3AM-IQA1626 Application for Amendment – Supporting Submission

Rev. 1 February 1, 2019

ISSUED FOR USE

NUNAMI
STANTEC LIMITED

Table of Contents

1 INTRODUCTION

1.1 Purpose of this Document

The purpose of this document is to supplement the 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

The City of Iqaluit (the “City”) obtains its potable water from Lake Geraldine. Lake Geraldine is an engineered reservoir designed to contain the volume of water necessary to satisfy the drinking water needs of the City (Figure 2-1). The reservoir is refilled annually during spring and summer by natural inflows from snowmelt and precipitation. In years when natural inflows or precipitation are low and the reservoir does not fill to full capacity, or, when seasonal demand has been high, there is a potential for a shortage of drinking water available to the City.

In 2018, following a spring with low recharge to the reservoir, the City applied for, and received, an amendment to its water licence on an emergency basis, to allow water to be withdrawn from the Niaqunguk (Apex) River to supplement the reservoir prior to freeze up in 2018. The “Supplementary Pumping Program” was completed in October 2018. The City is seeking approval to pump water from the Apex River to the Lake Geraldine Reservoir in future years, as needed, until a permanent solution to address the City’s water deficit is implemented.

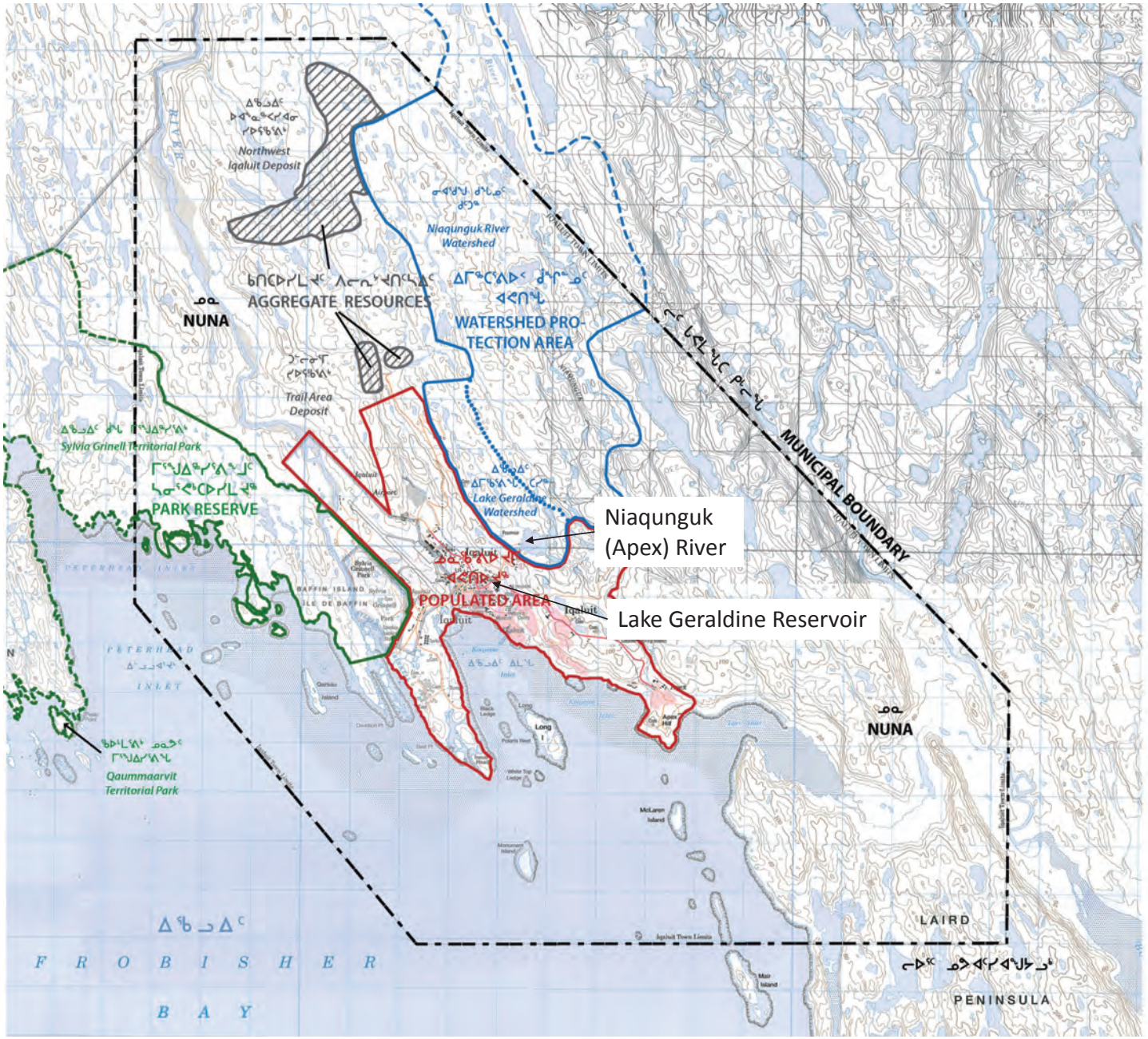


FIGURE A
GENERAL LAND USE
GENERAL PLAN
General Plan By-law No.703

Figure 2-1: Location Overview

Iqaluit

OFFICE CONSOLIDATION
OCTOBER 2015

2.2 Background

Lake Geraldine is estimated to contain approximately 1.8 million cubic metres of water at full capacity, with approximately 1.1 million cubic metres of this water available during winter months (November to June) (Nunami Stantec 2018). The remainder is unavailable during the winter months due to a portion being locked up as ice, and year-round due to the location of the water intake at depth. The City's water demands have been growing, and currently, approximately 73 to 78% of the available water in winter in Lake Geraldine is withdrawn to meet potable water demands (Figure 2-2). As recharge to the reservoir occurs only during open water months (July to October), the City's ability to supply water throughout the winter based on current demand, is based on having the full 1.1 million cubic metres of water in the Lake Geraldine Reservoir by the time of freeze-up.

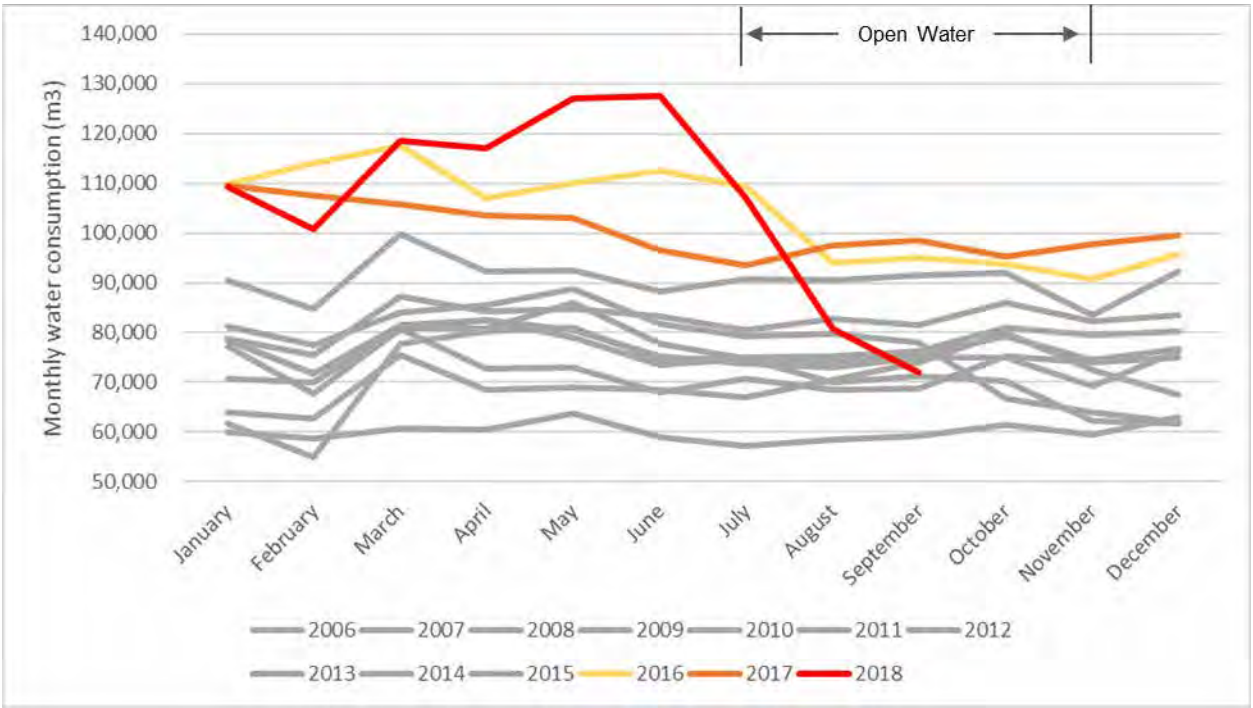


Figure 2-2: Iqaluit monthly water consumption 2006-2018

Since 2014, the City has been investigating long-term solutions to address potential drinking water shortage. These do not include other potential short-term solutions such as desalinization of sea water. Options being looked at include those that address supply, storage and demand:

1) Loss Control: identify and repair breaks and bleeds in the existing utilidor (fresh water distribution) system;
2) Conservation:

- actions that can be taken by residents and businesses to reduce drinking water consumption;
- conserving water within the water treatment plant

3) Alternate Water Sources:
   - Sylvia Grinnell River and Unnamed Lake
4) Demand Management:
   - Assessing planned and approved increases to water demand because of Development approvals
5) Water Storage
   - Capacity of Lake Geraldine Reservoir and accessibility of available water

None of these actions on their own will address the constraint of drinking water availability. The City continues to update residents on the progress of these studies. Regarding alternate water supply, the City expects to have feasibility-level studies complete in 2019, with final solutions designed in 2020. Temporary, alternate water supply from the Apex River may be required, as needed, until a final solution is commissioned in 2020 or later.

2.3 Scope of Amendment

The City is applying to:

- Withdraw up to 500,000 m^3 of water annually from the Apex River
- To increase the amount allowed to be withdrawn from Lake Geraldine, to 2,000,000 m^3

2.4 Description of Undertaking

2.4.1 Location of Undertaking

The City proposes to withdraw water annually from the Apex River, and to pump this water overland to the Lake Geraldine reservoir during open-water conditions, as needed until a permanent, long-term solution is implemented. Figure 2-3 shows the site plan for the proposed location of pumps within the Apex River and overland conveyance installation.

Up to three 35 kW submersible pumps equipped with fish screens will be placed within the Apex River at a location approximately 1.3 km upstream of the bridge on the Road to Nowhere. These submersible pumps will be powered by a diesel operated power generator with integrated fuel storage and containment system to be installed on shore. Flexible hoses or pipe will be connected to each of the pumps with a manifold and will be routed overland southwards to the reservoir.

The pump location is the same as the 2018 Supplementary Pumping Program. The pump location was selected based on the presence of deeper water at this location and on ease of access from the quarry at the end of the Road to Nowhere. The overland route from the pump

location to Lake Geraldine is has been re-routed along a portion of the route to optimize pumping efficiency.

Pumps and hose will be installed in association with the pumping program each year. Pumping equipment will be removed at the completion of the year's activities.

2.4.2 Withdrawal Rate

Water withdrawal from Apex River is proposed at up to 150 litres per second (L/s) (0.15 m^3/s) or 11,000 m^3/day over a 20 hour period, as flow conditions allow. Withdrawal may be ramped up or down so as to preferably not exceed 10% of the instantaneous flow of the Apex River when natural flow is above 30% of the mean annual discharge (MAD). Withdrawal within these parameters is accepted by DFO to have a low probability of impacts to fisheries (DFO 2013). Flows at the withdrawal site will be measured at a new hydrometric station to be installed upstream of the pump location, or can alternatively be calculated based on measured flows at Water Survey of Canada (WSC) Apex River at Apex hydrometric station (10UH002). MAD at the withdrawal location in 2017 was 0.717 m^3s and 30% of MAD was 0.215 m^3/s.

Should it be deemed necessary to withdraw water at a rate that exceeds 10% of instantaneous flow, or when natural flows are below 30% MAD in order to meet the City's water supply needs, additional monitoring will be triggered, as discussed in Section 5.0.

2.4.3 Timing of Activities

Flows in the Apex River, as measured by WSC, are highest in the spring and decline throughout the summer and fall. There are no flows during winter. The supplementary pumping of water, if required during a given year, will be completed during the open water period before flows cease and before hoses would otherwise freeze (July 15 to October 31).

In 2018, the City used a predictive model to forecast deficits in the City's water supply in Lake Geraldine under various consumption scenarios (Golder 2018; Golder 2013). From hydrological inputs based on historical data, and real-time measurements of water levels in Lake Geraldine, the City will be able to reasonably forecast from July onward of any given year, whether a deficit may be expected for the coming winter. The City will make a decision to implement supplementary pumping from the Apex River based on the outcomes of the predictive model.

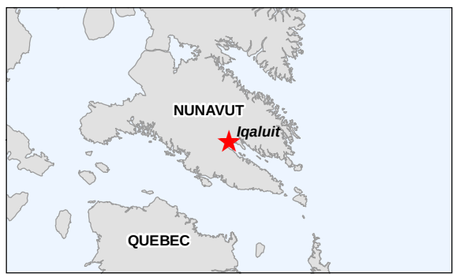
Figure 2-3: Site Plan

Stantec

Legend
- Pump Location
- Water Conveyance
- Minor Road
- Local Road

0 200 400 metres
1:15,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 19N
2. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation



Project Location
Iqaluit, NU

144902717

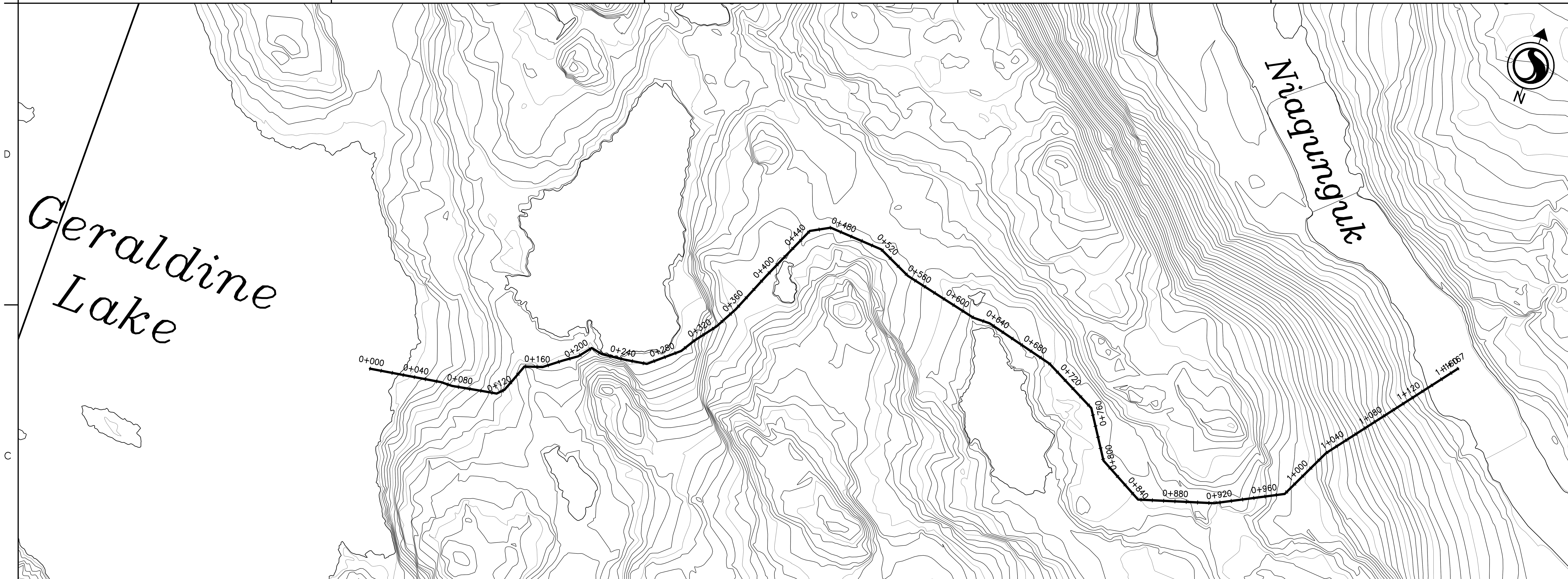
Prepared by ACampigotto on 2018-12-20
Technical Review by EBonhomme on 2018-12-20

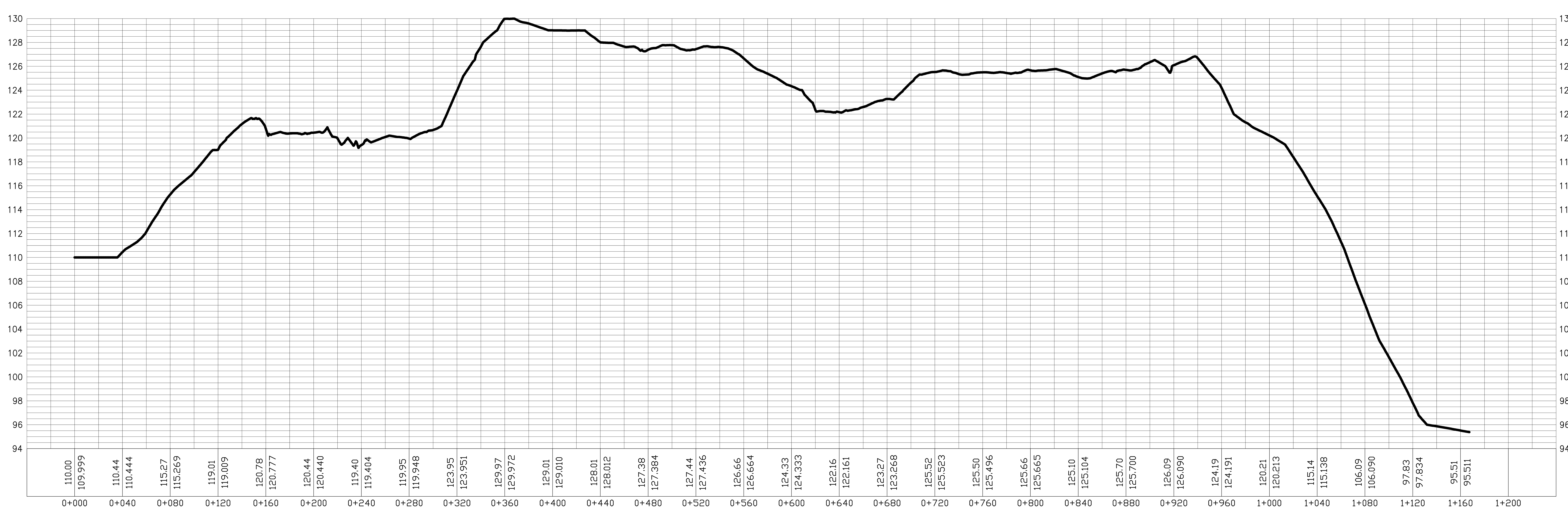
Client/Project
CITY OF IQALUIT
Iqaluit Apex Water Supply
Iqaluit, NU

Figure No.
2-**3a**

Title
Project Layout

G:_GIS_Project_Folder\144902717\ArcMaps\Figure 2-2 Project Layout 20181220.mxd Revised: 2018-12-20 By: ACampigotto





Stantec

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www.stantec.com

BENCHMARK: 67T154 (CCM28)
NORTHING: 6926628.647
EASTING: 635707.100
ELEVATION: 198.428

HORIZONTAL DATUM NOTE
PROJECTION: UNIVERSAL TRANSVERSE MERCATOR (UTM, ZONE 11, CM 117°00'00"W)
DATUM: NAD 83

VERTICAL DATUM NOTE
ELEVATIONS ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-2013:2010.0) AND ARE DERIVED FROM BENCHMARK MONUMENT No.67T154 (CCM28), HAVING AN ELEVATION OF 198.428 METRES DERIVED FROM NATURAL RESOURCES CANADA [CSRS-PPP (Canadian Spatial Reference System Precise Point Positioning) GNSS OBSERVATIONS] **OR** [GEODETIC REFERENCE SYSTEM STATION REPORT].

