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Nunavut liuqatigiingniq
Bâtir le Nunavut ensemble

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Department of Community and Government Services
Nunalingni Kavamatkunnilu Pivikhaqautikkut
Ministère des Services Communautaires et gouvernementaux

Taloyoak Water Licence: 3BM-TAL 0813 **Sewage Facility O&M manual**

Aug 10, 2014

Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1L0

Attention: Phyllis Beaulieu, Manager of Licensing

RE: Operation and Maintenance (O&M) manual - Hamlet of Taloyoak Sewage Waste Facility

Dear Ms. Phyllis,

The Hamlet of Taloyoak is pleased to submit to Nunavut Water Board the attached file of "O&M Manual" of sewage waste Facility and management as required and directed by the Board.

With the help of Government of Nunavut though Community and Government Services, the Hamlet has undertaken a comprehensive waste management program which has led to improve sewage waste facility, wetland improvement and effluent discharges. The annual monitoring program for sewage waste has been in effect for every year in summer and fall. Samples test results shown excellent remediation of contamination parameters within allowable limit comprising BOD, TSS, E-coli and Toxicity components and quality control on effluent before discharging into ocean.

We hope that Nunavut Water Board will find this O&M Manual effective in managing the sewage waste for the community. This O&M manual is in conjunction to the inclusion of Sewage and Solid waste facilities with Amendment Water Licence.

Best Regards,

Shah Alam, P. Eng.

Municipal Planning Engineer,
Government of Nunavut
Community and Government Services
Kitikmeot Region, Cambridge Bay, Nu
Phone: 867-983-4156, fax: 867-983-4124, salam@gov.nu.ca

Hamlet of Taloyoak, Nunavut

Sewage Treatment Facility

Operation and Maintenance (O&M) Plan

Prepared by

Shah Alam, P. Eng.
Municipal Planning Engineer,
Cambridge Bay, NU

Aug 10, 2014

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Appendix

1.0 Introduction

The current Sewage Facility have been developed in early 1980's with a series of two natural Lakes apart by a natural berm in between and with a raised outlet from the secondary Lake cell to a wide area wetland. This manual presents the operation and maintenance procedures associated with facilities. The proper operation and maintenance of the Lagoon facility is an important component of its sewage waste management system (SWMS). It is recognized that inappropriate operation and maintenance of a sewage lagoon can cause a facility become a source of potential public health hazards and adverse environmental impacts.

The community has a population of approximately 900 (2006), with an approximate 1.5 % projected growth rate. Community infrastructure includes:

- A water treatment plant, which draws water from the Canso Lake, treat it through filters & chlorine and transport it to the community through truck fill to holding tanks in each building
- A sewage lagoon which receives trucked sewage from holding tanks in each building, hold raw sewage for approximately 360 days and discharge into wetland for natural remediation.
- A Solid waste facility which includes a bulky metals disposal area, hazardous waste oil battery and other materials storage areas within the waste site.

This O&M manual covers information and requirements in managing municipal sewage waste:

- Location of the community
- Basic geographical information such as precipitation, permafrost, hydrological information
- Location of sewage lagoon, solid waste facility and other related infrastructure
- Population and projected growth trend – current uses and future demand
- Water distribution, frequency of distribution and quantity return to water body
- Sewage waste collection and quantity of daily/weekly/monthly production
- Sewage generation and composition projections and types
- Sewage treatment and disposal system, remediation and clearance
- History of facility development, time of operation, change and modification
- Location of wetland and trend of wetland condition during summer, winter and fall
- Discharge method and duration-continuous or intermittent
- Drainage swale- around the outside perimeter of the lagoon
- Operators name and contact numbers of associates and assistance
- Sampling procedure, frequency of sampling, sample storage, transportation and QA/QC
- SNP and station locations with GPS locator- temporary, fix or amendment
- Site records of sewage collection, effluent discharged and maintenance undertaken
- Safety procedure of operator, facilities, aquatic life and public
- Method of controlling access to site and adequate signs
- Sludge management and treatment if any
- Spill – contingency plan for spills and reporting procedure

1.1 Objective of facility O & M manual:

The purpose of O&M manual is to assist community staff doing proper operation and maintenance of their sewage waste disposal facilities. This document is prepared for the review of Nunavut Water Board (NWB) for client (community) uses in practicing the Water Licence of Hamlet of Taloyoak. The O&M manual include descriptions:

- How facilities are operated and maintained
- How often the activities are performed and who is responsible for the compliance
- Location of facilities and proximity to receiving water body
- Frequency of inspection of berms, drainage and dams
- Removal of floating materials from sewage disposal facilities
- Controlling effluent discharge quality
- Runoff and drainage control within and around the facility
- Treatment of effluent and drainage if any
- Prevention of windblown debris
- Method and frequency of site maintenance including berm, fence, gate, access way etc.

The following general requirements to minimize public health hazards and environmental impacts are addressed in this manual with the due diligence and operating principles that follows the core importance:

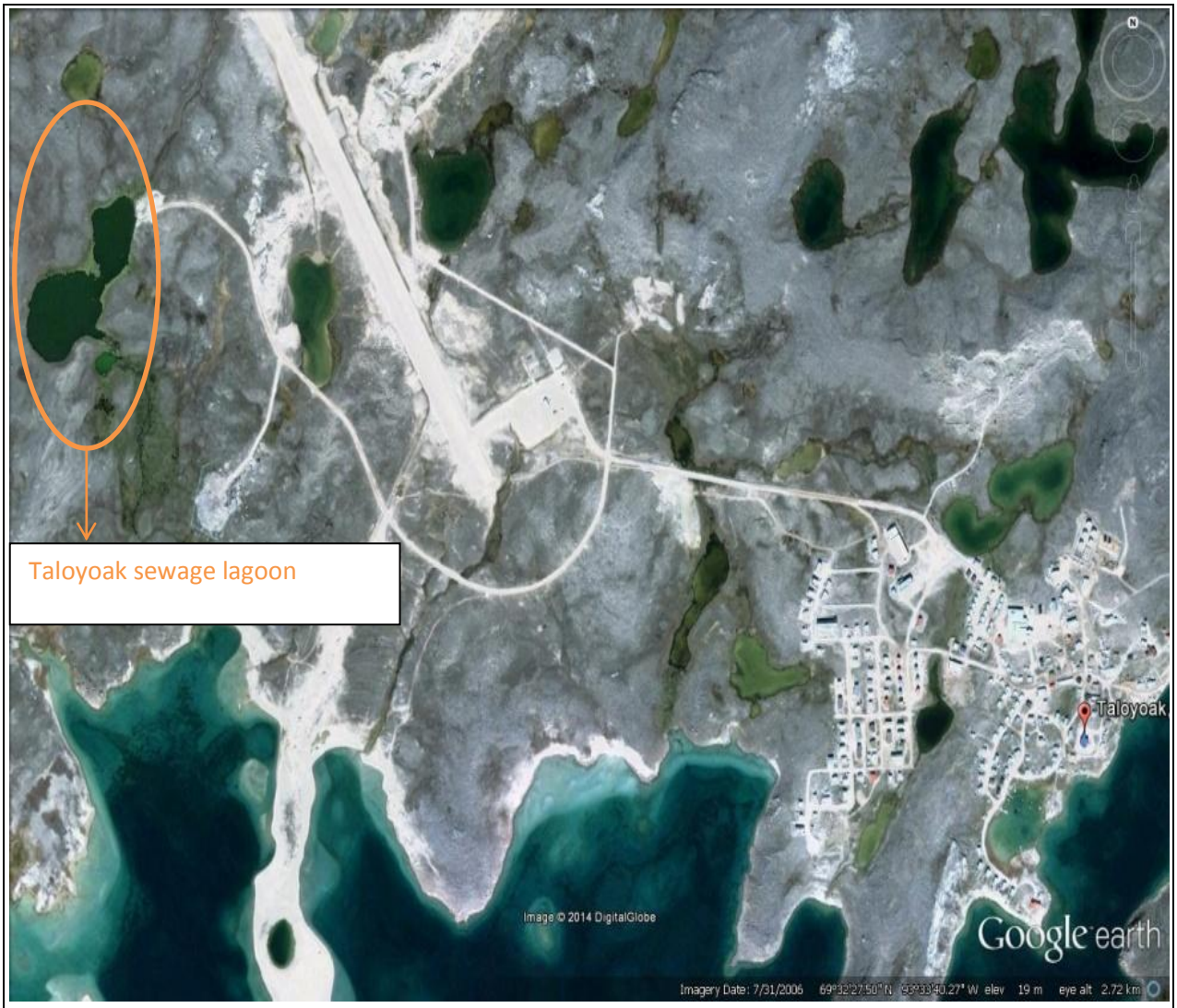
- to minimize environmental nuisances that can interfere with human & aquatic life
- to minimize the possibility of polluting surface water with retention, discharge and treatment
- to minimize occurrence of public health impacts through reduction of disease causing organisms.

The purpose is to implementation of “Best Management Practices” for planning and corrective action for good housekeeping, maintenance, inspection, record keeping, security, employee training, incident reporting, emergency responding, risk identification, situation assessment and corrective action.

1.2 Location of the Community and sewage lagoon facility:

Hamlet of Taloyoak is located on the Boothia Peninsula within the Kitikmeot region of Nunavut at a geographical location 69^0 32’ 0’’ N and 93^0 32’ 0” W, within a zone of continuous permafrost and situated on sand & gravel raised beaches with flat & rolling terrain with numerous lakes and ponds.

The lagoon system is located approximately 3.2 km from the community, about 35,700 m3 capacity. The primary cell receives raw sewage from trucked discharge and it stays in the primary cell for the winter. Upon spring / summer melt, effluent & water flows over a semi-submerged berm into the secondary cell, from where it naturally overflows onto wetland. The meandering wetland about 900 m, enriched with seasonal vegetation, helps the effluent remediation process tremendously before the final ending into Stanner Harbour.



Location Map of Taloyoak Sewage Lagoon Facility

1.3 Geographical and Climate information

The Hamlet of Taloyoak is situated in a zone of continuous permafrost and situated on sand & gravel raised beaches with flat & rolling terrain with numerous lakes and ponds, with seasonal vegetation (Canadian Arctic Profiles – Indigenous Culture, 2006). The surficial geology immediately surrounding the community is classified as a till veneer, with till deposits being patchy and generally less than 1m.

The bedrock geology of the Taloyoak area comprises sedimentary rocks (carbonates, shale's and sandstones). Bedrock is generally exposed at sporadic locations close to sea level, where exposed, the bedrock comprises layers of dolomite and shale, and is jointed and frost shattered. The reported ground temperature below 3 m depth averages about -10^0 C. The thickness of active layer varies from 0.3 m in

poorly drained areas to over 2 m in well drained areas. Excess ice contents of up to 10% have been reported in the subsurface soils.

The climate can be characterized by long cold winters and short cool summers. The average total annual precipitation is 13 cm, with about 85 cm of snowfall and 7 cm of rainfall. The July mean high is 12.3°C and mean low is 4.6°C. The January mean high is -25°C and mean low is -36°C. The prevalent wind direction is to the northwest at an annual average wind speed of 22 km/h

Taloyoak sewage facility: Two cell natural Lake sewage lagoon with natural berm in between

2.0 Facility Operational Policy

The manual demonstrates to the Water Board that the community is capable of operating and managing their waste sites. The policy covers basic and technical requirements including safety, site control, emergency response, litter & odor control, record keeping and employee training (but not limited) of the main policies for the operation and maintaining the sewage facility in compliance to the standard and in accordance to the northern communities.

2.1 Sewage collection and transportation

The Hamlet of Taloyoak provides trucked sewage pickup service for residents, business centres and institutions of the community and transports it to the lagoon. Sewage lagoon receives raw sewage from truck chute through discharge flume, retains them within the primary cell of where it stays for sufficient retention time before a move to the secondary cell when melts in summer and fall. Sewage collection, transportation and disposal operation carries by hamlet operators using hamlets sewage trucks - two on service and one as backup standby, to a distance about 3.2 km from the away of town. Sewage is collected daily normal working hours 8:00 am to 5:00 pm with exceptional extended hours on weekdays and week end by vacuum trucks from all households tank at a rate of 2-3 days interval and on daily basis from institution, offices and commercial builds. Additional trips also maintains as per needed and request.

The lagoon is designed to receive municipal sewage only as outlined in the water licence and termed as sewage and sanitary wastes-both grey water and black water. The discharge of other type of liquid wastes is prohibited unless it can be demonstrated that the waste quality do not have deleterious impact on the Sewage Treatment Facility.

The policy is to operate the lagoon in adherence to the Environmental Guidelines for Industrial Waste Discharge in Nunavut (Government of Nunavut, 2002) provides a Decision Flow Chart for managing an industrial waste discharge. It also includes schedules of comparative criteria for evaluating the liquid waste.

Liquid wastes meeting the criteria are acceptable for discharge into the sewage lagoon facility. Liquid wastes that do not meet the criteria must be pre-treated until they do, or be stored in the Hazardous waste storage area for future disposal at a licensed facility located outside of the community. Operation policies were developed to provide specific details related to the Operation and Maintenance of the facility with the intent of keeping the requirements of the Water License. Policies, presented in 'Appendix D' of this manual, cover a wide range of topics, personnel involved with the operation of the facility are fully conversant with these Policies.

2.2 Discharge Method

Sewage collected from household tank by vacuum truck and then discharge into the main cell lagoon for round the year. In the winter, this discharged sewage forms an ice pack in the lagoon and stays full winter which melts and flows over the submerged berm to the secondary cell during summer and fall. The summer discharge naturally settle down the sludge portion (about 10% of the total) at the bottom and flows out remaining watery portion (almost 90 %) over the berm to the secondary cell and finally line up with the previously meted water through the open outlet from secondary cell to wetland while temperatures are above freezing point. Effluents from secondary cell pass through a shallow and fairly narrower open area to wetland (see the picture) where maximum remediation takes place naturally to sewage runoff before completing the travel to the ocean. The hamlet of Taloyoak maintains a Log sheet to identify and taking necessary steps for sewage facility maintenance. A full - time employed Forman with other operators are making this effort while facility in operation. The long chute helps raw sewage bringing down into the main cell and in summer time it brings almost near the bottom at discharge point. Hence, less chances of mixing raw sewage with very top portion of retained sewage.

The primary settling cell helps in treating raw sewage through settling the solid portion at the bottom and retains for sufficient time, while comparatively liquid watery portion receives sunlight & Oxygen as needed BOD level for remediation. Melted sewage water also helps in transmitting heat & Oxygen to the under layer colloidal and solid portion before getting out of the cell. Seasonal vegetation on sides of the lagoon also helps in remediation process by reducing contamination level. The lagoon is capable of maintaining sufficient freeboard and no overflow on sides or up front, the primary cell is large enough to hold sewage accumulation from October through April-May. The secondary cell migrates along 900 m tundra wetland pathway to the ocean.

2.3 Normal Operations

Taloyoak sewage lagoon is intended for domestic municipal wastewater and sewage only. Be aware of the regular sewage truck operators and look for signs at the truck discharge and in general, that wastes other than municipal sanitary sewage aren't being discharged into the sewage lagoon system. For any spills, refer to the Spill Contingency Plan in Appendix E. Litter should be collected on a weekly basis during summer and fall. General public accesses to the lagoon area are discouraged. Possible contamination or infection from pathogenic organisms exists with every contact with the sanitary sewage. This area should not be used for recreational activities

2.3.1 Operation from Freeze-up to Break-up

Specific operation of the lagoon during this time is for winter. Changeover to winter operation occurs when effluent in the lagoon begins to freeze- starting from November normally until April. Sewage is collected using the sewage vacuum truck and discharged into the lagoon via the discharge flume.

