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March 22, 2019

File: 3AM-IQA1626

Attention: Derek Donald
Technical Advisor, Nunavut Water Board
[via email: derek.donald@nwb-oen.ca

Reference: 3AM-IQA1626 City of Iqaluit 2019 Application for Water Licence Amendment – Response to Information Requests (R-01) March 7, 2019

Dear Mr. Donald,

The City of Iqaluit has reviewed information requests from the following parties in response to the Nunavut Water Board's letter of February 13, 2019:

- Crown-Indigenous Relations and Northern Affairs Canada – Water Resources Division Nunavut

The City's response to these Information Requests is provided in the attachment to this letter. To address uncertainties raised in the Nunavut Impact Review Board process in regard to impacts of the proposal to the river ecosystem, the City is withdrawing its proposed contingency of pumping at a rate that exceeds DFO criteria (10% instantaneous flow; flows >30% mean annual discharge), and correspondingly, is also withdrawing its proposed Fish and Fish Habitat Monitoring Plan, which is only applicable under these conditions. The City demonstrates that the proposed annual withdrawal amount at the proposed withdrawal rate can be achieved.

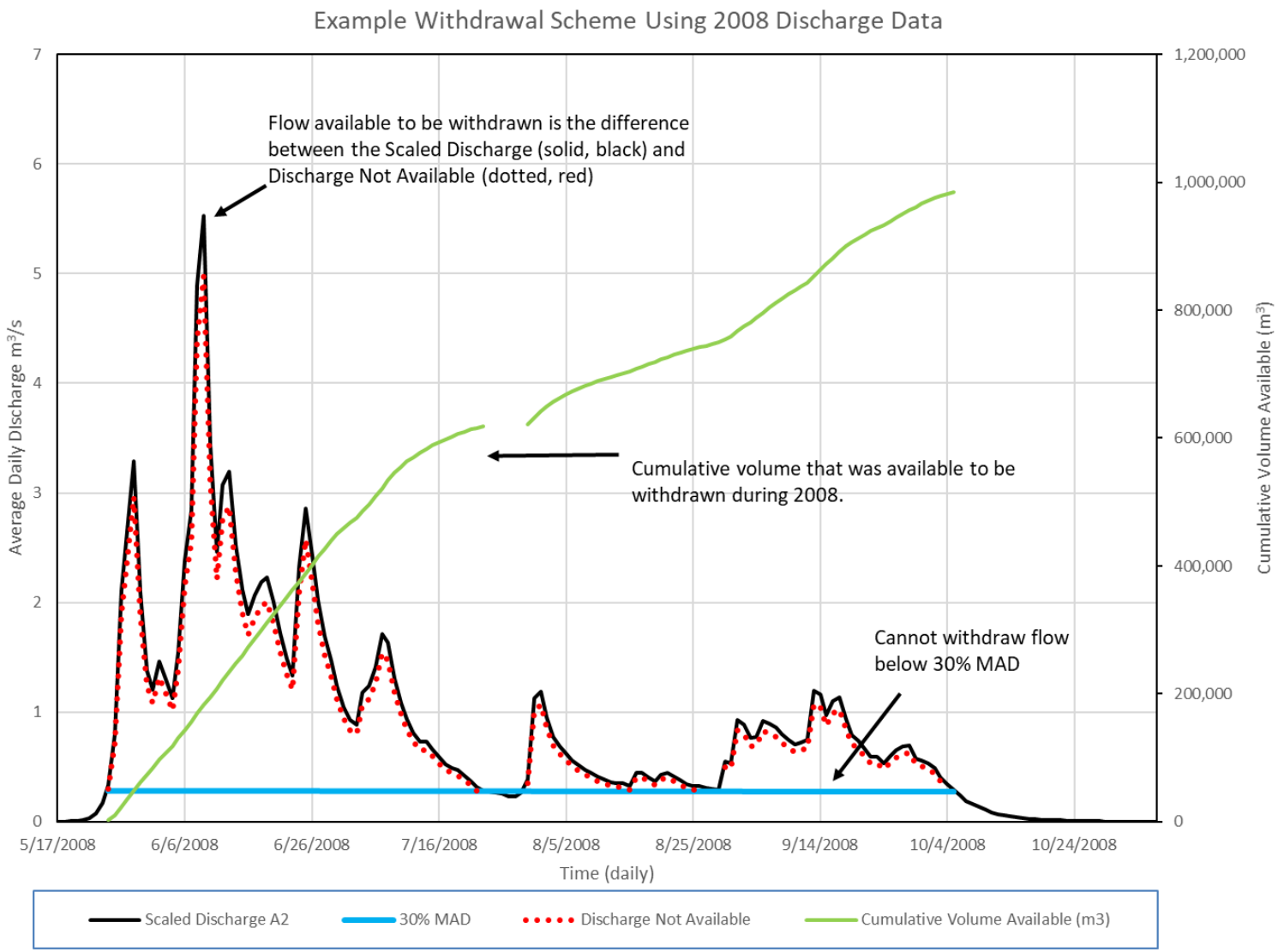
Should you have any questions regarding this information, please don't hesitate to contact me or the City's technical team: Josip Deronja (Josip.deronja@colliersprojectleaders.com); Erica Bonhomme (erica.bohomme@stantec.com).