Notes

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B	ISSUED FOR USE	NL	WO	18.12.21
A	ISSUED FOR REVIEW	NL	WO	18.07.26

Issued

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Permit/Seal

PRELIMINARY NOT FOR CONSTRUCTION

Not for permits, pricing or other official purposes. This document has not been completed or checked and is for general information or comment only.

Client/Project Logo

Iqaluit
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Client/Project
CITY OF IQALUIT

IQALUIT APEX WATER SUPPLY

IQALUIT, NU

Title
CIVIL
FIGURE 2-3
PLAN AND PROFILE

Project No. 144902717
Scale 1:2000H 1:200V

Revision A/0
Sheet 01 of 01
Drawing No. C-101

ORIGINAL SHEET - ANSI D

3 ALTERNATIVES

The supplementation of Lake Geraldine by withdrawal from the Apex River can be implemented with existing equipment available in Iqaluit, and with negligible environmental impacts under certain conditions; however, it is not practical as a long term solution due to the variability of flow in the Apex River (exp 2014) and potential impacts to overwintering fish downstream within the Apex River, should the withdrawal rate need to exceed DFO's guidelines for water withdrawal in order to meet the City's needs (Nunami Stantec 2017).

The City recognizes that a permanent solution of a long-term supplemental water source to meet the City's demands is required, and continuous progress to identify and evaluate these potential sources is underway. A permanent solution is considered an alternative to the temporary supplementation from Apex River.

Preliminary studies ongoing by the City, have shown that the Sylvia Grinnell River has enough flow during summer to meet the City's needs for supplemental pumping. The City is continuing with field and desktop studies and engagement to evaluate the feasibility of a permanent withdrawal location and associated systems for this Sylvia Grinnell River option.

The City is also investigating the feasibility of using Unnamed Lake, a large lake approximately 3 km northeast of the City as a long-term water source. There is no substantive information available about the water balance or water quality of this lake. Studies underway will help to evaluate its suitability as a long-term water source. In the meantime, due to its distance from Lake Geraldine and lack of access, mobilizing pumping equipment to this location, and daily maintenance is deemed too costly and inefficient for a temporary solution, as compared to the Apex River option.

As a third, and short-term alternative only, the City is advancing concept designs for the use of a reverse osmosis treatment system to desalinate seawater from Koojesse Inlet for addition to the potable water system.

4 ENVIRONMENTAL EFFECTS

4.1 Existing Conditions – Aquatic Resources

The Apex River supports a resident population of Arctic charr (Salvelinus alpinus) (Nunami Stantec 2017). All fish sampled from this population were collected at one site immediately below what is locally known as Swimming Lake. Two other reaches further downstream were sampled but no fish were captured. One site upstream at the Road to Nowhere bridge was also sampled with no fish captured. A barrier to fish passage exists just above the mouth of the Apex River where it enters Koojesse Inlet (Nunami Stantec 2017). No fish were observed in the Upper Apex River during monitoring of the 2018 Supplementary Pumping Program.

The resident population of Arctic charr is not expected to be part of a commercial, recreational or Aboriginal (CRA) fishery; due to the small size of the individual fish within the population, which is common of resident populations. The Apex River is not known to have been a fishery in the past. It is unknown whether individuals of this population support a CRA fishery and would likely only occur during spring freshet if some individuals were flushed from the system into Koojesse Inlet. Due to the small size of this resident population it is unlikely they would be captured in the existing Arctic charr fishery. Any potential supporting contribution would be negligible to other fisheries.

4.2 Potential Impacts – Aquatic Resources

Potential Impacts to aquatic resources are summarized in Table 4-1.

Table 4-1: Potential impacts to aquatic resources from Apex water withdrawal

Activity	Water Quality	Hydrology	Fish and Fish Habitat
Installation, operation and removal of pumps and hoses	· Change in sediment concentrations · Deposit of deleterious substance		· Change in substrate composition · Increased potential for erosion or sedimentation
Water withdrawal		· Reduced flow	· Entrainment or impingement in pumps · Fish stranding · Reduction or loss of fish habitat

4.2.1 Water Quality

The placement of the water intake pumps using machinery, and the maintenance of the pumps, may cause bank and bed erosion leading to increased sediment entering the watercourse. Onshore activities, such as driving, or maintenance activities in work areas prone to erosion (e.g., on sand or fine materials), may also lead to increased sediment entering the watercourse. The use of machinery in water can lead to the deposit of deleterious substances (e.g., grease, oil) into the water which may affect fish health.

4.2.2 Fish and Fish Habitat

In a previous Authorization issued to the City for the 2018 Supplementary Pumping Program (18-HCAA-01025), Fisheries and Oceans Canada (DFO) advised that water withdrawal not exceeding 10% instantaneous flow when conditions are greater than 30% MAD represents a low risk of serious harm to fish (“low risk criteria”).

Serious harm to the resident population of charr may occur when withdrawal exceeds 10% of the instantaneous flow or when withdrawal is under conditions below 30% MAD. Potential effects are:

- reduction of fish habitat including overwintering habitat due to water withdrawal, and
- mortality of fish by stranding due to water withdrawal.

Impingement or entrainment of fish causing injury or death can occur when pumps are not fitted with fish screens meeting applicable guidelines.

4.3 Assessment of Residual Effects on Aquatic Resources

Residual environmental effects are those effects which remain after the application of mitigation. The classification of residual effects is presented in Table 4-2.

Table 4-2 Assessment Criteria for Potential Residual Environmental Effects

Criteria	Potential Outcomes			
Duration	**Short-Term:** Effect lasts for duration of Project Construction	**Medium-Term:** Effect lasts for up to 5 years after construction activity ceases	**Long-Term:** Effect lasts beyond final remediation of site	
Frequency	**Once:** Effect occurs once	**Intermittent:** Effect occurs intermittently	**Continuous:** Effect occurs continuously	
Seasonal Timing	**Season-Specific:** Effect is restricted to a particular season or seasons	**Non Season-Specific:** Effect could occur year round		
Geographic Extent	**Project Footprint** Within project footprint	**Project Area** 500m surrounding project footprint	**Regional** 25km buffer around the Project footprint	
Reversibility[1]	**Reversible or Irreversible**			
Magnitude of effect	**None/negligible**	**Low**[2]	**Moderate**[3]	**High**[4]

NOTES:

1 Reversibility: The likelihood that the environmental component will recover from an environmental effect.

2 Low: The predicted trend in the measurable parameter under projected levels of development may result in a decline in the environmental component in the study area during the life of the Project, but levels should recover to baseline after Project closure.

3 Moderate: The predicted trend in the measurable parameter under projected levels of development will likely result in a decline in the environmental component to lower than baseline, but stable levels in the study area after Project closure and into the foreseeable future.

4 High: The predicted trend in the measurable parameter under projected levels of development could threaten the sustainability of the environmental component in the study area, after Project closure, and into the foreseeable future.

4.3.1 Water Quality

The City will implement mitigations during all project activities to reduce the effects of project activities on the aquatic environment.

Table 4-3 lists mitigations to be applied to reduce effects to water quality during supplemental pumping.

Table 4-3: Mitigations for potential effects to water quality

Potential Effect	Mitigation
Potential release of deleterious substance due to operation of machinery in and around water	· Machinery is to arrive on site in a clean condition and maintained free of fluid leaks, invasive species and noxious weeds. Eco friendly (e.g., biodegradable vegetable oil) hydraulic fluid and lubrication is to be used on equipment, where feasible. · Develop and implement a Spill Contingency Plan (Appendix A) that minimizes risk of accidental spills or releases from entering a watercourse or water body during all phases of the pumping. · Whenever possible, operate machinery on land above the high water mark (HWM), to minimize disturbance to the banks and bed of the water body. · Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water. · Remove all construction materials from site upon project completion.
Potential increase in erosion and sedimentation from operation of machinery in and around water	· Install effective erosion and sediment control measures before starting work to prevent sediment from entering the water body. · Avoid areas of steep banks or slopes when entering or exiting water body. · Inspect and maintain erosion and sediment control measures and structures during the course of construction. · Repair erosion and sediment control measures and structures, if damage occurs. · Remove non-biodegradable erosion and sediment control materials once site is stabilized. · Minimize in-water works · Adhere to measures provided in the Erosion and Sedimentation Control Plan (Appendix B)

With the application of measures to reduce the potential for, and effects of sediments entering the Apex River and release of deleterious substance, the residual effects to water quality will be short-term, restricted to open-water season, limited to the project area and will be reversible. The residual effect to water quality is predicted to be negligible.

4.3.2 Fish and Fish Habitat

If possible to meet water supplementation requirements of Lake Geraldine, water withdrawal from the Apex River at the proposed location will be at a rate less than 10% of the instantaneous flow, when natural flow is above 30% MAD. Flow and water levels are currently monitored at the Water Survey of Canada (WSC) Apex River at Apex hydrometric station (10UH002), located downstream of the proposed Upper Apex pumping location. Flows can be scaled to the pumping location on the upper Apex River using a simple drainage area ratio calculation: the upper Apex River location drains 60% of the drainage area measured at the WSC station. To more accurately reflect local conditions on the Upper Apex River, the City will install a new hydrometric station upstream of the withdrawal location.

Table 4-3 lists mitigations to be applied to reduce effects to fish and fish habitat.

Table 4-3: Mitigations for potential effects to fish and fish habitat

Potential Effect	· Mitigation
Potential fish entrapment or entrainment during pumping	· Screen water intakes pipes to prevent entrainment or impingement of fish in accordance with DFO's Freshwater Intake end-of-Pipe Fish Screen Guideline (1995). Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself. · Openings in the guides and seals are to be less than the opening criteria to make "fish tight". · Intakes are to be installed in a manner that prevents the uptake or entrainment of sediment and aquatic organisms associated with the bottom area. Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse. If the water depth is less than 300 mm (12 in.), additional measures may need to be implemented (e.g., using a screen basket with a solid bottom). · Structural support is to be provided to the screen panels to prevent sagging and collapse of the screen. · Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where there is debris loading (woody material, leaves, algae mats, etc.). A150 mm (6 in.) spacing between bars is typical. · Make provision for the removal, inspection, and cleaning of screens. · Implement regular maintenance and repair of cleaning apparatus, seals, and screens is carried out to prevent debris-fouling and impingement of fish. · Shut down pumps when fish screens are removed for inspection and cleaning.
Degradation or destruction of fish habitat	· It is preferable to adjust pumping rate as required such that withdrawal rate is less than 10% of instantaneous flow as measured or derived from hydrometric data, when flows are greater than 30% of mean annual discharge. · Should withdrawal rate need to exceed 10% instantaneous flow or when flows are less than 30% mean annual discharge, monitoring per the Fish and Fish Habitat Monitoring Plan will be implemented. · Fish and Fish Habitat Monitoring shall include: o Daily monitoring of water level, wetted width, habitat conditions, fish presence, fish stranding and fish mortality o Requirement for daily reporting

Potential Effect	· Mitigation
Fish stranding	· Fish rescue will be conducted where necessary, if stranded fish are observed during daily observations when such monitoring is required. Fish rescue will include; o Two personnel, including a qualified aquatic environmental specialist (QAES) will walk the river banks below the water withdrawal site daily, or as required to check for stranded or fish which will potentially stranded to rescue those fish. o Stranded fish will be dipped netted and placed in an oxygenated tub of water from the river. For fish at risk of being stranded and cannot be easily dip netted an electrofisher will be used to capture fish and placed into the oxygenated tub of water. o Stranded fish which may be observed by the community or others will be attempted to be rescued. o Fish rescue will be carried downstream to a suitable release area and released once fish have recovered from their capture. · All fish rescued will be counted and recorded. · Fish which are stranded but cannot be rescued will be retrieved, counted and frozen for later biological sampling to obtain a better understanding of this resident char population.

No fish were observed during 2018 pumping on the Apex River (Stantec 2019; Appendix D). Since it is unconfirmed whether Arctic charr are using the upper Apex River during their lifecycle, daily monitoring will by initiated when low-risk criteria are exceeded, in accordance with the Fish and Fish Habitat Monitoring Plan included in Appendix C.

In accordance with DFO guidance that water withdrawal below 10% instantaneous discharge where flows are greater than 30% MAD have a low probability of detectable impacts (DFO 2013), the residual effects of water withdrawal on fish and fish habitat under most conditions is considered to be negligible to low, without further assessment.

In the situation where withdrawal cannot be maintained below 10% instantaneous flow, or where flows are below 30% MAD to meet the City's needs, potential effects to fish and fish habitat may be short-term, singular, season-specific, limited to the project area and reversible. During monitoring conducted in 2018, no stranded fish or isolated pools were observed. With the application of measures to reduce the potential for effects on fish mortality and habitat loss or alternation from water withdrawal, including monitoring, it is predicted that the residual effects on fish and fish habitat are negligible.

5 MONITORING AND REPORTING

5.1.1 Monitoring

Monitoring will serve primarily to inform adjustments to the rate of water withdrawal, and to inform actions that may be required to protect fish and fish habitat. Monitoring activities include:

- Periodic inspection of effectiveness of erosion and sedimentation control measures
- Periodic inspection of performance and condition of fish screens
- Continuous metered monitoring of water withdrawal at the pumping location
- Daily recording of flows at Water Survey Canada Apex River station (10UH002)
- Daily recording of flows at a new hydrometric station to be established upstream of the pumping location.

The following monitoring will be implemented when/if withdrawal rates exceed 10% instantaneous flow or flows are below 30% MAD. Figure 5-1 shows locations of proposed monitoring stations as referenced in the Fish and Fish Habitat Monitoring Plan:

- Four locations downstream of the pumping locations will be monitored to assess the potential physical effects of pumping on fish and fish habitat. Cross-sections will be surveyed and rebar installed to represent the local reference datum against which to monitor water level and wetted perimeter. Daily measurements of the distance from the top of the rebar to the water surface will be recorded.
- Monitoring and response in accordance with the Fish and Fish Habitat Monitoring Plan
- Additional monitoring will be considered based on DFO recommendations

5.1.2 Reporting

The City will report on total monthly amounts withdrawn from the Apex River within the water licence Annual Report.

When daily monitoring is required, data from daily monitoring will be maintained for review and submission if requested by the regulator. A summary report of fish and fish habitat monitoring (if undertaken) will be provided by March 31 of the following calendar year.

The City will advise DFO and initiate daily monitoring for fish and fish habitat conditions when low risk criteria are exceeded.

Stantec

Legend

Monitoring Location

- Fish and Fish Habitat Monitoring Plan
- Surveillance Network Program
- Water Survey of Canada

- Water Conveyance
- Minor Road
- Local Road

0 200 400 metres

1:15,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 19N
2. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

Project Location
Iqaluit, NU

144902717

Prepared by ACampigotto on 2018-12-20
Technical Review by EBonhomme on 2018-12-20

Client/Project
CITY OF IQALUIT
Iqaluit Apex Water Supply
Iqaluit, NU

Figure No.
5-1

Title
Fish and Fish Habitat
Monitoring Locations

6 REFERENCES

exp. 2014. City of Iqaluit Supplementary Water Supply Study. Prepared for the City of Iqaluit, August, 2014

Fisheries and Oceans Canada. 2013. Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada. Accessed December 2018 at: http://waves-vagues.dfo-mpo.gc.ca/Library/348881.pdf

Nunami Stantec. 2017. Fish and Fish Habitat Assessment of the Niaqunguk (Apex) River, Lake Geraldine, and the Lake Geraldine Drainage Channel. Prepared for the City of Iqaluit.

Nunami Stantec 2018. Lake Geraldine Reservoir Storage – Desktop Review and Assessment Memo prepared for the City of Iqaluit.

Nunami Stantec 2019. Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping – DFO Authorization Monitoring Report.

Appendix A:
Spill Contingency Plan

APEX RIVER WATER WITHDRAWAL: SITE-SPECIFIC SPILL CONTINGENCY PLAN

1. INTRODUCTION

1.1 PURPOSE

The purpose of this Site-Specific Spill Contingency Plan is to identify measures to reduce the possibility of occurrence of spills of contaminants associated specifically with City's withdrawal of water from the Apex (Niaqunguk) River for the purpose of supplementing the City's drinking water supply at Lake Geraldine,.and to identify measures to be taken should a spill occur, in order to minimize impacts to the environment. This ESCP is complementary to the City's Spill Contingency Plan.

1.2 REVISIONS

The ESCP is to be reviewed annually prior to implementation of supplementary withdrawal with input from the contractor(s) conducting site activities for the City.

1.3 RESPONSIBILITIES

This Spill Contingency Plan Applies to the Prime contractor and its subcontractors during installation, operation and removal associated with water withdrawal at the Apex River.

Primary Contacts

Name	Role	Phone / Email
	City Project Manager	
	Alternate City Project Manager	
	Contractor Project Manager	
	Site Foreman	
	Media	

2.1 TRAINING

All project personnel will receive training on the purpose and procedures provided in this Spill Contingency Plan.

All personnel will receive training in safe work procedures related to handling of petroleum products and refueling equipment.

2. SPILL PREVENTION

2.1 MATERIALS AND EQUIPMENT STORAGE

The following substances/materials may be present at work sites:

- Diesel
- Engine Oil
- Lubricants

MSDS for substances to be stored on site are to be included with this Spill Contingency Plan.

APEX RIVER WATER WITHDRAWAL: SITE-SPECIFIC SPILL CONTINGENCY PLAN

Equipment containing fuels and oils/lubricants must be located or stored more than 50 m from the bank of the Apex River. No fuels are to be stored on site. Fuel-fired equipment such as generators and pumps will have secondary containment installed capable of retaining 110% of the capacity of the tanks and fuel drips or leaks during operations and refueling.

