Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Water Resources Division
Resource Management Directorate
Nunavut Regional Office
P.O. Box 100
Iqaluit, NU, X0A 0H0

Your file - Votre référence
3BM-PEL1419

June 14, 2019

Our file - Notre référence
CIDM#1253612

Ida Porter
Licensing Administrator
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0

Re: Crown-Indigenous Relations and Northern Affairs Canada's comments on the Government of Nunavut – Community and Government Service's renewal application for water licence #3BM-PEL1419 – Hamlet of Kugaaruk

Dear Ms. Porter,

Thank you for your May 9, 2019 invitation for technical review comments on the above referenced application.

The Water Resources Division of Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the renewal application and the results of our review are provided in the enclosed memorandum for the Nunavut Water Board's consideration. Comments have been provided pursuant to CIRNAC's mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Indian Affairs and Northern Development Act*.

CIRNAC appreciates the opportunity to participate in this review. If there are any questions or concerns, please contact me at (867) 975-3876 or by e-mail at sarah.forte@canada.ca.

Sincerely,

Sarah Forté

Sarah Forté
Water Management Specialist

Canada

Technical Review Memorandum

To: Ida Porter, Licensing Administrator, Nunavut Water Board

From: Sarah Forté, Water Management Specialist, Water Resources Division, CIRNAC

Date: June 14, 2019

Re: Review of Renewal Application for Type B Water Licence 3BM-PEL1419

Applicant: Government of Nunavut - Community and Government Services
Project: Hamlet of Kugaaruk
Region: Kitikmeot

A. BACKGROUND

On July 19, 2019, the Nunavut Water Board (NWB) provided notification of Government of Nunavut - Community and Government Services' (GN-CGS) submission of a renewal application for Type B water licence 3BM-PEL1419 for the Hamlet of Kugaaruk.

The Hamlet of Kugaaruk has an expired licence for municipal undertakings for the use of water and deposit of waste. This renewal application is for a 10 year licence term.

Water is drawn from Kugajuk River and treated at the water treatment plant/truck fill station, which was completed in 2015. In their application, the applicant is requesting an increase in allowable water use from 45 000 m^3/year to 60 000 m^3/year.

The Hamlet uses trucks for both delivering water and collecting sewage. The sewage is disposed of in a sewage lagoon rebuilt in 2008 with a capacity of 46 000 m^3. Twice a year, the lagoon is decanted into a smaller secondary cell, from which effluent flows over into approximately 160 m of wetland before reaching the ocean. The lagoon has been leaking since 2014 at the southeast end, and a new leak developed on the north side in 2018. A tender is open to find a contractor to repair the lagoon by levelling some areas and adding an HDPE geomembrane liner. Work is expected to be complete by October 2020.

Solid wastes in the Hamlet are segregated with bulky materials and metals disposed of at the metal dump and other waste including household waste brought to the landfill.

B. RESULTS OF REVIEW

Crown-Indigenous and Relations Northern Affairs Canada (CIRNAC) Water Resources has read the documentation provided with this application and found that much of the necessary information has been provided. We commend the Hamlet on their efforts at cleaning the landfill and improving their 2018 annual report with tables of results. We would also like to praise the Hamlet for their monitoring efforts; they have collected relevant data that can inform decisions on water management. However, we recommend the applicant clarify uncertainties and commit to updating certain plans prior to a renewed licence being issued.

On behalf of CIRNAC, the following comments and recommendations are provided for the NWB's consideration.

1. Water quantity requested

Reference:

- Water Licence 3BM-PEL1419, Nunavut Water Board, May 14, 2014.
- Water Licence Renewal Application 3BM-PEL1419, Hamlet of Kugaaruk, GN-CGS, April 3, 2019. Box 13
- Email correspondence between Assol Kubeisinova (NWB technical advisor) and Shah Alam (GN-CGS municipal planning engineer), May 8, 2019.
- Kugajuk River Hydrology, Water Intake and Treatment Upgrades, Kugaaruk NU, Williams Engineering Canada, January 31, 2012.

Comment:

The expired water licence grants permission to use a quantity of water not to exceed:

45 000 cubic meters per annum or 170 cubic meters per day

These quantities are not equivalent, since 170 m^3/day time 365 days is 62 050 m^3.

