



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  
3AM-IQA1626

July 17, 2020

Our file - Notre référence  
CIDM#1286963

Richard Dwyer  
Manager of Licensing  
Nunavut Water Board  
P.O. Box 119  
Gjoa Haven, NU, X0B 1J0  
sent via email: [licensing@nwb-oen.ca](mailto:licensing@nwb-oen.ca)

**Re: Crown-Indigenous Relations and Northern Affairs Canada's technical review of the City of Iqaluit's amendment application for water licence #3AM-IQA1626 for new solid waste disposal facilities**

Dear Mr. Dwyer,

Thank you for your June 19, 2020 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 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 Crown-Indigenous Relations and Northern Affairs Act*. If there are any questions or concerns, please contact Bridget Campbell at (867) 975-42782 or [bridget.campbell@canada.ca](mailto:bridget.campbell@canada.ca), or Sarah Forté at (867) 975-3876 or [sarah.forte@canada.ca](mailto:sarah.forte@canada.ca).

Sincerely,

Bridget Campbell  
Water Management Coordinator

## **Technical Review Memorandum**

To: Richard Dwyer, Manager of Licensing, Nunavut Water Board

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

Date: July 17, 2020

Re: Crown-Indigenous Relations and Northern Affairs Canada's technical review of the City of Iqaluit's amendment application for water licence #3AM-IQA1626 for new solid waste disposal facilities

Region: ☐ Kitikmeot ☐ Kivalliq ☒ Qikiqtani

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### **A. BACKGROUND**

The City of Iqaluit (the City) holds Type "A" Nunavut Water Board Water Licence 3AM-IQA1626, which allows for water withdrawal, wastewater release, and solid waste disposal for municipal purposes. The licence permits the City to extract water from Lake Geraldine and Apex (Niaqunngut) River and covers the operation of the water treatment plant, the wastewater treatment plant, and the West 40 landfill. Iqaluit is located in southern Baffin Island on Frobisher Bay.

The West 40 landfill is currently at capacity and the City requires another landfill to meet its solid waste disposal needs. The amendment application under review is to construct and operate a new solid waste treatment facility (landfill) approximately 6km northwest of the city and a waste transfer station (WTS) within the City's industrial area.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) submitted information requests on May 6, 2020 as part of the completeness check. The applicant responded on June 2, 2020.

## B. RESULTS OF REVIEW

On behalf of CIRNAC Water Resources, the following comments and recommendations are provided for the Nunavut Water Board's consideration. A list of the comment topics is compiled in Table 1 below. Many of the comments integrate material developed by Tetrattech Canada Inc., whom CIRNAC hired as consultants for this review.

Table 1: Recommendation topics

Recommendation	Topic
1	Reclamation of West 40 landfill
2	Runoff from baled waste at transfer station
3	Landfill leachate treatment
4	Landfill leachate collection
5	Surface water management at landfill
6	Fencing
7	Permafrost considerations
8	Waste transfer station geotechnical report
9	Landfill design drawings
10	Operations

### 1. Reclamation of West 40 landfill

#### Comment

As part of their latest water licence renewal application, in 2014 the City submitted a technical memo entitled Iqaluit Solid Waste Management Plan West 40 Landfill Decommissioning. The current amendment application includes a reclamation plan for the future landfill and waste transfer station.

CIRNAC did not find further information on reclamation plans for the current landfill and an update would be timely. Furthermore, the plan provided in 2014 lacks some details typically present in a final closure plan, principally relating to site drainage.

The Decommissioning Plan states: *“Runoff and run-on surface water would be re-directed away from the cap via drainage ditching around the waste disposal area. The runoff drainage ditching will drain in a northern direction, and be further directed towards the offsite retention pond.”* The design drawings have some sections of the existing ditches indicated, but they are principally the sections draining southward. It is not clear if the ditches in sections where none appear will be filled in by the proposed cover, or how everything will be re-graded to drain northwards.

### Recommendation

- 1) CIRNAC recommends the City provide an update on plans for reclaiming the West 40 landfill including:
  - An estimated schedule for reclamation work; and
  - details on site drainage, including where all the ditches would be on the decommissioned site, their drainage directions and how they connect with the offsite retention pond.