Mobile equipment will be refueled at least 50 m away from the bank of a watercourse or waterbody.

2.2 MONITORING

Vehicles and equipment will be checked daily prior to operation for evidence of leaking hoses or tanks, and leaks will be repaired promptly.

Observations and actions taken will be recorded as part of daily pre-op check.

3. SPILL RESPONSE

3.1 RESPONSE EQUIPMENT

Emergency spill kits will be maintained at the following locations:

- Generator
- Designated refueling areas

Each kit contains the following items stored into a 55 gallon plastic drums:

- • 5 Tyveck coveralls
- • 10 pairs of disposable gloves
- • 2 x 100 absorbent pad packs
- • 1 x 20kg granular absorbent bag
- • 4 x 2” diam. Floating absorbent booms
- • 10 yellow storage bags
- • One shovel

Additionally, each vehicle will be equipped with a spill kit, to include:

- 4 pairs disposable gloves
- 20 absorbent pads
- 2 clear or yellow storage bags

3.2 GENERAL PROCEDURES IN CASE OF SPILL

The following are general procedures that apply immediately in the case of a spill of any size. Steps are listed in the order of importance; however, depending on the circumstances, conditions, and potential injuries, this order may need to be altered to meet specific needs. :

- Stop, look, assess and control site hazards and risks to personnel.
    - o Is there a fire or explosion hazard?
    - o Are there people nearby?
    - o What is the spilled material? Is additional PPE needed?

- Eliminate all sources of ignition
- Stop the source of the spill if safe to do so
- Use material in spill kit or other available materials to contain spill
- Notify site foreman

3.3 SPECIFIC PROCEDURES IN CASE OF SPILL

Spill on Land

- Determine the likely movement of the spill overland and into the ground.
- Prevent spilled material from entering water using booms, creating berms or using absorbents
- Use absorbents to collect free product
- Excavate affected soil into empty drum or lined container, while minimizing destruction of root zone

Spill on or Near Water

- Block entry into water using booms and absorbent pads or other barriers
- Contain a spill in water with absorbent boom or other barrier.
- Remove minor spills with sorbent pads.
- Major spill in water will require pumping and disposal of contaminated water and other actions as determined in discussion with regulatory authorities.

Spill on Ice

- Evaluate ice conditions before proceeding
- Use snow or ice berms to prevent spill from spreading
- Use booms to contain free product
- Manually remove contaminated snow and ice from surface

3.4 REPORTING

All spills must be reported to the Site Foreman, and to the Designated Representative for the City. Additional reporting may be required.

For every spill exceeding the quantity specified in Table 3-1, the form “NWT-NU Spill Report” (Appendix A) must be completed and transmitted within 12 h of the incident to spills@gov.nt.ca. Pictures must be taken during and after the cleanup progress. The GPS coordinates of the spill location must be recorded. All information and pictures will be used for the spill report.

The person preparing the spill report shall give as much of the following information as possible. Reportable information includes but is not limited to the following:

- Date and time of spill
- Direction spill is moving (or if it has stopped)
- Name and phone number of persons close to the location of the spill
- Type of contaminant spilled and quantity spilled
- Cause of spill
- Whether the spill is continuing or has stopped

- Description of the existing containment
- Actions taken to recover, clean-up and dispose of spilled contaminant
- Name, address and phone number of person reporting the spill
- Name of person in charge of management or control at time of spill

Table 3-1: Reportable Spill Quantities

Substance	Reportable Quantity
Fuel	≥100 L
Toxic substances (for example, cleaners, solvents, glycol)	≥ 5 L or 5 kg
Releases or potential releases of deleterious substances, of any size that: • are near or in an open water body • Pose an imminent threat to human health or safety	Any amount

4. EMERGENCY CONTACT CALL-DOWN LIST IN CASE OF SPILL

Name	Company	Emergency Phone
tbd	Contractor Site Foreman	
Tbd	City Representative	
Above to confirm if spill is reportable prior to continuing with call-down		
Tbd	City Project Manager	
NWT/NU Spill Reporting Line		867-920-8130
tbd	Environmental Inspector	

Appendix A: NWT-NU Spill Report Form

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: MM DD YY	Report Time:	☐ Original Spill Report **OR** ☐ Update # _____ to the Original Spill Report	**Report Number:**
B	Occurrence Date: MM DD YY	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:		Region: ☐ NT ☐ Nunavut ☐ Adjacent Jurisdiction or Ocean	
E	Latitude: _____ Degrees _____ Minutes _____ Seconds		Longitude: _____ Degrees _____ Minutes _____ Seconds	
F	Responsible Party or Vessel Name:		Responsible Party Address or Office Location:	
G	Any Contractor Involved:		Contractor Address or Office Location:	
H	Product Spilled: ☐ Potential Spill	Quantity in Litres, Kilograms or Cubic Metres:	U.N. Number:	
I	Spill Source:	Spill Cause:	Area of Contamination in Square Metres:	
J	Factors Affecting Spill or Recovery:	Describe Any Assistance Required:	Hazards to Persons, Property or Environment:	
K	Additional Information, Comments, Actions Proposed or Taken to Contain, Recover or Dispose of Spilled Product and Contaminated Materials:			

L	Reported to Spill Line by:	Position:	Employer:	Location Calling From:	Telephone:
M	Any Alternate Contact:	Position:	Employer:	Alternate Contact Location:	Alternate Telephone:

REPORT LINE USE ONLY

N	Received at Spill Line by:	Position:	Employer:	Location Called:	Report Line Number:

Lead Agency: ☐ EC ☐ CCG/TCMSS ☐ GNWT ☐ GN ☐ ILA ☐ AANDC ☐ NEB ☐ Other: _____

Significance: ☐ Minor ☐ Major ☐ Unknown

File Status: ☐ Open ☐ Closed

Agency:	**Contact Name:**	**Contact Time:**	**Remarks:**
Lead Agency:			
First Support Agency:			
Second Support Agency:			
Third Support Agency:			

Appendix B: Erosion and Sedimentation Control Plan

APEX RIVER WATER WITHDRAWAL: EROSION AND SEDIMENTATION CONTROL PLAN

PURPOSE

This Erosion and Sedimentation Control Plan (ESCP) provides guidance and mitigation to the City of Iqaluit (the City) and its contractor to avoid or minimize erosion or sedimentation from activities related to the City's withdrawal of water from the Apex (Niaqunguk) River for the purpose of supplementing the City's drinking water supply at Lake Geraldine. It is to be applied in conjunction with the Fish and Fish Habitat Protection Plan and Spill Contingency Plan and applicable authorizations.

APPROACH

The ESCP is to be updated prior to project implementation by the City and reviewed annually with input from the contractor(s) conducting site activities for the City.

This plan uses DFO pathways of effects, measures to avoid or mitigate against serious harm to fish, and professional judgement to determine where effects from erosion and sedimentation might occur and the appropriate mitigation measures to avoid or reduce these effects. This ESCP is in effect during all phases of withdrawal from the Apex River in any single year, from the start of project set-up (including mobilization of equipment), through to the demobilization of project equipment.

TRAINING

The ESCP will be reviewed with the contractor that will be undertaking project installation, maintenance and removal. All project personnel are to be trained by the contractor in the purpose and requirements of the plan

MITIGATIONS

On-site activities, subsequent potential effects from these, and proposed mitigations for these activities are outlined in Table 1.

Table 1: Project Activities, Potential Effects, and Proposed Mitigation Measures

Activity	Potential effect	Mitigation Measures
Placement, removal, and operation of pumps	The placement of the water intake pumps using machinery, and the maintenance of the pumps, may cause bank and bed erosion leading to increased sediment entering the watercourse.	1. Disturbance to the riparian vegetation will be minimized. Use existing roads and trails wherever possible. Rig mats are to be used when ground is excessively wet and prone to erosion. 2. Equipment will avoid steep banks for entry and egress from water. 3. The removal of rocks, sand or other materials from the banks, the shore and shoreline, or the bed of the waterbody, below the ordinary high-water mark, will be minimized. If material is removed from the waterbody, it will be set aside and returned to the original location if practical to do so, once construction activities are completed. 4. Site isolation measures (e.g., silt boom, silt curtain, silt fencing) will be used for containing suspended sediment where in-water work is required, and downgradient of erosion-prone on-shore work areas.
On-shore activities in work areas that are prone to erosion	On-shore activities, such as driving or maintenance activities in work areas prone to erosion (e.g., on sand or fine materials), may cause erosion leading to increased sediment entering the watercourse	

Table 1: Project Activities, Potential Effects, and Proposed Mitigation Measures

Activity	Potential effect	Mitigation Measures
		5. Waste material (e.g., construction waste and materials, accumulated debris) will be contained and stabilized above the high-water mark of the Apex River to prevent re-entry. 6. Regular inspection and maintenance of effectiveness of erosion and sediment control measures and structures will be conducted during the course of operations. 7. If the shoreline or banks are destabilized, re-stabilize them immediately to prevent erosion and/or sedimentation. 8. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, use appropriately-sized, clean rock. The rock will be installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment. 9. All pumping materials will be removed from site upon project completion.
Use of machinery in water	The use of machinery in water can lead to sedimentation and erosion which may affect fish health.	1. Machinery on-site will be in a clean condition and maintained free of fluid leaks, invasive species and noxious weeds. 2. Machinery used in the watercourse will be limited to placing and removing the intake pump. 3. Machinery will not be left in the watercourse. 4.

MONITORING AND REPORTING

The implementation of erosion and sedimentation control measures shall be recorded daily by the contractor. This report should note aspects such as performance of silt curtains, days of in-water works, etc.

Appendix C:
Fish and Fish Habitat Monitoring Plan

APEX RIVER SUPPLEMENTARY PUMPING 2018: FISH AND FISH HABITAT MONITORING PLAN

INTRODUCTION

The City of Iqaluit is applying to withdraw water from the Niaqunguk (Apex) River during unfrozen conditions (July to October) for the purpose of supplementing the City's drinking water supply at Lake Geraldine when required. The withdrawal of water from the Apex River may exceed DFO's low risk criteria for serious harm to fish: 10% of instantaneous flow when natural flow is at or above 30% of the mean annual discharge (MAD).

This Fish and Fish Habitat Monitoring Plan specifies monitoring that will initiate measures to mitigate serious harm to fish.

MONITORING REQUIREMENTS

Monitoring of fish and fish habitat will be undertaken when water withdrawals exceed the low risk criteria for serious harm to fish. Table 1 summarizes monitoring locations and parameters. Locations are shown in Appendix FFHMP-A

Table 1: Aquatic Monitoring Stations within the Apex River During Water Withdrawals

Station ID[1]	Station Description	UTM Coordinates		Monitoring Parameters[3,4,5]	Monitoring Frequency	Monitoring Rationale
		Easting	Northing			
Throughout Pumping Period						
SNP IQA-10 (Apex Pump Location)	At pumping location	525820	7070467	Pump flow rate Pump volume (daily and cumulative) Daily average discharge (measured at new hydrometric station)	Daily	Monitor daily pump rate and river flow/discharge in relation to DFO low risk criteria
10UH002	Water Survey of Canada station, downstream of pump location, upstream of Apex Road bridge	527087	7067694	Daily average discharge	Daily (remotely)	Monitor flow conditions at downstream end of Apex River; monitored remotely via online connection to WSC station
Hydro 1	Immediately Upstream of pump location	tbd	tbd	Daily average discharge	Daily	Monitor flow conditions at pump location Apex River
Exceedance of Low Risk Criteria						
SNP IQA-10 (Apex Pump Location)	At pumping location	525820	7070467	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence at pumping location

Table 1: Aquatic Monitoring Stations within the Apex River During Water Withdrawals

Station ID[1]	Station Description	UTM Coordinates		Monitoring Parameters[3,4,5]	Monitoring Frequency	Monitoring Rationale
		Easting	Northing			
AR-07	Immediately downstream (46 m) of pumping location	525850	7070428	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence immediately downstream of pumping location
A1	Downstream of pumping location, upstream of Road to Nowhere Bridge	526497	7070003	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location Continuity of monitoring location with 2016 fisheries program
A2	Downstream of pumping location, upstream of Swimming Lake	526299	7069247	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location Continuity of monitoring location with 2016 fisheries program (fish previously captured here)
AR-02	Downstream of pumping location and downstream of Swimming Lake	526592	7068573	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location and immediately downstream of Swimming Lake Continuity of monitoring location with 2016 fisheries program

Notes:

1. UTM coordinates (Zone 19V) provided for established stations, as of August 20, 2018.

MONITORING PROCEDURES

PRE-PUMPING MONITORING

Baseline channel and flow conditions at each of the above-noted stations were established in 2018. Measurements were completed as per the BC-MOE *Manual of British Columbia Hydrometric Standards* (2009), available here: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/science-data/man_bc_hydrometric_stand_v10.pdf. Specifically, per monitoring station/transect, there was a minimum of 20 measurements and no one measurement would account for more than 10% of the discharge. The program used a Marsh-McBirney Flo-Mate 2000 electromagnetic flow meter.

Fish and fish habitat conditions were also assessed at each of these stations in 2018, as well as fish presence via electro-fishing. No fish were caught at these monitoring stations via electrofisher.

Finally, a visual survey, along length of Apex River from AR-05 to AR-02, was also completed to identify locations where stranding potential for fish if high based on channel morphology (such as broad, shallow areas). No additional areas, other than the stations identified in Table 1, were considered at higher risk for stranding.

WATER WITHDRAWAL DAILY MONITORING

Throughout Pumping

During the water withdrawal period (i.e., throughout pumping), the following parameters will be monitored:

Withdrawal:	Measured at the pump location (SNP IQA-10) in accordance with Water Licence 3AM-IQA1626
Discharge:	Measured at the Water Survey of Canada Apex River station 10UH002 and a new hydrometric station to be established upstream of the pumping location (daily average)

At SNP IQA-10, the withdrawal rate and volume will be monitored daily and reported as a daily average. The daily average discharge at a new upstream hydrometric station will also be monitored daily to obtain river discharge at the IQA-10 pump location. These parameters are monitored for compliance with the water licence and to evaluate pump rate in relation to river discharge and the DFO low risk criteria.

Exceedance of Low Risk Criteria

Daily monitoring for fish and fish habitat parameters will commence when water withdrawals are close to exceeding the low risk criteria. The parameters to be collected during this daily monitoring include:

Water Level:	Measured as a distance between the top of the installed gauge stakes to the water surface, and to river bottom, on the upstream side of the gauge stakes, at monitoring locations in Table 1.
Wetted Width:	Measured as the wetted distance between the outermost gauge stakes established pre-pumping at monitoring locations in Table 1.
Habitat Conditions:	Descriptive observations of changes to pools, riffles, runs, or other habitat features at each monitoring locations.
Fish Presence:	Observations of fish presence at each monitoring location, with documentation of species and numbers, if available.
Fish stranding:	Location of, and numbers of stranded fish, along with documentation of fish rescue (if any) completed. Fish rescued or suffered serious injury or morality will be identified and counted.
Fish Mortality:	Location and number of dead fish.

REPORTING

DAILY REPORTING

Daily monitoring reports will be retained and made available for review if requested.

When exceedance of the low risk criteria is imminent, the City will advise DFO and initiate daily monitoring for fish and fish habitat conditions.

FINAL REPORT

A summary report of fish and fish habitat monitoring will be provided in the City's water licence Annual Report.

APPENDIX FFHMP-A: MONITORING STATION LOCATIONS

Stantec

Legend

Monitoring Location

- Fish and Fish Habitat Monitoring Plan
- Surveillance Network Program
- Water Survey of Canada

- Water Conveyance
- Minor Road
- Local Road

0 200 400 metres

1:15,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 19N
2. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

Project Location
Iqaluit, NU

144902717

Prepared by ACampigotto on 2018-12-20
Technical Review by EBonhomme on 2018-12-20

Client/Project
CITY OF IQALUIT
Iqaluit Apex Water Supply
Iqaluit, NU

Figure No.
5-1

Title
Fish and Fish Habitat
Monitoring Locations

Appendix D:
Iqaluit Emergency Water Supply Project – DFO Authorization Monitoring Report

NUNAMI
STANTEC LIMITED

Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping – DFO Authorization Monitoring Report

January 2019

Prepared for:
City of Iqaluit
Iqaluit, Nunavut

Prepared by:
Nunami Stantec Limited
Rankin Inlet, Nunavut

Project Number: 144902717

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Abbreviations

m ..... metres
m^3/s ..... cubic metres per second
City ..... City of Iqaluit
DFO ..... Fisheries and Oceans Canada
MAD ..... Mean annual discharge
UTM ..... Universal Transverse Mercator
WSC ..... Water Survey of Canada

1 INTRODUCTION

In August/September 2018, the City of Iqaluit, Nunavut (the City) undertook an emergency water supply project whereby water from the Niaqunguk (Apex) River was withdrawn and conveyed to their Lake Geraldine reservoir to supplement the community's drinking water supply. Supplementation of the Lake Geraldine reservoir supply was considered necessary to provide sufficient water for the community through the 2018-2019 winter period, until spring freshet in 2019 replenishes the reservoir.

This report outlines the results of water withdrawal and environmental monitoring completed along the Niaqunguk River, during the supplementary pumping, to support the City's emergency *Fisheries Act* Authorization obtained from Fisheries and Oceans Canada (DFO) in advance of pumping.

1.1 Background

On August 16, 2018, Fisheries and Oceans Canada (DFO) issued to the City of Iqaluit (the City) a Paragraph 35(2)(b) *Fisheries Act* Authorization – Emergency Circumstances (DFO Authorization). The DFO Authorization was for the withdrawal of water from the Niaqunguk River for the purpose of supplementing the City's drinking water supply in the Lake Geraldine reservoir. At the time it was unknown whether withdrawal of water from the Niaqunguk River would exceed DFO's low risk criteria for Serious Harm: 10% of instantaneous flow when natural flow is at or above 30% of the mean annual discharge (MAD) and the likelihood of serious harm to fish. The emergency DFO Authorization included conditions for implementation of measures to avoid and mitigate serious harm to fish, monitoring and reporting.

Nunami Stantec Ltd. (Nunami) was contracted by the City to monitor and assess the potential risk for serious harm to Arctic charr (*Salvelinus alpinus*) related to the withdrawal of water from the Niaqunguk River. In particular, the potential existed for water levels in the Niaqunguk River, at and/or below the location of water withdrawal (herein referred to as the "study area"), to drop to a point where fish, if present, could become stranded or could lack sufficient water depth to overwinter. The Niaqunguk River is located approximately 1 km east of Iqaluit, Nunavut (Figure 1). The river is formed from numerous lower order streams and unnamed lakes to the north and east of Iqaluit, that combine into a main channel that flows from north to south, eventually draining into the Koojesse Inlet of Frobisher Bay.

