions in the aquatic study area (ASA). The overwintering fish habitat field program results provide context for the effects assessments completed for fish and fish habitat and land and resource use, and for future operational environmental effects monitoring for the Project.

CLOSING

Golder is pleased to submit this report to NexGen in support of the environmental assessment for the Rook I Project. For details on the limitations and use of information presented in this report, please refer to the Study Limitations section following this page. If you have any questions or require additional details related to this study, please contact the undersigned.

Golder Associates Ltd.

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STUDY LIMITATIONS

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The passage of time affects the information and assessment provided in this report. Golder's opinions are based upon information that existed at the time of the production of the report. The Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the

suggestions, recommendations and opinions expressed in this report, reference must be to the foregoing and to the entirety of the report. Golder cannot be responsible for use of portions of the report without reference to the entire report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client and were prepared for the specific purpose set out herein. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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APPENDIX A

Photos

Photo 1: View looking away from shore at the Camp Freshwater Intake site.

Photo 2: View away from shore at the at the Treated Effluent Discharge site, from Station 19.

Photo 3: View looking towards shore at the Freshwater Intake at Mine/Mill site.

Photo 4: View looking upstream at the Clearwater River below Patterson Lake site, from Station CWR1.

Photo 5: View looking downstream at the Clearwater River above Patterson Lake site, from Station 7.

Photo 6: View looking upstream at the Clearwater River below Beet Lake site, from Station 50.

Photo 7: View upstream at Clearwater River above Beet Lake site, station CWR4.

Photo 8: View looking downstream at the Downstream of Naomi Lake site, from Station 39.

Photo 9: View looking upstream at the Tributary Inflow to Naomi Lake site, from Station 43.

Photo 10: View looking downstream at the Tributary Inflow to Patterson Lake from Lake G site, from Station 12.