Any sewage spilled onto the truck turn around or standing point must be cleaned up immediately to prevent the accumulation of ice. Any accumulation of ice on the discharge flume also be cleared away to keep the flume clean and free of blockages.

2.3.2 Operation from Break-up to Freeze-up

Operation of the lagoon during the time of summer, changeover to summer operations occurs when stored effluent in the lagoon has thawed. Sewage collected and discharged into the lagoon for winter operations. Natural discharge happens during this time from secondary cell to wetland. Effluent will be discharged to wetland over the raised crest from secondary cell. During the start of discharge, hamlet must inform CGS and/or AANDC Inspector effluent sampling program. Residual sewage will be stored in the lagoon during the winter along with new discharged sewage from the community.

During the summer and fall operations, implementation of monitoring program begins and hamlet's responsibility to ensure the program is carried on time in each summer and fall in compliance with the requirement of the standard practice and with the requirement of an amended/renewal Licence.

2.4 Resource and Personnel

The Hamlet Forman and operators are responsible for overall operation of raw sewage collection, transportation and disposal to treatment facility as well as general operation and maintenance of vehicles and facilities. One person is employed to operate each sewage truck and another person in connecting house tank outlet to the hose at the vacuum truck for each team operation, daily 8:00 am to 5:00 P M and 5 days a week. The Hamlet is operating such two trucks with two full time drivers and one truck as backup in case of failure of regular one. Regular 5 days a week service with overtime operation during Saturday and Sunday in the case of emergency. In absence of a regular employee, a casual hiring from local people encouraged with appropriate training. To assist in such filling and to create sufficient local employee, the hamlet keeps a plan and budget in creating more jobs for the local operators – coop students are also encouraged. Thus, more trained personnel become resource for the community through the operation of sewage waste facility. Also, local people can take part in the facility operation.

Contact person for any information and action as below:

Operators Name	Title	contact number
Chester Porter	Forman	867-561-5112
Mike Ukuqtunnuaq	Operator	867-561-5112
Greg Holitizki	SAO	867-561-2302

3.0 Effluent Guidelines

As set out in the original Licence, effluent discharged from the lagoon & wetland must be monitored during the period of natural treatment process. The lagoon is the main storage & primary treatment facility for sewage. Once discharged out to wetland, secondary treatment occurs through biological process in presence of sunlight and Oxygen where effluent is exposed to warmer temperature and air. The wetland makes the changes in contamination and polishing effluent by removing some organic and inorganic materials. The Hamlet of Taloyoak sewage effluent quality levels to be measured at TAL-4 (final discharge point of effluent before merging to ocean). Wastewater effluent quality parameters at the final discharge point can be seen in the Table:

Parameters	Maximum concentration of any Grab sample
Fecal Coliforms	1 x 10^6 CFU/dl
BOD_5	100 mg/L
Total suspended Solids (TSS)	120 mg/L
Oil and grease	No visible seen
p^H	Between 6 and 9

3.1 Effluent Monitoring

Monitoring points are located at the outlet point of discharge from the secondary cell lagoon to the wetland (TAL -2) and at selected locations down-stream on wetland before mixing with solid waste effluent point (TAL-4) prior to entering the ocean (Appendix B: QA/QC plan). The lagoon is sized to contain the annual volume of sewage for about a year. The wetland treatment system is designed to natural flow channel which gradually become a more biologically rich area to provide natural attenuation processes as the discharge volume increases year by year.

Sewage effluent parameters

Parameter	
Alkalinity	Sodium (Na)
Conductivity	Sulphate (S04)
P^H	Aluminium (Al)
Total Suspended Solid (TSS)	Arsenic (As)
Ammonia as N2	Cadmium (Cd)
Biochemical Oxygen Demand (BOD)	Chromium (Cr)
Carbonaceous Oxygen Demand (CBOD)	Cobalt (Co)
Nitrate as N2 (NO3)	Copper (Cu)
Nitrite as N2 (NO2)	Iron (Fe)
Calcium (Ca)	Lead (Pb)
Chloride (Cl)	Manganese (Mn)
Hardness (Total)	Nickel (Ni)
Magnesium (Mg)	Zinc (Zn)
Potassium (k)	Mercury (Hg)

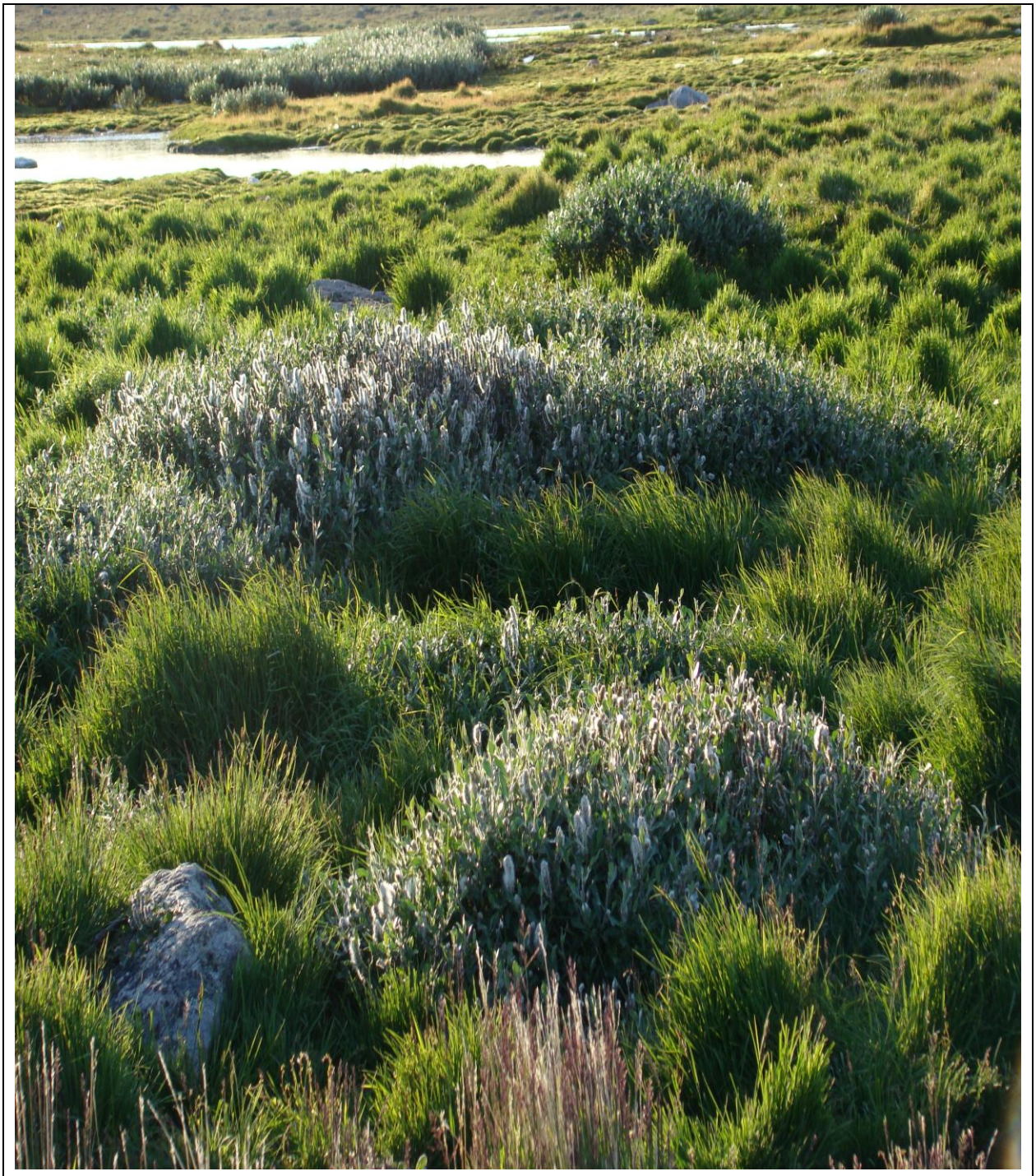
Additional analytical parameters, which could become a requirement of the NWB water license or be requested by an Inspector as defined in the Nunavut Waters and Nunavut Surface Rights Tribunal Act. Other parameters can be added as needed.

3.2 Monitoring stations:

Taloyoak sewage lagoon facility is about 3.2 km away from the community and to the other side of water body. The wetland connects the sewage lagoon in one end and the Ocean on the other end. Monitoring stations are marked with GPS locator on each station point on wetland for grab samples collection best representing the effluent status at that point. These monitoring stations are marked with signage for operation and inspection purposes, visible for inspector and operators. Additional station points can be selected based on requirement and issues on existing location. It is the responsibility of the Hamlet to maintain these station points and signage at all the time. Records to be maintained of these station points and sample results and update with Annual Report to NWB.

Table: Monitoring Stations of sewage and solid waste sample collection points:

Sampling Station	GPS Location		Description	Comments
	Latitude	Longitude		
TAL-1	N 69^0 32′ 39″	W 93^0 32′ 05″	Raw Water supply at Water Lake	Volume of water collected from lake
TAL-2	N 69^0 32′ 38″	W 93^0 35′ 39″	Sewage outfall entry to wetland	Outside the lagoon , onto wetland
TAL-3	N 69^0 32′ 26″	W 93^0 35′ 22″	Solid waste discharge run-off	Outside the fenced area on wetland
TAL-4	N 69^0 32′ 22″	W 93^0 35′ 25″	Effluent Final discharge point before meeting ocean	Combined effluent at the end of wetland
TAL-5	N 69^0 32′ 23″	W 93^0 34′ 34″	Hazardous storage cell retention water	New station. Sample collect only when decanting requires



Taloyoak Sewage Treatment Facility: Natural Wetland (seasonal vegetation)

3.3 Record Keeping

Record keeping is mandatory to have information updated of the status of the lagoon system at a specific time and for keeping track of operation or occurrences. Keeping records of facility operation and monitoring are important for the hamlet and regulatory organization in practicing regulations. Records must be in detail to facilitate evaluation of operation and to track the development of problems. Records also provide list and sequence of completed and list of obligation. Lagoon management must establish and maintain an operating record and prepare annual reports.

Copies of such record shall be kept at the Hamlet office for review and reference. Records shall be contained with information such as:

- Number of trips makes per day and approximate volume of sewage discharged
- Information of any monitoring for the day of a plan for next day(s)
- Results of monitoring program- (Appendix E – Samples test results)
- Any maintenance carried, required or in plan for the day or later the date

3.4 Site Management:

The normal operational check of the sewage lagoon system involves observation of daily truck load numbers and quantity of sewage disposal as well as any spills or unwanted / abnormal situations. Observations should also be made of the lagoon surface, noting if there is material floating and what the material may be. An entry should be made every day on the Daily Inspection Record to either indicate that the operation is normal or that something abnormal was observed and corrective step to be taken.

The log shall be maintained with the operator, with a copy to the MSM daily/weekly for recording and reporting purposes.

3.4.1 Inspection of Sewage Lagoon System and Components

Daily: A brief check of the lagoon shall be done daily when raw sewage discharge into the lagoon. Site and weather conditions shall be noted, as well as any activities carried out that day.

Weekly: During snow-free period in summer and fall, integrity of main components (discharge chute, flute tie and support, pad) of the sewage lagoon system should be inspected. A report shall be filed, noting the date and any issues identified. The truck discharge point and surrounding area should be examined weekly for signs of cracking, sliding or other operational issues.

The truck discharge system consists of discharge chute laid on a slope for conveying sewage from the truck discharge into the primary cell. The chute is anchored at the top and bottom of the slope. A pressure treated timber wheel stop and steel bumper posts are provided to control the position of the

trucks during discharge. The timber wheel stop and steel bumper posts should be inspected regularly for any signs of damage or instability.
During open water periods, the water level in the lagoon should be observed and recorded.

Sewage Colour

The variations in the colour of sewage during open water periods can be an important indicator of a sewage lagoon system performance. The following list provides frequently observed sewage colours and associated performance indicators:

- **Dark Green** – Good. High pH and high dissolved oxygen (DO).
- **Dull Green to Yellow** – Not very good. P^H dropping, DO dropping and blue-green algae are coming to establish.
- **Grey to Black** – Very bad. Lagoon anaerobic.
- **Tan to Brown** – Okay if caused by a type of algae bloom. Not good if due to silt or bank erosion.
- **Red or Pink** – Indicates presence of sulphur bacteria (anaerobic conditions) or presence of red algae

Lagoon colour shall be noted during the weekly inspections. If the lagoon colour indicates poor performance (dull green to yellow, grey to black and red or pink) the Hamlet shall consult with the NWB to determine appropriate remedial actions. Sewage of this colour is not ready for decanting

4.0 Administrative Structure

Hamlet administrative decision runs by council member's motion and decision. Council members select and appoint Mayor, Deputy Mayor using direct vote. Hamlets council members with the help of Executive members appoint the SAO. The Senior Administration Officer (SAO) has overall responsibility on Departments including the Municipal Services or Public Works Manager which is responsible for management and operation of the sewage lagoon facility. Duties of the SAO in relation to the sewage lagoon include:

- Review Municipal Plan and projects in conjunction to improvements to the lagoon.
- Review maintenance, administrative & management cost and allocate annual budget
- Confirm personnel training, operator hiring and emergency casual staff with proper training
- Monitor overall operations to confirm it in accordance with this O&M manual and Water License
- Obtain and review operating and monitoring records
- Review emergency response plans and confirm exercises occur on a regular basis
- Coordinate with AANDC for sampling, monitoring and annual inspection of the facility
- Liaise with the NWB
- Review and submit reports to the NWB, as required by the Water License
- Respond to public inquiries
- Address any complaints

4.1 Municipal Services Manager (MSM)

The MSM is responsible for management of the Sewage Lagoon and reports to the SAO. A local contractor is also available and in contract for any interim help or emergency response. Duties of the MSM in relation to the sewage lagoon include the following:

- Plan for operators and improvement of the facility operation
- Conduct sewage lagoon inspections as required
- Ensure sampling and monitoring occurs as required in the Water Licence and standards.
- Prepare annual operation and maintenance budgets
- Manage maintenance activities with standard lagoon system and in this manual
- Organize training of personnel on Environmental awareness and facility operation
- Prepare emergency response plans and schedule regular exercises
- Update the Safety Plan for the facility and environment
- Prepare reports required by the Water License
- Prepare and maintain an operational record of the facility
- Ensure current and accurate facility signage, warning and contact information for facility users
- Conduct Safety Orientation for visitors and Contractors

4.2 Lagoon operation

The Lagoon Operator reports to the MSM and/or SAO is responsible for overseeing vehicular traffic, day-to-day operations of the lagoon and monitoring lagoon in all weather. Duties of the Lagoon Operator include:

- Carry out winter and summer maintenance of roads, sewage disposal area, and ditches of lagoon with inspections of infrastructure as required in the Water Licence
- Maintain equipment and keep records of sewage disposal and annual quantities of disposal
- Coordinate overall operations to ensure lagoon site is operated according to the O&M manual
- Co-ordinate and collect grab samples from Monitoring Stations and any instructed point.
- Complete or arrange for packing, labelling and transportation to the laboratory for testing
- Take corrective action for issues of non-compliance and instruction by AANDC/NWB
- Respond to corrective action to swage collection, transportation, disposal and lagoon operation for any spills, leakage, failure or unauthorized uses of the facility
- Administer the Site Safety Plan and Spill Contingency Plan, Litter control
- Surface water management and assist with third party water sampling
- Emergency response and spill control as per Spill Contingency Plan in Appendix E
- Record keeping for sewage, vehicle, equipment and reporting to Municipal Services Manager

A complete and current list of personnel responsible for operation and maintenance of the lagoon sites along with emergency and regulatory contact information must be maintained. The current contact list is presented in Appendix B with Emergency Contacts; this list should be updated as required.