GN-CGS is requesting that a renewed licence allow for the use of 60 000 m^3/year. The hydrology report indicates that this is well within the flow the Kugajuk River can provide, though there may be issues with saline intrusions and winter availability in certain years.

CIRNAC does not have concerns with the quantity of water requested.

Recommendation:

CIRNAC recommends that any renewed water licence should grant permission for equivalent daily and yearly quantities of water use.

2. Infrastructure capacity for growing population

Reference:

- Hamlet of Kugaaruk, NU, Sewage Treatment Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010. Section 2.1
- Hamlet of Kugaaruk, NU, Solid Waste Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010. Section 2.1
- Nunavut, Regional and Community Population Projections 2014 to 2035, Nunavut Bureau of Statistics, December 17, 2014.
- Census Profile, 2016 Census, Kugaaruk, Nunavut, Statistics Canada.
- Water Licence Renewal Application 3BM-PEL1419, Hamlet of Kugaaruk, GN-CGS, April 3, 2019. Executive Summary

Comment:

The population of Kugaaruk is growing, as is acknowledged by GN-CGS requesting more water for this 10 year renewal licence. It is not clear whether the other municipal infrastructure will have the capacity to meet the community's growing need over the next 10 years.

Several conflicting data on the population growth rate are available, as outlined in Table 1. The different rates can be used to calculate a projected population for the end of the requested licence term, which has been done starting from the 2016 census population of 933.

Table 1. Project population for Kugaaruk in 2029 using growth rates from different sources

Source	Year	Rate (%)	Projected population in 2029
Operation and maintenance manuals	2010	2.6	1303
Nunavut Bureau of Statistics	2014	1.2-1.4	1104
Statistics Canada Census	2016	3.9	1534
Renewal application executive summary	2019	5.7	1918

The 2010 operation and maintenance (O&M) manuals state there is sufficient capacity in the sewage lagoon and landfill for a projected population of 1127 in 2028. It appears as if the sewage lagoon capacity of 46 000 m^3 will not be sufficient for the increase water use of 60 000 m^3. It is not clear what the landfill capacity is.

The application should include management measures for the duration of the water licence term requested.

Recommendation:
The applicant should be required to clarify how their current infrastructure will meet the needs of the community for the next 10 years. If a modification to the sewage lagoon or different operation methods will be necessary to manage increased sewage production from the increased water withdrawal, these need to be detailed.

3. Measuring water quantity and water returned to the source

Reference:

- 2018 Annual Report for the Hamlet of Kugaaruk, GN-CGS, February 14, 2019
- Water Licence Renewal Application 3BM-PEL1419, Hamlet of Kugaaruk, GN-CGS, April 3, 2019, Box 13
- Kugaaruk Water Treatment Plant Technical Manual Rev. 06, Project #2400, BI Pure Water (Canada) Inc., November 2014. Section 1.4
- July 2018 3BM-PEL Water Licence Inspection Form, CIRNAC, October 18, 2018.
- RE: NWB Technical Review of 2017 Annual Report for water Licence 3BM-PEL1419, Date: June 8, 2018, signed by Dave Baines, Technical Advisor, NWB, GN-CGS, May 9, 2019.

Comment:
In the annual report, water quantity used is reported from the "On Tap Water Delivery System". It is not clear if this includes all water; two possible extra uses are:

1. The water treatment plant technical manual states "*Surplus water is returned to the river through intake casing #2.*" Since this surplus water is not delivered, it may not have been counted.
2. The renewal application includes an estimated 95 m^3/day returned to the source. No detail was found on where and how this occurs, whether it is the same water as for #1 above, and whether it has been counted.

CIRNAC has noted there is a raw water flow meter (Photo 1 of 2018 inspection report). However, the applicant's response in the May 9, 2019 letter to the NWB may be interpreted as saying the daily number of truck loads is used instead of the flow meter reading. They state: "*Flow meter at the treatment plant records water volume drawn and no storage before or after treated. Therefore, truck supply quantity is considered reasonable accurate and precise to calculate the volume from daily number of truck loads.*"

Recommendation:
CIRNAC recommends the applicant should specify:

- if the water quantity reported from the "On Tap Water Delivery System" is the same as is read from the raw water flow meter; and
- if surplus water from the water treatment plant, and water returned to the source are included in the quantity reported.