A fish and fish habitat assessment conducted in 2016 (Nunami 2017) reported the presence of a resident population of Arctic charr in the Niaqunguk River study area, specifically the Swimming Lake area of the river. The presence of a permanent barrier at the outlet of the Niaqunguk River prevents anadromous Arctic charr from utilizing the river. This report provides results of the fall 2018 monitoring required under the emergency DFO Authorization.


Figure 1: Apex River Pumping Location (August/September 2018)
Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping - DFO Authorization Monitoring Report
Legend
IQA-10 SNP
Swimming Lake Area
WSC 10UH002
Lake Geraldine Reservoir
IQA-10 SNP
Iqaluit
Koojesse Inlet
WSC 10UH002
Apex
Google earth
© 2018 Google
Image © 2018 DigitalGlobe
N
1 km

2 NIAQUNGUK RIVER WATER WITHDRAWAL

Water withdrawal from the Niaqunguk River was conducted using two pumps (Pump A and Pump B) at the pumping location SNP IQA-10 (as per the City's Water Licence 3AM-IQA1626; UTM coordinates 525785 Easting, 7070476 Northing; see Figure 1). Pumps were housed in a screened cage to meet DFO's Freshwater Intake End-of-Pipe fish Screen Guidelines (DFO 1995).

3 FISH AND FISH HABITAT MONITORING PLAN

A Fish and Fish Habitat Monitoring Plan (Appendix A) was prepared to monitor the potential effects on fish and fish habitat due to the supplementary pumping of water from the Niaqunguk River in fall 2018. Monitoring included:

- Daily monitoring of pump rate, water withdrawal volumes and river discharge.
- Monitoring of potential fish stranding or mortality if water withdrawal (pump rate) exceeded 10% of instantaneous flow when natural flow is at or above 30% of the MAD.
- Fish rescue, if fish stranding was observed.
- Calculations of wetted width to be initiated at selected sites when water withdrawal exceeded 10% instantaneous flow.

4 PRE-PUMPING SURVEYS

Water level surveys were conducted on August 16 and 17, 2018, along the Niaqunguk River, before pumping began, to establish monitoring stations. Fish and fish habitat surveys were conducted along the Niaqunguk River between August 22 and 31, 2018 to further assess monitoring stations (Figure 2). Supplementary pumping from the Niaqunguk River began on August 19, 2018.

4.1 Water Level

Water level monitoring stations were established along the Niaqunguk River at six locations, including two stations upstream of the pumping location and four stations downstream of the pumping location (see Figure 2). At each station, stakes were installed to measure relative water levels before pumping began, and during pumping if the water withdrawal rate exceeded 10% of instantaneous flow. From the pre-pumping water levels, estimated water level at 30% of MAD were then calculated for each monitoring station. Pre-pumping water levels, and calculated 30% MAD water levels, relative to the top of installed stakes, are outlined in Table 1.

4.2 Fish Habitat

The fish habitat survey included wetted width, depth, substrate composition and general site description at nine sites along the Niaqunguk River, including the six water level stations. At the time of the fish habitat surveys, water levels in Niaqunguk River had been influenced by recent precipitation events that resulted in water overflowing the banks and extending into the vegetated riparian areas. Results of the survey are provided in Table 1.

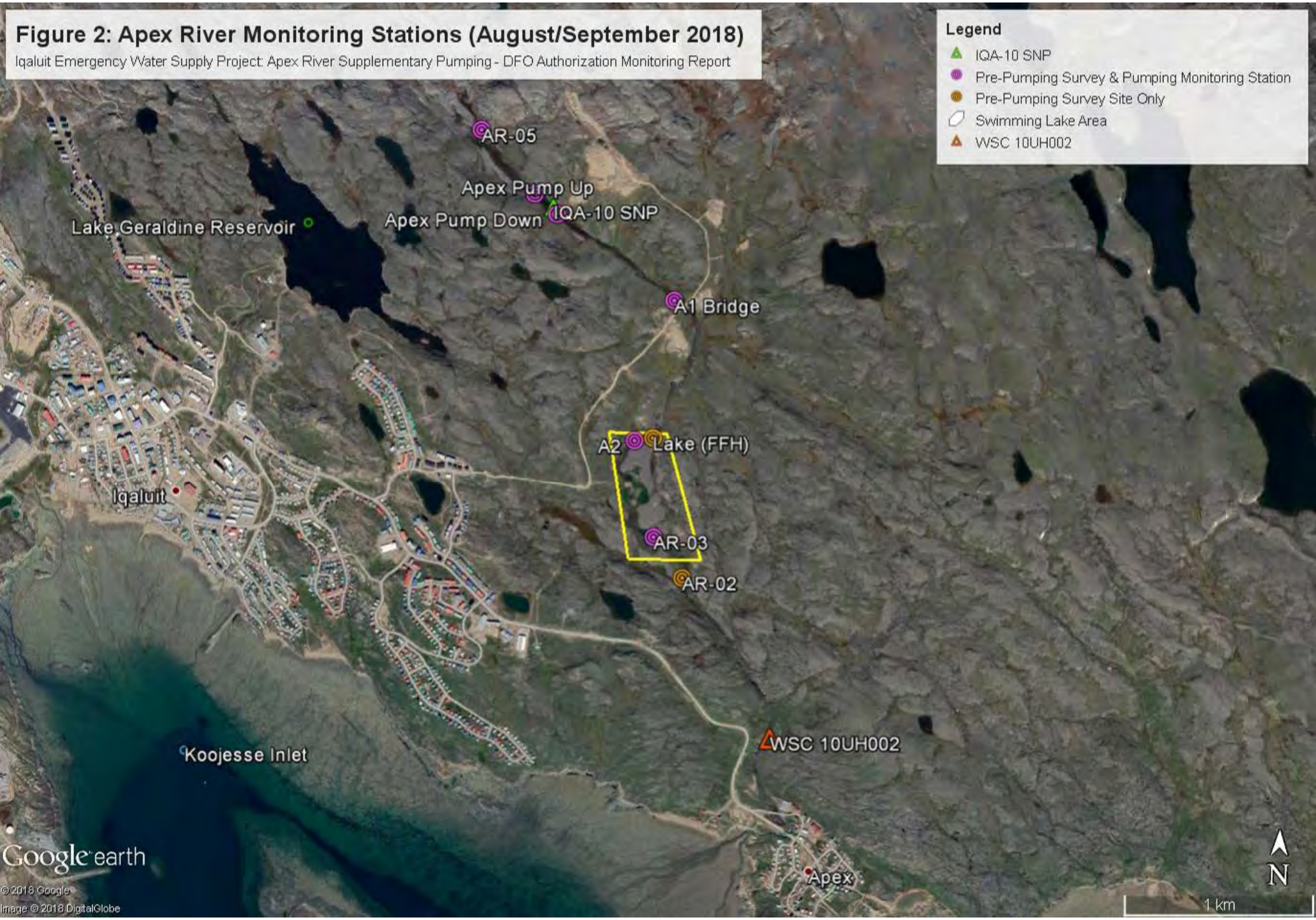
Figure 2: Apex River Monitoring Stations (August/September 2018)
Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping - DFO Authorization Monitoring Report
Legend
IQA-10 SNP
Pre-Pumping Survey & Pumping Monitoring Station
Pre-Pumping Survey Site Only
Swimming Lake Area
WSC 10UH002
AR-05
Apex Pump Up
Apex Pump Down
IQA-10 SNP
Lake Geraldine Reservoir
A1 Bridge
A2
Lake (FFH)
Iqaluit
AR-03
AR-02
WSC 10UH002
Koojesse Inlet
Apex
N
1 km
Google earth
© 2018 Google
Image © 2018 DigitalGlobe

Table 1: Pre-Pumping Water Levels and Fish and Fish Habitat Characteristics at Niaqunguk River Monitoring Stations[1]

Site ID	UTM Coordinates		Site Description and Channel Characteristics	Pre-Pumping Water Level (m)[2]	30% MAD Water Level (m)[2]	Channel Width (m)	Wetted Width (m)	Maximum Depth (m)	Substrate	Incidental Observations	Carried into Pumping Monitoring Program?
	Easting	Northing									
AR-05 (Hydro 1)	525421	7070859	Approximately 400 m above the pool where pumping will occur. Transition area from a riffle (upstream) to a run (downstream).	RS: 0.261 LS: 0.386	RS: 0.441 LS: 0.566	20	7.9	0.90	75% large angular boulders and rocks with deep interstitial spaces. 25% large rounded rocks with large interstitial spaces. There is 0% embeddedness, and the substrate is prone to movement.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
Apex Pump Up	525718	7070532	The head of the pool from which the water is being drawn. The site is immediately below a riffle.	RS: 0.456 LS: 0.302	RS: 0.536 LS: 0.382	40	28.6	0.45	80% large rounded rocks, with 20% large rounded boulders. 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
Apex Pump Location (SNP IQA-10)	525785	7070476	Approximately half-way between the head (Up) and the tail (Down) of the pool	—	—	55	—	≤ 2.0	Not assessed as this was an active construction site and water too deep to wade.	Not assessed as this was an active construction site and water too deep to wade.	No
Apex Pump Down	525841	7070429	The tail end of the pool from which the water is being drawn. The site is the transition zone at which the pool becomes a riffle.	RS: 0.358 LS: 0.380	RS: 0.478 LS: 0.500	49	32.5	0.40	95% large rounded rocks, with 5% large rounded boulders. 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
A1 Bridge	526480	7070000	The site is the transition zone at which a riffle (upstream) becomes a deeper run.	RS: 0.120 LS: 0.170	RS: 0.325 LS: 0.375	27	13.5	1.1	A mix of large angular boulders (25%), rounded boulders (25%), large rounded rocks (25%) and sand (25%). The sand is distributed equally across the channel and at such depth such there is ≥50% embeddedness of boulders and rocks and little to no interstitial spacing.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
Lake (FFH)	526397	7069268	Approximately 60 m upstream of A2. This is the deepest pool in the Study Area and is located immediately downstream of a 100 m stretch of cascades and falls carved through the bedrock in a narrow gorge.	—	—	40	—	> 2	Northern half of the pool is predominantly bedrock with rock, cobble, and gravel comprising the bottom substrate in the southern half and in the deeper areas.	Excellent water clarity. No fish observed. No aquatic invertebrates observed. Arctic charr were observed here in 2016. The cascades/falls upstream of the Swimming Lake may pose a barrier to the upstream passage of fish.	No
A2	526300	7069250	Riffle	RS: 0.279 LS: 0.328	RS: 0.484 LS: 0.533	24	14.8	0.42	95% rounded rocks, with 5% large rounded boulders. 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.	Excellent water clarity. No fish observed. No aquatic invertebrates observed. Arctic charr were captured here in 2016.	Yes
AR-03	526422	7068738	The tail end of a pool just upstream of where the river transitions into a run.	RS: 0.349 LS: 0.163	RS: 0.569 LS: 0.383	27	15.8	1.0	80% rounded rocks, 10% rounded cobble, and 10% sand. 25% embeddedness with little to no interstitial spaces.	Excellent water clarity. No fish observed. No aquatic invertebrates observed.	Yes
AR-02 (Lower Reach)	526869 (up) 527028 (down)	7068178 (up) 7067177 (down)	Predominantly a fast-flowing run through a narrow gorge with series of cascades.	—	—	8 to 35	—	1.4	80% bedrock, 20% large rock. Little to no interstitial spaces. There is a vertical drop of ≥1.5 m in height located just downstream of the bridge on Nìaqunnusiariaq Road.	Excellent water clarity. No fish observed. No aquatic invertebrates observed. Vertical drop near outlet could pose barrier to upstream passage of fish.	No

NOTES:
1. — = not measured
2. Water levels provided as distance from top of stake to water level in metres for stake on right bank (RS) and stake on left bank (LS); pre-pumping water levels measured August 16 or 17, 2018

4.3 Fish Surveys

A Smith-Root LR-24 electrofisher was used to survey seven monitoring stations (see Table 2 and Figure 2) in the study area for the presence of fish on August 24, 2018. A small mesh (6 mm) dip net was used to allow for the capture of small-bodied fish (e.g., sticklebacks) that may also be present as well as invertebrates that may have been incidentally dislodged during electrofishing. Water clarity was excellent at each of the seven survey sites and overcast skies at the time of the survey reduced water surface glare that could otherwise impede the ability of the electrofisher operator to spot fish. Water levels were elevated on the day electrofishing was conducted due to recent precipitation events (e.g., 9.4 mm rain on August 23, 2018; ECCC 2018).

Table 2: Electrofishing results for Niaqunguk River, Iqaluit, Nunavut, August 24, 2018

Location	Start Time	Weather	Operator(s)	Voltage	Run Time (Seconds)	Results
AR-05	08h52	Overcast	T. Vickers I. Freda	585	194	No fish captured or observed No invertebrates captured or observed
Apex Pump Up	09h27	Overcast	T. Vickers I. Freda	585 to 600	184	No fish captured or observed No invertebrates captured or observed
Apex Pump Down	09h42	Overcast	T. Vickers I. Freda	640	129	No fish captured or observed No invertebrates captured or observed
A1 Bridge	10h04	Overcast	T. Vickers I. Freda	505	114	No fish captured or observed No invertebrates captured or observed
A2	10h23	Overcast	T. Vickers I. Freda	605	70	No fish captured or observed No invertebrates captured or observed
AR-03	10h41	Overcast	T. Vickers I. Freda	450	167	No fish captured or observed No invertebrates captured or observed
AR-02	10h52	Overcast	T. Vickers I. Freda	530	106	No fish captured or observed No invertebrates captured or observed

No fish or invertebrates were captured or observed at the seven sites surveyed. The highwater levels that followed recent rainfalls could have decreased the efficacy of electrofishing.

Sampling for environmental DNA (eDNA) was conducted on August 29 and 30, -2018 at six of the seven sites selected for electrofishing using a portable eDNA backpack sampler; site AR-03 was not sampled. A sample was also collected from the Sylvia Grinnell River (see Figure 2) to serve as a positive control since Arctic charr were known to be in the river at the time. A negative control and post-positive negative control were also sampled to assess the sampling protocols, including decontamination techniques.

Established protocols for the sampling of eDNA in the field were unsuccessful because the 5 µm pore filters that collect the eDNA were inadvertently discarded, and only the pre-filters were retained for analysis. Analyses of these pre-filters by Precision Biomonitoring (Guelph, ON) did not produce evidence of eDNA in the Niaqunguk River locations nor in the positive control from the Sylvia Grinnell River and results could not be relied upon. During the survey, a local Elder indicated that there are fish throughout the Niaqunguk River system (Mary Ellen Thomas, personal communication) although she did not specify the species.

5 WATER WITHDRAWAL MONITORING

Water withdrawal at SNP IQA-10 began on August 19, 2018, using Pump A while water withdrawal began on August 20, 2018, using Pump B. Pump A was shut down on September 12, 2018, and Pump B was shut down on September 16, 2018, and no water withdrawal occurred after this date. Water withdrawal from both pumps was continuous from start-up to shut down, though pump time varied daily. In total, there were 10 days where the cumulative water withdrawal rate (from both Pump A and Pump B) exceeded the 10% instantaneous flow threshold, which was measured as the scaled 24-hour discharge at the pumping location SNP IQA-10 (see Table 3). Water levels did not fall below the calculated 30% MAD water levels at five monitoring stations (one upstream and four downstream of the pump) over the pumping period. Water levels did fall below the calculated 30% MAD water level at one upstream monitoring station (Apex Pump Up, left bank only). Daily water withdrawal and environmental monitoring records are provided in Appendix B. Plots of monitoring station relative water levels with the 30% MAD water levels are provided in Appendix C.

Table 3: Pumping Days and Pump Rate that Exceeded the 10% Instantaneous Flow Threshold

Pumping Date (2018)	Estimated Average Pump Rate (m^3/s)[1]	24-hour Discharge at Pumping Site (SNP IQA-10) (m^3/s)[2]	% Average Pump Rate of 24-Hour Discharge at Pumping Site
August 30	0.092	0.814	11.34
August 31	0.092	0.736	12.55
September 6	0.093	0.828	11.19
September 7	0.090	0.745	12.12
September 8	0.091	0.670	13.62
September 9	0.093	0.623	14.87
September 10	0.093	0.658	14.06
September 11	0.092	0.591	15.62
September 12	0.093	0.529	17.64
September 15	0.050	0.481	10.38

NOTES:
1. Estimated average pump rate is the cumulative rate for Pump A and Pump B on each day, except September 15 which is for Pump B only (Pump A shut down September 12)
2. 24-hour discharge at the pumping site (SNP IQA-10) scaled from the Water Survey of Canada Station 10UH002 located near the Apex River mouth; scaled discharge accounts for daily withdrawals.

Monitoring for potential fish stranding of stations downstream of the pump location was conducted when there was an exceedance in water withdrawal rate above the 10% instantaneous flow and one week after pumping ceased (see Appendix B for daily monitoring records). Monitoring of stations occurred daily from September 1 to September 17, 2018, and a final time on September 24, 2018. No fish were observed during any of the daily monitoring, nor were any isolated pools where stranding would likely occur. Given the overall reduction in water levels at each monitoring station over the monitoring period.

At the six monitoring stations where the wetted width was calculated, a reduction in wetted width was observed both upstream and downstream of the pumping location during water withdrawal in September, except at the monitoring station immediately downstream of the pumping site (Table 4). Station AR-05 upstream o the pumping site had a loss of wetted width of 6-8%, likely due natural flow conditions during the fall. Stations downstream of the pumping site, except the station immediately downstream of the pumping site had approximate reductions in wetted width between 8 – 14%. This reduction can be likely be attributed to three factors; natural flow conditions as observed upstream of the pumping station, the low slope and shallow depth at the downstream stations and water withdrawal. Although wetted width was reduced at monitoring stations within the Swimming Lake area (i.e., A2 and AR-02; see Figure 2), where Arctic charr were previously observed, water levels remained relatively consistent from September 9 through to September 17, and on the final monitoring date of September 24 (see plots in Appendix C). Throughout the monitoring period water flows continued through the main channel of the Niaqunguk River.