Further details on water sampling can be found in **Appendix B: QA/QC Plan**.

4.3 Wetland Treatment Area

The Wetland Treatment Area is an integral part of the Sewage Treatment Facility. It consists of a meandering stream pathway that reaches across the tundra a distance of approximately 900 m between the lagoon and ocean. Monitoring of the existing wetland downstream has shown that the wetland has been providing adequate treatment that NWB license requirements were being met before discharging into the ocean (Appendix B: QA/QC plan). Continuous monitoring will allow ample warning if maintenance efforts such as diverting some of the flow into adjacent drainage systems is required.

5.0 Maintenance

Maintenance includes access road, discharge chute, vehicle turn around pad, splash pad, flow wire, protection berm, signage, wetland and sampling station points. Maintenance of the access road should follow winter and summer maintenance with snow clearing in the winter and surface grading debris free in the summer.

The following maintenance procedures will be undertaken by the hamlet staff to ensure wastewater treatment infrastructure operates efficiently:

- The roadway and truck move around shall be maintained by snow clearing in the winter and surface grading in the summer with any defects repaired as necessary
- Lagoon containment shall be inspected periodically during the summer and fall.
- Wetland drainage channels shall be inspected during summer and repaired as necessary
- Facility identity and warning signage which identifies Sewage Treatment Facility shall be inspected monthly, and repaired or replaced as necessary.
- The discharge flume shall be inspected for displacement or damage monthly and as necessary.
- Any airborne litter shall be removed from sewage lagoon periodically and dump at dump site.

5.1 Odour Problems and Weed & Insect Control

Under normal operating conditions, the sewage lagoon system will not cause any serious odour problems. However, at times, severe odours may occur subject to sewage quality and various

environmental factors. The sewage lagoon is located a significant distance from the community, therefore, odour is not normally considered to be a problem.

The periods of concern for odour are:

- During the period following ice break-up and thereafter
- During an extensive period of cloud cover, where the absence of sunlight would lead to reduced algae activity and reduced oxygen production, and
- The presence of extensive floating sludge mats

The operator of the sewage lagoon system has limited control over these conditions. The problem will normally be of short duration during and after the ice breaking. For other periods in summer & fall, the situation should improve once the cloud cover breaks. For situation of floating scum and algae mats, there is a need to be broken up and screened for removal and drying on the sludge drying pad, for eventual disposal in the landfill

5.2 Lagoon Vegetation

Seasonal surface weeds can develop in sewage lagoons during summer and fall. The primary concern with surface weeds is that they may obstruct sunlight going close near to lagoon waste which mostly needed for sewage treatment. Also, those weeds attract insects and breed there. In addition, when floating plants die, they began to decompose and deplete oxygen, which is needed by the bacteria for sewage treatment

Surface weeds may be controlled by the hamlet operator or with expert hiring as follows:

- Skimming – this is often difficult and must be done numerous times, and
- Use of herbicides – Approval from Nunavut Water Board is required for their use.

The removed weeds should be buried, where possible, to prevent odour and insect problems

5.3 Insect Control

Flies and mosquitoes create the most common insect problems on the open area sewage lagoon. Most mosquitoes breed in sheltered, calm water containing vegetation and floating materials to waste which the female can attach eggs. The egg clusters are fragile and easily damaged by turbulent action caused by wind and currents. Improper weed control and the accumulation of a scum layer will make insect problems worse

6.0 Sludge Management

The lagoon was originally built with natural discharge of effluent will clean up almost all sewage waste during the following year of accumulation within the primary cell, and very least 5-10% sludge as residue on lagoon bottom. With long time uses, there has possibility of developing sludge blanket on the bottom of the lagoon and will reduce the capacity for raw sewage. Currently No bathymetry survey data available to assess the sludge quantity in the lagoon. To keep the lagoon capacity in holding the designed quantity, sludge removal can be suggested for every 5-10 years of operation of the lagoon. The general monitoring procedures for sludge management are as follows:

- Sludge measurement – sludge measurements will be taken with a "sludge judge" which is Approximately a 2-cm clear tube, pushed into the sludge and withdrawn and measure the sludge marking. Sampling will take place at the discharge pipe concrete retaining wall.
- Water levels – water levels will be measured from a fixed point on the discharge
- Lagoon discharge samples will be collected from the monitoring point form the discharge

Raw sewage samples will be collected from the base of the input flume, after several consecutive loads have been dumped to obtain a representative sample of several loads. Sample will collected using a pole with bottle clamp. All other samples will be collected from designated surface water sampling stations.

(Refer. Monitoring Plan and QA/QC Plan for sample collection and handling details)

7.0 Health and Safety

Health and safety of workers and the public is the first priority while operating the sewage treatment facility. The requirements of the Nunavut Safety Act must be followed at all times. All actions and operations must be undertaken with safety as the first priority. The Lagoon Operator(s) must make sure that all aspects of municipal sanitary sewage management are conducted safely. Site safety at the lagoon is coordinated through the lagoon operator. All operations are to be conducted with safety as a priority at all times and in accordance with the Safe Work Policy. Possible contamination or infection from pathogenic microorganisms exists with every contact with the sanitary sewage. General public access to the lagoon area should be discouraged. Possible contamination or infection from pathogenic organisms exists with every contact with the sanitary sewage. This area should not be used for recreational activities. Equipment and any other structures should be kept clean. This reduces safety hazards and protects equipment.

Use of proper hand gloves, safety boots, safety vest, jacket, pants, safety eyewear and any primary safety tools are mandatory during sewage collection and disposal and lagoon operation. After work,

before eating, and at other convenient times, the Lagoon Operator(s) should wash their hands thoroughly. Caution should be used when working with sanitary sewage. If an operator is splashed accidentally with sewage, the area should be promptly washed with plenty of water. All cuts and skin abrasions should be treated immediately to prevent any infection.

Operators and personnel should remain attentive and aware of any potential health and safety hazards, such as tripping hazards; like debris or ice. When possible, hazards should be removed. Care should especially be taken when obtaining samples; gloves (nitrile - not latex) must be worn. All employees shall:

- Receive the appropriate safety training
- Wear the appropriate personal safety equipment
- Not endanger themselves or others at any time
- Report unsafe practices
- Notify other employees or site users when they are acting in an unsafe man

7.1 Lagoon Emergencies, Accidents and Near Misses

All accidents, injuries, or near misses should be reported to the Lagoon Operator, Municipal Services Manager and the appropriate safety official of the Hamlet of Taloyoak. For all accidents, injuries, or near misses, the operator or 1st witness of the scene needs to:

- Investigate the incident immediately
- Find out the cause
- Make a complete accident report
- Take immediate measures to correct the cause and prevent it reoccurring
- Have a safety meeting with employees as soon as possible after the incident

During any lagoon emergency, the press will likely become aware and cover the story. The MSM or SAO will be the only spokespersons for the Hamlet.

7.2 Accidents:

All accidents at the lagoon shall be investigated and an Accident Report Form for the incident shall be completed. Traffic accidents occurring at the site shall be reported to the RCMP if applicable. Complete the form providing as many facts as possible, provide only the facts and include the following information as required on the form:

- Who was involved?
- Which vehicles were involved?
- What were the personal injuries, if any?
- What property was damaged?
- Which agencies or individuals responded to the accident?
- Date, time, weather conditions, witnesses, and other pertinent information

7.3 Medical Emergencies

All injuries should be considered important and should be reported as a safety incident to the Lagoon Operator. Possible contamination or infection from pathogenic microorganisms exists with every contact with the sanitary sewage.

First Aid should be applied in a manner that is appropriate to the nature of the injury. If the injury requires medical assistance, the individual should be taken to a medical emergency centre.

A medical doctor should be consulted for all injuries that could result in infections as a result of working with sanitary sewage. This includes injuries such as cuts and scrapes, or skin punctures.

If the person injured on-site is a customer or visitor, Lagoon Operator's employees shall provide any assistance necessary and appropriate First Aid.

8.0 Training to operator and supervisor

Staff training is an important aspect of the operation of a Sewage Treatment Facility. Staff must be adequately trained to follow this O&M Plan and operate the facility. GN CGS has arranged several session with the help of MTO and expert consultant in training the operator and program covering ' Training for Trainer' to create more trained people within the community. Hamlet has more responsibility in creating appropriate trained operator of hire a trained operator in the operation of the lagoon. This O&M Plan is dependent on sufficient site specific training to allow staff to operate the facility and helping the hamlet for proactive awareness of Environmental Regulation.

8.1 Emergency Response

The lagoon emergency response plan sets out appropriate procedures to address foreseeable emergencies. In the event of an emergency, guidance and site emergency response can be obtained from the sources shown in the Table.

The key elements of this plan are:

- What is the nature and severity of the emergency?
- What is to be done?
- Who does it?

Table: Emergency Contact Information

Emergency Contacts	Contact	Location	Telephone	Fax
AANDC	Water/Wastewater Resources Manager	Iqaluit	(867) 975-4550	(867) 979-6445
Hamlet of Taloyoak	SAO	Taloyoak	867-561-2302	
CGS-GN	Regional Engineer	Cambridge Bay	867-983-4156	867-983-4123
Environment Canada	Inspector	Iqaluit	(867) 975-4644	(867) 975-4594
Fire Department		Cambridge Bay	(867) 983-4016	(867) 983-4003
RCMP				
Health Center				

8.2 Emergency Plan Updates

Municipal Services of the Hamlet shall review the emergency plan annually and, following an emergency incident, ensure that:

- Emergency response procedures for the lagoon are effective and updated as necessary
- Appropriate individuals are appointed to manage emergency situations
- Regular safety and emergency meetings are held with lagoon employees

9.0 wastewater Study and Research of Treatment process

A GN project for Taloyoak Sewage Lagoon and Wastewater Feasibility Study is currently under way. RFP (2014-45) for consultant hiring closed on July 21, 2014 and received couple of bid proposals- waiting for selecting the consultant. Expecting the study will start in fall 2014 and continue 2015. Scope of the study included technical, operational, economic analysis for wastewater treatment system, site visit, research, need assessment and a Design Brief of best alternative option compare to current practice.

APPENDIX – 'A'

Spill Contingency Plan

Sewage Lagoon Facility

Hamlet of Taloyoak

10. Introduction

The purpose of this plan is to outline response actions for potential spills. The plan identifies key persons and their roles in the event of a spill, as well as the equipment and other resources available to clean up a spill. This plan will explain and enable the hamlet on spill response procedures to minimize potential health and safety hazards, environmental protection, aquatic life threat and compliance to regulation. This included the responses Contact List for Nunavut and the reporting requirements of sewage waste, chemical, fuel, or hazardous waste spill.

10.1 Scope and purpose

The scope and purpose of the plan is to:

- Provide a understanding statement and procedure to be followed in response to a spill
- Minimize the potential environmental impact of a spill by establishing a pre-determined action plan
- Protect public health and ensure safety of the personnel involved in the Spill Response activities
- Provide a response reporting and follow up action for spills or emergency situation
- Ensure site protection, restoration and re-business the facility for sewage discharge
- Identify the roles and responsibilities involved in the spill response activities and
- Identify skill personnel, materials and equipment needed to make an adequate response to a spill.

10.2 Community Policy

The Hamlet of Taloyoak is committed to operate the sewage lagoon and waste in an environmentally sensitive way and complying requirements of the standard set out in the Nunavut Water Board since the facility remains waiting for the inclusion of the expired Water Licence. This plan will be used for activities associated with hamlet operations in the standard operation of the sewage disposal site in north.

10.3 Possible Spills and Contaminant Storage

Hamlet stores a 12% solution of sodium hypochlorite in the raw water pumphouse and treatment plant which are used to disinfect drinking water. Beside this chemical and fuel oil are used for heating and to run pumps and other equipment. The fuel storage tanks are also to the other side of the community and close near the water body lake. Sewage trucks drive from community to Sewage Lagoon to a distance of 3.2 km after collecting raw sewage from house sewage tanks. All these are in the risk list of possible spills in conjunction to water, sewage waste and municipal waste.

10.4 Petroleum product, waste oil, paint and antifreeze

Many operational uses of petroleum products in the community for transportation, heating, water and waste systems, used oil and paint drums end up at the waste disposal facility. These product spills from their operation (such as gas tank filling) to constant leaks from pipelines comes to repair, and major spills cause large contamination to soil and supply water issues.

Depending on the location of the spill, a petroleum product spill may result in contaminated soil, snow, ice or water. The contaminated materials must be cleaned up and removed for disposal along with the spilled petroleum product.

Waste oil, paint, antifreeze or engine coolant products are used in automotive engines and generally consist of ethylene glycol or propylene glycol mixed with distilled water (propylene glycol is significantly less toxic). Like petroleum products, used antifreeze product drums or other containers end up at the waste disposal facility and can range from minor spills to large spills.

Petroleum and antifreeze product spills can be handled in the same manner. Refer to WHMIS (Workplace Hazardous Materials Information System) labels and MSDS (material safety data sheets).

10.5 Potential Environmental Impacts of Sewage Spill

Sewage spills impacts normal life and living causing nuisance to human movement. In general, sewage spills, environmental impacts are lower during the winter, as snow is a natural sorbent and ice forms a barrier lining for limiting soil or water contamination. Spills can be more readily recovered when identified and reported.

10.6 Sewage Spill Concerns:

- Human and wildlife health hazard, and unsightly appearance and
- High nutrient concentrations could negatively impact to water bodies and runoff into water bodies

Worst Case Scenario: Full sewage truck releases all of its contents onto ground or into water body and surrounding environment or substantial failure of the sewage lagoon berm that releases the entire contents of the lagoon uncontrolled into the surrounding environment.

11.0 Action Plan in the Event of a Spill

The Hamlet of Taloyoak remains responsible for spill response clean up in the event of a spill during the facility operation and sewage waste collection disposal program. For severe issues and large spill, expert consultation will be required. This plan explains details information and responsive action in the event of a spill for immediate action and follow measures for regulatory reporting.

11.1 Initial Action:

In the event of a sewage spill, the following measures should be followed by the first person on the scene:

- Ensure safety of the assessor and associates.
- Assess the spills risk and affected personnel & pets.
- If possible, facilitate for ventilation of the area of leak or spill (opening doors and windows).
- Gather information of cause of spills, time and source of spill, status of spills as much as possible
- Estimate the size and amount of spills and affected area

11.2 Actual response to spill:

- Make all precaution and safety measure necessary to deal with spills
- Wear personal protective equipment (shoes, gloves, safety glasses, safety long-sleeved shirt if any).
- Wear respirator/self-contained breathing apparatus (SCBA), especially for large spills.
- Remove all other non-affected chemicals from the area if safe to do.
- Spray water to dilute the spills, mop or wipe up and place in proper container.
- Contain by diking (soil/dry sand/kitty litter), absorb with inert material (soil/dry sand/kitty litter) and by placing chemical waste container. After mopping up chemical, wash the affected area with soap and water, mop into spill container and store safely.
- Avoid using any combustible materials such as sawdust, plywood, cardboard and remove them if any in or around the spill area.
- Contain runoff from spill clean-up.
- Notify the Northwest Territories/Nunavut twenty-four (24) hour spill reporting centre at (867) 920-8130 and receive disposal information

11.3 Procedures for Containing and Controlling Spill

General procedures noted below will be used to contain and control all spills, specifically for spills on land, water, snow and ice.