4. Monitoring program

Reference:

- Water Licence 3BM-PEL1419, Nunavut Water Board, May 14, 2014.
- RE: NWB Technical Review of 2017 Annual Report for water Licence 3BM-PEL1419, Date: June 8, 2018, signed by Dave Baines, Technical Advisor, NWB, GN-CGS, May 9, 2019.
- Proposed changes to 3BM-PEL1419 Monitoring Program, Appendix A of August 2014 3BM-PEL Water Licence Inspection Form, Aboriginal Affairs and Northern Development Canada, September 3, 2014.

Comment:

The water licence monitoring program includes 13 stations. Changes to the monitoring program were recommended by an Aboriginal Affairs and Northern Development Canada (AANDC) Inspector in 2014. These changes are echoed with some modifications in GN-CGS June 2019 letter to the NWB. Table 2 summarizes the changes, with a last column suggesting further changes based on this application review.

Table 2. Monitoring program stations with proposed changes

Station	Description	Type Frequency	AANDC 2014 suggested modifications	GN-CGS 2019 suggested modifications	CIRNAC 2019 suggested modifications
PEL-1	Raw water supply intake at the Kugajuk River	Volume. Daily.	No change.	No change.	No change.
PEL-2	Raw sewage from pump-out truck 68°31'13.7"N 89°49'49.3"W	Volume. Daily.	No change.	No change.	No change.
PEL-3-1	Effluent discharge from lagoon to settlement pond 68°31'16.7"N 89°50'05.7" W	Quality. Monthly (July-Sept.).	Reduce frequency to: prior to each decant. Change coordinates to: 68°31'16.2"N 89°50'02.2"W	Adopt AANDC suggestion.	Adopt AANDC suggestion.
PEL-3-2	Effluent discharge from settlement pond to wetland 68°31'17.9"N 89°50'03.2"W	Quality. Monthly (July-Sept.).	Reduce frequency to: prior to each decant.	Reduce frequency to: during decanting.	Adopt AANDC suggestion.
PEL-4	Effluent final discharge point from wetland to ocean 68°31'21.4"N 89°50'16.1"W	Quality. Monthly (July-Sept.).	No change.	No change.	No change.
PEL-6	Run-off from the solid waste disposal facility 68°31'14.0"N 89°49'43.7"W	Quality. During periods of run-off or seepage.	No change.	No change.	No change.
PEL-7	Monitoring well located up gradient of the solid waste disposal facility (metal dump) 68°31'03.7"N 89°49'03.1"W	Quality. Once during ground thaw.	Remove.	No change.	Remove

Station	Description	Type Frequency	AANDC 2014 suggested modifications	GN-CGS 2019 suggested modifications	CIRNAC 2019 suggested modifications
PEL-8-1	Monitoring well located up gradient of the solid waste disposal facility 68°31'08.9"N 89°49'31.8"W	Quality. Once during ground thaw.	Remove.	Remove.	Remove.
PEL-8-2	Monitoring well located down gradient of the solid waste disposal facility 68°31'13.3"N 89°49'23.8"W	Quality. Once during ground thaw.	Remove.	Remove.	Remove.
PEL-9-1	Monitoring well located down gradient of the solid waste disposal facility (metal dump) 68°30'58.8"N 89°49'24.0"W	Quality. Once during ground thaw.	Change coordinates to: 68° 30'58.6"N 89° 49'16.4"W	No change.	Remove.
PEL-9-2	Monitoring well located down gradient of the solid waste disposal facility (metal dump) 68°30'59.9"N 89°49'26.2"W	Quality. Once during ground thaw.	Change from monitoring well to run-off sampling.	Adopt AANDC suggestion. Change frequency to: Monthly (July-Sept.).	Adopt GN-CGS suggestion.
PEL-10-1	Monitoring well (optional) located down gradient of the solid waste disposal facility 68°31'13.5"N 89°49'42.1"W	Quality. Once during ground thaw.	Remove.	Remove.	Remove.
PEL-10-2	Monitoring well (optional) located down gradient of the solid waste disposal facility 68°31'09.6"N 89°49'42.0"W	Quality. Once during ground thaw.	Make mandatory rather than optional.	Adopt AANDC suggestion.	Remove.

