

Operation & Maintenance Plan for
Naujaat Municipal Water Licence:
Sewage Disposal Facilities
2022

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1.0 Site Description

Date this plan was prepared:

December 13, 2022

1.1 Location of the Sewage Disposal Facility (SDF)

Municipality:

Naujaat

Latitude:

66° 31' 39" N

Longitude:

86° 13' 20" W

Proximity to Town:

400 m SW



Figure 1 Naujaat Sewage Disposal Facility

1.2 SDF Site Summary

Year of commissioning the SDF:

Unknown

Design life of the SDF:

Unknown

Site History:

The Sewage Treatment Facility operated by the Hamlet of Naujaat is located approximately 400m to the northeast edge of the community. Sewage is collected daily by truck from all the houses and occupied buildings with holding tanks. The sewage collected from the holding tanks via external discharge ports on the exterior wall of these buildings. The trucks discharge the sewage into a natural depression of a wetland area.

The Naujaat sewage disposal facility is a non-engineered system where sewage is deposited into a natural depression on the upstream end of a wetland, where it is held for an undetermined amount of time before flowing through the wetland and into the Hudson's Bay. The area is not lined and does not provide adequate retention for any significant treatment to occur. During the winter, effluent may discharge over the ice towards the receiving water body.

Only municipal sewage is to be deposited at the sewage disposal site. The discharge of other liquid wastes is prohibited unless it can be demonstrated that the waste will not have deleterious impact on the Sewage Treatment Facility.

2.0 Staff

Role:	Senior Administrative Officer	Name:	Sandra Clark
Phone:	867-462-9952	Email:	saonaujaat@qiniq.com

Responsibilities:

The SAO manages the municipal staff to ensure that:

- proper operation of the SDF is carried out
- sampling and inspections are completed
- annual reporting to the Nunavut Water Board (NWB) is prepared by the Government of Nunavut Department of Community and Government Services (GN-CGS)

Role:	Foreman	Name:	Katelyn Kusugak
Phone:	867-462-9952	Email:	N/A

Responsibilities: The foreman is responsible for:

- daily operations and maintenance of the SDF
- the sampling program at the monitoring stations
- maintaining signage at the SDF and monitoring stations
- annual decanting of the lagoon effluent into the adjacent wetland treatment area

Role: Sewage Truck Drivers
Phone: N/A

Name: Various
Email: N/A

Responsibilities: The sewage vacuum truck drivers collect sewage from holding tanks within the municipality. Sewage is transported to the lagoon where it is deposited.

3.0 Health and Safety

All personnel working within the SDF must follow the *Nunavut Safety Act* and be made aware of potential health hazards associated with working around sewage and wastewater. This is imperative so individuals make a conscious effort to perform all necessary safety procedures to protect themselves, their co-workers and family members at home. Safety precautions include:

- Ensure all equipment is kept as clean as possible;
- Assume anything touched by sewage is contaminated;
- Protective clothing such as coveralls, gloves, boots, and safety glasses are to be provided to personnel and always worn when working around sewage;
- Workers must always wear protective gloves
- Work clothing is not worn home
- Workers must wash their hands with soap and water on a regular basis, especially before delivering drinking water, eating and before going home;
- Workers are prohibited from eating or drinking in and around the sewage vacuum trucks; and
- Workers must keep their vaccinations up to date.

4.0 Security and Control

Access Control of to the facility:

- Perimeter fencing around the lagoon
- Signage
- 450 m restricted land use development setback surrounding the SDF

5.0 Wastewater Conveyance

Wastewater transportation:	Trucked
Annual volume of sewage collected:	46,687.329 m ³
Number of days per week sewage is collected:	5

Operations:

The following sewage collection operational procedures shall be carried out by the staff of the Hamlet of Naujaat daily dependent upon weather conditions:

- Household and commercial sewage holding tanks will be pumped out using a vacuum truck and hauled to the Sewage Disposal location
- Daily waste volumes deposited to the Sewage disposal facility (and trip counts) shall be recorded on the recording form included in Appendix C
- In the event of an accident, a spill of sewage or petroleum products or a fire during sewage collection operations, the Environmental Emergency Contingency Plan, Hamlet of Naujaat shall be implemented (separate document)
- Any non-sewage liquid wastes must be properly assessed prior to discharge to the lagoon

Influent Volume:

Table 1 Wastewater generation estimates

Year	Estimated Wastewater Volume (m³)	Difference (%)
2015	35,977	-
2016	36,922	2.6%
2017	39,460	6.4%
2018	44,014	10.3%
2019	41,327	-6.4%
2020	44,396	6.9%
2021	46,687	4.9%
Average	41,255	4.1%

6.0 SDF Design

Lagoon Capacity:	Undefined
Wetland Treatment Area:	1,400 m
Effluent Path Length:	1,400 m
Discharge Method:	Passive exfiltration
Final Receiving Body:	Hudson Bay
Type of Receiving Environment:	Marine

An overview of the wastewater treatment process:

There is approximately 1,400 metres of wetland between the Sewage Disposal Facility and the ocean which is identified as the wetland treatment area in Figure 2. Wetland systems operate by dispersing effluent over an area of sufficient size, to allow natural processes such as sedimentation, adsorption by soil particles, uptake, and digestion of nutrient components by plants, microbial decomposition of complex molecules, physical entrainment in changing flow regimes, and dilution by intermixing with the natural water system. The Wetland Treatment Area is designed as part of the Sewage Treatment Facility and the land area is formally set aside for this land use and designated with a 450 m Public Health setback.