Table 4: Wetted Widths Calculated at Monitoring Stations on the Niaqunguk River

Date	AR-05 (u/s pump) Wetted Width (m)	PUMP (u/s pump) Wetted Width (m)	PUMP (d/s pump) Wetted Width (m)	A1 (u/s bridge) Wetted Width (m)	A2 (u/s Swim Lk) Wetted Width (m)	AR-02 (d/s Swim Lk) Wetted Width (m)
8/16/2018	12.10	34.50	45.90	n/m	n/m	n/m
8/17/2018	n/m	n/m	n/m	24.40	22.30	25.50
9/1/2018	12.10	35.10	48.10	22.70	22.20	25.50
9/2/2018	12.60	36.00	49.30	24.20	22.30	25.90
9/3/2018	11.90	35.10	48.10	22.70	22.20	25.00
9/4/2018	11.50	34.80	48.10	22.60	21.90	24.20
9/5/2018	11.40	34.50	47.80	22.60	21.90	23.90
9/6/2018	11.40	34.30	47.10	22.50	20.70	23.50
9/7/2018	11.40	34.00	47.10	22.50	20.20	23.20
9/8/2018	11.30	33.70	46.80	22.50	20.20	22.90
9/9/2018	11.30	33.70	46.50	22.40	19.90	22.60
9/10/2018	11.30	33.50	46.80	22.40	20.20	22.90
9/11/2018	11.30	33.50	46.50	22.40	19.90	22.60
9/12/2018	11.30	33.50	46.50	22.40	19.90	22.60
9/13/2018	11.30	33.20	46.20	22.40	19.50	22.60
9/14/2018	11.10	33.20	45.90	22.40	19.50	22.60
9/15/2018	11.10	33.20	45.90	22.40	19.50	22.60
9/16/2018	11.10	32.90	45.90	22.40	19.50	22.60
9/17/2018	11.10	32.90	45.90	22.40	19.20	22.60
9/24/2018	11.40	34.50	47.40	22.40	19.20	22.90

NOTE:
n/m = no measurement

6 DISCUSSION

Supplemental water withdrawal from the Niaqunguk River was conducted over 29 days from August 19 to September 12, 2018. No fish were observed at the pumping location SNP IQA-10 over the pumping duration. There were 10 days in which water withdrawal rate exceeded the 10% threshold of instantaneous flow, measured as the scaled 24-hour discharge at SNP IQA-10. These water withdrawals ranged from 10.38 to 17.64% of instantaneous flow. Water levels did not fall below the calculated 30% MAD water levels at most monitoring stations over the pumping duration, with the exception of one station upstream of the pump location. This may be due to less flow inputs into the river further upstream.

A resident population of Arctic charr has been reported in the Niaqunguk River in the Swimming Lake area (Nunami 2017). A waterfall at the mouth of the Niaqunguk River provides a barrier for anadromous charr to use the river for upstream migration. Several pools downstream of the SNP IQA-10 pumping location, locally referred to as lakes (e.g., Swimming Lake), may provide overwintering habitat for this resident population of Arctic charr (Nunami 2017). It is unknown if water depth in these pools were ultimately decreased due to the supplemental water withdrawal, however. Flow in the Niaqunguk River would be expected to return to natural levels shortly after the cessation of water withdrawal and these pools/overwintering areas would be recharged.

Reductions in wetted width occurred both upstream and downstream of the pumping site. Changes in wetted width is a naturally occurring function related to many different parameters including precipitation events, seasonal cooler temperatures, bank slope, river bed morphology and water depth. It is unknown how much of wetted width was reduced through water withdrawal however at least a portion of this reduction would be due to natural conditions. The loss of wetted width at downstream station locations is unlikely to have significant effects on fish as ample and higher quality habitat still existed. Before freeze-up the Niaqunguk River would have resumed its natural flow and depth patters for that time of year.

No stranding or mortality of fish were observed during the pumping duration. Decreases in wetted width observed were near the shallow banks of the river likely provide marginal habitat for the resident population of charr due to a lack of cover. Flows continued in the main channel of the Niaqunguk River during the period of supplemental water withdrawal.

Potential effects to fish and fish habitat, if any, were temporary and of low magnitude. It is unlikely that water withdrawal from the Niaqunguk River resulted in serious harm to fish.

7 LIMITATIONS

This document titled Iqaluit Emergency Water Supply Project: Apex River Supplementary Pumping – DFO Authorization Monitoring Report was prepared by Nunami Stantec Ltd. ("Nunami") for the account of the City of Iqaluit (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Nunami's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Nunami and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Nunami did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Nunami shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

8 CLOSURE

Nunami Stantec Ltd. has prepared this report for the sole benefit of the City of Iqaluit (the City) for the purpose of summarizing the results from water withdrawal and environmental monitoring during the supplementary pumping from the Apex River in August/September 2018. The report was prepared to support the City's emergency *Fisheries Act* Authorization, obtained in advance of pumping. The report may not be relied upon by any other person or entity, other than for its intended purposes, with the express written consent of Nunami Stantec Ltd. and the City. Any use of this report by a third party, or any reliance on decisions made based upon it, are the responsibility of such third parties.

The information provided in this report was compiled from existing documents and data provided by the City, and by field data compiled by Nunami Stantec Ltd. This report represents the best professional judgement of our personnel available at the time of its preparation. Nunami Stantec Ltd. reserves the right to modify the contents of this report, in whole or in part, to reflect any new information that becomes available. If any conditions become apparent that differ significantly from our understanding of conditions presented in this report, we requested that we be notified immediately to reassess the conclusions provided herein.

Respectfully Submitted,

NUNAMI STANTEC LIMITED

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9 REFERENCES

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Fisheries and Oceans Canada (DFO). 1995. Freshwater Intake end-of-Pipe Fish Screen Guidelines. Ottawa, Canada.

Mary Ellen Thomas, Arctic College, Nunavut Research Institute, personal communication, December 10, 2018.

Nunami Stantec Ltd. (Nunami). 2017. Fish and Fish Habitat Assessment of the Niaqunguk (Apex) River, Lake Geraldine, and the Lake Geraldine Draining Channel. Project No. 144930051.

APPENDIX A

Apex River Supplementary Pumping 2018:

Fish and Fish Habitat Monitoring Plan

NUNAMI STANTEC

APEX RIVER SUPPLEMENTARY PUMPING 2018: FISH AND FISH HABITAT MONITORING PLAN - Rev0

INTRODUCTION

On August 16, 2018, Fisheries and Oceans Canada issued a Paragraph 35(2)(b) Fisheries Act Authorization – Emergency Circumstances (DFO Authorization) to the City of Iqaluit (City). The DFO Authorization is for the emergency withdrawal of water from the Niaqunguk (Apex) River for the purpose of supplementing the City's drinking water supply at Lake Geraldine from August 14 to October 30, 2018. The withdrawal of water from the Apex River may exceed DFO's low risk criteria for Serious Harm: 10% of instantaneous flow when natural flow is at or above 30% of the mean annual discharge (MAD).

The DFO Authorization includes conditions for implementation of measures to avoid and mitigate serious harm to fish; monitoring and reporting; and, offsetting serious harm to fish.

MONITORING REQUIREMENTS

Monitoring of fish and fish habitat will be undertaken when water withdrawals exceed the low risk criteria as required in section 3.1.2 of the DFO Authorization. Table 1 summarizes monitoring locations and parameters. Locations are shown in Appendix A

Table 1: Aquatic Monitoring Stations within the Apex River During Water Withdrawals

Station ID[1]	Station Description	UTM Coordinates		Monitoring Parameters[3,4,5]	Monitoring Frequency	Monitoring Rationale
		Easting	Northing			
Throughout Pumping Period						
SNP IQA-10 (Apex Pump Location)	At pumping location	525820	7070467	Pump flow rate Pump volume (daily and cumulative) Daily average discharge (scaled from 10UH002)	Daily	Monitor daily pump rate and river flow/discharge in relation to DFO low risk criteria, and in accordance with Water Licence 3AM-IQA1626
10UH002	Water Survey of Canada station, downstream of pump location, upstream of Apex Road bridge	527087	7067694	Daily average discharge	Daily (remotely)	Monitor flow conditions at downstream end of Apex River; monitored remotely via online connection to WSC station
Exceedance of Low Risk Criteria						
AR-05	Upstream (540 m) of pump location	525408	7070814	Wetted width Water Level/Depth Habitat Conditions Fish Presence	Daily	Monitor natural inflowing conditions, upstream of pumping location
AR-06	Immediately upstream	525712	7070535	Wetted width Water Level/Depth	Daily	Monitor natural inflowing conditions,

Table 1: Aquatic Monitoring Stations within the Apex River During Water Withdrawals

Station ID[1]	Station Description	UTM Coordinates		Monitoring Parameters[3,4,5]	Monitoring Frequency	Monitoring Rationale
		Easting	Northing			
	(125 m) of pump location			Habitat Conditions Fish Presence		immediately upstream of pumping location
SNP IQA-10 (Apex Pump Location)	At pumping location	525820	7070467	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence at pumping location
AR-07	Immediately downstream (46 m) of pumping location	525850	7070428	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence immediately downstream of pumping location
A1	Downstream of pumping location, upstream of Road to Nowhere Bridge	526497	7070003	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location Continuity of monitoring location with 2016 fisheries program
A2	Downstream of pumping location, upstream of Swimming Lake	526299	7069247	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location Continuity of monitoring location with 2016 fisheries program (fish previously captured here)
AR-03	Downstream of pumping location, at the downstream end of a pool within the Swimming Lake area				Daily	Observe fish habitat conditions and fish presence downstream of pumping location and within the Swimming Lake area
AR-02	Downstream of pumping location and downstream of Swimming Lake	526592	7068573	Wetted width Water Level/Depth Habitat Conditions Fish Presence Fish Stranding Fish Mortality	Daily	Monitor fish habitat conditions and fish presence downstream of pumping location and immediately downstream of Swimming Lake Continuity of monitoring location with 2016 fisheries program

Table 1: Aquatic Monitoring Stations within the Apex River During Water Withdrawals

Station ID[1]	Station Description	UTM Coordinates		Monitoring Parameters[3,4,5]	Monitoring Frequency	Monitoring Rationale
		Easting	Northing			
Notes: 1. UTM coordinates (Zone 19V) provided for established stations, as of August 20, 2018.						

A monitoring station for water level/depth, was also planned within the downstream-most pool of the Swimming Lake area (proposed as AR-03). During the pre-pumping survey, it was determined that this station was not a suitable location for fish habitat or flow data, and water depth at the station limited access. However, given the on-site conditions, monitoring at AR-02, immediately downstream of the Swimming Lake area, will provide an indication of potential changes in water level within the Swimming Lake area.

MONITORING PROCEDURES

PRE-PUMPING MONITORING

Prior to pumping, flow/discharge and water level measurements were collected, and channel profiles established, to identify pre-pumping baseline conditions at each of the above-noted stations in Table 1. Measurements were completed as per the BC-MOE *Manual of British Columbia Hydrometric Standards* (2009), available here: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/science-data/man_bc_hydrometric_stand_v10.pdf. Specifically, per monitoring station/transect, there was a minimum of 20 measurements and no one measurement would account for more than 10% of the discharge. The program used a Marsh-McBirney Flo-Mate 2000 electromagnetic flow meter. Pre-pumping flow measurements at each of these stations are provided in Appendix B.

Fish and fish habitat conditions were also assessed at each of these stations, as well as fish presence via electro-fishing. No fish were caught at these monitoring stations via electrofisher. Environmental DNA (eDNA) sampling is planned to be undertaken as a measure to confirm fish (Salvelinus alpinus) presence/absence. As of the date of this plan, eDNA sampling has not been completed. A summary of recorded pre-pumping habitat conditions is provided in Appendix C.

Finally, a visual survey, along length of Apex River from AR-05 to AR-02, was also completed to identify locations where stranding potential for fish if high based on channel morphology (such as broad, shallow areas). No additional areas, other than the stations identified in Table 1, were considered at higher risk for stranding.

WATER WITHDRAWAL DAILY MONITORING

Throughout Pumping

During the water withdrawal period (i.e., throughout pumping), the following parameters will be monitored:

Withdrawal: Measured at the pump location (SNP IQA-10) in accordance with Water Licence 3AM-IQA1626

Discharge: Measured at the Water Survey of Canada Apex River station 10UH002 (daily average)

At SNP IQA-10, the withdrawal rate and volume will be monitored daily and reported as a daily average. The daily average discharge at the WSC station 10UH002 (Apex River) will also be monitored daily to scale river discharge to the IQA-10 pump location. These parameters are monitored for compliance with Water Licence

3AM-IQA1626 and to evaluate pump rate in relation to river discharge and the low risk criteria, as outlined in the DFO Authorization.

Exceedance of Low Risk Criteria

Daily monitoring for fish and fish habitat parameters will commence when water withdrawals are close to exceeding the low risk criteria. The parameters to be collected during this daily monitoring include:

Water Level:	Measured as a distance between the top of the installed gauge stakes to the water surface, and to river bottom, on the upstream side of the gauge stakes, at monitoring locations in Table 1.
Wetted Width:	Measured as the wetted distance between the outermost gauge stakes established pre-pumping at monitoring locations in Table 1.
Habitat Conditions:	Descriptive observations of changes to pools, riffles, runs, or other habitat features at each monitoring locations.
Fish Presence:	Observations of fish presence at each monitoring location, with documentation of species and numbers, if available.
Fish stranding:	Location of, and numbers of stranded fish, along with documentation of fish rescue (if any) completed. Fish rescued or suffered serious injury or morality will be identified and counted.
Fish Mortality:	Location and number of dead fish.

REPORTING

DAILY REPORTING

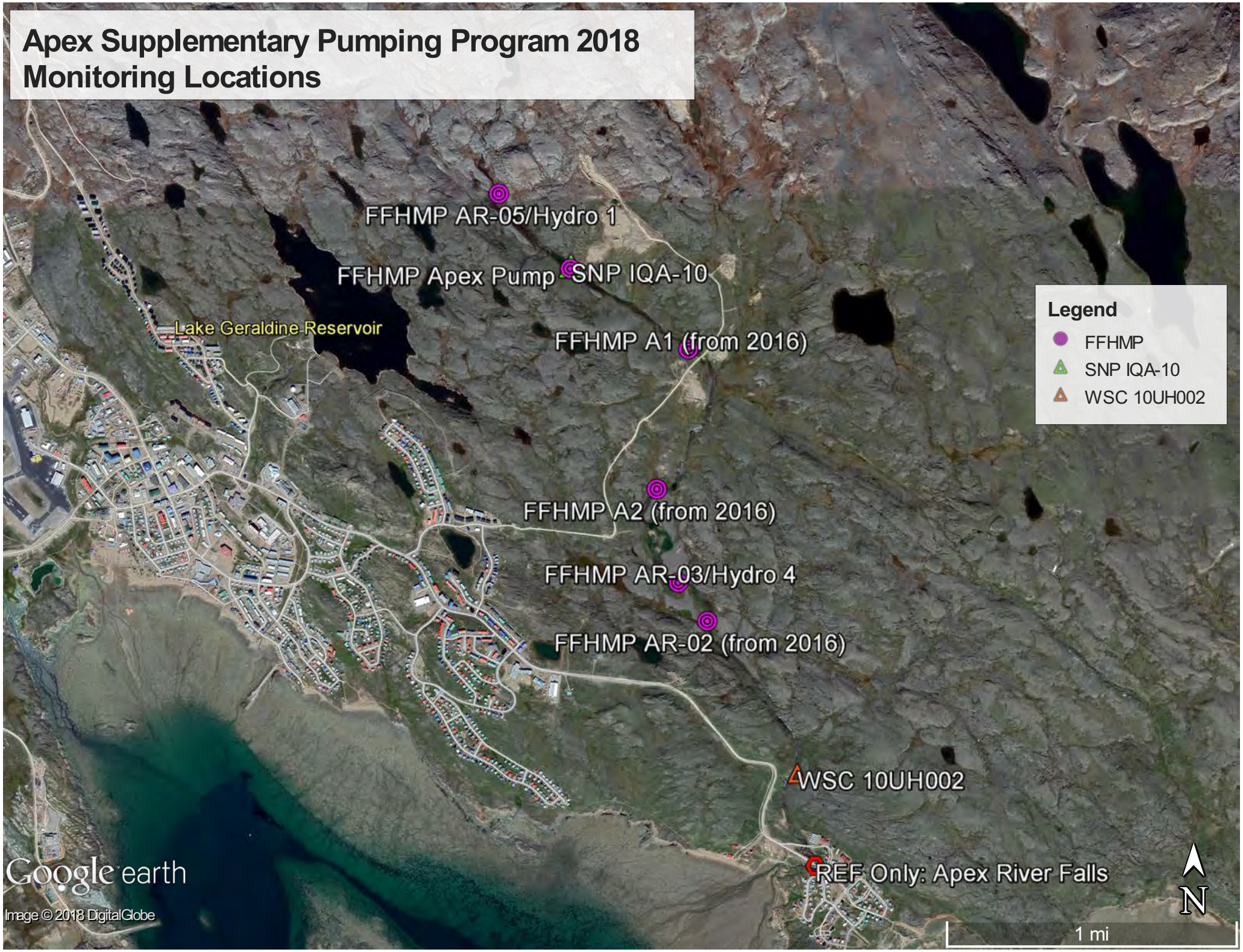
Daily monitoring reports will be prepared and uploaded to the secure Project FTP site, which will be made available for review.

When exceedance of the low risk criteria is near, Nunami will advise DFO and initiate daily monitoring for fish and fish habitat conditions.

FINAL REPORT

A summary report of fish and fish habitat monitoring will be provided by December 31, 2018.