Certain stations defined as monitoring wells, and to our knowledge, the only monitoring well on site is near the sewage lagoon. Since the applicant is able to take surface samples of the run-off from the solid waste and metal dumps, we recommend keeping only surface run-off stations for the solid waste and metal dumps, to be sampled monthly between July and September when water is flowing.

We also recommend adopting a change in frequency of sampling from the sewage lagoon and effluent pond to “prior to decant”. Since no effluent is supposed to be released between decants, it should not be necessary to test it.

This series of proposed changes has led to confusion, and it is not always clear which sample results reported by the applicant in their annual report correspond to which locations. Simplifying and harmonizing the licence sampling stations will help with consistent and coherent sampling.

Recommendation:
CIRNAC recommends the monitoring program stations be simplified in any renewed licence to help with more effective monitoring. We have included suggested modifications in the right most column of Table 2.

5. Water quality of sewage lagoon effluent

Reference:

- Water Licence 3BM-PEL1419, Nunavut Water Board, May 14, 2014.
- 2014 to 2018 Annual Reports for the Hamlet of Kugaaruk, GN-CGS, 2015 to 2019
- Canadian Water Quality Guidelines for the Protection of Aquatic Life, Phenols, mono- and dihydric phenols, Canadian Council of Ministers of the Environment, 1999.

Comment:

The licence has discharge criteria for the sewage disposal facility (station PEL-3) and the wetland treatment area at its final discharge point (PEL-4). The list of monitoring stations has PEL-3-1 and PEL-3-2, and it is not clear if the PEL-3 criteria apply to both the stations, or only one of the two.

When reviewing sampling results reported over the last 5 years, we note that all samples from PEL-3-1 (n=7) and PEL-3-2 (n=6) meet the oil & grease and total suspended solids criteria of "no visible sheen" and 180 mg/L respectively. A single sample does not meet the pH criteria of "between 6 and 9". More than half of the samples exceed the Faecal Coliform and BOD_5 limits of 10^4 CFU/dL and 120 mg/L respectively. No pattern or trend was found in the sample results over the 5 years to help predict which ones would not conform.

The discharge criteria set in the licence for PEL-4 are the same for Faecal Coliform, oil & grease, and pH. For BOD_5 and total suspended solids, maximum allowable concentrations are reduced to 45 mg/L for both parameters. Results reported for PEL-4 (n=9) only have one sample with exceedances, in September 2018 BOD_5 was 76 mg/L and Fecal Coliform were at 1.25×10^4 CFU/dL.

These data suggest that the sewage lagoon and secondary settlement cell do not consistently reduce BOD_5 and Faecal Coliform below discharge limits. However, the wetland is effective enough at lowering these parameters for its final discharge to meet more stringent requirements.

Total phenols concentrations are quantified in the annual reports, and we note that concentrations are elevated – values range from 6.5 to 1150 µg/L with an average of 557 µg/L. The water licence does not have discharge limits for phenols. The Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG-PAL) value for freshwater is 4 µg/L.

Recommendation:

CIRNAC recommends the applicant continue monitoring the water quality.

6. Water quality of solid waste facility and metal dump run-off

Reference:

- Water Licence 3BM-PEL1419, Nunavut Water Board, May 14, 2014.
- 2014 to 2018 Annual Reports for the Hamlet of Kugaaruk, GN-CGS, 2015 to 2019
- Canadian Water Quality Guidelines for the Protection of Aquatic Life, Canadian Council of Ministers of the Environment, 1999.
- Hamlet of Kugaaruk, NU, Solid Waste Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010.

Comment:

We reviewed sampling results from annual reports over the last five years. As mentioned in comment 4, changes in sample station designation have led to the use of many station names that can be difficult to correlate. For this review, two groupings were used, samples from the metal dump (that include station names PEL-5, PEL-7, PEL-8, PEL-8-1, PEL-8-2, PEL-9 and PEL-9-2) and samples from the solid waste facility (station names PEL-6 and PEL-10-1).

