3AM-IQA1626 Application for Amendment – Supporting Submission

August 4, 2018_Rev1

ISSUED FOR USE

NUNAMI
STANTEC LIMITED

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1 INTRODUCTION

1.1 Purpose of this Document

The purpose of this document is to supplement the emergency Application to Amend Type A Water Licence 3AM-IQA1626 for the City of Iqaluit. This document should be read in conjunction with and constitutes part of, that application.

2 DETAILS OF AMENDMENT APPLICATION

2.1 Purpose of Amendment – Emergency Direction

On July 27, 2018, the Government of Nunavut Department of Health (DOH) Chief Medical Officer declared that the City's inability to provide adequate domestic drinking water to the community over the coming winter season 2018/19 is viewed by the DOH as a health emergency. The DOH directed the City to immediately intervene to ensure the City has sufficient water quantity for the season. This amendment to supplement the Lake Geraldine Reservoir is being sought on an emergency basis in response to this direction (the "Supplementary Pumping Program")

2.2 Background

The City of Iqaluit (the "City") relies upon the Lake Geraldine Reservoir to impound the volume of source water necessary to satisfy the drinking water demands of the City. The City has observed through monitoring that the level of source water as of early July 2018 was well below normal levels as of that date. As recharge to the reservoir occurs only during open water months, the City became concerned that sufficient water may not be present in the Lake Geraldine Reservoir by the end of the open water season to meet the City's drinking water demands for the 2018-2019 winter period.

The City immediately retained Golder Associates (Golder) to assess the current situation and to determine what level of rainfall would be required to replenish this reservoir in the remainder of the unfrozen season of 2018 under various water taking demand conditions. They also assessed what level the reservoir would attain under those same water taking conditions. The City received a report from Golder titled "Supplementary Lake Geraldine Water Balance Modelling" dated 25 July 2018 indicating that under certain climatic and demand conditions, sufficient source water would not be retained by the Reservoir to satisfy the City's winter water demands. Given the public health and safety importance of drinking water to the community, the City established a Task Force to identify and implement a number of initiatives all intended to provide sufficient water for the City to meet its winter water taking requirements.

The Task Force has identified four (4) primary means to address the potential drinking water shortfall:

1) Loss Control: identify and repair breaks and bleeds in the existing utilidor (fresh water distribution) system;
2) Conservation: develop and communicate to residents and businesses actions that can be taken to reduce drinking water consumption;
3) Supplementary Supply; includes:
    a. conserving water within the water treatment plant
    b. evaluating desalinization of seawater as a source option
    c. pumping from the Apex River watershed and available water bodies
4) Demand Management; includes:
    a. Assessing planned and approved increases to water demand as a result of Development approvals,
    b. Determine timing of these increased demands,
    c. Consider the City's ability to reduce, defer or delay these increased demands.

The above options, apart from pumping from the Apex River, are currently being implemented by the City, though none by themselves will address the shortfall. To begin supplementary pumping, the City requires approval from the Nunavut Water Board and Fisheries and Oceans Canada.

2.3 Scope of Amendment

The City is applying to:

- Withdraw up to 500,000 m^3 of water from the Apex River watershed and unnamed waterbodies
- Temporarily alter the flow of water in the Apex River watershed

2.4 Description of Works and Activities

The City proposes to withdraw and divert supplemental water from the Apex River watershed into Lake Geraldine Reservoir (reservoir) in two phases, beginning August 9 2018, and ending October 30, 2018 (Figure 2-1). The Supplementary Pumping Program may need to be conducted again in 2019 until a permanent, long-term solution is implemented.

Phase I, 2018:

Install two pumps on the south shore of the Apex River at a location approximately 1.3 km upstream of the bridge on the Road to Nowhere (the "upper Apex location"). These submersible drainage pumps (Figure 2-2) will be powered by a diesel operated power generator (Figure 2-3) with integrated fuel storage and containment system. Flexible hose (Figure 2-4) will be

connected to the pumps with a manifold. Hoses will be routed overland southwards to the reservoir.

Water withdrawal from the upper Apex location is proposed at up to 95 litres per second (8,200 m^3/day) as flow conditions allow. Withdrawal will be ramped up or down as required to address potential impacts to fish and fish habitat, as based on monitoring. Flow and water levels will be monitored daily at the Bridge to Nowhere and observations of isolated ponds and wetted perimeter will be monitored as required by DFO.