- First anticipate what will be affected by the spill
- Assess direction and speed of spill, and any factors that could affect these
- Determine best location for containing spill

11.3.1 Spills on Land:

Ditch and trenches can be constructed to contain spills on it, preferable to use liner on sides. Soil from the spill area can be dug out and piled up to create a barrier for the spill. A liner or plastic retention tarp can be placed at the base of the ditch with gradient of flow, the frozen layer can be helpful in making such containment and the pooled material can be removed with sorbent materials. Once spills substrate is contained, it can be pumped out, or removed by using sorbent materials. If the spill is a minimum, such ditch may not be necessary and the material can be removed before migrating away from the location.

11.3.2 Spills on Water:

Spills on water are considered the most serious. Often, there is no harmful containment of the spilled material and water quality and aquatic life are negatively impacted, but it does indulge the Drinking Water Quality. Booms and weirs can be installed to contain the spill if spills are in ocean or lake. Booms are designed to float and are made of absorbent material to soak spills of suspended and colloidal. They are deployed from the shore or a boat, to create a circle around the spill. Weirs are installed across a stream to prevent further migration. Barriers made of fence or netting can be used as well, with sorbent material placed at the base of the barrier. Once contained, the spill contents can be removed by absorbent materials, pumped out or evaporation.

11.3.3 Spills on Snow:

Spills on snow can be managed more easily and visible. Snow acts as a natural sorbent for spills. Spill on snow is easily visible and can be shoveled into empty drums or barrels for proper disposal. If the spill is migrating around in down gradient, a snow dyke can be constructed to contain the spill. A plastic tarp can be placed at the base of the dyke where spills can to pool. The collected spill and impacted snow can be removed with absorbent materials or shoveled into barrels for disposal.

11.3.4 Spills on Ice:

Spill on ice layer is considered impermeable, so in general easy to clean up. Spills can be cleaned up by placing absorbent materials on top of the ice. Impacted snow and slush can then be removed by shovels and placing in barrels for disposal. For larger spills, dykes of snow and trenches can be constructed to contain the spill. The pooled spill can then be removed by adsorbent materials or pumped out. Impacted snow and slush can be shoveled into barrels for disposal.

The worst case scenarios include a dyke or trench overflowing and large spill on water that cannot be housed with materials and resources available in the community. A trench or collection pit could be constructed downstream to collect the spill, if not able to manage the spill, an emergency response team would need to be called with appropriate equipment to deal with the spill.

12.0 Spill response training

Hamlet operations personnel should have up-to-date spill training so they are prepared in the event of a chemical, fuel or waste spill. This training will at least include on-the-job training, and may include formal spill training courses and on-site spill training exercises (mock spills). Hamlet personnel may receive formal spill response training from the Department of Environment, GN in Iqaluit.

If the Hamlet brings contractors on-site to make modifications to the water and waste facilities, the contractors should be made aware of procedures to be followed in the event of a spill.

Workplace Hazardous Materials Information System (WHMIS) training should be given to employees. WHMIS training is legally required in Canada for all employees who are exposed/likely will be exposed to a hazardous material at the workplace.

12.1 Spill prevention measures

In consideration to the environment and possibility of a spill, the hamlet must take the following spill preventions measures for sewage and wastewater facility:

- Sewage truck operators must be trained in safe truck operation and sewage disposal procedures
- Operators must take caution to ensure that the sewage trucks are not filled to capacity

12.2 Managing spills waste

In the event of a spill, cleaning generally starts at the outer line of the affected spot and move towards the point of the spill. Sponging, sorbent materials and hand tools such as cans and shovels are used for smaller spills. Larger spills can be managed with the use of a pump or other suction equipment. Spill wastes include absorbent materials and containers of impacted spill water and snow. Sorbent materials should be placed in plastic bags for proper disposal. The containers of impacted water and snow should be sealed and stored until disposal at an approved facility can be arranged. Following a spill, those used materials need to be properly washed and replaced.

12.3 Restoring affected area or spot

Once a spill has been contained, community personnel will consult with regulatory personnel assigned to the file to determine the level of clean-up required. Regulatory personnel may request that a site specific study be conducted, to ensure appropriate clean-up levels are met

12.4 Follow-Up Action

After cleaning up spills, other reporting, disposal and follow-up activities may be required. The following measures should be taken if applicable:

- Dispose of chemical, inert absorbent material, and mop-up water as directed by Spill Reporting Line
- Arrange for repair or replacement of chemical containers, pipelines and equipment, if damaged
- Submit a detailed report on the occurrence to an AANDC Inspector, within thirty (30) days of reporting the event.

12.5 Spill Reporting Procedures

- Spills should be reported immediately to the Municipal Supervisor and/or SAO who will determine if the spill is to be reported to the 24-Hour Spill Report Line at 867-920-8130.
- Copies of the Spill Report form are available in each spill kit. The form will be filled out by the Public Works Foreman or Director and faxed or emailed to the 24-Hour
- Spill Report Line. Contact information is as follows:
  24-Hour Spill Report Line; Phone: (867) 920-8130 Fax: (867) 873-6924 Email: spills@gov.nt.ca

Spill Response Contact List

Organization	**Contact /Location**	**Phone / contact Number**
AANDC Water Resources	Water Resource Officers in Iqaluit	Ph: (867) 975-4295 Ph: (867) 975-4500
Northwest Territories/Nunavut 24 Hour Spill Report Line		Ph: (867) 920-8130 Fax: 867-873-6924 spills@gov.nt.ca
Nunavut Department of Environment Conservation Office		Ph : (867) 983-4164
Environment Canada	Environmental Protection Operations, Environmental Emergencies	Ph: (780) 951-8861
Kitikmeot Inuit Association	Cambridge Bay	Ph: (867) 983-2458
Fisheries Management, Department of Fisheries and Oceans.	Iqaluit	Ph: (867) 979-8000

12.6 Reporting Requirements

The Water License calls for any chemical or petroleum product spill or unauthorized discharge of waste to be reported immediately to both the twenty-four (24) hour Spill Reporting Line and an AANDC Water Resources Inspector. Spills to be reported include spills that have already occurred, or potential spills that are about to occur. Spills must be reported if the amount is greater than or equal to the amount listed in the Nunavut (or interim GNWT) Spill Contingency Planning and Reporting Regulations for each contaminant.

Environment Canada requires that spills or environmental accidents be reported to the twenty-four (24) hour Spill Report Line. When reporting a spill to the twenty-four (24) Hour Report Line, give as much of the following information as possible:

- Date and time of spill,
- Location of spill,
- Direction spill is moving,
- Name and phone number of a contact person close to the location of spill,
- Type and quantity of contaminant spilled,
- Whether spill is continuing or stopped,
- Actions taken to contain, recover, clean-up and dispose of contaminant,
- Name and phone number of person reporting spill and person in charge of the facility.

The Hamlet must also submit to an Inspector a detailed report on the occurrence within thirty (30) days of reporting the event.

12.7 Public Notification Procedure

- The Contingency Planning and Spill Reporting Regulations for Nunavut require that Spill Contingency Plans include a public reporting procedure used to alert anyone who may be affected by a spill.
- On a case-by-case basis, hamlet's Senior Operating Officer and the Hamlet Council decide on the type of public notification procedure that is to be implemented to ensure public health and safety in the case of a spill.
- Typically, in the case of a large scale spill that is deemed to have a potential impact on public health and safety, the hamlet will notify local residents verbally and in person, via individual household visits.
- In the case of a small spill, where a negative impact on public health and safety is unlikely, the hamlet gives public notice of the spill via the local community radio.

13.0 Spill Kit

A spill kit should be in the safe storage and available when required in the event of a spill. The kit should include:

- Heavy-duty gloves
- Safety glasses
- Mop/wringer/spill squeegee
- Shovel/ broom/dustpan
- Chemical spill container with sealable lid
- Sand/kitty litter (absorbent, non-flammable material)

It is recommended that the hamlet retain one spill kit in the community, located at operator working area. The spill kit should contain the following with a 56 Gallon Universal Sorbent:

- (30)–3" x 48" socks
- (6)–3" x 10' socks
- (50)–15" x 17" pads
- (4)–pillows
- (50)–wipers
- (24)–disposal bags and ties
- (5)–tamperproof seals
- (4)–pair nitrile gloves
- (4)-shovels
- (2) Spill signs
- (1)–emergency response guidebook
- (1) Safety and Compliance Directory;

13.1 First Aid

The following first aid recommendations relate to spills of sodium hypochlorite. For first aid with other chemicals, follow any chemical-specific instructions or call the twenty-four (24) hour Spill Reporting Line for assistance.

13.1.1 Skin Contact

Immediately flush skin with water for at least twenty (20) minutes while removing all exposed clothing. Get medical attention immediately. Wash all exposed clothing with soap and water and dry before reuse, thoroughly clean exposed shoes.

13.1.2 Inhalation

Remove person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Ensure the person is at rest – no physical exertion. Get medical attention immediately.

APPENDIX 'B'

QA/QC Plan

Sewage Lagoon facility
Hamlet of Taloyoak

14.0 Introduction

The purpose of this QA/QC plan is to provide guidance to ensure that sewage facility is in compliance with requirements and environmental monitoring program of grab samples collected in the field are done with a high degree of quality to ensure the accurately reflect the physical and chemical nature of the matrix being tested.

14.1 Background

Hamlet of Taloyoak is located on the Boothia Peninsula within the Kitikmeot region of Nunavut, within a zone of continuous permafrost and situated on sand & gravel raised beaches with flat & rolling terrain with numerous lakes and ponds.

The lagoon system is located approximately 3.2 km from the community, with about 35,700 m3 capacity. The primary cell receives raw sewage from trucked discharge and it stays in the primary cell for the winter. Upon spring / summer melt, effluent & water flows over a semi-submerged berm into the secondary cell, from where it naturally overflows onto wetland. The meandering wetland about 900 m, enriched with seasonal vegetation, helps effluent remediation process excellent before runs to ocean.

14.2 Objectives

This QA/QC plan is prepared in accordance with “Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class “B” Licensees in Collecting Representative Water Samples in the Field and for submission of a QA/QC Plan” (Department of Indian and Northern Affairs Canada, July 1996).

The objective of this QA/QC plan is to ensure the reliability of the monitoring activities of sampling specified in the identified stations and to satisfy the requirements of the water licence.

14.2.1 Scope of Work

This QA/QC Plan covers the environmental monitoring undertaken at the sewage waste facility The following definitions that are relevant to this plan include:

Quality Assurance: is a system that ensures that quality control procedures are correctly performed.

Quality Control: refers to the established procedures observed both in the field and in the laboratory, designed to ensure that the resulting end data meet intended quality objectives.

Trip Blank: is a sample of clean water that was prepared by the analytical laboratory and shipped to the sample site in the cooler along with the empty sample bottles. This trip blank sample remains unopened and is transported back to the laboratory with the monitoring program samples. The trip blanks is

analyzed by the laboratory along with the monitoring program samples. The purpose of the trip blank is the assess contamination introduced during shipping and field handling procedures.

CALA: refers to the Canadian Association for Laboratory Accreditation, formally known as the CanadianAssociation for Environmental Analytical Laboratories (CAEAL).

Chain of Custody Documentation: refers to the documentation that accompanies samples sent to an analytical laboratory. It is a legal document which ensures that the sample taken at a specific site is the same sample received in the laboratory. It also provides information on the sample condition and integrity as received by the laboratory

14.3 Sampling Procedures

All sampling, samples preservation and analyses are to be conducted in accordance with methods described in the manual, standard practice for northern weather and in the original or expired Water Licence. Procedure also remains in compliance with practice and guidance to CALA laboratory (here Taiga Laboratory in Yellowknife) approved for the Hamlet of Taloyoak.

To obtain meaningful results from the analyses, the following factors are of particular importance:

- Sample collection as per schedule and location of monitoring stations.
- Correct usage of container/sample bottle for parameter being tested.
- Correct labelling of sample bottles and filling out record/field sheet.
- Correct procedure for field sampling.
- Proper and timely shipment of samples to the laboratory.
- Timely delivery of samples to the laboratory from the air cargo facility.

14.4 Sampling Collection

Refer to the Environmental Monitoring Program Check list, details on the sampling locations, equipment and sampling methods.

Locations:

The water licence issued to the Hamlet by the NWB does not specify any monitoring locations. However, three monitoring locations are proposed in this plan.

- Station TAL-2 is an effluent discharge sampling location from the Sewage Disposal Facility.
- Station TAL-3 is run-off effluent sampling location from the Solid Waste Disposal Facilities.
- Station TAL-4 is a combined effluent discharge sampling location from the Sewage lagoon and solid waste run off before merging into Ocean.

The following table includes the geographic coordinates for the three monitoring stations.

Sampling Station	GPS Location		Description	Comments
	Latitude	Longitude		
TAL-1	N 69^0 32$'$ 39$''$	W 93^0 32$'$ 05$''$	Raw Water supply at Water Lake	Volume of water collected from lake
TAL-2	N 69^0 32$'$ 38$''$	W 93^0 35$'$ 39$''$	Sewage outfall entry to wetland	Outside the lagoon , onto wetland
TAL-3	N 69^0 32$'$ 26$''$	W 93^0 35$'$ 22$''$	Solid waste discharge run-off	Outside the fenced area on wetland
TAL-4	N 69^0 32$'$ 22$''$	W 93^0 35$'$ 25$''$	Effluent Final discharge point before meeting ocean	Combined effluent at the end of wetland
TAL-5	N 69^0 32$'$ 23$''$	W 93^0 34$'$ 34$''$	Hazardous storage cell retention water	New station. Sample collect only when decanting requires

14.5 Sampling Equipment

Dedicated latex or nitrile gloves (i.e., one pair per sample) are to be used during sample handling. Dedicated sampling equipment such as sampling poles are to be cleaned with sanitizer and water after each sample is collected to prevent cross-contamination.

Environmental monitoring samples collected for analysis of selected chemical parameters are to be placed directly into new pre-cleaned, laboratory-supplied sample bottles. All monitoring samples are to be placed in clean coolers for transportation to the subcontract laboratory.

The samples are transported/submitted under Chain of Custody documentation. Included on a Chain of Custody form is the client information, the sample information, the analyses requested, the relevant regulations, the turnaround time for the analytical results, comments, and temperature of the samples at the time they arrived in the laboratory. An example of a completed Chain of Custody form is included in Appendix D.

14.6 Sampling Methods

As a general recommendation, please refrain from using insect repellant, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.

14.6.1 Sewage wastewater effluent sampling

Effluent discharge is to be collected from the sewage discharge (Station TAL-2). Effluent samples are collected from the receiving water body by immersing the sample bottle into the water neck first to a depth of 5 to 10 cm. The sampling container is filled with effluent and the sample bottle is raised neck first to prevent sample spillage (Picture).