In 2017 Dalhousie University Center for Water Resources completed an assessment of the Naujaat Wetland Treatment Area. It was found that the wetland generally produces effluent that is within acceptable limits, and below the parameters in the existing water licence. It was found that the primary mechanism for concentration reduction in the wetland was dilution. Any changes to the hydrological regime may contribute to changes in the quality of the effluent at the end of the wetland and at the water licence compliance location, REP-6.

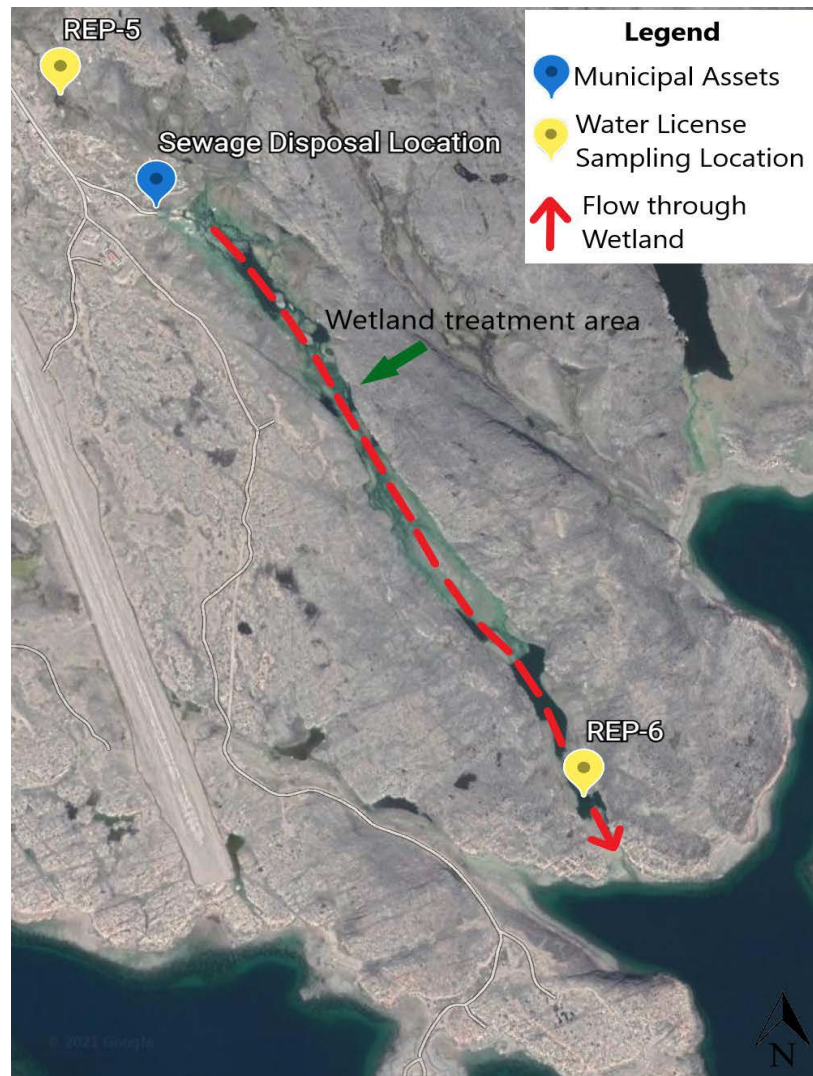


Figure 2 Seasonal Effluent flow through the wetland treatment area

7.0 Maintenance

Overview of Maintenance Activities:

1. Annual inspections will be undertaken by Crown Indigenous Relations and Affairs Canada (CIRNAC) accompanied by a licensee and/or a licensee representative from GN-CGS. The inspection report and recommendations will be reviewed by a GN-CGS municipal engineer and submitted in the Annual Report submitted to the Nunavut Water Board (NWB).

2. Regular visual inspections by municipal staff of the:

- Offload chutes
- Lagoon berms
- Lagoon fence
- Signage

Any issues identified by municipal staff must be reported to the regional municipal engineer. Follow-up actions will be undertaken by the municipality with support from the GN-CGS.

3. Inspection of the lagoon berms by a qualified engineer as outlined in the municipal water licence.

Sludge Management:

Sludge has never been removed from the natural depression or wetland treatment area. A sludge management plan will be included in the Operations and Maintenance Plan for the new lagoon.

Surface Water Management:

There is a large catchment area that drains to this wetland area and provides dilution to the effluent. Dilution has been identified as the primary mechanism in reducing effluent concentrations.