To mitigate for fish entrainment, DFO's Freshwater Intake End-of-Pipe Fish Screen Guideline (1995) will be applied. To mitigate against excessive sediment entrainment, a free-standing or water-filled, temporary modular coffer dam may be installed to train water towards the pump location. This coffer will not impede overall flow and will not impact the bed of the watercourse.

Phase 2, 2018:

Once flow levels in the upper Apex River decrease below allowable levels for withdrawal as specified by DFO, pumping equipment will be relocated to an Unnamed Lake approximately 1.6 km northeast of the end of the Road to Nowhere. This lake is part of the Apex River watershed and seasonally discharges to an intermittent stream that joins the Apex River approximately 100 m east of the bridge on the Road to Nowhere. This lake has a surface area of over 1 Mm^2 and documented to be greater than 18 m deep in places, and therefore expected to be adequate as a source for the remainder of the required water withdrawal.

Pumps and hose will be set up to lift water from the Unnamed Lake over the topographic barrier that prevents year-round discharge. Water may be directed by hose, or via free flow, down the remainder of the watercourse. Water will be intercepted upstream of the bridge on the Road to Nowhere using modular coffer dam or in a natural depression and redirected to the reservoir from there using additional pumps and hose.

Additional Sources:

Small waterbodies immediately north of the reservoir may be used as supplemental water sources if depth conditions indicate that they are unlikely to support overwintering fish.

Pumping and hose configuration may be modified if the supplementary pumping is needed to be conducted during the open water period of 2019.

2.5 Timing of Activities

Flows in the Apex River, as measured by Water Survey Canada, are highest in the spring and decline throughout the summer and fall. There are no flows during winter. The supplementary pumping of water must be completed during the open water period before flows cease and before hoses would otherwise freeze. Therefore, pumping from the Upper Apex River location in 2018 is proposed to begin August 9th, and will be complete by October 30th as conditions allow.

If required in 2019, the supplementary pumping activities would be conducted between August 1st and October 30th. A 2019 Pumping Plan will be submitted for approval by the regulator(s). This plan will take into account learnings from the 2018 pumping activities.

3 ALTERNATIVES

The initial withdrawal from the Upper Apex location is required to be implemented initially because it can be implemented with existing equipment available in Iqaluit. The option to commence withdrawal from the Unnamed Lake location requires additional hoses and pumping equipment that is not currently available.

In addition to investigating an option to supplement 2018/19 winter supply with desalinized seawater, the City is investigating a long-term solution to address the deficit of water in Lake Geraldine Reservoir.

The City recognizes that a permanent solution for supplemental pumping is required, and has been making continuous progress to implement this solution. Work completed in 2017, identified that as a result of presence of overwintering fish within the Apex River, that the Apex River could not meet the City's long term needs for supplementary water, while meeting DFO water withdrawal guidelines. The City immediately shifted their assessment to the Sylvia Grinnell River and determined that sufficient flows exist in this river to meet the City's needs for supplemental pumping while complying with DFO guidelines. With this assessment, the City in 2017 has continued with field studies to be carried out in the Sylvia Grinnell River to identify potential withdrawal locations. This work identified two potential long term withdrawal points. A more detailed assessment of two preferred withdrawal locations to select a preferred point is ongoing. Once this site has been identified, the City will commence preliminary engineering of a permanent pumping station and piping systems.

The City expects that, including an allowance for permitting, the commissioning of the long term supplemental pumping solution may be 2-3 years in the future. The City has committed to determining if the commissioning of the permanent solution can be expedited.

In addition to investigating an option to supplement 2018/19 winter supply with desalinized seawater, the City is investigating a long-term solution to address the deficit of water in Lake Geraldine Reservoir.