## **2. Runoff from baled waste at transfer station**

### Comment

The Waste Transfer Station and Landfill Operation and Maintenance (O&M) Manual outlines how waste will be baled and covered in plastic at the waste transfer station. Section 4.1.3 describes the station's interior layout, where a trench will collect liquid from the baler, to be pumped into a tank and transferred to the wastewater treatment plant. Bales will be brought directly to the landfill, but the exterior yard area includes an area for temporary storage of baled waste "*to address short-term instances when direct transport to the Landfill is not possible*" (section 4.1.6).

The yard has a gravel surface and the Method Statement of Construction Report specifies "*The site will be graded to drain predominately to the drainage ditch, along the eastern property boundary and Qaqqamiut Road, and to the northern boundary along the unnamed road.*"

Leachate and surface water in contact with the bales could potentially be contaminated and CIRNAC was unable to find any reference to what would be done to contain and manage this water.

Additionally, the 0.25% grades, presented in the Waste transfer station Design Drawings – 90% submission drawing LF-C01, are insufficient to ensure overland flow, which might lead to ponding. Coordinates and elevations that can be surveyed would be beneficial for construction.

### Recommendation

- 2) CIRNAC recommends the applicant provide rationale for not controlling leachate and contact water from the bale storage area at the waste transfer station. Additionally, they should explain how they will ensure proper drainage at the waste transfer treatment site with such small grades.

## **3. Landfill leachate treatment**

### Comment

Given the novelty of a landfill using plastic wrapped bales in an arctic environment, the quantity and quality of leachate that will be generated is uncertain. CIRNAC acknowledges it is therefore difficult to design an effective and efficient way of treating the leachate. Several options are discussed in the documents submitted and it is not clear where the current position is.

Two ponds will be constructed at the landfill and the O&M Manual states (Section 4.2.5): *"The volume of the ponds has been established based (conservatively) with the objective of providing a minimum of two years of effluent and precipitation storage capacity."* Three options are discussed in the O&M Manual for discharging the ponds:

- Transporting effluent to the West 40 landfill;
- Transporting effluent to the City's wastewater treatment plant; and
- Controlled release of effluent to a gravel bed diffuser, which is included in the 90% submission landfill design drawings (LF-C02, LF-C06, LF-C13, LF-C14).

Instead of a gravel bed diffuser, the Climate Change Resilience Assessment refers to treatment in a wetland. Specifically, section 1.0 states: *"The lagoon will serve to store leachate that is pumped out from the landfill to provide biological treatment before discharging to an engineered wetland area downstream. In the wetland, native plants will provide a surface for biofilm to grow, which filters the water naturally as semi-treated leachate passes through it. An area of approximately 2.5 ha for the lagoon holding ponds and wetland is anticipated to be used."*

#### Recommendations

- 3) CIRNAC recommends the applicant clarify what the current position is for treating landfill leachate, their plan for collecting the necessary data for an informed decision, and the factors that will control their decision.

#### **4. Landfill leachate collection**

##### Comment

A robust leachate collection system is critical with regard to environmental protection and reducing future liability as it ensures continued leachate removal from the landfill into the post closure period, reducing head on the liner system and thus potential for uncontrolled discharges into the environment underneath the landfill.

The design drawings for the landfill are a 90% submission, which CIRNAC is interpreting as almost complete. There are several elements missing from these drawings and the Method of Construction Statement Report, which should be incorporated in final documents, including:

- i. **Leachate collection pipes:** More information on leachate collection pipes is necessary because they are mentioned but no details are given. Section 12.2 of the O&M Manual refers to a *"leachate collection layer/perforated pipe system within the disposal area liner system."* The Typical Perimeter Berm Section on drawing LF-C20 shows a leachate pipe, but collection pipes are not shown anywhere else. Flow paths for leachate within the leachate collection layer are quite long within Cell 1 (up to 225m) and get even longer when future cells are taken into account.
- ii. **Leachate sump and manhole:** Once Cell 4 is being constructed, it is inferred that the temporary manhole in Cell 1 and the temporary leachate conveyance line are to be removed along with the temporary berm on the east side of the cell.