Thank you,

Matthew Hamp
Director of Public Works & Engineering, City of Iqaluit

CC: Amy Elgersma – Chief Administrative Officer, City of Iqaluit
Josip Deronja – Acting Manager of Engineering, City of Iqaluit (Colliers Project Leaders)
Erica Bonhomme – Team Lead, Environmental Services North, Stantec

IR#[1]	Request	City of Iqaluit Response	Reference
WRD-1	**CIRNAC requests that the proponent present and analyze all the available historic flow and water level data at Station 10UH002 to predict if the Apex River has sufficient quantity of water to meet the predicted needs.**		
Response	Data from the Apex River Station (10UH002) were obtained from the HYDAT database, managed by the Water Survey of Canada (WSC). Nunami Stantec conducted an analysis of available flows from historic data, taking into consideration the DFO Ecological Flow Requirements. The available period of record for approved data from the Apex WSC station was 1973 to 2015 (data after 2015 is currently provisional); data from 2015 to 2018 is included with the understanding that it is currently preliminary. This analysis assumes that pumping (withdrawal) rates will be adjusted according to observed flows, in order to adhere to the DFO guidelines. A scaling factor was used to adjust the Apex WSC station data to the proposed withdrawal location. Mean Annual Discharge (MAD) was calculated for the open water season only (i.e. excluding zero values), in order to result in a conservative value for the calculated 30% MAD each year. Maximum flows were capped at the proposed maximum withdrawal rate of 150 L/s. An example / case study year (2008) is presented in the figure below, which shows flows scaled from the Apex WSC station in 2008, calculated available flows (above 30% calculated MAD, and below 10% instantaneous flow rates), and cumulative volumes available over the pumping window.		



Similar calculations were conducted for the entire period of record available for the Apex River station, scaled to the proposed withdrawal location, and capped by the maximum withdrawal rate as above. Data were missing for 1984, and 1996-2005 inclusive and were excluded from this analysis. A summary of annual calculated withdrawal volumes is presented in the table below. The volumes listed below assume flows are being adjusted daily. Climate change effects were not considered in this analysis – due to the short-term nature of the permit application timeframe (7 years), internal natural climatological and hydrological variability is expected to govern over

uncertainties related to climate change extremes.

Year	Number of Days with Observations	Calculated MAD	Calculated 30% MAD	Number of Days >30% MAD	Annual Total Volume available over 30% MAD	Annual Total Volume available at 10% instantaneous flow, pump capacity of 150 L/s	Annual Total Volume available between July and October, following 30/10 guidelines
%	%	m^3/s	m^3/s	%	m^3	m^3	m^3
1973	122	1.61	0.48	100	16,255,357	971,022	675,999
1974	105	0.87	0.26	77	7,449,182	580,254	341,956
1975	105	0.86	0.26	105	7,834,552	679,033	570,181
1976	107	1.21	0.36	82	10,630,723	753,521	562,999
1977	92	0.65	0.20	89	5,137,719	452,041	452,041
1978	64	2.35	0.70	60	12,790,371	633,048	633,048
1979	92	1.17	0.35	80	8,944,745	724,242	724,242
1980	99	0.58	0.17	99	4,964,271	433,718	342,998
1981	87	0.81	0.24	65	5,705,430	459,367	355,687
1982	153	0.66	0.20	103	8,505,133	673,921	433,986
1983	122	0.96	0.29	42	8,825,539	454,448	221,859
1985	176	1.15	0.35	130	15,380,423	1,119,274	719,801
1986	153	1.70	0.51	110	19,702,368	1,195,991	993,387
1987	122	1.78	0.53	108	18,176,278	1,095,732	796,577
1988	214	1.09	0.33	121	14,490,792	1,034,815	794,940
1989	365	0.82	0.25	96	10,170,612	702,417	569,631
1990	365	1.26	0.38	110	15,486,951	1,072,003	847,959
1991	365	0.78	0.23	113	10,461,942	872,701	659,564
1992	366	0.82	0.25	97	9,847,053	651,180	582,907
1993	305	0.72	0.21	109	7,974,319	742,101	732,451
1994	365	0.87	0.26	144	14,067,011	1,041,998	697,780
1995	324	0.73	0.22	108	7,628,621	703,114	662,685