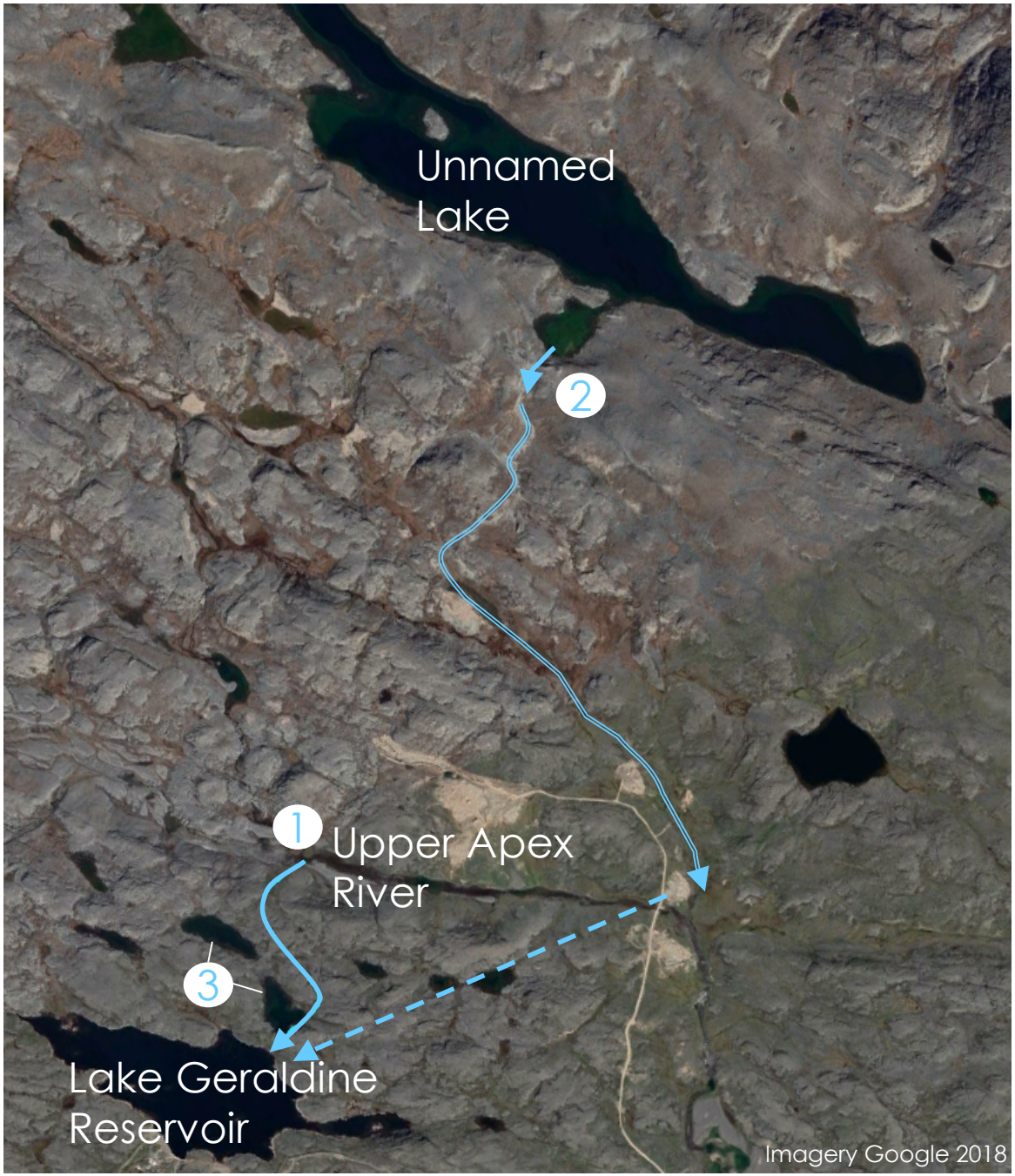
The City recognizes that even with these efforts, it may not be possible to restore the Lake Geraldine Reservoir to full elevation by the end of the open water season. There also remains uncertainty regarding the winter precipitation that will be necessary for replenishment after the spring freshet. For this reason, the City seeks in this application approval for a second year of supplementary pumping, with the need for, and execution plan to be determined in the late spring of 2019 in consultation with the NWB and regulatory agencies.

4 ENVIRONMENTAL IMPACTS

The Supplementary Pumping Program has the potential to impact fish in the Apex River. To prevent entrainment of fish, fish screens will be used. The City aims to minimize direct impacts to fish by adjusting flow rates based on monitoring of fish habitat conditions in the river. Additional information is pending.