14.6.2 Combined effluent discharge and Solid waste run-off sampling

A sample of the combined effluent of sewage effluent discharge and solid waste run-off is to be collected once a month during periods of observed flow (July-Oct) from station TAL-4. The combined effluent discharge and runoff sample is to be collected from the receiving water body by immersing the sample bottle into the effluent runoff stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is to be filled with effluent runoff and the sample bottle is raised neck first to prevent sample spillage (see Picture).

Sampling at station: TAL-2

Sampling at station: TAL-4

14.7 Sample Handling

All water samples are to be collected in laboratory-supplied containers with the proper preservative, where applicable. A complete list of parameter handling and preservatives can be found in this manual. All sample containers are to be tightly sealed and properly labelled with the sample ID, Date and Time of sample collection, location of sample collection and parameters to be analyzed. The outside of the bottles are to be cleaned with soft tissue after sampling and dried off prior to placing the samples in the cooler. Samples are to be stored on ice in a cooler until delivery to the laboratory. A chain of custody form is to be filled out completely and is used to track samples and placed in the cooler along with the samples, in a zip lock bag. Keep the last page of the Chain of Custody and give it to the Hamlet Foreman for their records.

The following checks are generally performed by the laboratory upon receipt:

- Verification of the integrity and condition of all sample coolers.
- Verification of the integrity and condition of all sample containers.
- Checks for leakage, cracked or broken closures or containers, evidence of grossly contaminated container exteriors or shipping cooler interiors, and obvious odours, etc.
- Verification of receipt of complete documentation for each container.
- Verification that sample identification numbers on sample transmittal forms corresponds to sample identification numbers on the sample containers.

Verifications that holding times were met and samples were kept cool during transit.

14.8 Quality Assurance and Quality Control Program

Cross contamination is a common source of error in sampling procedures. QC samples help identify when and how contamination might occur. There are various types of QC samples. For the purposes of the Hamlet's environmental monitoring, it is recommended the use of trip blanks.

It is essential to request a trip blank sample to be prepared when placing the bottle order with the contract laboratory

15.0 **Laboratory Analysis**

Laboratory Accreditation

As indicated in the Guidelines, the Hamlet should use an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL) for the monitoring program.

Summary results from APPENDIX- 'E'

Table: Summary of Leachate Sampling Results (SNP Monitoring Station)

Sewage and solid waste effluent samples collected on Aug 22, 2013

	MAC	units	July 05, 2013		Aug 22, 2013	
Parameter	Limits		TAL-2	TAL-4	TAL-2	TAL-3
Alkalinity		mg/L	275	201	202	217
Conductivity		µS/cm	950	803	802	1070
P^H	6-9		7.46	7.90	8.65	7.56
TSS		mg/L	30	<3	115	42
Ammonia as N2		mg/L	15.8	0.10	1.20	0.31
BOD		mg/L	18	<2	58	29
CBOD		mg/L	15	<2	56	29
Nitrate as N2		mg/L	0.24	0.48	0.24	0.69
Nitrite as N2		mg/L	0.08	0.07		
Calcium		mg/L	55.8	58.2	50.3	76.2
chloride		mg/L	93.6	99.9	109	144
Hardness		mg/L	241	259	233	351
Magnesium		mg/L	24.7	27.7	26	39.1
Potasium		mg/L	15.1	7.5	16.1	9.9
Sodium		mg/L	70.3	69.2	81.5	98.3
Sulphate		mg/L	51	60	57	136
Fecal Coliform		CFU/100mL			1970	TNTC
Oil and Gas	5000	µg/L	Invis.	Invis.	Invis.	Invis.
Aluminium		µg/L	38	<5	63	32
Arsenic	100	µg/L	0.5	0.4	2.3	2.2
Cadmium	10	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium	100	µg/L	0.4	0.4	1.0	3.0
Cobalt	50	µg/L	<0.1	<0.1	<0.1	<0.1
Copper	200	µg/L	9.8	0.6	6.5	38
Iron		µg/L	88	224	146	856
Lead	50	µg/L	<0.1	<0.1	0.2	<0.1
Manganese		µg/L	27.3	21.7	26.5	51.1
Nickel	200	µg/L	1.2	0.8	2.1	2.5
Zinc	500	µg/L	10	<5	10	6

16.0 Facility Inspection

The SAO or MSM of the Hamlet will direct the Lagoon facility operation team in carrying regular or as required inspection of the facility. The sewage collection team usually maintain a log sheet in their daily operation of vehicles and sewage collection, transportation and discharge. Partly the operator will carry visual inspection of the discharge area and access road. The Forman or MSM will maintain those log sheet and record for annual report.

16.1 Inspection of sewage lagoon and components

Daily: A brief check of the lagoon shall be done daily when raw sewage discharge into the lagoon. Site and weather conditions shall be noted, as well as any activities carried out that day.

Weekly: During snow-free period in summer and fall, integrity of main components (discharge chute, flute tie and support, pad) of the sewage lagoon system should be inspected. A report shall be filed, noting the date and any issues identified. The truck discharge point and surrounding area should be examined weekly for signs of cracking, sliding or other operational issues.

The truck discharge system consists of discharge chute laid on a slope for conveying sewage from the truck discharge into the primary cell. The chute is anchored at the top and bottom of the slope. A pressure treated timber wheel stop and steel bumper posts are provided to control the position of the trucks during discharge. The timber wheel stop and steel bumper posts should be inspected regularly for any signs of damage or instability.
During open water periods, the water level in the lagoon should be observed and recorded.

16.2 Sewage Colour

The variations in the colour of sewage during open water periods can be an important indicator of a sewage lagoon system performance. The following list provides frequently observed sewage colours and associated performance indicators:

- *Dark Green* – Good. high pH and high dissolved oxygen (DO).
- *Dull Green to Yellow* – Not very good. pH dropping, DO dropping, and blue-green algae are becoming established.
- *Grey to Black* – Very bad. Lagoon anaerobic.
- *Tan to Brown* – Okay if caused by a type of algae bloom. Not good if due to silt or bank erosion.

- *Red or Pink* – Indicates presence of sulphur bacteria (anaerobic conditions) or presence of red algae (aerobic conditions).

Lagoon colour shall be noted during the weekly inspections. If the lagoon colour indicates poor performance (dull green to yellow, grey to black and red or pink) the Hamlet shall consult with the NWB to determine appropriate remedial actions. Sewage of this colour is not ready for discharge to ocean.

16.3 Reporting Requirements

As a condition of NWB Licence the Hamlet is required to submit an Annual Report to the NWB, no later than March 31st of the year following the calendar year reported. Among other requirements, the annual report is required to include tabular summaries of all analytical data generated under the Monitoring Program.

APPENDIX ‘C’

NWB Water Licence

3BM-TAL 0813

Hamlet of Taloyoak

P.O. BOX 119
GJOA HAVEN, NU X0B 1J0
TEL: (867) 360-6338
FAX: (867) 360-6369

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No.: 3BM-TAL0813

December 11, 2008

Mr. Chris Dixon
Acting SAO of Taloyoak
Hamlet of Taloyoak
P.O. Box 8
Taloyoak, NU X0B 1B0
E-mail: sao_hbhamlet@qiniq.com

RE: NWB Licence No. 3BM-TAL0813

Dear Mr. Dixon;

Please find attached Licence No. 3BM-TAL0813 issued to the Hamlet of Taloyoak by the Nunavut Water Board (NWB) pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*. The terms and conditions of the attached Licence related to water use are an integral part of this approval.

If the Licensee contemplates the renewal of this Licence, it is the responsibility of the Licensee to apply to the NWB for its renewal. The past performance of the Licensee, new documentation and information, and issues raised during a public hearing, if the NWB is required to hold one, will be used to determine the terms and conditions of the Licence renewal. Note that if the Licence expires before the NWB issues a new one, then water use must cease, or the Licensee will be in contravention of the *Nunavut Land Claims Agreement* (NLCA) and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA). However, the expiry or cancellation of a licence does not relieve the holder from any obligations imposed by the licence. The NWB recommends that an application for the renewal of this Licence be filed at least three months prior to the Licence expiry date.

If the Licensee contemplates or requires an amendment to this licence, the NWB may decide, in the public interest, to hold a public hearing. The Licensee should submit applications for amendment as soon as possible to give the NWB sufficient time to go through the amendment process. The process and timing may vary depending on the scope of the amendment, however a minimum of sixty (60) days is required from time of acceptance by the NWB. It is the responsibility of the Licensee to ensure that all application materials have been

received and acknowledged by the Manager of Licensing.

The NWB strongly recommends that the Licensee consult the comments received from interested persons on issues identified[1]. The NWB notes that among the comments received were recommendations from the Department of Fisheries and Oceans on how the water intake facilities should be constructed and operated such that impact to fish habitat are minimized. The Hamlet should consider implementing the DFO's recommendations. This information is attached for your consideration.

Sincerely,

Thomas Kabloona
Nunavut Water Board
Chair

TK/db

Enclosure: Licence No. 3BM-TAL0813
Comments: DOE, EC, INAC

cc: Kitikmeot Distribution List

[1] Government of Nunavut Department of the Environment, August 11, 2008; Department of Fisheries and Oceans Canada, June 9, 2008; Department of Indian and Northern Affairs, August 25, 2008; Environment Canada, August 29, 2008.

P.O. Box 119
Gjoa Haven, NU X0B 1J0
Tel: (867) 360-6338
Fax: (867) 360-6369

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

DECISION

LICENCE NUMBER: 3BM-TAL0813

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a new water Licence received on May 30, 2008, made by:

Hamlet of Taloyoak

to allow for the use of water for the Hamlet of Taloyoak, located within the Kitikmeot Region of Nunavut. With respect to this application, the NWB gave notice to the public on July 17, 2008 that the Hamlet had filed an application for a new water licence.

DECISION

After having been satisfied that the application was exempt from the requirement for screening by the Nunavut Impact Review Board in accordance with S. 12.3.2 of the *Nunavut Land Claims Agreement* (NLCA), the NWB decided that the application could proceed through the regulatory process. After reviewing the full submission of the Applicant and written comments expressed by interested parties, the NWB, having given due regard to the facts and circumstances, the merits of the submissions made to it and to the purpose, scope and intent of the *NLCA* and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and determined that:

Licence Number 3BM-TAL0813 be issued subject to the terms and conditions contained therein. (Motion #: 2008-06-L20)

SIGNED this 11th day of December, 2008 at Gjoa Haven, NU.

Thomas Kabloona
Nunavut Water Board
Chair

TABLE OF CONTENTS

I. BACKGROUND

The Hamlet of Taloyoak has a population of approximately 800 people and is located at the coordinates of 69° 32' north latitude and 93° 31' west longitude on the Boothia Peninsula within the Kitikmeot region of Nunavut. Taloyoak is located within a zone of continuous permafrost and is located on sand and gravel raised beaches with flat and gently rolling terrain containing numerous lakes and ponds.

Existing water use and waste disposal facilities include a freshwater intake pump and reservoir, sewage lagoon, solid waste disposal and hazardous waste storage.

II. PROCEDURAL HISTORY

The Hamlet of Taloyoak is currently unlicensed. Inspections carried out by the INAC Inspector have made reference to the need for the Hamlet to prepare the appropriate documentation and submit an application to the NWB for approval of the water source and intake along with the waste disposal facilities (solid waste and sewage) associated with the Hamlet. Inspections dating back to 1997 and those carried out from 2002 through to the latest Inspection Report dated January 11, 2008 for an inspection carried out on September 11, 2008 all have made note of the lack of a licence and the need for the Hamlet to comply with the *Act*. Currently, a Licence [1BR-TAL0712] for the operation of a landfarm within the Hamlet, was applied for on December 16, 2004 and issued on December 10, 2007.

On May 30, 2008 an application for a water licence for Taloyoak's new water treatment plant was submitted along with support documents in the form of Pre-Design reports produced by Dillon Consulting. Additional Tender Documents were submitted on July 16, 2008 following requests made by the Technical Advisor assigned to the file. Following a preliminary review of the application, the NWB concluded that it met the requirements of section 48(1) of the *Nunavut Waters and Surface Rights Tribunal Act* (the Act) and advised the Applicant and distribution list accordingly on July 17, 2008.

Information contained in the July 17, 2008 submission and distributed for review included the following:

- Application cover letter, May 28, 2008;
- NWB Licence Application form;
- Pre-Design Report, Water System Upgrades, Taloyoak; Dillon Consulting, November 13, 2007;
- Alternative Power Generation Report; Dillon Consulting, November 8, 2007;
- Taloyoak Water System Upgrade Planning Study; Dillon Consulting, April 2005;
- Taloyoak Water System Site Investigation and Remedial Action Plan; Dillon Consulting, December 13, 2004; and
- Submitted tender drawings, June 28, 2008.

The scope of the licence application applied only to the construction and operation of the water treatment plant. No other information was presented to the NWB. An amendment application should be made for the operation of both the landfill and the sewage lagoon, which are currently in operation, however unlicensed.

On July 17, 2008, the Nunavut Water Board publicly posted notice of this application, in accordance with Section 55.1 of the *Act* and Article 13 of the *Nunavut Land Claims Agreement* (*NLCA*). This assessment process included the referral of the application to a variety of Federal, Territorial and local organizations for their review and comment.

As no public concern was expressed, the NWB waived the requirement to hold a public hearing and proceeded with the application process.

The NWB received comments on the application from the Department of Fisheries and Oceans Canada (DFO) on June 9, 2008, the Government of Nunavut Department of Environment (GN-DoE) on August 11, 2008, the Department of Indian and Northern Affairs Canada (INAC) on August 25, 2008 and from Environment Canada (EC) on August 29, 2008.

Based upon the results of the detailed assessment, including consideration of any potential accidents, malfunctions, or impacts to water that the overall project might have in the area, the Board approved the application and has issued Licence 3BM-TAL0813.

III. ISSUES

Term of Licence

In accordance with Section 45 of the Act, the NWB may issue a licence for a term not exceeding twenty-five (25) years. In determining an appropriate term of a water licence, the Board considers a number of factors, including, but not limited to, the results of INAC site inspections and the compliance record of the Applicant. In review of the Inspection Reports prepared by INAC, the NWB has noted that there were several issues with the existing water source and treatment system that precipitated the need for upgrades. These were as follows:

i. The close proximity of the existing water source to the community resulting in the potential contamination of the water source;
ii. Run-off from the community has been observed to enter into the water source;
iii. The existing water treatment plant is outdated and requires upgrades to its electrical and mechanical components;
iv. The water treatment plant could no longer meet the needs of the increasing population;

Having considered INAC's inspection comments, as well as the history of the applicant, the NWB has decided on a five (5) year term for the Licence. This term is longer than the two (2) years the applicant originally requested and is principally due to the fact that the Licence

currently only covers the water taking operation and not the wastewater treatment and landfill operations. If a two (2) year term were awarded then the Licencee would not have sufficient time to seek amendments to this Licence to allow for wastewater and landfilling activities. The Licencee is strongly encouraged to seek amendments to this Licence as soon as possible in order to have its wastewater treatment and landfilling activities permitted under a Water Board Licence. The NWB has placed a requirement for the Licensee to submit a 'Plan for Compliance' that will detail how the waste management facilities will be brought under the Licence. This requirement is found under Part B, Item 10 of the Licence.