Year¤	Number·of·Days·with·Observations¤	Calculated·MAD¤	Calculated·30%·MAD¤	Number·of·Days·>30%·MAD¤	Annual·Total·Volume·available·over·30%·MAD¤	Annual·Total·Volume·available·at·10%·instantaneous·flow,·pump·capacity·of·150·L/s¤	Annual·Total·Volume·available·between·July·and·October,·following·30/10·guidelines¤
2006¤	91¤	0.98¤	0.29¤	60¤	6,180,362¤	554,667¤	550,870¤
2007¤	365¤	1.01¤	0.30¤	107¤	15,825,585¤	976,995¤	692,814¤
2008¤	366¤	0.84¤	0.25¤	132¤	12,431,176¤	984,032¤	533,416¤
2009¤	365¤	1.12¤	0.34¤	104¤	15,050,808¤	924,938¤	661,071¤
2010¤	365¤	0.92¤	0.27¤	154¤	16,920,325¤	1,267,939¤	921,262¤
2011¤	365¤	1.09¤	0.33¤	125¤	13,471,548¤	937,413¤	655,553¤
2012¤	366¤	1.13¤	0.34¤	118¤	15,034,851¤	1,033,585¤	680,514¤
2013¤	365¤	1.36¤	0.41¤	99¤	17,497,497¤	886,352¤	640,836¤
2014¤	365¤	1.14¤	0.34¤	117¤	17,027,169¤	1,029,938¤	619,994¤
2015¤	361¤	1.23¤	0.37¤	85¤	15,030,763¤	780,392¤	521,143¤
2016¤	366¤	0.81¤	0.24¤	120¤	14,759,037¤	954,706¤	675,943¤
2017¤	365¤	0.82¤	0.25¤	131¤	15,711,951¤	1,064,204¤	695,757¤
2018¤	363¤	2.15¤	0.64¤	91¤	24,961,675¤	1,002,144¤	717,024¤
Average¤	¤	1.09¤	0.33¤	103¤	12,580,918¤	841,236¤	626,825¤
Min¤	¤	0.58¤	0.17¤	42¤	4,964,271¤	433,718¤	221,859¤
Max¤	¤	2.35¤	0.70¤	154¤	24,961,675¤	1,267,939¤	993,387¤

The final column in this summary table estimates the maximum available pumped volume for each year, subject to the following limits:

- Rate of extraction is below 10% of the instantaneous discharge
- Extraction does not occur at or below 30% MAD for the given year
- Pumping rates are adjusted daily
- Extraction rates are limited to the maximum capacity of the pump at 150L/s
- Extraction is limited to July-October each year

This analysis shows that, of the 35 years analyzed here, 29 years would have had available extraction volumes at or above the requested 500,000 m3.

The City further notes that the requested 500,000 m3 is the maximum volume that could be extracted annually, and that the full volume may not be
required each year.

WRD-2	**CIRNAC requests the City demonstrate how the limit will be set for daily withdrawals if a rate of less than 10% of the instantaneous flow, when natural flow is above 30% MAD, is not possible to meet the water supplementation requirements of Lake Geraldine.**
Response	The City will maintain withdrawal at rates less than 10% instantaneous flow, and when flows are greater than 30% mean annual discharge. As indicated in the response to WRD-1, the applied for withdrawals can be achieved based on the historical record, and furthermore, the City may not need to withdraw this full amount in any given year to meet supplementation requirements. Daily river flows will be monitored immediately upstream of the withdrawal site, and pumping rates will be adjusted as required daily to meet the withdrawal criteria. The City is withdrawing its contingency proposal to withdraw amounts exceeding the 10% instantaneous flow / 30% MAD threshold on the basis that the supplementation needs are likely to be met without doing so. The City is also correspondingly withdrawing the proposed Fish and Fish Habitat Monitoring Plan, as it only applied under conditions exceeding these criteria.
WRD-3	**CIRNAC requests that the proponent indicate how much fuel will be transported to site daily, the method of transportation, and any mitigation measures which will be followed to handle fuel and prevent spills during transportation.**
Response	The submersible pumps will be powered by an on-site generator. This generator will be refueled daily by fuel truck originating in the City of Iqaluit, and using the Road to Nowhere to access the pumping site. The estimated daily fuel (diesel) requirement has been updated to 1,080 litres. The generator will be housed within a trailer, stationed within a concrete lined enclosure, similar to what was erected in 2018 per photo below. The site is monitored 24 hours per day, with radio access. The fuel truck will be equipped with a spill kit, and a spill kit will be located at the refueling site. 