5 MONITORING

Information pending



Diversion (pumping)

Free Flow

Diversion (unknown route)

(2) Water Source

1 km

Figure 2-2: Submersible Pump

Submersible Drainage Pump J 405

SULZER

Specification

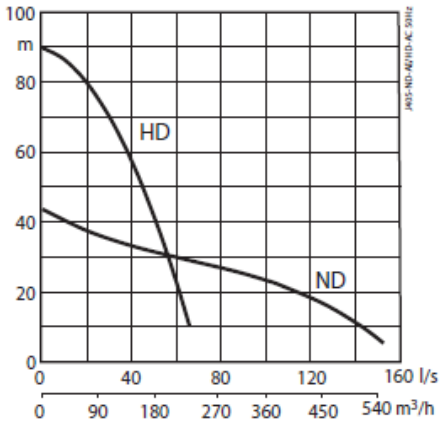
Electric submersible pump.
Maximum submergence: 20 m. Protection class IP 68.
Max temperature of pumped medium at max power input and continuous duty 40 °C.
Max medium density 1100 kg/m³. pH of the pumped medium 5-8.
Strainer hole: 8 x 34 mm. Max number of starts 30/hour.

J 405 ND Medium head, 3-phase
J 405 HD High head, 3-phase

Electric Motor

3-phase squirrel-cage induction motor, 50 Hz.
Service factor 1.1. Class F insulation.
Motor rating P_2: 35.0 kW. Speed: 2930 rpm.

Voltage, V	230	400	500-550	690	1000
Nominal current, A	108	62	51	36	25



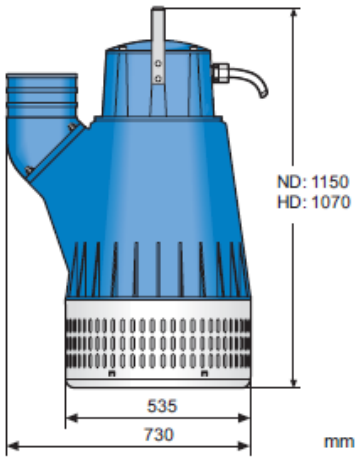


Figure 2-3: Generator

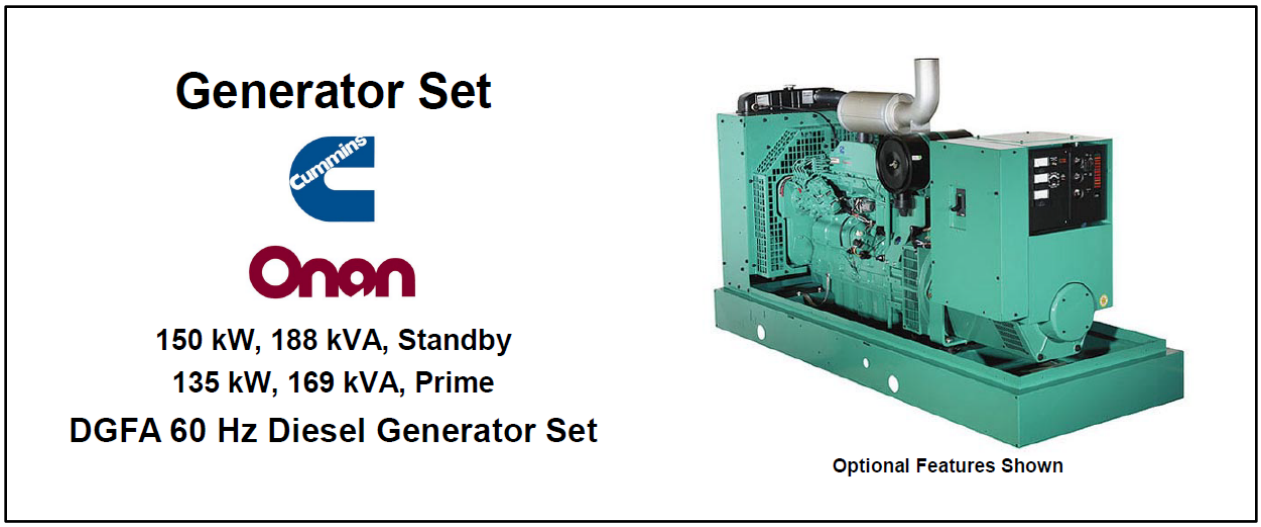


Figure 2-4: Flexible Hose