APPENDIX A: MONITORING STATION LOCATIONS


Apex Supplementary Pumping Program 2018
Monitoring Locations
FFHMP AR-05/Hydro 1
FFHMP Apex Pump
SNP IQA-10
Lake Geraldine Reservoir
FFHMP A1 (from 2016)
FFHMP A2 (from 2016)
FFHMP AR-03/Hydro 4
FFHMP AR-02 (from 2016)
WSC 10UH002
REF Only: Apex River Falls
Legend
FFHMP
SNP IQA-10
WSC 10UH002
Google earth
Image © 2018 DigitalGlobe
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APPENDIX B: PRE-PUMPING FLOW DATA FOR APEX RIVER MONITORING STATIONS

Table 2: Pre-pumping Flow Measurements at Apex River Monitoring Stations (August 2018)

Station ID	Date/Time	Measured Flow (Q) (m^3/s)	Flow (Q) at WSC 10UH002 (m^3/s)	Station-WSC 10UH002 Relation-ship (%)	Slope	30% Mean Annual Discharge (MAD)	Wetted Width (m)	Surveyed Water Level Elevation (m)	Top of Stake to Water Level (m)	30% MAD (Est.)[1]	
										Water Level Elevation (m)	Top of Stake to Water Level (m)
AR-05	16-Aug-18 12:00	0.307	1.56	20	0.0035	0.071	7.85	499.30	0.261	499.12	0.441
AR-06	16-Aug-18 17:00	1.168	1.53	76	0.0052	0.275	28.6	397.02	0.302	396.94	0.382
SNP IQA-10	—	—	—	73[a]	—	0.261	—	—	—	—	—
AR-07	16-Aug-18 18:30	1.101	1.60	69	0.0054	0.248	32.5	396.92	0.380	396.80	0.500
A1	17-Aug-18 9:00	1.572	2.37	66	0.0015	0.239	13.5	299.79	0.170	299.59	0.375
A2	17-Aug-18 12:00	2.463	2.4	103	0.0067	0.369	14.8	599.86	0.328	599.66	0.533
AR-02	17-Aug-18 19:00	2.410	2.42	100	0.0046	0.358	15.8	699.76	0.163	699.54	0.383

Notes:

a. Relationship of monitoring station SNP IQA-10 (Apex Pump Location) to WSC Station 10UH002 is average of relationship at AR-06 (immediately upstream of pump) and AR-07 (immediately downstream of pump)

1. Estimates provided for water level elevation and distance from top of gauge stake to water level at 30% mean annual discharge (MAD)

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APPENDIX C: PRE-PUMPING FISH HABITAT DATA FOR APEX RIVER MONITORING STATIONS

Table 3: Pre-pumping Fish Habitat Conditions at Apex River Monitoring Stations (August 2018)

Station ID	Maximum Water Depth (m)	Watercourse Characteristics	Substrate Characteristics
AR-05	0.90	Immediately downstream end of a riffle as it transitions into a run. Water has high clarity even after 24 hours of rainfall.	75% large angular boulders and rocks with deep interstitial spaces 25% large rounded rocks with large interstitial spaces 0% embeddedness, and the substrate is prone to movement
AR-06	0.45	The head of the pool from which the supplemental water is being drawn. The station is immediately below a riffle. Water has high clarity even after 24 hours of rainfall.	80% large rounded rocks, with 20% large rounded boulders 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.
AR-07	0.40	The tail end of the pool from which the supplemental water is being drawn. The station is the transition zone at which the pool becomes a riffle. Water has high clarity even after 24 hours of rainfall. No indication of sediment from construction or pumping activities.	95% large rounded rocks, with 5% large rounded boulders 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.
A1	1.1	At the transition zone at which a riffle (upstream) becomes a deeper run. Water has high clarity even after 24 hours of rainfall.	A mix of large angular boulders (25%), rounded boulders (25%), large rounded rocks (25%) and sand (25%). The sand is distributed equally across the channel and at such depth that there is ≥50% embeddedness of boulders and rocks with little to no interstitial spacing.
A2	0.40	This location is a riffle. Water had elevated levels of suspended solids after 24 hours of rainfall. Suspended solids were entering Apex River from two tributaries that join with Apex approximately 130 m downstream of Site A1.	95% rounded rocks, with 5% large rounded boulders 0% embeddedness with visible interstitial spaces. The substrate is prone to movement.
AR-03	1.0	The tail end of a Swimming Lake pool just upstream of where the river transitions into a run. Water had elevated levels of suspended solids after 24 hours of rainfall.	80% rounded rocks, 10% rounded cobble, and 10% sand 25% embeddedness with little to no interstitial spaces.
AR-02	0.50	The tail end of a run just upstream of where the river transitions into a riffle. Water had elevated levels of suspended solids after 24 hours of rainfall.	40% rounded boulders, 40% large rounded rocks, 10% cobble, and 10% sand 10% embeddedness with small interstitial spacing.

APPENDIX B

Daily Monitoring Records

UPPER APEX IQA-10 - Daily Pumping Record
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	20-Aug-18	[enter value]
Time Completed	1:18 PM	[enter value]
Prepared by	Andrea Kneale	[enter name]
Date of Pumping Record Summary	19-Aug-18	[enter value]
Date and Time Updated	27-Aug-18	[enter value]

Pump Rate

Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
Total Averaged Estimated Pump Rate (m3/s)	0.094	

Pump Volume

Pumping Time for Pump A (minutes)	540	[enter value]
Pumping Time for Pump B (minutes)	0	[enter value]
Daily Pump Volume Withdrawn (m3)	1,472	
Cumulative Pump Volume Withdrawn (m3)	1,472	

Lake Geraldine

24hrs level at WSC 10UH013 (m)	110.29	[enter value]
Estimated volume available (m3)	308,000	[enter value]

% Instantaneous Flow (IF)

7.64

24hrs flow at WSC 10UH002 (m3/s)	1.61	[enter value]
24hrs flow at Apex IQA-10 (m3/s)	1.24	[enter value]

IF > 10 → **NOTIFY STANTEC** [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

**Cumulative Volume (m3) Withdrawn Before 19-Aug-18 = 0

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	1:18 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	19-Aug-18

% IF: 7.64 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.235 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		21-Aug-18	[enter value]
Time Completed		3:53 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		20-Aug-18	[enter value]
Date and Time Updated		27-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.095	
Pump Volume	Pumping Time for Pump A (minutes)	1,140	[enter value]
	Pumping Time for Pump B (minutes)	360	[enter value]
	Daily Pump Volume Withdrawn (m3)	4,178	
	Cumulative Pump Volume Withdrawn (m3)	5,650	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.32	[enter value]
	Estimated volume available (m3)	308,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.82	[enter value]
6.84	24hrs flow at Apex IQA-10 (m3/s)	1.39	[enter value]
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 20-Aug-18 = 1,472

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	3:53 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	20-Aug-18

% IF: 6.84 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.39 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	22-Aug-18	[enter value]	
Time Completed	8:27 AM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	21-Aug-18	[enter value]	
Date and Time Updated	27-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.095	
Pump Volume	Pumping Time for Pump A (minutes)	750	[enter value]
	Pumping Time for Pump B (minutes)	810	[enter value]
	Daily Pump Volume Withdrawn (m3)	4,454	
	Cumulative Pump Volume Withdrawn (m3)	10,104	

**Cumulative Volume (m3) Withdrawn Before 21-Aug-18 = 5,650

Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.35	[enter value]
	Estimated volume available (m3)	294,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.83	[enter value]
6.79	24hrs flow at Apex IQA-10 (m3/s)	1.40	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	8:27 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	21-Aug-18

% IF: 6.79 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.40 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	23-Aug-18	[enter value]	
Time Completed	2:12 PM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	23-Aug-18	[enter value]	
Date and Time Updated	27-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.095	
Pump Volume	Pumping Time for Pump A (minutes)	645	[enter value]
	Pumping Time for Pump B (minutes)	1,380	[enter value]
	Daily Pump Volume Withdrawn (m3)	5,864	
	Cumulative Pump Volume Withdrawn (m3)	23,278	

**Cumulative Volume (m3) Withdrawn Before 23-Aug-18 = 17,414

Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.42	[enter value]
	Estimated volume available (m3)	280,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.65	[enter value]
7.48	24hrs flow at Apex IQA-10 (m3/s)	1.27	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	2:12 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	23-Aug-18

% IF: 7.48 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.27 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	23-Aug-18	[enter value]	
Time Completed	9:08 AM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	22-Aug-18	[enter value]	
Date and Time Updated	27-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	45	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.095	

Pump Volume	Pumping Time for Pump A (minutes)	1,110	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,310	
	Cumulative Pump Volume Withdrawn (m3)	17,414	

**Cumulative Volume (m3) Withdrawn Before 22-Aug-18 = 10,104

Lake Geraldine	24hrs level at WSC 10UH013 (m)	10.39	[enter value]
	Estimated volume available (m3)	280,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.59	[enter value]
7.72	24hrs flow at Apex IQA-10 (m3/s)	1.23	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump rate verified August 23, 2018, following testing to confirm flow meter functionality
- pumping times verified August 27, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed (UPDATE)	27-Aug-18
Time Completed	9:08 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	22-Aug-18

% IF: 7.72 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.23 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	27-Aug-18	[enter value]	
Time Completed	9:00 AM	[enter value]	
Prepared by	Andrea Kneale	[enter name]	
Date of Pumping Record Summary	24-Aug-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,992	
	Cumulative Pump Volume Withdrawn (m3)	31,270	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.49	[enter value]
	Estimated volume available (m3)	250,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 24-Aug-18 = 23,278

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	3.09	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	2.31	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
4.00

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	27-Aug-18
Time Completed	9:00 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	24-Aug-18

% IF: 4.00 **24-hr Flow at IQA-10 (vs. 30% MAD):** 2.31 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		27-Aug-18	[enter value]
Time Completed		9:42 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		25-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	1,380	[enter value]
	Pumping Time for Pump B (minutes)	1,380	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,659	
	Cumulative Pump Volume Withdrawn (m3)	38,929	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.56	[enter value]
	Estimated volume available (m3)	230,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	2.80	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	2.10	[enter value]

**Cumulative Volume (m3) Withdrawn Before 25-Aug-18 = 31,270

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
4.40

IF > 10 → **NOTIFY STANTEC** [enter name]
PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	27-Aug-18
Time Completed	9:42 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	25-Aug-18

% IF: 4.40 **24-hr Flow at IQA-10 (vs. 30% MAD):** 2.10 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		27-Aug-18	[enter value]
Time Completed		9:49 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		26-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,992	
	Cumulative Pump Volume Withdrawn (m3)	46,921	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.61	[enter value]
	Estimated volume available (m3)	210,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	2.18	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.65	[enter value]

**Cumulative Volume (m3) Withdrawn Before 26-Aug-18 = 38,929

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
5.61

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	27-Aug-18
Time Completed	9:49 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	26-Aug-18

% IF: 5.61 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.65 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		28-Aug-18	[enter value]
Time Completed		1:53 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		27-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	48	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,954	
	Cumulative Pump Volume Withdrawn (m3)	54,875	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.66	[enter value]
	Estimated volume available (m3)	200,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	1.68	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.29	[enter value]

**Cumulative Volume (m3) Withdrawn Before 27-Aug-18 = 46,921

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
7.16

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	28-Aug-18
Time Completed	1:53 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	27-Aug-18

% IF: 7.16 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.29 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		30-Aug-18	[enter value]
Time Completed		9:25 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		28-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	48	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,972	
	Cumulative Pump Volume Withdrawn (m3)	62,847	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.70	[enter value]
	Estimated volume available (m3)	190,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	1.45	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.05	[enter value]

**Cumulative Volume (m3) Withdrawn Before 28-Aug-18 = 54,875

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
8.79

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	30-Aug-18
Time Completed	9:25 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	28-Aug-18

% IF: 8.79 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.05 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		31-Aug-18	[enter value]
Time Completed		2:25 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		29-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	48	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,961	
	Cumulative Pump Volume Withdrawn (m3)	70,807	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.73	[enter value]
	Estimated volume available (m3)	180,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	1.19	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.94	[enter value]

**Cumulative Volume (m3) Withdrawn Before 29-Aug-18 = 62,847

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
9.85

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	31-Aug-18
Time Completed	2:25 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	29-Aug-18

% IF: 9.85 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.94 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.
AR-05	RS							
u/s pump	MID							
	LS							
PUMP	RS							
at pump	MID							
	LS							
A1	RS							
u/s bridge	MID							
	LS							
A2	RS							
u/s Swim. Lk	MID							
	LS							
AR-03	RS							
in Swim. Lk	MID							
	LS							
AR-02	RS							
d/s Swim. Lk	MID							
	LS							

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:24 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		31-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,974	
	Cumulative Pump Volume Withdrawn (m3)	86,424	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.78	[enter value]
	Estimated volume available (m3)	160,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	0.92	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.74	[enter value]

**Cumulative Volume (m3) Withdrawn Before 31-Aug-18 = 78,449

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
12.55

IF > 10 → **NOTIFY STANTEC** Andrea Kneale [enter name]
PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:24 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	31-Aug-18

% IF: 12.55 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.74 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☑ NO, Other (provide reason): monitoring started 01-Sep-18

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS								
u/s pump	LS								
PUMP	RS								
u/s pump	LS								
PUMP	RS								
d/s pump	LS								
A1	RS								
u/s bridge	LS								
A2	RS								
u/s Swim. Lk	LS								
AR-02	RS								
d/s Swim. Lk	LS								

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:20 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		30-Aug-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,380	[enter value]
	Pumping Time for Pump B (minutes)	1,380	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,642	
	Cumulative Pump Volume Withdrawn (m3)	78,449	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.76	[enter value]
	Estimated volume available (m3)	166,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.03	[enter value]
11.34	24hrs flow at Apex IQA-10 (m3/s)	0.81	[enter value]
IF > 10	**NOTIFY STANTEC**	Andrea Kneale	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 30-Aug-18 = 70,807

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:20 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	30-Aug-18

% IF: 11.34 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.81 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☑ NO, Other (provide reason): monitoring started 01-Sep-18

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS								
u/s pump	LS								
PUMP	RS								
u/s pump	LS								
PUMP	RS								
d/s pump	LS								
A1	RS								
u/s bridge	LS								
A2	RS								
u/s Swim. Lk	LS								
AR-02	RS								
d/s Swim. Lk	LS								

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:26 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		1-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,974	
	Cumulative Pump Volume Withdrawn (m3)	94,398	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.83	[enter value]
	Estimated volume available (m3)	145,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.98	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.51	[enter value]
6.13			
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 1-Sep-18 = 86,424

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:26 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	1-Sep-18

% IF: 6.13 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.51 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): withdrawal >10% IF 30-Aug-18 and 31-Aug-18
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason):

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.38	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.27							
PUMP	RS	0.30	Run	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.42							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.32							
A1	RS	0.17	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.20							
A2	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.36							
AR-02	RS	0.36	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.16							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:30 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		2-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,974	
	Cumulative Pump Volume Withdrawn (m3)	102,372	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.90	[enter value]
	Estimated volume available (m3)	145,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	2.38	[enter value]
5.13	24hrs flow at Apex IQA-10 (m3/s)	1.80	[enter value]
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 2-Sep-18 = 94,398

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:30 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	2-Sep-18

% IF: 5.13 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.80 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): withdrawal >10% IF 30-Aug-18 and 31-Aug-18
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason):

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.34	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.23							
PUMP	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.40							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.28							
A1	RS	0.14	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.17							
A2	RS	0.25	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.34							
AR-02	RS	0.33	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.14							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Sep-18	[enter value]
Time Completed		4:31 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		3-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	43	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.091	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,893	
	Cumulative Pump Volume Withdrawn (m3)	110,265	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.94	[enter value]
	Estimated volume available (m3)	111,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.69	[enter value]
7.43	24hrs flow at Apex IQA-10 (m3/s)	1.23	[enter value]
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 3-Sep-18 = 102,372

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Sep-18
Time Completed	4:31 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	3-Sep-18

% IF: 7.43 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.23 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): withdrawal >10% IF 30-Aug-18 and 31-Aug-18
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.37	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.26							
PUMP	RS	0.29	Run	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.42							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.31							
A1	RS	0.18	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.21							
A2	RS	0.28	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.37							
AR-02	RS	0.37	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.17							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		5-Sep-18	[enter value]
Time Completed		4:05 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		4-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	43	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.091	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,897	
	Cumulative Pump Volume Withdrawn (m3)	118,162	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	110.98	[enter value]
	Estimated volume available (m3)	98,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	1.41	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	1.09	[enter value]

**Cumulative Volume (m3) Withdrawn Before 4-Sep-18 = 110,265

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
8.42

IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	5-Sep-18
Time Completed	4:05 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	4-Sep-18

% IF: 8.42 **24-hr Flow at IQA-10 (vs. 30% MAD):** 1.09 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): withdrawal >10% IF 30-Aug-18 and 31-Aug-18
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.39	Run	No fish	N/A	N/A	N/A	IMG_8216	N/A
u/s pump	LS	0.28							
PUMP	RS	0.31	Run	No fish	N/A	N/A	N/A	IMG_8217	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.43							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.31							
A1	RS	0.20	Run	No fish	N/A	N/A	N/A	IMG_8218	N/A
u/s bridge	LS	0.22							
A2	RS	0.29	Run	No fish	N/A	N/A	N/A	IMG_8219	N/A
u/s Swim. Lk	LS	0.39							
AR-02	RS	0.38	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.19							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		6-Sep-18	[enter value]
Time Completed		1:09 PM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		5-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	43	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.091	
Pump Volume	Pumping Time for Pump A (minutes)	1,170	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,206	
	Cumulative Pump Volume Withdrawn (m3)	125,368	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.01	[enter value]
	Estimated volume available (m3)	88,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.19	[enter value]
9.87	24hrs flow at Apex IQA-10 (m3/s)	0.93	[enter value]
IF > 10	**NOTIFY STANTEC**		[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

**Cumulative Volume (m3) Withdrawn Before 5-Sep-18 = 118,162

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	6-Sep-18
Time Completed	1:09 PM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	5-Sep-18

% IF: 9.87 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.93 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): flow decreased to potentially have withdrawal > 10% IF
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.40	Run	No fish	N/A	N/A	N/A	IMG_8227	N/A
u/s pump	LS	0.30							
PUMP	RS	0.32	Run/Riffle	No fish	N/A	N/A	N/A	IMG_8228	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.44							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	IMG_8229	N/A
d/s pump	LS	0.33							
A1	RS	0.21	Run	No fish	N/A	N/A	N/A	IMG_8230	N/A
u/s bridge	LS	0.23							
A2	RS	0.30	Run	No fish	N/A	N/A	N/A	IMG_8231	N/A
u/s Swim. Lk	LS	0.39							
AR-02	RS	0.40	Run	No fish	N/A	N/A	N/A	IMG_8232	N/A
d/s Swim. Lk	LS	0.20							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		7-Sep-18	[enter value]
Time Completed		9:46 AM	[enter value]
Prepared by		Andrea Kneale	[enter name]
Date of Pumping Record Summary		6-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.093	
Pump Volume	Pumping Time for Pump A (minutes)	930	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	6,659	
	Cumulative Pump Volume Withdrawn (m3)	132,028	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.04	[enter value]
	Estimated volume available (m3)	81,000	[enter value]
% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	1.05	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.83	[enter value]
30% MAD at Apex IQA-10			

11.19

IF > 10 → **NOTIFY STANTEC** — Andrea Kneale [enter name]

PUMP RATE REDUCED (IF APPLICABLE) — [enter adjustment made]

IF < 10 → NO ACTION

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** — [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

**Cumulative Volume (m3) Withdrawn Before 6-Sep-18 = 125,368

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	7-Sep-18
Time Completed	9:46 AM
Prepared by	Andrea Kneale
Date of Pumping Record Summary	6-Sep-18

% IF: 11.19 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.83 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.41	Run	No fish	N/A	N/A	N/A	IMG_8233	N/A
u/s pump	LS	0.31							
PUMP	RS	0.33	Riffle	No fish	N/A	N/A	N/A	IMG_8234	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.45							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	IMG_8236	N/A
d/s pump	LS	0.34							
A1	RS	0.23	Run	No fish	N/A	N/A	N/A	IMG_8241	N/A
u/s bridge	LS	0.25							
A2	RS	0.32	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.41							
AR-02	RS	0.41	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.21							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18	[enter value]	
Time Completed	12:170:00 AM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	9-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.093		
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]	This report revised to reflect pump operation for 24hrs instead of the assume 15.5.
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	8,001		
	Cumulative Pump Volume Withdrawn (m3)	155,715		**Cumulative Volume (m3) Withdrawn Before 9-Sep-18 = 147,714
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.12	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	57,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.76	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.62	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
14.87

IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18
Time Completed	12:170:00 AM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	9-Sep-18

% IF: 14.87 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.62 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.45	Run	No fish	N/A	N/A	N/A	IMG_8271.jpg	N/A
u/s pump	LS	0.34							
PUMP	RS	0.35	Riffle	No fish	N/A	N/A	N/A	IMG_8272.jpg	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.48							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	IMG_8273.jpg	N/A
d/s pump	LS	0.36							
A1	RS	0.25	Run	No fish	N/A	N/A	N/A	IMG_8274.jpg	N/A
u/s bridge	LS	0.28							
A2	RS	0.34	Run	No fish	N/A	N/A	N/A	IMG_8275.jpg	N/A
u/s Swim. Lk	LS	0.43							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	IMG_8276.jpg	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	9-Sep-18	[enter value]
Time Completed	9:33 AM	[enter value]
Prepared by	Alice Kruchten	[enter name]
Date of Pumping Record Summary	7-Sep-18	[enter value]

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	42	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.090	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,803	
	Cumulative Pump Volume Withdrawn (m3)	139,830	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.07	[enter value]
	Estimated volume available (m3)	72,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 7-Sep-18 = 132,028

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.94	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.74	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)

12.12

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	9-Sep-18
Time Completed	9:33 AM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	7-Sep-18

% IF: 12.12 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.74 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.32							
PUMP	RS	0.33	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.46							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.34							
A1	RS	0.24	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.25							
A2	RS	0.33	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.42							
AR-02	RS	0.42	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.21							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18	[enter value]	
Time Completed	12:30:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	10-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.093		
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]	
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	7,993		
	Cumulative Pump Volume Withdrawn (m3)	163,707		**Cumulative Volume (m3) Withdrawn Before 10-Sep-18 = 155,715
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.14	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	49,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.81	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.66	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
14.06

IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18
Time Completed	12:30:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	10-Sep-18

% IF: 14.06 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.66 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.45	Run	No fish	N/A	N/A	N/A	IMG_8280.jpg	N/A
u/s pump	LS	0.35							
PUMP	RS	0.35	Riffle	No fish	N/A	N/A	N/A	IMG_8281.jpg	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.49							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	IMG_8282.jpg	N/A
d/s pump	LS	0.36							
A1	RS	0.25	Run	No fish	N/A	N/A	N/A	IMG_8283.jpg	N/A
u/s bridge	LS	0.27							
A2	RS	0.33	Run	No fish	N/A	N/A	N/A	IMG_8284.jpg	N/A
u/s Swim. Lk	LS	0.42							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	IMG_8279.jpg	N/A
d/s Swim. Lk	LS	0.23							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		12-Sep-18	[enter value]
Time Completed		4:25:00PM	[enter value]
Prepared by		Alice Kruchten	[enter name]
Date of Pumping Record Summary		11-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.092	
Pump Volume	Pumping Time for Pump A (minutes)	1,440	[enter value]
	Pumping Time for Pump B (minutes)	1,440	[enter value]
	Daily Pump Volume Withdrawn (m3)	7,981	
	Cumulative Pump Volume Withdrawn (m3)	171,689	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.16	[enter value]
	Estimated volume available (m3)	42,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	0.72	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.59	[enter value]

**Cumulative Volume (m3) Withdrawn Before 11-Sep-18 = 163,707

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)

15.62

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	12-Sep-18
Time Completed	4:25:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	11-Sep-18

% IF: 15.62 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.59 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.45	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.35							
PUMP	RS	0.35	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.49							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.37							
A1	RS	0.26	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.27							
A2	RS	0.34	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.43							
AR-02	RS	0.44	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.23							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	13-Sep-18	[enter value]	
Time Completed	4:48:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	12-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	44	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	49	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.069		
Pump Volume	Pumping Time for Pump A (minutes)	630	[enter value]	Pump A shut off after approximately 10.5 hours of operation on September 12th
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	5,929		
	Cumulative Pump Volume Withdrawn (m3)	177,618		**Cumulative Volume (m3) Withdrawn Before 12-Sep-18 = 171,689
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.18	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	36,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.66	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.53	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)
12.97

IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		

30% MAD at Apex IQA-10
0.261

24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	13-Sep-18
Time Completed	4:48:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	12-Sep-18

% IF: 12.97 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.53 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.45	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.35							
PUMP	RS	0.35	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.49							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.37							
A1	RS	0.26	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.27							
A2	RS	0.34	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.43							
AR-02	RS	0.44	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.23							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	14-Sep-18	[enter value]	
Time Completed	1:40:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	13-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.050		
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]	Pump A shut off on September 12th
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	4,328		
	Cumulative Pump Volume Withdrawn (m3)	181,946		**Cumulative Volume (m3) Withdrawn Before 13-Sep-18 = 177,618
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.20	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	30,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.72	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.56	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station
% Instantaneous Flow (IF) 8.96				
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]	
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]	
IF < 10	NO ACTION			
30% MAD at Apex IQA-10 0.261				
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]	
24-hr Flow > 0.261	NO ACTION			

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	14-Sep-18
Time Completed	1:40:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	13-Sep-18

% IF: 8.96 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.56 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): monitoring triggered on previous days
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.47	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.36							
PUMP	RS	0.36	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.49							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.38							
A1	RS	0.26	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.27							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.44							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	15-Sep-18	[enter value]	
Time Completed	1:00:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	14-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.050		
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]	Pump A shut off on September 12th
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	4,309		
	Cumulative Pump Volume Withdrawn (m3)	186,255		**Cumulative Volume (m3) Withdrawn Before 14-Sep-18 = 181,946
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.21	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	26,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.64	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.50	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)

9.91

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	15-Sep-18
Time Completed	1:00:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	14-Sep-18

% IF: 9.91 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.50 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): monitoring triggered on previous days
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.47	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.37							
PUMP	RS	0.36	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.50							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.38							
A1	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.29							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.44							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	16-Sep-18	[enter value]	
Time Completed	12:05:00PM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	15-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.050		
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]	Pump A shut off on September 12th
	Pumping Time for Pump B (minutes)	1,440	[enter value]	
	Daily Pump Volume Withdrawn (m3)	4,314		
	Cumulative Pump Volume Withdrawn (m3)	190,569		**Cumulative Volume (m3) Withdrawn Before 15-Sep-18 = 186,255
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.23	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	22,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	0.61	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
10.38	24hrs flow at Apex IQA-10 (m3/s)	0.48	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]	
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]	
IF < 10	NO ACTION			
30% MAD at Apex IQA-10				
0.261				
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]	
24-hr Flow > 0.261	NO ACTION			

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	16-Sep-18
Time Completed	12:05:00PM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	15-Sep-18

% IF: 10.38 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.48 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☑ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☐ YES, Other (provide reason): _____
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.47	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.37							
PUMP	RS	0.36	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.50							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.38							
A1	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.29							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.44							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	18-Sep-18	[enter value]
Time Completed	9:15:00AM	[enter value]
Prepared by	Alice Kruchten	[enter name]
Date of Pumping Record Summary	17-Sep-18	[enter value]

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	

Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	

Pump A shut off on September 12th

Pump B shut off on September 16th

**Cumulative Volume (m3) Withdrawn Before 17-Sep-18 = 193,074

Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]
	Estimated volume available (m3)	15,000	[enter value]

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.66	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.48	[enter value]

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)

0.00

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	17-Sep-18	[enter value]	
Time Completed	9:45:00AM	[enter value]	
Prepared by	Alice Kruchten	[enter name]	
Date of Pumping Record Summary	16-Sep-18	[enter value]	

Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]	
	Average Estimated Pump Rate for Pump B (L/s)	50	[enter value]	
	Total Averaged Estimated Pump Rate (m3/s)	0.029		
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]	Pump A shut off on September 12th
	Pumping Time for Pump B (minutes)	840	[enter value]	Pump B shut off on September 16th (approximately 2pm)
	Daily Pump Volume Withdrawn (m3)	2,505		
	Cumulative Pump Volume Withdrawn (m3)	193,074		**Cumulative Volume (m3) Withdrawn Before 16-Sep-18 = 190,569
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]	** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)
	Estimated volume available (m3)	16,000	[enter value]	** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

	24hrs flow at WSC 10UH002 (m3/s)	0.66	[enter value]	** Daily Average Flow - measured from WSC 10UH002 (Apex River) station
	24hrs flow at Apex IQA-10 (m3/s)	0.51	[enter value]	** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station
% Instantaneous Flow (IF) 5.65				
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]	
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]	
IF < 10	NO ACTION			
30% MAD at Apex IQA-10 0.261				
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]	
24-hr Flow > 0.261	NO ACTION			

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	17-Sep-18
Time Completed	9:45:00AM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	16-Sep-18

% IF: 5.65 **24-hr Flow at IQA-10 (vs. 30% MAD):** 0.51 Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): monitoring triggered on previous days
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.47	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.37							
PUMP	RS	0.37	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. No concern b/c flow > 30% MAD and RS water level > 30% MAD water level.
u/s pump	LS	0.50							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.38							
A1	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.29							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.45							
AR-02	RS	0.43	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

Notes:
- RS: right stake
- LS: left stake

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		19-Sep-18	[enter value]
Time Completed		9:25:00AM	[enter value]
Prepared by		Alice Kruchten	[enter name]
Date of Pumping Record Summary		18-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]
	Estimated volume available (m3)	16,000	[enter value]
	24hrs flow at WSC 10UH002 (m3/s)	0.61	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	0.44	[enter value]

**Cumulative Volume (m3) Withdrawn Before 18-Sep-18 = 193,074

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

% Instantaneous Flow (IF)

0.00

IF > 10 → **NOTIFY STANTEC** Alice Kruchten [enter name]

PUMP RATE REDUCED (IF APPLICABLE) [enter adjustment made]

IF < 10 → NO ACTION

30% MAD at Apex IQA-10

0.261

24-hr Flow < 0.261 → **STANTEC to NOTIFY DFO** [enter ACTION]

24-hr Flow > 0.261 → NO ACTION

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump A shut off September 12th, 2018
- pump B shut off September 16th, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		20-Sep-18	[enter value]
Time Completed		9:10:00AM	[enter value]
Prepared by		Alice Kruchten	[enter name]
Date of Pumping Record Summary		19-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]
	Estimated volume available (m3)	16,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 19-Sep-18 = 193,074

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	0.57	[enter value]
0.00	24hrs flow at Apex IQA-10 (m3/s)	0.41	[enter value]
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump A shut off September 12th, 2018
- pump B shut off September 16th, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		21-Sep-18	[enter value]
Time Completed		6:30:00AM	[enter value]
Prepared by		Alice Kruchten	[enter name]
Date of Pumping Record Summary		20-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.25	[enter value]
	Estimated volume available (m3)	16,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 20-Sep-18 = 193,074

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	0.52	[enter value]
0.00	24hrs flow at Apex IQA-10 (m3/s)	0.37	[enter value]
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump A shut off September 12th, 2018
- pump B shut off September 16th, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed		4-Oct-18	[enter value]
Time Completed		9:00:00AM	[enter value]
Prepared by		Alice Kruchten	[enter name]
Date of Pumping Record Summary		24-Sep-18	[enter value]
Pump Rate	Average Estimated Pump Rate for Pump A (L/s)	0	[enter value]
	Average Estimated Pump Rate for Pump B (L/s)	0	[enter value]
	Total Averaged Estimated Pump Rate (m3/s)	0.000	
Pump Volume	Pumping Time for Pump A (minutes)	0	[enter value]
	Pumping Time for Pump B (minutes)	0	[enter value]
	Daily Pump Volume Withdrawn (m3)	0	
	Cumulative Pump Volume Withdrawn (m3)	193,074	
Lake Geraldine	24hrs level at WSC 10UH013 (m)	111.24	[enter value]
	Estimated volume available (m3)	17,000	[enter value]

**Cumulative Volume (m3) Withdrawn Before 24-Sep-18 = 193,074

** Daily Average Water Level measured from WSC 10UH013 (Lake Geraldine)

** Until spillway elevation (111.3 mASL) reached (using reservoir rating curve)

% Instantaneous Flow (IF)	24hrs flow at WSC 10UH002 (m3/s)	N/A	[enter value]
	24hrs flow at Apex IQA-10 (m3/s)	N/A	[enter value]
IF > 10	**NOTIFY STANTEC**	Alice Kruchten	[enter name]
	PUMP RATE REDUCED (IF APPLICABLE)		[enter adjustment made]
IF < 10	NO ACTION		
30% MAD at Apex IQA-10			
0.261			
24-hr Flow < 0.261	**STANTEC to NOTIFY DFO**		[enter ACTION]
24-hr Flow > 0.261	NO ACTION		

** Daily Average Flow - measured from WSC 10UH002 (Apex River) station

** Daily Average Flow - directly upstream of pumping location (not including effect from pumping rate), scaled from WSC 10UH002 (Apex River) station

Additional Notes/Comments:
- pump rate for Pump A and Pump B is estimated average daily rate from installed flow meters
- pump A shut off September 12th, 2018
- pump B shut off September 16th, 2018
- hydrometric station 10UH002 did not have recorded flow for September 22nd to 24th, 2018

APEX RIVER - Daily Environmental Report
City of Iqaluit - Lake Geraldine Emergency Water Supply

Date Completed	4-Oct-18
Time Completed	9:00:00AM
Prepared by	Alice Kruchten
Date of Pumping Record Summary	24-Sep-18

% IF: 0.00 **24-hr Flow at IQA-10 (vs. 30% MAD):** N/A

Note: cell colours will change based on % IF and % MAD value

Monitoring Completed?

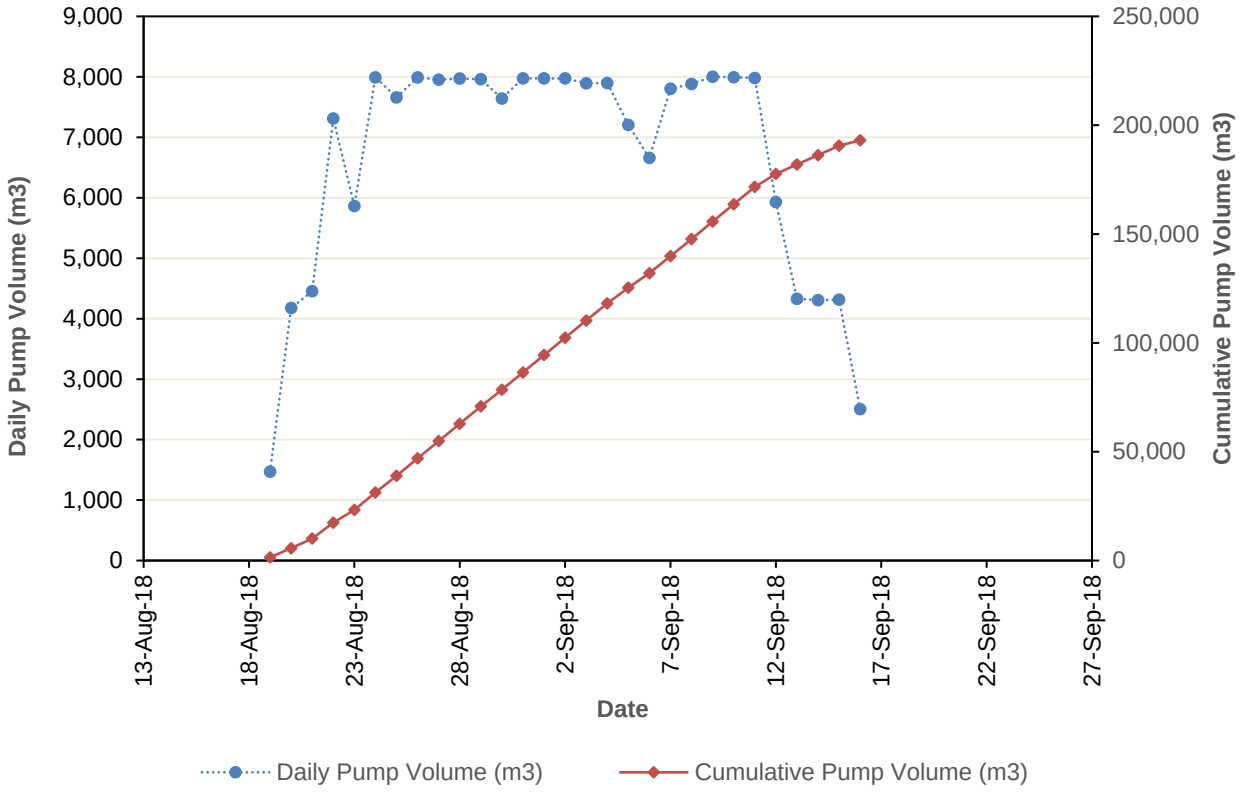
- ☐ YES (withdrawal > 10% IF and/or Flow < 30% MAD)
- ☑ YES, Other (provide reason): monitoring one week post pump shutoff
- ☐ NO (withdrawal < 10% IF and > 30% MAD)
- ☐ NO, Other (provide reason): _____