WRD-4	**CIRNAC requests a written update or report on how these Task Teams [Supplemental Pumping; Water Loss Control; Water Efficiency/Water Conservation] have improved the water shortage situation in Lake Geraldine, if and how the Task Teams are continuing to work on this issue, and the results of the above actions initiated by the City.**
Response	The Task Teams were successful in improving the water shortage situation in Lake Geraldine, as the various initiatives played a combined role in successfully replenishing required water reservoir levels in Lake Geraldine in 2018 prior to the winter season, while instilling water sustainability practices within the municipality. The various Task Teams were responsible for temporary supplementation of water from Apex River to Lake Geraldine through an emergency amendment to the City's Type A water license, monitoring water demand usage while assessing usage in the field through observations, monitoring and addressing leaks in the water distribution system immediately as they arise, and communication campaigns to the general public regarding water wise tips to assist with water conservation and sustainability. The Task Teams are continuing to work on these files, in anticipation of further water shortage conditions in Lake Geraldine. Some of these efforts consist of the following: • Monitoring of water demand usage on a weekly basis and comparing with historical levels. Trends in both increased and/ or decreased water demand are assessed with field campaigns related to operations and maintenance of the water distribution system. • Drinking Water Management Program aimed at engaging the public through scheduled consultations in order to address excess water usage, while continuing to promote water wise practices. • Monitoring and addressing water leaks within the water distribution system once they are identified. • Continued development of an asset management program aimed at addressing both short and long term Utilidor (water distribution) issues. • Investigation of a viable long-term water supplementation solution for the Lake Geraldine water reservoir. The City is presently investigating the Sylvia Grinnell River at a concept design level. The City is also assessing "Unnamed Lake"; and is presently gathering data to assist with assessing lake recharge and the water balance. All of these initiatives will help to alleviate shortages of water supply for Iqaluit's growing population; however, and despite these initiatives, the Lake Geraldine watershed will not supply enough water for Iqaluit in the future, and thus the City has proactively taken steps to identify long-term solutions, including the designation of the Apex River Watershed Protection Area for its possible use as a supplemental supply.
WRD-5	**CIRNAC seeks further details on the City of Iqaluit's strategies to complete the studies to determine potential long term water sources.**
Response	The Niaqunguk (Apex River) is identified as a potential source of supplemental water in the Iqaluit General Plan (By-law #703; Fotenn, 2010). The General Plan designates the Niaqunguk Watershed Protection Area as an area protected from development, specifically because the Niaqunguk River is identified for potential future water supply for the City: Policies identified in Section 7.3 of the General Plan identify the studies required before the Niaqunguk can be identified as a permanent supplemental water source. The results of these studies are presented in exp, 2014.

	The City is currently studying the feasibility of three potential permanent supplemental potable water sources: the Sylvia Grinnell River, "Unnamed Lake", and the Apex River. At Sylvia Grinnell, two potential intake sites and overland pipeline routing options have been compared in terms of their sustainability, implementation, reliability, community concerns and cost. At Unnamed Lake, the City has installed water level loggers and will be completing a water balance model to determine its recharge capacity. Conveyance options will be studied in terms of their implementation, reliability community concerns and cost, as compared to other options. A new hydrometric station will be installed at the proposed pumping location to obtain site-specific flow information. The presence of Arctic char in the Apex has been confirmed (Nunami Stantec 2017) and the capacity of the Apex to provide potable water under an unrestricted pumping scenario was confirmed in exp, 2014.
WRD-6	**CIRNAC seeks clarification on the starting date for installation and for operation of the pumps.**
Response	The City is proposing to access water from the Apex River during the open water season, prior to flows ceasing. This will vary from year-to-year, but will occur between June 15 and October 15, for example see response to WRD-1. The City wishes to revise its proposed dates for pumping to: "the open-water period, not before June 15, and not later than October 15". The installation of equipment may begin prior to this, as conditions allow.
WRD-7	**CIRNAC requests that this report be made available for review. [ref. Under Monitoring and Reporting of the Sedimentation and Control Plan, Appendix B, page 2, the City of Iqaluit notes that, "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."]**
Response	This is reasonable
[1] Organizations are abbreviated as follows WRD: Crown-Indigenous Relations and Northern Affairs Canada – Water Resources Division Nunavut Regional Office (March 1, 2019)	

References:

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

Fotenn. 2010. City of Iqaluit General Plan. By-law #703. Consolidated October 2015.

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, September 2017.