As the run-off from the facilities is not controlled, the licence does not include discharge criteria. Reported concentrations were compared with CWQG-PAL, as the water sampled is directly in the environment.

Run-off samples from the metal dump (n=13) met the guidelines in almost all cases. Exceedances were sporadic and within 2-3 times the guideline; one sample had high aluminum concentration, two samples had high iron, and one of the two with high iron also had high lead concentration.

This contrasts with run-off samples from the solid waste facility (n=8), which show consistently high concentrations of iron and zinc, respectively 4-19 times and 3-8 times the guidelines. Manganese concentrations are also high, although there is no CWQG-PAL for this element.

At present the only water management measure referred to in the solid waste facility O&M manual is a bermed area used to store hazardous waste at the solid waste facility. Water quality of water flowing through the solid waste facility is being degraded, which suggests water management measures are insufficient.

Recommendation:

CIRNAC recommends the applicant be required to take measures that will reduce water contamination from the solid waste facility. These might include building a berm or ditch around the southeast of the facility to reduce the amount of water flowing through it.

7. Salt water intrusions

Reference:

- Kugajuk River Hydrology, Water Intake and Treatment Upgrades, Kugaaruk NU, Williams Engineering Canada, January 31, 2012.
- 2011 to 2018 Annual Reports for the Hamlet of Kugaaruk, GN-CGS, 2012 to 2019

Comment:

The hydrology report references salt water intrusions from the ocean into the Kugajuk River in 1992 and 2011-12, which reached the Hamlet's water intakes in the river and interrupted their supply. The 2011 annual report also makes reference to a salt intrusion. When such intrusions occur, emergency measures are required to find an alternate water source. The hydrology report was commissioned "*to better understand various factors which influence salinity intrusions and to inventory the fresh water supply within the river near the intake.*"

The report concluded with several recommendations including:

- the addition of a staff gauge near the hamlet's raw water intake;
- collaborating to collect hydrometric and tidal data to predict the distance upstream that could be affected by tides at different flow rates; and
- an alternative water supply be explored.

In the documents submitted since 2012, no further reference to saline intrusions or any work to increase preparedness were found.

Recommendation:

CIRNAC recommends that the applicant provide an update on salt water intrusions including:

- If and when any intrusions have occurred since 2012;
- Which of the report's recommendations have been implemented;
- A schedule for completion of the outstanding recommendations, or justification as to why they will not be implemented.

8. Spill contingency plan

Reference:

- Hamlet of Kugaaruk, NU, Spill Contingency Plan, Sewage and Solid Waste Sites, Dillon Consulting Limited, October 6, 2009.
- RE: Spill Contingency Plan Approval for Licence 3BM-PEL0712, Part F Item 2, Type "B", Nunavut Water Board, January 22, 2010.
- RE: NWB Technical Review of 2017 Annual Report for the Hamlet of Kugaaruk; Water Licence No. 3BM-PEL1419, Nunavut Water Board, June 8, 2019.

- RE: NWB Technical Review of 2017 Annual Report for water Licence 3BM-PEL1419, Date: June 8, 2018, signed by Dave Baines, Technical Advisor, NWB, GN-CGS, May 9, 2019.
- Kugaaruk Water Treatment Plant Technical Manual Rev. 06, Project #2400, BI Pure Water (Canada) Inc., November 2014. Section 1.2
- Hamlet of Kugaaruk, NU, Solid Waste Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010. Appendix G

Comment:
The most recent version of a spill contingency plan found on the NWB's ftp registry dates from 2009. It was approved by the NWB in 2010 with the caveat that an addendum would be produced within 60 days. There has since been communication on the topic between the NWB and the applicant which are unclear. The NWB has no record of receiving any further information for the spill contingency plan, to which the applicant replied they had shared O&M manuals including a technical manual for the water treatment plant.