Annual Report

The NWB has imposed on the Licensee, the requirement to produce an Annual Report. These Reports are for the purpose of ensuring that the NWB has an accurate annual update of municipal activities during a calendar year. This information is maintained on the public registry and is available to interested parties upon request. A *"Standardized Form for Annual Reporting"* is to be used by the Licensee and is available from the NWB file transfer protocol (FTP) site under the Public Registry link at the NWB Website. Additional information may be submitted as required.
(ftp://nunavutwaterboard.org/ADMINISTRATION/Standardized%20Forms/).

Operational Manuals and Plans

Appropriate Manuals and Plans need to be developed to the satisfaction of the NWB for the operation and maintenance of the facilities, the protection of the environment with regard to potential spills through day-to-day operations, and abandonment and restoration of the sites.

It is noted that the Licensee has not submitted an Operations and Maintenance (O&M) Manual as part of the application process and as such, a requirement to provide a plan is included in the conditions of the Licence. The O&M Manual is to include the following in accordance with Part F, Item 1 of the Licence:

i. *Water Storage and Distribution Facility Operation and Maintenance (O&M) Manual*;
ii. *Spill Contingency Plan; and*
iii. *Monitoring Program Quality Assurance/Quality Control Plan.*

The purpose of the O&M Manual noted above is to assist Hamlet staff in carrying out the procedures relating to their water access and distribution facilities. The O&M Manual should demonstrate to the NWB that the Hamlet is capable of operating and maintaining the infrastructure related to water use in such a way that it meets the requirements of the Licence. The O&M Manual should be based, at a minimum, on the various NWB-approved guidelines and other regulatory guidelines as deemed appropriate.

Water Use

The Hamlet of Taloyoak currently obtains its water from "Water Lake" for potable use. This source is not currently licensed by the Board. The proposed new source of potable water for the Hamlet is Canso Lake, located to the northeast. No concerns were raised by the parties in their written submissions as to the amount of water required by the Hamlet, the manner in which it is obtained, the location of the water source or the manner in which this water will be used. The Department of Fisheries and Oceans Canada (DFO) however, did make several recommendations with respect to the construction window, including a timeframe when construction of the new water taking infrastructure should take place and mitigation procedures that should be implemented during construction. Provided that the additional mitigation measures described within DFO's submission, are incorporated into the plans, DFO has concluded that the proposal is not likely to result in impacts to fish and fish habitat, and that formal approval from DFO is not needed to proceed.

Sewage

The application as received did not provide information on the activities related to sewage collection, treatment, containment and disposal. Therefore an amendment to this Licence will be required in order to permit these activities.

Solid Waste

As with the sewage disposal, the application as received did not provide information on the activities related to solid waste collection, containment, disposal or storage (hazardous wastes). Therefore, an amendment to this Licence will be required in order to permit these activities.

Abandonment and Restoration

To ensure that all existing end-of-life facilities are reclaimed in an appropriate manner, the NWB requires Licensees to submit an *Abandonment and Restoration Plan*. The NWB notes that the existing Water Supply Facilities are being replaced and as such the Board requires the Licensee submit for approval within ninety (90) days of issuance of this Licence an *Abandonment and Restoration Plan* for this facility. In addition to the above Plan the NWB also requires the Licensee to submit at least six (6) months prior to final closure of any licensed facility, or upon submission of the final design drawings for the construction of new facilities to replace existing ones, an *Abandonment and Restoration Plan* for the licensed facilities. The requirements for the Plans are outlined in Part G, Item 1 and 2 of this Licence. The Licensee should also be aware that any on-going restoration work is to be reported in the annual report.

IV. LICENCE 3BM-TAL0813

Pursuant to the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

HAMLET OF TALOYOAK
(Licensee)

of

P.O. BOX 8, TALOYOAK, NUNAVUT X0B 1B0
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water for a period subject to restrictions and conditions contained within this Licence:

Licence Number **3BM-TAL0813**

Water Management Area **NUNAVUT 07**

Location **TALOYOAK, KITIKMEOT REGION, NUNAVUT (Latitude 69°32'N and Longitude 93°31'W)**

Purpose: **WATER TAKING AND WATER USE**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to Exceed **TWO HUNDRED AND FORTY EIGHT (248) CUBIC METRES PER DAY**

Date of Licence **DECEMBER 11, 2008**

Expiry Date of Licence **SEPTEMBER 30, 2013**

Dated this 11th of December, 2008 at Gjoa Haven, NU.

Thomas Kabloona
Nunavut Water Board
Chair

PART A: SCOPE AND DEFINITIONS

1. Scope

This Licence allows for the use of water for an undertaking classified as municipal as per Schedule II of the Regulations at the Hamlet of Taloyoak, Kitikmeot Region, Nunavut (69° 32' N; 93° 31'W).

a. This Licence is issued subject to the conditions contained herein with respect to the taking of water. Whenever new Regulations are made or existing *Regulations* are amended by the Governor in Council under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, or other statutes imposing more stringent conditions relating to the taking of water, this Licence shall be deemed, upon promulgation of such Regulations, to be subject to such requirements; and.

b. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. Definitions

In this Licence: **3BM-TAL0813**

"Act" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

"Amendment" means a change to original terms and conditions of this Licence requiring correction, addition or deletion of specific terms and conditions of the Licence; modifications inconsistent with the terms of the set terms and conditions of the Licence;

"Analyst" means an Analyst designated by the Minister under Section 85 (1) of the *Act*;

''Appurtenant undertaking'' means an undertaking in relation to which a use of waters or a deposit of waste is permitted by a licence issued by the Board;

"Average Concentration" means the arithmetic mean of the last four consecutive analytical results for composite or grab samples collected from the monitoring stations identified in Part H;

"Board" means the Nunavut Water Board established under the *Nunavut Land Claims Agreement*;

"Composite Sample" means a water or wastewater sample made up of four (4) samples taken at regular periods over a 24 hour period;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Engineering, Geological and Geophysical Act (Nunavut)* S.N.W.T. 1998, c.38, s.5;

"Freeboard" means the vertical distance between water line and the designed maximum operating height on the crest of a dam or dyke's upstream slope;

"Geotechnical Engineer" means a professional engineer registered with the Association of Professional Engineers, Geologist and Geophysicists of Nunavut and whose principal field of specialization with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments;

"Grab Sample" means a single water or wastewater sample taken at a time and place representative of the total discharge;

"Greywater" means all liquid wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet wastes;

"**Inspector**" means an Inspector designated by the Minister under Section 85 (1) of the Act;

"Licensee" means the holder of this Licence;

"Modification" means an alteration to a physical work that introduces new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion, and changes to the operating system that are consistent with the terms of this Licence and do not require amendment;

"Monitoring Program" means a monitoring program established to collect data on surface water and groundwater quality to assess impacts to the freshwater aquatic environment of an appurtenant undertaking;

"Nunavut Land Claims Agreement" (NLCA) means the "*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*", including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"Waste" means, as defined in S.4 of the Act, any substance that, by itself or in combination with other substances found in water, would have the effect of altering the quality of any water to which the substance is added to an extent that is detrimental to its use by people or by any animal, fish or plant, or any water that would have that effect because of the quantity or concentration of the substances contained in it or because it has been treated or changed, by heat or other means;

"Water Supply Facilities" comprises the area and associated intake infrastructure at Canso Lake, as described in the Application for Water Licence filed by the Applicant on May 30, 2008.

3. Enforcement

a. Failure to comply with this Licence will be a violation of the *Act*, subjecting the Licensee to the enforcement measures and the penalties provided for in the *Act*;

b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the *Act*;

c. For the purpose of enforcing this Licence and with respect to the use of water by the Licensee, Inspectors appointed under the *Act*, hold all powers, privileges and protections that are conferred upon them by the *Act* or by other applicable law; and

d. The Licensee shall, in relation to any application to renew or amend the Licence, provide an updated Plan for Compliance as submitted pursuant to Part B, Item 10. The updated Plan for Compliance must be submitted at the time of Application, in order for the Application to be deemed complete.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board not later than March 31st of the year following the calendar year reported which shall contain the following information:

a. tabular summaries of all data generated under the "Monitoring Program";

b. the monthly and annual quantities in cubic metres of fresh water obtained at the Water Supply Facilities;

c. a summary of modifications and/or major maintenance work carried out on the Water Supply Facilities including all associated structures and facilities;

d. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

e. Any updates or revisions for manuals and plans (i.e., *Operations and Maintenance Manual*) as required by changes in operation and/or technology;

f. a summary of any studies or reports requested by the Board that relate to water use or restoration, and a brief description of any future studies planned; and

g. any other details on water use requested by the Board by November 1st of the year being reported.

2. The Licensee shall comply with the "Monitoring Program" described in this Licence, and any amendments to the "Monitoring Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Monitoring Program" and compliance dates specified in the Licence may be modified at the discretion of the Board.

4. Meters, devices or other such methods used for measuring the volumes of water used and waste discharged shall be installed, operated and maintained by the Licensee.

5. The Licensee shall, within ninety (90) days after the first visit by the Inspector following issuance of this Licence, post the necessary signs to identify the stations of the "Monitoring Program." All signage postings shall be in the Official Languages of Nunavut.

6. The Licensee shall immediately report to the 24-Hour Spill Report Line (867-920-8130) any spills, which are reported to, or observed by the Licensee, within the boundaries of the Water Supply Plant and source water.

7. The Licensee shall ensure a copy of this Licence is maintained at the Municipal Office at all times. Any communication with respect to this Licence shall be made in writing to the attention of:

Manager of Licensing:
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nunavutwaterboard.org

Inspector Contact:
Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

Analyst Contact:

Taiga Laboratories
Department of Indian and Northern Affairs
4601 – 52 Avenue, P.O. Box 1500
Yellowknife, NT X1A 2R3
Telephone: (867) 669-2781
Fax: (867) 669-2718

8. The Licensee shall submit one paper copy and one electronic copy of all reports, studies, and plans to the Board. Reports or studies submitted to the Board by the Licensee shall include a detailed executive summary in Inuktitut.

9. The Licensee shall ensure that all document(s) and correspondence submitted by the Licensee to the Board are received and acknowledged by the Manager of Licensing.

10. The Licensee shall submit to the Board for approval, within ninety (90) days of Licence issuance or upon the filing of any application in relation to the Licence within that time, a Plan for Compliance that clearly demonstrates the measures the Licensee will undertake, including an implementation schedule, to achieve full compliance with the conditions of this Licence, including the approval of the waste water and solid waste disposal facilities.

11. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as approved by the Board in writing.

12. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and condition imposed upon approval of a Plan by the Board become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.

13. This Licence is not assignable except as provided in Section 44 of the Act.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all fresh water from Canso Lake using the Water Supply Facilities or as otherwise approved by the Board in writing.

2. The daily quantity of water used for all purposes shall not exceed two hundred and forty eight (248) cubic metres.

3. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.

4. The Licensee shall not remove any material from below the ordinary high water mark of any water body unless otherwise approved by the Board in writing.

5. The Licensee shall not cause erosion to the banks of any body of water and shall provide necessary controls to prevent such erosion.

6. Sediment and erosion control measures shall be implemented prior to and maintained during the operation to prevent entry of sediment into water.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. This Licence does not allow for any activities related to sewage disposal, treatment and discharge, solid waste collection, containment or disposal. An application for an amendment to this licence will be required to permit these activities.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for written approval, construction design drawings stamped by a qualified engineer registered in Nunavut, prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water.

2. The Licensee may, without written approval from the Board, carry out modifications to the Water Supply provided that such modifications are consistent with the terms of this Licence and the following requirements are met:

    a. the Licensee has notified the Board in writing of such proposed modifications at least sixty (60) days prior to beginning the modifications;

    b. these modifications do not place the Licensee in contravention of the Licence or the Act;

    c. the Board has not, during the sixty (60) days following notification of the proposed modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and

    d. the Board has not rejected the proposed modifications.

3. Modifications for which all of the conditions referred to in Part E, Item 2, have not been met may be carried out only with written approval from the Board. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modification. These plans and drawings shall be stamped by an Engineer.

4. All activities shall be conducted in such a way as to minimize impacts on surface drainage and the Licensee shall immediately undertake any corrective measures in the event of any impacts on surface drainage

5. The Licensee shall implement sediment and erosion control measures prior to and during all activities carried out under this Part to prevent the release of sediment and minimize erosion.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board for approval, within ninety (90) days of issuance of the Licence, an Operations and Maintenance Manual prepared where appropriate, in accordance with the *"Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories; 1996"*. The Manual shall take into consideration the comments received during the application review process and shall contain a Spill Contingency Plan in the format set out by the *Consolidation of Spill Contingency Planning and Reporting Regulations R-068-9*. The Spill Contingency Plan shall be appended to the Operation and Maintenance Manual.

2. The Licensee shall review the O&M Manual referred to in Part F, Item 1 as required by changes in operation and/or technology and modify accordingly. Revisions are to be submitted in the form of an Addendum to be included with the Annual Report.

3. The Licensee shall perform more frequent inspections of the engineered facilities at the request of an Inspector.

4. If, during the period of this Licence, a fuel or chemical spill occurs, the Licensee shall:

    a. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and
    b. submit to the Inspector, a detailed report on each occurrence, not later than thirty (30) days after initially reporting the event, that provides the necessary information on the location (including the GPS coordinates), initial response action, remediation/clean-up, status of response (ongoing, complete), proposed disposal options for dealing with contaminated materials and preventative measures to be implemented.
    c. include all relevant data about the spill location, quantity, cause, clean-up efforts and future prevention in the annual report to the Board.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit for Board for approval within ninety (90) days of issuance of this Licence an *Abandonment and Restoration Plan* for the existing water intake facility that is being decommissioned.

2. The Licensee shall submit to the Board for approval an *Abandonment and Restoration Plan* at least six (6) months prior to abandoning of any facilities or upon submission of the final design drawings for the construction of new facilities to replace existing ones. Where applicable, the Plan shall include information on the following:

    a. water intake facilities;
    b. the water treatment facilities;
    c. petroleum and chemical storage areas;
    d. an implementation schedule;
    e. maps delineating all disturbed areas, and site facilities;
    f. consideration of altered drainage patterns; and
    g. future area use.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall measure and record, in cubic metres, the monthly and annual quantities of water pumped at the Water Supply Facilities, for all purposes.

2. The Licensee shall include all of the data and information required by the "Monitoring Program" in the Licensee's Annual Report, as required *per* Part B, Item 1, or as requested by an Inspector.

3. Modifications to the Monitoring Program may be made only upon written approval from the NWB.

4. All data concerning spills that occur within the boundaries of the Water Supply Plant and source shall be detailed in the annual report to the Board.