There is no clarity on what is to happen with the leachate sump. If the sump remains within the grades shown on the drawings it would remain as a low point that would accumulate leachate but not be accessible for leachate removal. The Cell 1 sump also has a temporary manhole proposed to allow placement of a pump for leachate removal (see Detail on LF-C13). However, there is no indicated access to the top of the manhole for pump placement and removal as well as an unsupported leachate removal pipe that runs from the top of the manhole to the temporary berm. The choice of using manholes instead of something like lowering the pump into the sump from the berm via a slope leachate riser is unexpected.

- iii. **Liner installation:** Section 10.6 of the Preliminary Geotechnical Investigation Report recommends *“that the liners should be installed with several folds to prevent large strain development in the liners due to settlement of the ground.”* We did not find any implementation of thermal slack or folds for settlement in the Method of Construction Report. Additionally, the thickness of the geotextile on either side of the geomembrane is not specified in the drawings.
- iv. **Cell 10 leachate collection:** Cell 10 appears to have a low point against the permanent separation berm that is not connected to the leachate sump to its south unless there is a planned leachate trench intended between these two locations. This would create a long-term risk of leachate ponding in this area and not being able to be removed.

#### Recommendations

- 4.1) CIRNAC recommends the applicant provide more detail on leachate collection pipes including:
  - Showing leachate piping intended for Cell 1 in detail and providing conceptual layout for piping for the remaining cells;
  - Providing details in the drawings for piping diameter, perforation and clean out/inspection access (if any);
  - Providing details on whether leachate piping would be placed on cell floor or within leachate collection trenches; and
  - Providing evidence to demonstrate how the leachate pipe will not be deformed under waste loading.
- 4.2) CIRNAC recommends the applicant provide information on the leachate sumps including:
  - More detail on design intent for leachate sump in each cell once the cells are at capacity; and
  - An explanation on the choice of manholes to lower pumps into the sump.
- 4.3) CIRNAC recommends the applicant provide more information on the liner system including:
  - Thermal or settlement slack in the geomembrane placement requirements; and
  - Details on the proposed geotextile.
- 4.4) CIRNAC recommends the applicant provide clarification in design intent for Cell 10 leachate collection to ensure all leachate from Cells 10, 11 and 12 can be removed.

## 5. Surface water management at landfill

### Comment

Surface water management at landfills is important to prevent run-on to landfill cells and operating areas by conveying clean off-site runoff around the site and to manage site run-off such that it does not cause damage at the point of release. It is also important to avoid erosion of built up berms to prevent structural damage to landfill cells or roads.

As per comment 4, several elements are missing or unclear from the 90% submission design drawings for the landfill, including:

- i. **Surface water ponding:** The site currently contains ephemeral drainages that cross the site from the north-west to the south-east and drain towards two surface water bodies to the south-east of the site. The construction of Cell 1 will cut off at least one of these drainage pathways. No detail is provided on the drawings to show how run-off will be managed on the north side of Cell 1 to ensure there is no ponding or potential erosion along the low spot.
- ii. **Stormwater berm in Cell 1:** To reduce initial leachate production, a stormwater berm is to be installed within Cell 1. There is no indication if this berm is to be temporary or permanent.
- iii. **Erosion control features:** Drawing LF-C03 outlines proposed erosion control features along the north side of the south access road as well as at the end of this road for the initial site development to limit in ditch erosion and sediment transport into the natural environment off site. The rationale for placement of these sediment control features only in certain areas is unclear.

### Recommendations

5.1) CIRNAC recommends the applicant provide details on surface water ditching on north side of Cell 1 to convey drainage around the bermed area.

5.2) CIRNAC recommends the applicant provide information on the stormwater berm in Cell 1. Specifically, if the berm is temporary, information should be provided in the drawings on the design intent for removal of the berm. If the berm is permanent, then information should be provided on how filling of bales should occur at the berm location.