In addition to the deficiencies identified in the NWB's 2010 approval letter, CIRNAC would like to re-emphasize and draw attention to the following points:

- The plan needs to be updated with a new cover page and date, so people are aware it is still relevant.
- Contact names and phone numbers need to be updated in sections 1.1, 1.3, 1.11, 2.1 & 4.1. For the CIRNAC contact, please use Manager of Field Operations at 867-975-4553.
- The material safety data sheets (MSDS) need to be updated as they are expired. They need to be replaced every 3 years.
- The water treatment plant manual refers to sodium hypochlorite, which should be included in tables 2 and 4 listing hazardous materials. While updating, the lists in these tables should be reviewed for any other modifications, additions or removals necessary.
- The water treatment plant needs to be included more thoroughly in the plan; in the title and as a site with hazardous materials in section 1.8 and figure 1.
- A map needs to be provided with site drainage and location of spill kits. Figure 2 in appendix G of the solid waste facility O&M manual has drainage patterns around the hamlet and could be of help.
- Spill kits are a necessity, so wording of section 4.1 referring to them as a recommendation should be changed to be more definitive.

Recommendation:
CIRNAC recommends that the applicant update their Spill Contingency Plan to address points raised in the NWB's 2010 approval letter as well as the items listed above.

9. Solid waste facility operation and maintenance manual

Reference:

- Hamlet of Kugaaruk, NU, Solid Waste Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010.
- July 2016 3BM-PEL Water Licence Inspection Form, Aboriginal Affairs and Northern Development Canada, November 7, 2016.
- 2018 Annual Report for the Hamlet of Kugaaruk, GN-CGS, February 14, 2019

Comment:

The most recent version of a solid waste facility O&M manual we found on the NWB's ftp registry dates from 2010. As with the Spill Contingency Plan, communication between the NWB and applicant possibly refers to a more recent version.

The solid waste facility O&M manual is outdated and does not reflect current practises. CIRNAC would like to emphasize that our Inspector has found the site clean and well maintained. Revisions for an updated manual should include:

- A new cover page and date, so people are aware it is still relevant.
- Contact names and phone numbers need to be updated in section 8.1.
- Landfill capacity (section 2.1) needs to be revisited in the context of a population growing faster than previously measured (related to comment 2).
- Procedures for burning. Section 4.9 of the 2010 manual state "*There is to be **NO** burning of waste at any time in the Solid Waste or Bulky Metals Facilities.*" However, there is a burn box at the landfill facility (photo 10 of 2016 inspection report), and the 2018 annual report refers to cleaning up ashes from burns. Since burning is used to manage the garbage, including a procedure in the O&M manual will help ensure safe and consistent work.
- The manual prescribes covering compacted refuse with a 300 mm layer of granular cover material every day. This does not occur and it is not necessary to do it every day given the amount of garbage generated. The O&M procedure should be more practical and reflective of reality.

Any modifications to operating procedures resulting from the recommendation associated to comment 6 above should be incorporated into the manual.

Recommendation:

CIRNAC recommends the applicant update their solid waste facility O&M manual.

10. Sewage treatment facility operation and maintenance manual

Reference:

- Hamlet of Kugaaruk, NU, Sewage Treatment Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010.
- Water Licence Renewal Application 3BM-PEL1419, Hamlet of Kugaaruk, GN-CGS, April 3, 2019. Executive summary.
- Kugaaruk Wastewater Treatment, Issued for Tender, Project No. 15425-00239, GN-CGS, May 2018.

- Hamlet of Kugaaruk, Dam Safety Review, Project Number OTT-00219538-A0, Exp Services Inc., November 2014.

Comment:
The most recent version of a sewage treatment O&M manual we found on the NWB's ftp registry dates from 2010. As with the Spill Contingency Plan, communication between the NWB and applicant possibly refers to a more recent version.

The sewage facility O&M manual is outdated and does not reflect current practises. CIRNAC recognizes that GN-CGS currently has an open tender to improve the sewage lagoon facility and work is expected to be complete by 2020. Based on the issued for tender drawings, it appears as if the operation will be similar to what is currently done. Revisions for an updated manual should include:

- A new cover page and date, so people are aware it is still relevant.
- Contact names and phone numbers need to be updated in section 3.12.
- Sewage lagoon capacity (section 2.1) needs to be revisited in the context of a population growing faster than previously measured (related to comment 2).
- Procedures for operation from break-up to freeze-up. Section 3.2.2 of the 2010 manual describes how to use the discharge pipe valve to decant the sewage lagoon into the secondary cell. However, since at least 2014, decanting has been done using a generate on the west berm, "*hooked up to a sump pump that is installed below the effluent surface in the upper cell and connected to a hose that extends over the top of the berm and down the downstream slope to the lower cell.*" If procedures used allow the lagoon to operate as designed, the O&M manual should reflect them to help ensure safe and consistent work.

