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,

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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

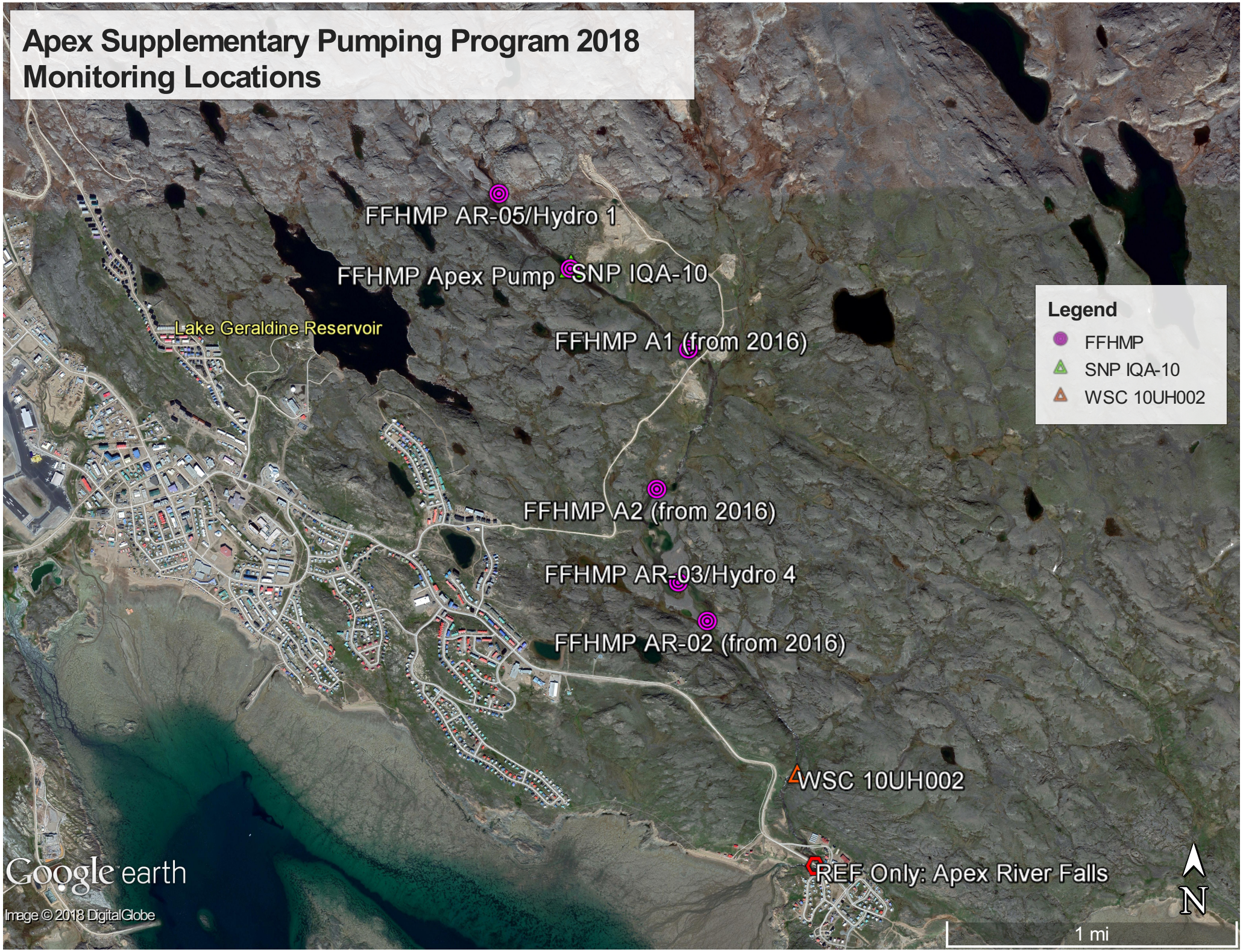
Daily monitoring reports will be prepared and uploaded to the secure Project FTP site, which will be made available for review.

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.