APPENDIX ‘D’

Operation Policy

Sewage Waste facility
Hamlet of Taloyoak

HAMLET OF TALOYOAK
ENVIRONMENTAL MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling (see Environmental Monitoring Program Schedule in Appendix E), send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups.	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspections	Perform an initial inspection of all routinely-monitored sampling locations before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Dedicated sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination. As a general recommendation, please refrain from using insect repellant, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.	☐
Sample Care (including Packing of Cooler)	All sample containers should be tightly sealed and properly labelled with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed. The outside of the bottles should be cleaned with soap and water and dried prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples and placed in the cooler with the samples, in a ziplock bag. Keep the last page of the Chain of Custody and give it to the Hamlet Foreman for their records.	☐
RAW WATER SUPPLY		
Sampling Station TAL-1	Station TAL-1 (see Figure 2) is a raw water supply (from Canso Lake) volume monitoring location. Measure and record (in m^3) the monthly and annual quantities of water pumped from Station TAL-1.	☐
SEWAGE DISPOSAL FACILITY		
Sampling Station TAL-2	Effluent discharge is collected from the existing Sewage Disposal Facility (see Figure 2) monthly during the months of May to August (see Schedule in Appendix E for timing and list of parameters to be sampled). Effluent samples are collected from the stream by immersing the sample bottle into the stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff and the sample bottle is raised neck first to prevent sample spillage.	☐
SOLID WASTE DISPOSAL FACILITY		
Sampling Station TAL-3	Landfill runoff is collected at the beginning, middle, and near the end of the season when flow is observed (see Schedule in Appendix E for timing and list of parameters to be sampled). Runoff samples are collected from the receiving water body (see Figure 2) by immersing the sample bottle into the runoff stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff and the sample bottle is raised neck first to prevent sample spillage.	☐
COMBINED EFFLUENT/RUNOFFF FROM SEWAGE DISPOSAL & SOLID WASTE DISPOSAL FACILITIES		
Sampling Station TAL-4	Combined effluent/runoff discharge is collected from the stream downgradient of the Sewage Disposal Facility and the Solid Waste Disposal Facility (see Figure 2) monthly during the months of May to August (see Schedule in Appendix E for timing and list of parameters to be sampled). Effluent/runoff samples are collected from the stream by immersing the sample bottle into the stream	☐

	neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff and the sample bottle is raised neck first to prevent sample spillage.	
HAZARDOUS WASTE DISPOSAL FACILITY		
Sampling Station TAL-5	Runoff from the Hazardous Waste Disposal Facility is collected at the beginning, middle, and near the end of the season when flow is observed (see Schedule in Appendix E for timing and list of parameters to be sampled). Runoff samples are collected from the receiving water body (see Figure 2) by immersing the sample bottle into the runoff stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff and the sample bottle is raised neck first to prevent sample spillage.	☐
POST-SAMPLING ACTIVITIES		
Sample Shipment	See **Sample Care** section for sampling handling and cooler packing instructions. Ensure all samples are shipped to the contract laboratory immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board.	☐

Checklist Performed By:

Name	Signature	Date

Sample Bottle Requirements
Nunavut Water Board Licence No. 3BM-TAL0813

Parameter	Recommended Sample Container	Preservative	Hold Time
Alkalinity	500 mL plastic	None	14 days
Anions (Br, Cl, F, NO_3, NO_2, PO_4, SO_4)	500 mL plastic	None	5/28 Days
Biochemical Oxygen Demand (BOD_5)	500 mL plastic	None	4 days
Carbon, Total Organic (TOC)	250 mL plastic	H_2SO_4 (pH < 2)	10 days
Conductivity	500 mL plastic	None	28 days
Dissolved ICPMS, ICP Metals	250 mL plastic	HNO3 (pH < 2)	60 days
Total ICPMS, ICP Metals - NOT FILTERED	250 mL plastic	HNO_3 (pH < 2)	30 days
Nitrogen - Ammonia (NH_3 - N) / Total Kjeldahl Nitrogen (TKN)	250 mL plastic	H_2SO_4 (pH < 2)	10 days
Phenolics - Total	120 mL amber glass	H_2SO_4 (pH < 2)	30 days
Solids - (TS, TSS, TDS)	500 mL plastic	None	7 days
Microbiological (incl. faecal coliforms)	300 mL plastic - Sterilized	$Na_2S_2O_3$	48 hours
Total Hardness	500 mL plastic	None	28 days
Total Petroleum Hydrocarbons	2 x 500 mL amber glass	$NaHSO_4$ (pH < 2)	40 days
	3 x 40 mL clear glass septum vial	$NaHSO_4$ (pH < 2)	14 days

TAIGA
Environmental Laboratory
Laboratoire Environnemental

TAIGA ENVIRONMENTAL LABORATORY
LABORATOIRE ENVIRONNEMENTAL TAIGA
4601 – 52 Avenue, P.O. Box 1500, Yellowknife, NT, X1A 2R3
Tel: (867) 669-2788 • Fax: (867) 669-2718
www.taiga.gc.ca

FIELD SHEET

Batch No: [illegible]

Send Results & Invoice to:
(Please notify if results or invoice are to be sent to different locations)

Company/Agency: Hamlet of Taloyoak
Address:
City/Town: Taloyoak Province/Territory: NU
Postal Code: X0B 1B0
Phone: 867-123-4567 Fax: 867-987-6543
E-mail: john.smith@gmail.com
Signature:

Client Project No:
Date collected: July 10/13
Time collected: 9:45 AM (TAL-2), 10:05 AM (TAL-3), 10:30 AM (TAL-4)
Sampler: John Smith
Location: Sewage Disposal / Landfill
Rush Required: ☐Yes ☐No
Note: *Analysis may be subcontracted without prior notice.*
See reverse for how to complete form and sampling protocols.

Date Received: Received By:
Comments:
(Laboratory use only)

-WATER SAMPLES –

Sample Type (freshwater, sewage, wastewater, potable, groundwater, salt water, *etc*)	Wastewater	Wastewater	Wastewater
Client Sample ID (As it should appear on final report)	TAL-2	TAL-3	TAL-4
Taiga Sample ID (Laboratory use only)			

[√] PLEASE CHECK PARAMETERS REQUESTED BELOW:

Bottle Type and Parameter			
Routine: pH, Conductivity, Alkalinity	✓pH ✓Cond ✓Alk	✓pH ✓Cond ✓Alk	✓pH ✓Cond ✓Alk
Routine: Individual Anions Suite ☐	Cl SO4 F NO2-N NO3-N	Cl SO4 F NO2-N NO3-N	Cl SO4 F NO2-N NO3-N
Routine: Total Nitrite (NO_2) + Nitrate (NO_3)	✓NO_2 + NO_3-N	✓NO_2 + NO_3-N	✓NO_2 + NO_3-N
Routine: Individual Cations Suite ☐	Ca Mg Na K	Ca Mg Na K	Ca Mg Na K
Routine: Hardness (Calculated)	✓Hardness	✓Hardness	✓Hardness
Routine: Reactive Silica	SiO_2	SiO_2	SiO_2
Routine: Laboratory use only	Rec'd Y N	Rec'd Y N	Rec'd Y N
Nutrients: Chlorine: Total, Residual	T. Cl R. Cl	T. Cl R. Cl	T. Cl R. Cl
Nutrients: Chemical Oxygen Demand	COD	COD	COD
Nutrients: Color	Apparent True	Apparent True	Apparent True
Nutrients: Turbidity	Turbidity	Turbidity	Turbidity
Nutrients: Total Suspended Solids, Dissolved Solids	✓TSS TDS	✓TSS TDS	✓TSS TDS
Nutrients: Ammonia	✓NH_3	✓NH_3	✓NH_3-N
Nutrients: Phosphorus: Total, Dissolved, Ortho	TP DP OP	TP DP OP	TP DP OP
Nutrients: Carbon: Total, Dissolved	✓TOC DOC	✓TOC DOC	✓TOC DOC
Nutrients: Nitrogen: Total, Dissolved	TN DN	TN DN	TN DN
Nutrients: Visible Oil and Grease	✓Visible	✓Visible	✓Visible
Nutrients: Laboratory use only	Received Y N	Received Y N	Received Y N
Sterile: Fecal Coliforms (FC)	✓FC	✓FC	✓FC
Sterile: Total Coliforms (TC), E. Coli (EC)	TC EC	TC EC	TC EC
Sterile: Fecal Streptococcus (FS)	FS	FS	FS
Sterile: Laboratory use only	Received Y N T: ____°C Sterile container Y N	Received Y N T: ____°C Sterile container Y N	Received Y N T: ____°C Sterile container Y N
Biological Oxygen Demand	✓BOD	✓BOD	✓BOD
Carbonaceous BOD	CBOD	CBOD	CBOD
Laboratory use only	Received Y N T: ____°C	Received Y N T: ____°C	Received Y N T: ____°C
Metals: Please indicate if sample is preserved and/or filtered	Pres ✓ Filt ☐ Pres ☐	Pres ✓ Filt ☐ Pres ☐	Pres ✓ Filt ☐ Pres ☐
Metals: ICP-MS(1): Cd, Cr, Cu, Co, Mn, Ni, Pb, Zn, Fe	Total Dissolved	Total Dissolved	Total Dissolved
Metals: ICP-MS(2): 25 element scan includes As (not included: B, Bi, Hg, Sn)	✓Total Dissolved	✓Total Dissolved	✓Total Dissolved
Metals: Individual Metals by ICP-MS (please circle each metal): Ag, Al, As, B, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Fe, Hg, Li, Mn, Mo, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ti, Tl, U, V, Zn	✓Total Dissolved	✓Total Dissolved	✓Total Dissolved
Metals: Laboratory use only	TM rec'd Y N DM rec'd Y N	TM rec'd Y N DM rec'd Y N	TM rec'd Y N DM rec'd Y N
Hexane Extractable Material (O&G)	HEM	HEM	HEM
Laboratory use only	Rec'd Y N Pres Y N	Rec'd Y N Pres Y N	Rec'd Y N Pres Y N
BTEX, Purgeable HC (40mL x 2 vials)	BTEX Purg HC	BTEX Purg HC	BTEX Purg HC
Extractable HC (1L amber glass bottle)	Ext HC	Ext HC	Ext HC
Trihalomethanes (40 mL x 2 vials)	THM	THM	THM
Laboratory use only	Vial rec'd Y N Ext rec'd Y N	Vial rec'd Y N Ext rec'd Y N	Vial rec'd Y N Ext rec'd Y N
Other: *see special request form*	Total Phenols	Total Phenols	Total Phenols

For safety purposes, please disclose any contaminants (e.g. heavy metals, cyanide, etc.) that may be present at high levels and pose a risk to human health:

Taloyoak Monitoring Program Schedule
Nunavut Water Board Licence No. 3BM-TAL0813

Monitoring	Location	Month												
Station ID	Description	January	February	March	April	May	June	July	August	September	October	November	December	Annual
TAL-1	Raw water supply intake at Canso Lake	V	V	V	V	V	V	V	V	V	V	V	V	V
TAL-2	Effluent discharge from Sewage Disposal Facility	V	V	V	V	V, R	V, R	V, R	V, R	V	V	V	V	V
TAL-3	Runoff from Solid Waste Disposal Facilities						R	R	R	R				
TAL-4	Combined effluent/runoff from Sewage Disposal & Solid Waste Disposal Facilities						R	R	R	R				
TAL-5	Runoff from Hazardous Waste Disposal Facilities						R	R	R	R				

Test Groups		
V	Volume (m^3)	
R	Routine	(Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), conductivity, oil & grease (visual), magnesium, sodium, chloride, total hardness, ammonia nitrogen, total cadmium, total cobalt, total chromium, total copper, total aluminum, total mercury, faecal coliforms, pH, nitrate-nitrite, total phenols, calcium, potassium, sulphate, total alkalinity, total zinc, total iron, total manganese, total nickel, total lead, total arsenic, total organic carbon (TOC), Total Petroleum Hydrocarbons (TPH))

APPENDIX ‘E’

Environmental samples Test Results

Sewage Waste facility
Hamlet of Taloyoak

Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.:
130486

- FINAL REPORT -

Prepared For: Hamlet of Taloyoak

Address: Box 8
Hamlet of Taloyoak, NU
X0E 1B0

Attn: **Chester Porter** **Facsimile: (867) 561-5057**

Final report has been reviewed and approved by:

Angelique Ruzindana
Quality Assurance Officer

NOTES:

- Test methods and data are validated by the laboratory's Quality Assurance Program. Taiga Environmental Laboratory is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) as a testing laboratory for specific tests registered with CALA.
- Routine methods are based on recognized procedures from sources such as
  - Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF;
  - Environment Canada
  - USEPA
- Samples shall be kept for thirty (30) days after the final report is issued. All microbiological samples shall be disposed of immediately upon completion of analysis to minimize biohazardous risks to laboratory personnel. Please contact the laboratory if you have any special requirements.
- Final results are based on the specific tests at the time of analysis and do not represent the conditions during sampling.

ReportDate: Monday, July 15, 2013
Print Date: Monday, July 15, 2013

Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.: 130486

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-1 **Taiga Sample ID:** 001

Client Project: TAL 0713
Sample Type: Water
Received Date: 07-Jul-13
Sampling Date: 05-Jul-13
Sampling Time: 11:15
Location: Taloyoak, NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	275	0.4	mg/L	07-Jul-13	SM2320:B	
Conductivity, Specific (@ 25°C)	950	0.4	µS/cm	07-Jul-13	SM2510:B	
pH	7.46		pH units	07-Jul-13	SM4500-H:B	
Solids, Total Suspended	30	3	mg/L	07-Jul-13	SM2540:D	
Inorganics - Nutrients						
Ammonia as Nitrogen	15.8	0.005	mg/L	11-Jul-13	SM4500-NH3:	
Biochemical Oxygen Demand	18	2	mg/L	07-Jul-13	SM5210:B	
CBOD	15	2	mg/L	07-Jul-13	SM5210:B	
Major Ions						
Calcium	55.8	0.1	mg/L	08-Jul-13	SM4110:B	
Chloride	93.6	0.7	mg/L	08-Jul-13	SM4110:B	
Hardness	241	0.7	mg/L	08-Jul-13	SM2340:B	
Magnesium	24.7	0.1	mg/L	08-Jul-13	SM4110:B	
Nitrate as Nitrogen	0.24	0.01	mg/L	08-Jul-13	SM4110:B	

ReportDate: Monday, July 15, 2013
Print Date: Monday, July 15, 2013

Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.: 130486

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-1 **Taiga Sample ID:** 001

Nitrite as Nitrogen	0.08	0.01	mg/L	08-Jul-13	SM4110:B	
Potassium	15.1	0.1	mg/L	08-Jul-13	SM4110:B	
Sodium	70.3	0.1	mg/L	08-Jul-13	SM4110:B	
Sulphate	51	1	mg/L	08-Jul-13	SM4110:B	
Microbiology						
Coliforms, Fecal (other)			CFU/100mL		SM9222:D	105
Organics						
Oil and Grease, visible	Non-visible			10-Jul-13	Visual Exam	
Trace Metals, Total						
Aluminum	38	5	µg/L	09-Jul-13	EPA200.8	
Arsenic	0.5	0.2	µg/L	09-Jul-13	EPA200.8	
Cadmium	< 0.1	0.1	µg/L	09-Jul-13	EPA200.8	
Chromium	0.4	0.1	µg/L	09-Jul-13	EPA200.8	
Cobalt	< 0.1	0.1	µg/L	09-Jul-13	EPA200.8	
Copper	9.8	0.2	µg/L	09-Jul-13	EPA200.8	
Iron	88	5	µg/L	09-Jul-13	EPA200.8	
Lead	< 0.1	0.1	µg/L	09-Jul-13	EPA200.8	
Manganese	27.3	0.1	µg/L	09-Jul-13	EPA200.8	
Nickel	1.2	0.1	µg/L	09-Jul-13	EPA200.8	
Zinc	10	5	µg/L	09-Jul-13	EPA200.8	