5.3) CIRNAC recommends the applicant provide rationale for why erosion control features were not deemed necessary in the following areas:

- Sediment traps along west side of west access road and along south side of south access road; and
- Fibre rolls and silt fence on both sides of Leachate lagoon road.

## 6. Fencing

### Comment

The landfill design drawings do not provide an indication of which areas will be fenced. It appears that the leachate lagoons are to be fenced because of fence detail on

drawing LF-C21. However, fences are not included in any of the plan views and there is no indication of a gate to the overall site or fencing around the landfill cell, which would allow access to the general public and terrestrial wildlife into the landfill cells.

### Recommendations

- 6) CIRNAC recommends the applicant provide clarification on where fencing and gates are to be installed and, if no fencing is planned around the landfill site, provide details on how wildlife and general public will be restricted from access.

## **7. Permafrost considerations**

### Comment

The documents reviewed have very little discussion on how permafrost will be protected and monitored during construction, operation, closure and post closure of the facilities including the landfill and waste transfer station.

The Method Statement of Construction report is silent on the permafrost environment, its sensitivity to construction, and the importance of protecting permafrost during construction. CIRNAC was unable to find where the Preliminary Geotechnical Investigation Report's recommendations pertaining to permafrost were integrated. Specifically, the Executive Summary states "*The base of the cells and the leachate holding ponds should be set at a depth of 1 m below existing grade or 1.5 m above the seasonal high groundwater table or the permafrost level.*" This does not appear to have been adopted in the 90% design drawings for the landfill which instead show several metres of excavation.

Permafrost underlies the lagoon and the Environmental Protection Plan states (Section 4.5): "*Permanent basins and traps should be avoided in areas of permafrost as ponding of water will contribute to increased rates of permafrost thaw or degradation.*" There is no discussion in the information provided on what the permafrost conditions are at the proposed lagoon site and how permafrost is being addressed in the design, construction, and operation of the facility.

Monitoring of permafrost conditions is touched on in section 3.2.1 of the Facility Monitoring Plan and Figure 2 shows 5 thermistor installations. All the locations shown are beyond the footprint of the development and will only provide background data. Permafrost monitoring is also mentioned in section 4.2.6 of the O&M Manual; "*With regards to potential impacts of landfill infrastructure to permafrost, a thermistor array is situated in the base of the liner systems for both the landfill and the leachate treatment system ponds.*" Though the O&M Manual directs the reader to the Facility Monitoring Plan for more details, no reference to these thermistor arrays was found in it. Ground temperature monitoring is required within the facilities. No ground temperature monitoring sites appear to be shown within and below the landfill nor is any ground temperature monitoring shown adjacent and beneath the leachate collection lagoon.



Considerations for the permafrost environment are touched on in the Climate Resiliency Assessment Report, which includes geothermal modeling in Appendix A. The thermal modeling of freezing of baled waste does not seem to account for the fact that municipal waste with organic materials can generate heat when it decomposes.

#### Recommendations

- 7.1) CIRNAC recommends the applicant describe what construction methodologies will be used to minimize impact on permafrost of construction activities. Additionally, they should provide a basis for the design approach recognizing the geotechnical and permafrost conditions that exist at the landfill site.
- 7.2) CIRNAC recommends the applicant describe permafrost conditions at the proposed leachate pond location and explain how permafrost conditions have been addressed in the design, construction and operation of the ponds.
- 7.3) CIRNAC recommends the applicant describe the rationale for thermistor locations and how they will monitor ground temperature changes within and below the facilities.
- 7.4) CIRNAC recommends the applicant explain why it was not deemed necessary to consider heat generation from decomposing municipal waste in the thermal modelling of the landfill.

### **8. Waste transfer station geotechnical report**

#### Comment

CIRNAC was unable to locate the report titled “City of Iqaluit Geotechnical Investigation Proposed Waste Transfer Station Lots 3586 228/17/18/20 and 3480 220 1 Iqaluit, Nunavut, October 2018.” referred to in the Method Statement of Construction Report.

#### Recommendation

- 8) CIRNAC recommends the applicant identify where this report can be found.