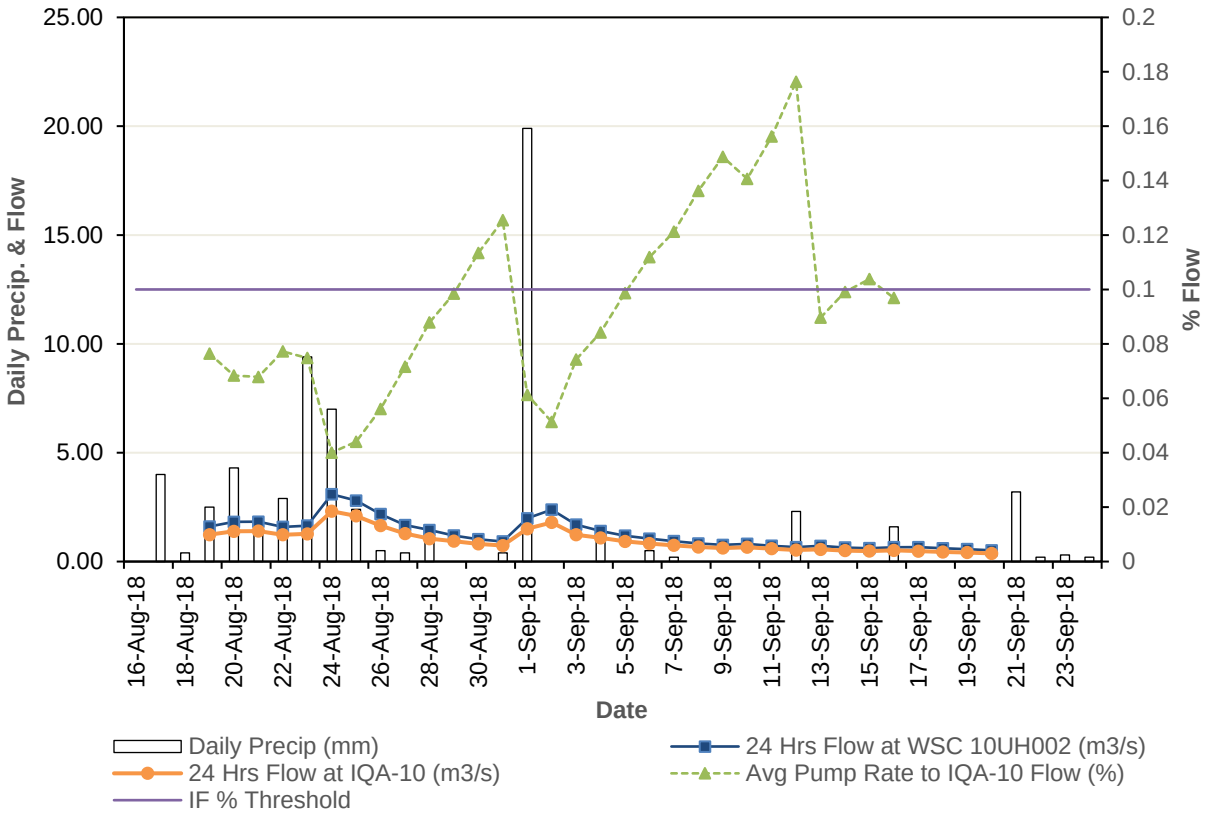
Meas./Obs.		Top of Stake to Water Level (m)	Habitat Conditions (pool/riffle/run)	Fish Observations	Fish Salvage?	If Fish Salvage Completed, OR Dead Fish Obs., No. Fish Rescued & Species	Transfer Locn.	Photo Nos.	Notes
AR-05	RS	0.42	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s pump	LS	0.32							
PUMP	RS	0.32	Riffle	No fish	N/A	N/A	N/A	N/A	LS water level < 30% MAD water level. Pumping shut off for several days.
u/s pump	LS	0.43							
PUMP	RS	N/A	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s pump	LS	0.33							
A1	RS	0.27	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s bridge	LS	0.29							
A2	RS	0.35	Run	No fish	N/A	N/A	N/A	N/A	N/A
u/s Swim. Lk	LS	0.45							
AR-02	RS	0.42	Run	No fish	N/A	N/A	N/A	N/A	N/A
d/s Swim. Lk	LS	0.24							

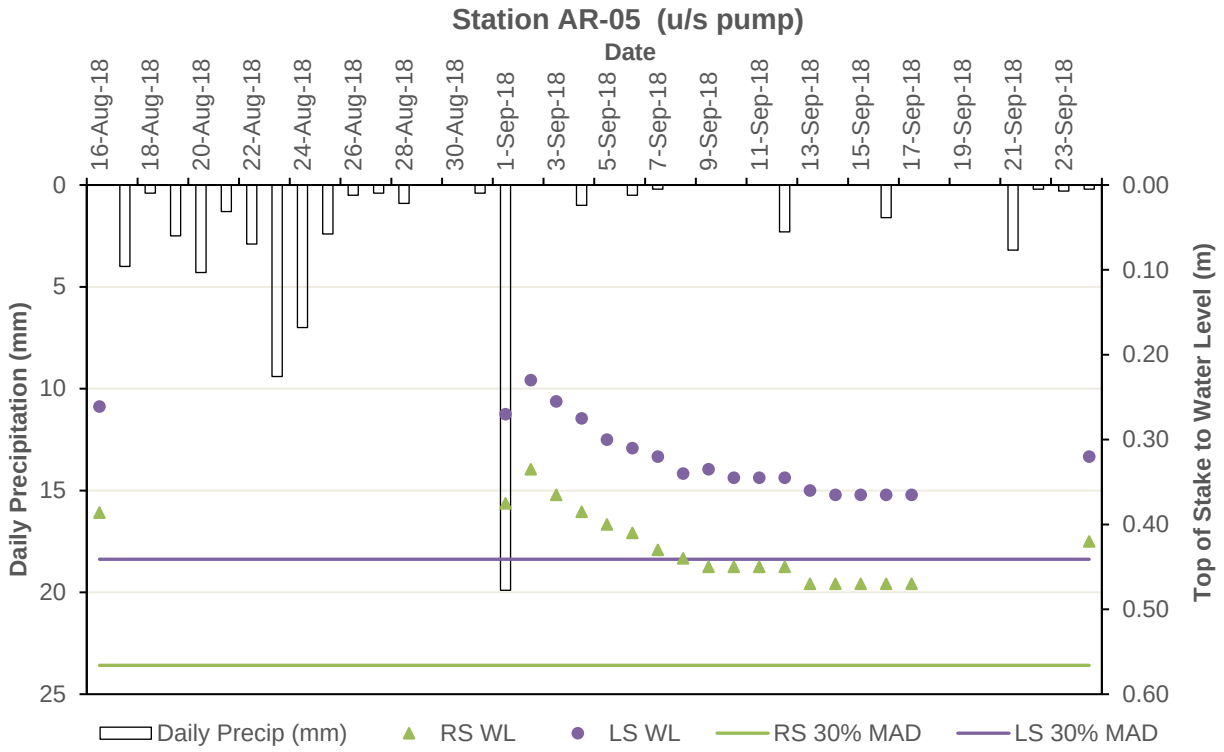
Notes:
- RS: right stake
- LS: left stake

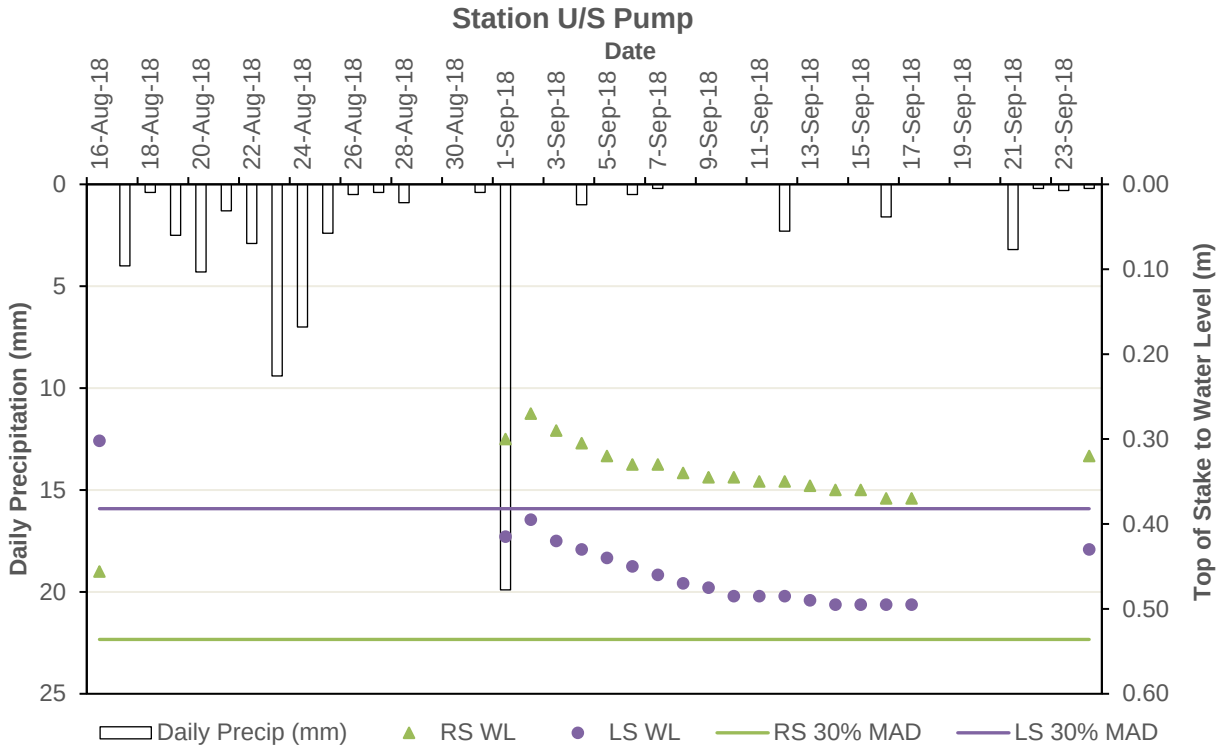
APPENDIX C

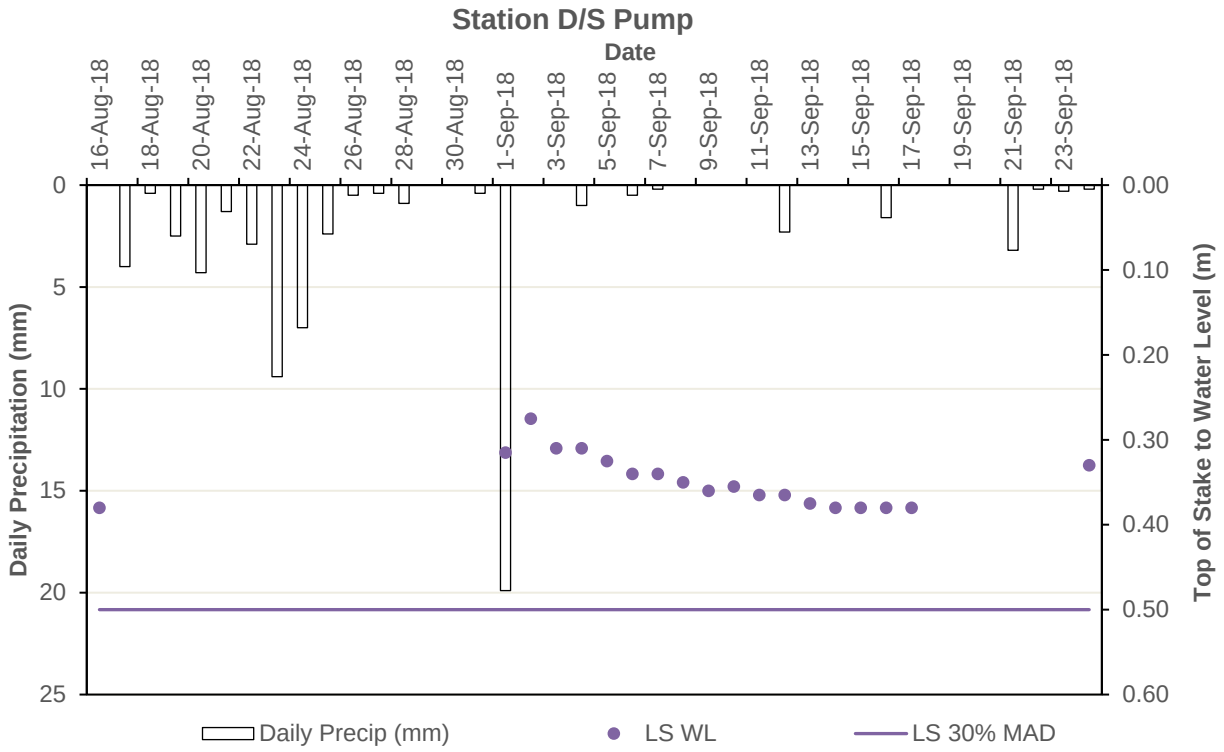
Station Relative Water Level with 30% MAD Level Plots

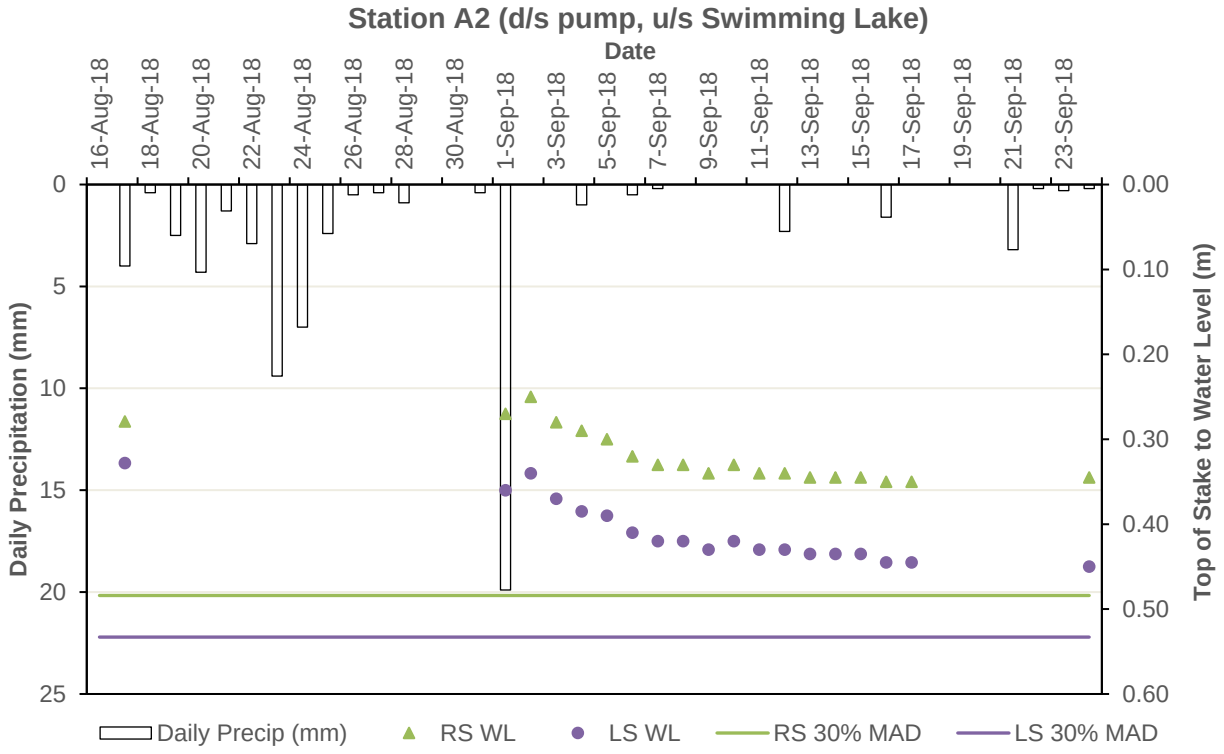

9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Daily Pump Volume (m3)
250,000
200,000
150,000
100,000
50,000
0
Cumulative Pump Volume (m3)
13-Aug-18
18-Aug-18
23-Aug-18
28-Aug-18
2-Sep-18
7-Sep-18
12-Sep-18
17-Sep-18
22-Sep-18
27-Sep-18
Date
Daily Pump Volume (m3)
Cumulative Pump Volume (m3)

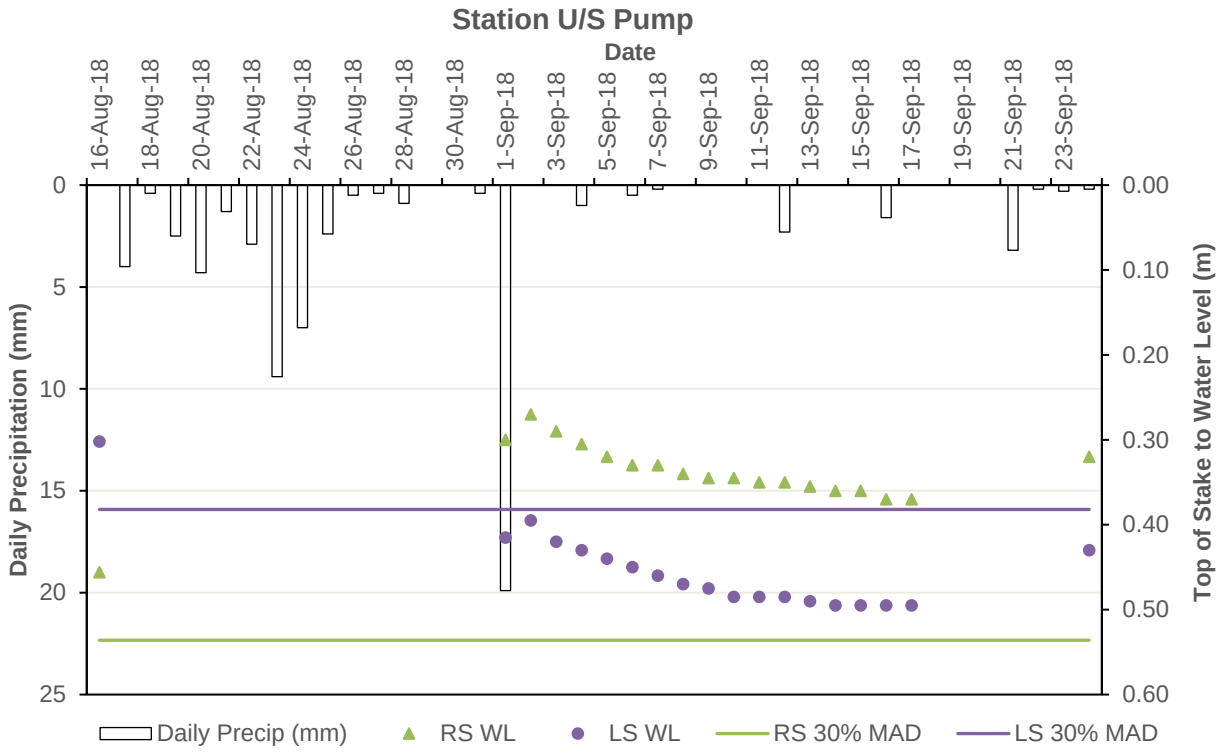

25.00
20.00
15.00
10.00
5.00
0.00
Daily Precip. & Flow
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
% Flow
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Date
Daily Precip (mm)
24 Hrs Flow at IQA-10 (m3/s)
IF % Threshold
24 Hrs Flow at WSC 10UH002 (m3/s)
Avg Pump Rate to IQA-10 Flow (%)


Station AR-05 (u/s pump)
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
RS WL
LS WL
RS 30% MAD
LS 30% MAD


Station U/S Pump
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
RS WL
LS WL
RS 30% MAD
LS 30% MAD


Station D/S Pump
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
LS WL
LS 30% MAD


Station A2 (d/s pump, u/s Swimming Lake)
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
RS WL
LS WL
RS 30% MAD
LS 30% MAD


Station U/S Pump
Date
16-Aug-18
18-Aug-18
20-Aug-18
22-Aug-18
24-Aug-18
26-Aug-18
28-Aug-18
30-Aug-18
1-Sep-18
3-Sep-18
5-Sep-18
7-Sep-18
9-Sep-18
11-Sep-18
13-Sep-18
15-Sep-18
17-Sep-18
19-Sep-18
21-Sep-18
23-Sep-18
Daily Precipitation (mm)
0
5
10
15
20
25
Top of Stake to Water Level (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Daily Precip (mm)
RS WL
LS WL
RS 30% MAD
LS 30% MAD