ReportDate: Monday, July 15, 2013
Print Date: Monday, July 15, 2013

Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.: 130486

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-2 **Taiga Sample ID:** 002

Client Project: TAL 0713
Sample Type: Water
Received Date: 07-Jul-13
Sampling Date: 05-Jul-13
Sampling Time: 11:15
Location: Taloyoak, NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	201	0.4	mg/L	07-Jul-13	SM2320:B	
Conductivity, Specific (@ 25°C)	803	0.4	µS/cm	07-Jul-13	SM2510:B	
pH	7.90		pH units	07-Jul-13	SM4500-H:B	
Solids, Total Suspended	< 3	3	mg/L	07-Jul-13	SM2540:D	
Inorganics - Nutrients						
Ammonia as Nitrogen	0.105	0.005	mg/L	11-Jul-13	SM4500-NH3:	
Biochemical Oxygen Demand	< 2	2	mg/L	07-Jul-13	SM5210:B	
CBOD	< 2	2	mg/L	07-Jul-13	SM5210:B	
Major Ions						
Calcium	58.2	0.1	mg/L	08-Jul-13	SM4110:B	
Chloride	99.9	0.7	mg/L	08-Jul-13	SM4110:B	
Hardness	259	0.7	mg/L	08-Jul-13	SM2340:B	
Magnesium	27.7	0.1	mg/L	08-Jul-13	SM4110:B	
Nitrate as Nitrogen	0.48	0.01	mg/L	08-Jul-13	SM4110:B	
Nitrite as Nitrogen	0.07	0.01	mg/L	08-Jul-13	SM4110:B	

ReportDate: Monday, July 15, 2013
Print Date: Monday, July 15, 2013

Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.: 130486

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-2 **Taiga Sample ID:** 002

Potassium	7.5	0.1	mg/L	08-Jul-13	SM4110:B	
Sodium	69.2	0.1	mg/L	08-Jul-13	SM4110:B	
Sulphate	60	1	mg/L	08-Jul-13	SM4110:B	
Microbiology						
Coliforms, Fecal (other)			CFU/100mL		SM9222:D	105
Organics						
Oil and Grease, visible	Non-visible			10-Jul-13	Visual Exam	
Trace Metals, Total						
Aluminum	< 5	5	µg/L	09-Jul-13	EPA200.8	
Arsenic	0.4	0.2	µg/L	09-Jul-13	EPA200.8	
Cadmium	< 0.1	0.1	µg/L	09-Jul-13	EPA200.8	
Chromium	0.4	0.1	µg/L	09-Jul-13	EPA200.8	
Cobalt	< 0.1	0.1	µg/L	09-Jul-13	EPA200.8	
Copper	0.6	0.2	µg/L	09-Jul-13	EPA200.8	
Iron	224	5	µg/L	09-Jul-13	EPA200.8	
Lead	< 0.1	0.1	µg/L	09-Jul-13	EPA200.8	
Manganese	21.7	0.1	µg/L	09-Jul-13	EPA200.8	
Nickel	0.8	0.1	µg/L	09-Jul-13	EPA200.8	
Zinc	< 5	5	µg/L	09-Jul-13	EPA200.8	

ReportDate: Monday, July 15, 2013
Print Date: Monday, July 15, 2013

Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.: 130486

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-2 **Taiga Sample ID:** 002

- DATA QUALIFERS -

Data Qualifier Descriptions:

105 *Samples received past hold time, analysis not possible.*

*** Taiga analytical methods are based on the following standard analytical methods**

SM - Standard Methods for the Examination of Water and Wastewater

EPA - United States Environmental Protection Agency

ReportDate: Monday, July 15, 2013
Print Date: Monday, July 15, 2013

Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.: 130709

- FINAL REPORT -

Prepared For: Hamlet of Taloyoak

Address: Box 8
Hamlet of Taloyoak, NU
X0E 1B0

Attn: **Chester Porter** **Facsimile: (867) 561-5057**

Final report has been reviewed and approved by:

Judy Mah
Client Service Officer

NOTES:

- Test methods and data are validated by the laboratory's Quality Assurance Program. Taiga Environmental Laboratory is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) as a testing laboratory for specific tests registered with CALA.
- Routine methods are based on recognized procedures from sources such as
  - Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF;
  - Environment Canada
  - USEPA
- Samples shall be kept for thirty (30) days after the final report is issued. All microbiological samples shall be disposed of immediately upon completion of analysis to minimize biohazardous risks to laboratory personnel. Please contact the laboratory if you have any special requirements.
- Final results are based on the specific tests at the time of analysis and do not represent the conditions during sampling.

ReportDate: Monday, September 09, 2013
Print Date: Monday, September 09, 2013

Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-3 **Taiga Sample ID:** 001

Client Project:
Sample Type: Water
Received Date: 23-Aug-13
Sampling Date: 22-Aug-13
Sampling Time: 14:00
Location:
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	217	0.4	mg/L	23-Aug-13	SM2320:B	
Conductivity, Specific (@ 25°C)	1070	0.4	µS/cm	23-Aug-13	SM2510:B	
pH	7.56		pH units	23-Aug-13	SM4500-H:B	
Solids, Total Suspended	42	3	mg/L	29-Aug-13	SM2540:D	
Inorganics - Nutrients						
Ammonia as Nitrogen	0.310	0.005	mg/L	04-Sep-13	SM4500-NH3:	
Biochemical Oxygen Demand	29	2	mg/L	23-Aug-13	SM5210:B	
CBOD	29	2	mg/L	23-Aug-13	SM5210:B	
Major Ions						
Calcium	76.2	0.1	mg/L	23-Aug-13	SM4110:B	
Chloride	144	0.7	mg/L	23-Aug-13	SM4110:B	
Hardness	351	0.7	mg/L	23-Aug-13	SM2340:B	
Magnesium	39.1	0.1	mg/L	23-Aug-13	SM4110:B	
Nitrate as Nitrogen	0.69	0.01	mg/L	23-Aug-13	SM4110:B	

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Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-3 **Taiga Sample ID:** 001

Nitrite as Nitrogen	0.12	0.01	mg/L	23-Aug-13	SM4110:B	
Potassium	9.9	0.1	mg/L	23-Aug-13	SM4110:B	
Sodium	98.3	0.1	mg/L	23-Aug-13	SM4110:B	
Sulphate	136	1	mg/L	23-Aug-13	SM4110:B	
Microbiology						
Coliforms, Fecal (other)	TNTC	1	CFU/100mL	23-Aug-13	SM9222:D	86
Organics						
Oil and Grease, visible	Non-visible			29-Aug-13	Visual Exam	
Trace Metals, Total						
Aluminum	32	5	µg/L	28-Aug-13	EPA200.8	
Arsenic	2.2	0.2	µg/L	28-Aug-13	EPA200.8	
Cadmium	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8	
Chromium	3.0	0.1	µg/L	28-Aug-13	EPA200.8	
Cobalt	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8	
Copper	3.8	0.2	µg/L	28-Aug-13	EPA200.8	
Iron	856	5	µg/L	28-Aug-13	EPA200.8	
Lead	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8	
Manganese	51.1	0.1	µg/L	28-Aug-13	EPA200.8	
Nickel	2.5	0.1	µg/L	28-Aug-13	EPA200.8	
Zinc	6	5	µg/L	28-Aug-13	EPA200.8	

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Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-2 **Taiga Sample ID:** 002

Client Project:
Sample Type: Water
Received Date: 23-Aug-13
Sampling Date: 22-Aug-13
Sampling Time: 13:45
Location:
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	202	0.4	mg/L	23-Aug-13	SM2320:B	
Conductivity, Specific (@ 25°C)	802	0.4	µS/cm	23-Aug-13	SM2510:B	
pH	8.65		pH units	23-Aug-13	SM4500-H:B	
Solids, Total Suspended	115	3	mg/L	29-Aug-13	SM2540:D	
Inorganics - Nutrients						
Ammonia as Nitrogen	1.20	0.005	mg/L	04-Sep-13	SM4500-NH3:	
Biochemical Oxygen Demand	58	2	mg/L	23-Aug-13	SM5210:B	
CBOD	56	2	mg/L	23-Aug-13	SM5210:B	
Major Ions						
Calcium	50.3	0.1	mg/L	23-Aug-13	SM4110:B	
Chloride	109	0.7	mg/L	23-Aug-13	SM4110:B	
Hardness	233	0.7	mg/L	23-Aug-13	SM2340:B	
Magnesium	26.0	0.1	mg/L	23-Aug-13	SM4110:B	
Nitrate as Nitrogen	0.24	0.01	mg/L	23-Aug-13	SM4110:B	
Nitrite as Nitrogen	0.23	0.01	mg/L	23-Aug-13	SM4110:B	

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Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-2 **Taiga Sample ID:** 002

Potassium	16.1	0.1	mg/L	23-Aug-13	SM4110:B
Sodium	81.5	0.1	mg/L	23-Aug-13	SM4110:B
Sulphate	57	1	mg/L	23-Aug-13	SM4110:B
Microbiology					
Coliforms, Fecal (other)	1970	10	CFU/100mL	23-Aug-13	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			29-Aug-13	Visual Exam
Trace Metals, Total					
Aluminum	63	5	µg/L	28-Aug-13	EPA200.8
Arsenic	2.3	0.2	µg/L	28-Aug-13	EPA200.8
Cadmium	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8
Chromium	1.0	0.1	µg/L	28-Aug-13	EPA200.8
Cobalt	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8
Copper	6.5	0.2	µg/L	28-Aug-13	EPA200.8
Iron	146	5	µg/L	28-Aug-13	EPA200.8
Lead	0.2	0.1	µg/L	28-Aug-13	EPA200.8
Manganese	26.5	0.1	µg/L	28-Aug-13	EPA200.8
Nickel	2.1	0.1	µg/L	28-Aug-13	EPA200.8
Zinc	10	5	µg/L	28-Aug-13	EPA200.8

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Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-2 **Taiga Sample ID:** 003

Client Project:
Sample Type: Water
Received Date: 23-Aug-13
Sampling Date: 22-Aug-13
Sampling Time: 13:17
Location:
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	240	0.4	mg/L	23-Aug-13	SM2320:B	
Conductivity, Specific (@ 25°C)	2270	0.4	µS/cm	23-Aug-13	SM2510:B	
pH	7.93		pH units	23-Aug-13	SM4500-H:B	
Solids, Total Suspended	36	3	mg/L	29-Aug-13	SM2540:D	
Inorganics - Nutrients						
Ammonia as Nitrogen	0.009	0.005	mg/L	04-Sep-13	SM4500-NH3:	
Biochemical Oxygen Demand	4	2	mg/L	23-Aug-13	SM5210:B	
CBOD	3	2	mg/L	23-Aug-13	SM5210:B	
Major Ions						
Calcium	294	0.1	mg/L	23-Aug-13	SM4110:B	
Chloride	139	0.7	mg/L	23-Aug-13	SM4110:B	
Hardness	1090	0.7	mg/L	23-Aug-13	SM2340:B	
Magnesium	87.8	0.1	mg/L	23-Aug-13	SM4110:B	
Nitrate as Nitrogen	0.28	0.01	mg/L	23-Aug-13	SM4110:B	
Nitrite as Nitrogen	2.21	0.01	mg/L	23-Aug-13	SM4110:B	

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Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-2 **Taiga Sample ID:** 003

Potassium	46.2	0.1	mg/L	23-Aug-13	SM4110:B
Sodium	123	0.1	mg/L	23-Aug-13	SM4110:B
Sulphate	930	1	mg/L	23-Aug-13	SM4110:B
Microbiology					
Coliforms, Fecal (other)	87	1	CFU/100mL	23-Aug-13	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			29-Aug-13	Visual Exam
Trace Metals, Total					
Aluminum	82	5	µg/L	28-Aug-13	EPA200.8
Arsenic	4.0	0.2	µg/L	28-Aug-13	EPA200.8
Cadmium	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8
Chromium	1.1	0.1	µg/L	28-Aug-13	EPA200.8
Cobalt	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8
Copper	3.4	0.2	µg/L	28-Aug-13	EPA200.8
Iron	6940	5	µg/L	28-Aug-13	EPA200.8
Lead	1.8	0.1	µg/L	28-Aug-13	EPA200.8
Manganese	208	0.1	µg/L	28-Aug-13	EPA200.8
Nickel	5.5	0.1	µg/L	28-Aug-13	EPA200.8
Zinc	74	5	µg/L	28-Aug-13	EPA200.8

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Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-4 **Taiga Sample ID:** 004

Client Project:
Sample Type: Water
Received Date: 23-Aug-13
Sampling Date: 22-Aug-13
Sampling Time: 14:15
Location:
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	220	0.4	mg/L	23-Aug-13	SM2320:B	
Conductivity, Specific (@ 25°C)	1090	0.4	µS/cm	23-Aug-13	SM2510:B	
pH	7.97		pH units	23-Aug-13	SM4500-H:B	
Solids, Total Suspended	32	3	mg/L	29-Aug-13	SM2540:D	
Inorganics - Nutrients						
Ammonia as Nitrogen	0.050	0.005	mg/L	04-Sep-13	SM4500-NH3:	
Biochemical Oxygen Demand	25	2	mg/L	23-Aug-13	SM5210:B	
CBOD	23	2	mg/L	23-Aug-13	SM5210:B	
Major Ions						
Calcium	77.0	0.1	mg/L	23-Aug-13	SM4110:B	
Chloride	148	0.7	mg/L	23-Aug-13	SM4110:B	
Hardness	357	0.7	mg/L	23-Aug-13	SM2340:B	
Magnesium	40.0	0.1	mg/L	23-Aug-13	SM4110:B	
Nitrate as Nitrogen	0.34	0.01	mg/L	23-Aug-13	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	23-Aug-13	SM4110:B	

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Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-4 **Taiga Sample ID:** 004

Potassium	10.1	0.1	mg/L	23-Aug-13	SM4110:B	
Sodium	100	0.1	mg/L	23-Aug-13	SM4110:B	
Sulphate	131	1	mg/L	23-Aug-13	SM4110:B	
Microbiology						
Coliforms, Fecal (other)	TNTC	1	CFU/100mL	23-Aug-13	SM9222:D	86
Organics						
Oil and Grease, visible	Non-visible			29-Aug-13	Visual Exam	
Trace Metals, Total						
Aluminum	23	5	µg/L	28-Aug-13	EPA200.8	
Arsenic	1.9	0.2	µg/L	28-Aug-13	EPA200.8	
Cadmium	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8	
Chromium	0.6	0.1	µg/L	28-Aug-13	EPA200.8	
Cobalt	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8	
Copper	3.0	0.2	µg/L	28-Aug-13	EPA200.8	
Iron	492	5	µg/L	28-Aug-13	EPA200.8	
Lead	< 0.1	0.1	µg/L	28-Aug-13	EPA200.8	
Manganese	26.6	0.1	µg/L	28-Aug-13	EPA200.8	
Nickel	1.7	0.1	µg/L	28-Aug-13	EPA200.8	
Zinc	< 5	5	µg/L	28-Aug-13	EPA200.8	

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Taiga Batch No.: 130709

- CERTIFICATE OF ANALYSIS -

Client Sample ID: TAL-4 **Taiga Sample ID:** 004

- DATA QUALIFERS -

Data Qualifier Descriptions:

86 *Too numerous to count. Unable to repeat analysis at higher dilution. Holding time exceeded.*

*** Taiga analytical methods are based on the following standard analytical methods**

SM - Standard Methods for the Examination of Water and Wastewater

EPA - United States Environmental Protection Agency

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