### **9. Landfill design drawings**

#### Comment

The design drawings for the landfill are a 90% submission, which CIRNAC is interpreting as almost complete. There are several elements missing from these drawings which we would expect to see in final documents, including:

- **Cuts in rock and overburden:** Drawings LF-CF21, LF-C04 and LF-C06 show cuts in overburden soil or bedrock. There is no mention of drilling and blasting of rock in any of the documentation reviewed including the Method Statement of Construction. This would represent a significant modification to the work plan as it is presently presented in the Method Statement of Construction.
- **Ditches:** all road sections in drawing LF-C21 show a ditch, which may not be required in all circumstances. For example, the road embankment on the sloped ground cross-section does not require a ditch on the downslope side of the road embankment since runoff will be draining away from the embankment.

### Recommendation

- 9) CIRNAC recommends the applicant clarify the construction methodology for cuts and ditches at the landfill.

## **10. Operations**

### Comment

There are certain elements of operations which have insufficient detail in the O&M Manual.

- i. **Non-baled waste in landfill:** Sections 8.3.1 describes the placement of waste in the landfill including bales, processed waste, and construction and demolition (C&D) wastes. Are there any plans to compact the processed and C&D wastes? In event of a mechanical breakdown of the baling or shredding equipment at the waste transfer station, how would municipal solid waste be handled at the landfill?
- ii. **Hazardous waste management:** Section 4.1.5 covers handling of household hazardous waste without identifying which wastes will be accepted. The waste is to be stored in "*steel intermodal ("seacan") containers, modified to address storage requirements for HHW materials*" and it is not clear if this includes secondary containment.
- iii. **Leachate pumping:** Section 12.2 indicates that staff are to check leachate levels but does not provide an indication on when pumping is required. Though annual inspections of the leachate collection system elements are recommended, staff should be monitoring the hoses and pipes for any leaks during pumping operations.
- iv. **Landfill cover:** Section 8.3.2 specifies that cover over baled waste is only required as a precursor to final capping, or at the discretion of the Manager over non-typical waste material to control nuisances.

### Recommendations

- 10.1) CIRNAC recommends the applicant describe if non-baled waste in the landfill will be compacted, and how solid waste will be handled at the landfill in event of a mechanical breakdown of the baling or shredding equipment.
- 10.2) CIRNAC recommends the applicant clarify what household hazardous wastes will be accepted and if the hazardous waste storage area includes secondary containment.
- 10.3) CIRNAC recommends the applicant provide additional detail on leachate pumping including: objective criteria for when pumping is required (e.g. maximum allowable leachate head); method to be used to measure the leachate head and the level in the sump; and requirements for monitoring of pond levels and hoses for leaks during pumping operations.
- 10.4) CIRNAC recommends a water licence condition be developed to require additional cover if nuisances occur.

## **C. REFERENCES**

- City of Iqaluit Climate Change Resilience Assessment Solid Waste Landfill and Transfer Station, Dillon Consulting, January 2020.
- City of Iqaluit Closure and Decommissioning Plan (Final) Landfill and Waste Transfer Station, Dillon Consulting, January 2020.
- City of Iqaluit Environmental Protection Plan – Operations, Closure and Post-Closure Phases (Revised Final) Landfill and Waste Transfer Station, Dillon Consulting, January 2020.
- City of Iqaluit Facility Monitoring Plan Landfill and Waste Transfer Station, Dillon Consulting, January 2020.
- City of Iqaluit Method Statement of Construction Landfill, Waste Transfer Station and Road, Dillon Consulting, January 2020.
- City of Iqaluit Operations and Maintenance Manual (Revised Final) Landfill and Waste Transfer Station, Dillon Consulting, January 2020. Landfill drawings.
- City of Iqaluit Preliminary Geotechnical Investigation Report Revision 1, EXP Services Inc., January 28, 2020.
- City of Iqaluit Solid Waste Landfill, Waste Transfer Station and Northwest Aggregate Deposit Road – 90 % Submission, Dillon Consulting, January 24, 2020.
- Iqaluit Solid Waste Management Plan West 40 Landfill Decommissioning Technical Memorandum, AECOM, January 2014.