As will be detailed in the O&M Plan for the new facility, the new lagoon has been designed to account for surface water within the catchment area and allows other water to bypass the lagoon.

8.0 Monitoring

Regulatory Inspection: The annual CIRNAC inspection will take place accompanied by the licensee and/or with a licensee representative from GN-CGS. The inspection report will be reviewed by a GN-CGS municipal engineer and submitted with the annual report.

Table 2 Licence requirements related to O&M of the SDF

Requirements	Reported
Monthly and annual quantities of wastewater disposal	Annual report submitted to NWB
The Licensee shall provide a minimum of ten (10) days' notice to an Inspector prior to initiating any decant of the Sewage Disposal Facility.	Notice given to the CIRNAC inspector
A summary of modifications and/or major maintenance work carried out on the SDF	Proposal submitted to NWB 60 days prior
A list of spills and unauthorized discharges.	Annual report submitted to NWB
A summary of any studies requested for the SDF and future planned studies planned	Annual report submitted to NWB
Monitoring Program Station REP-6 shall not exceed the effluent quality limits: <ul style="list-style-type: none"> • 80 mg/L BOD₅ • 70 mg/L TSS • 1 x 10⁶ CFU/100ml Fecal Coliform • No visible sheen of Oil and grease • 6-9 pH 	Annual report submitted to NWB
The Licensee shall sample at Monitoring Program Station REP-6 according to the frequency established under Part H, Item 1, during periods of observed flow. Samples shall be analyzed for the following parameters: (see license for table)	Annual report submitted to NWB
A freeboard of 1.0 m in the lagoon must be maintained	Annual report submitted to NWB

Table 3 Monitoring Program Station description and locations

Station	Description	Latitude	Longitude
REP-3A	Raw Wastewater at truck offload point (new offload point to commence after construction of sewage lagoon)	To be updated upon construction	To be updated upon construction

REP-4	Pump discharge point from sewage lagoon (to commence after construction of sewage lagoon)	To be updated upon construction	To be updated upon construction
REP-4A	Spillway discharge point (to commence after construction of sewage lagoon)	To be updated upon construction	To be updated upon construction
REP-6	Final discharge from Wetland Area into Hudson Bay	66°31'0.49"	86°12'22"

9.0 Modifications and Upgrades

Modifications or upgrades needed for the SDF: Construction of impervious lagoon

Planned modifications or upgrades:

GN-CGS has planned the construction of a single cell lagoon located adjacent the current wastewater disposal site and is applying for the amendment of the discharge effluent limits in the existing water licence to effectively service the growing population in Naujaat until the design horizon of 2043.

The treatment facility will be designed with a new upstream primary lagoon cell that is impermeable. The existing downstream natural depression that is acting as the current lagoon will become a secondary treatment cell, and the existing downstream wetland-treatment-area (WTA) will remain in use. Seasonal effluent pump out to the secondary cell and WTA is to occur late in the summer season to allow spring freshet to pass and to allow the wetland to recharge to promote its ability to support effluent biodegradation.

The requested amendment to the effluent limits within the WTA is based on the most comprehensive research completed to date on lagoon-wetland systems in Nunavut and considers the significant change to the hydrologic regime that will be influenced by the seasonal pump out of the future impermeable lagoon that will replace the passive exfiltration and dilution that occurs now.

CGS retained Dillon Consulting Limited to develop the Pre-Design Report for the upgrade of the current sewage facility in the Hamlet of Naujaat. This study projected the flow and loadings based on the population growth, proposed the treated effluent goals and standards, reviewed, and selected the most suitable location and treatment technologies, sized the lagoon system, and developed a conceptual schematic design. The treatment goals for the lagoon-wetland effluent criteria, at the end of the treatment process, were established as 100, 120, and 1.25 mg/L for carbonaceous biochemical oxygen demand, total suspended solids, and un-ionized ammonia as nitrogen, respectively, to protect the final receiving environment. These effluent criteria are based

on 6 years of research completed by the Centre for Water Resources Studies at Dalhousie University directly in Naujaat and across Nunavut.

Given an estimated population of 1,225 residents in 2021 by Statistics Canada, the design population to be serviced by the expanded lagoon was projected to be 2,175 people in 2043. This population will require an active storage volume 121,469 m³ for 12 months of storage.

The lagoon discharge point will be by controlled manual pump out into the secondary lagoon that will then exfiltrate into the WTA which will remain at the same location. The decant system will be designed with a flowrate below 2500 m³/day to ensure effluent has sufficient residency time in the WTA.

10.0 Previous Reports

- Desktop Risk Assessment on the Sustainability of Nunavut's Primary Drinking Water Sources, Dalhousie Centre for Water Resource Studies, 2016
- Naujaat Wastewater Treatment Facility Pre-Design Report, Dillon Consulting, 2022
- Wetland Treatment Area Study, Dalhousie Centre for Water Resource Studies, 2017

Appendix A: As-Built Drawings

As-built drawings for the new sewage treatment facility will be provided once they are available