Recommendation:
CIRNAC recommends the applicant update their sewage treatment facility O&M plan once the repair work has been completed.

11. Sewage sludge management

Reference:

- Hamlet of Kugaaruk, NU, Sewage Treatment Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010.
- Hamlet of Kugaaruk, NU, Solid Waste Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010.
- Water Licence Renewal Application 3BM-PEL1419, Hamlet of Kugaaruk, GN-CGS, April 3, 2019. Executive summary.
- Kugaaruk Wastewater Treatment, Issued for Tender Drawings, Project No. 15425-00239, GN-CGS, May 2018.

Comment:
The sewage treatment facility O&M manual describes how to measure sludge depth and take samples in the lagoon, and recommends using the services of an engineer to

remove sludge if it is thicker than 0.5 m. No further information on disposal of dewatered sludge is provided, and no reference to sewage sludge disposal was found in the solid waste facility O&M manual.

From the renewal application executive summary and the issued for tender drawings, it appears that geo-tubes will be used to dewater sludge removed from the lagoon, and the tubes will be placed on a provisional geo-tube pad site plan that includes berms.

These are inferences, and we do not know how water collected in the bermed geo-tube pad will be managed, nor where the de-watered sludge will be disposed.

Recommendation:
CIRNAC recommends the applicant be required to provide information on their sludge management so that the measures to prevent contaminated water from entering the environment can be evaluated, and a water licence can include appropriate discharge criteria and monitoring requirements.

12. Temporary sewage treatment measures

Reference:

- Water Licence Renewal Application 3BM-PEL1419, Hamlet of Kugaaruk, GN-CGS, April 3, 2019. Executive summary.
- Kugaaruk Wastewater Treatment, Issued for Tender Drawings, Project No. 15425-00239, GN-CGS, May 2018.

Comment:
Temporary sewage treatment measures will be required during the work to repair the sewage lagoon. CIRNAC was unable to find information on these measures and we are therefore unable to evaluate the possible effectiveness of sewage treatment during the construction period.

Recommendation:
CIRNAC recommends that the applicant be required to provide information on temporary sewage treatment measures, including actions to prevent unauthorized discharges.

13. Quality assurance/quality control plan

Reference:

- Water Licence 3BM-PEL1419, Nunavut Water Board, May 14, 2014.
- Re: Water Licence No. 3BM-PEL0712, Part H, Item 10, Dillon Consulting Limited, December 9, 2009.
- Hamlet of Kugaaruk, NU, Sewage Treatment Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010.
- Hamlet of Kugaaruk, NU, Solid Waste Facility Operation and Maintenance Manual, Dillon Consulting Limited, October 27, 2010.

Comment:
The hamlet of Kugaaruk does not have a quality assurance/quality control (QA/QC) plan, as required by Part H Item 11 of their water licence. In 2009, Dillon Consulting sent a letter asking the NWB to consider sections within the sewage treatment facility and the solid waste facility O&M manuals as meeting the requirements for a QA/QC plan. The decision accompanying the 2014 water licence explains why the O&M plans are insufficient: "*The QA/QC Plan included within the STF O&M Manual is very general and does not include information about the laboratory accreditation pursuant to ISO/IEC Standard 17025.*"
A QA/QC plan is a requirement of all municipal licences, with which the majority of hamlets comply. It should therefore not be too onerous to provide one for Kugaaruk, and though the sampling locations and frequencies would have to be modified, the sampling methods and QA/QC procedures could be copied from another of GN-CGS' hamlet licences.

QA/QC samples can include travel blanks, field blanks and duplicates. If resources limit the number of QA/QC samples, we recommend keeping duplicates, as a measure of how accurate the samples are. Therefore if instructions prescribe the number of sample bottles to order, they should include an extra for a duplicate.

Recommendation:
CIRNAC recommends that the applicant be required to submit a QA/QC plan, addressing deficiencies identified. We further recommend that the submission date be after the list of sampling stations is agreed on, so they can be accurately reflected in the plan.