Annual Report-2015

Water Licence: 3BM-GJO1318

Hamlet of Gjoa Haven, NU

Submitted to the Nunavut Water Board

March 24, 2016

Submitted by:

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Gjoa Haven Water Licence: 3BM-GJO 1318 — Annual Report-2015

March 24, 2016

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

Attention: Karen Kharatyan, Ph D., P. Eng., Manager of Licensing

RE: Water 3BM-GJO1318- Annual Report 2015, Hamlet of Gjoa Haven, NU

Dear Mr. Karen,

The Hamlet of Gjoa Haven is pleased to submit to Nunavut Water Board the attached file of "Annual Report 2015" of water uses and sewage solid waste disposal as required under the compliance of Water Licence, 3BM-GJO1318. Copies of required tests reports are attached here for your reference.

The Licensee has undertaken some effective steps for waste management during the summer and fall which has led improvement to sewage and solid waste facilities and effluent discharges. Monitoring program has been in effect during **June-September** each year as required in the Licence. Samples test result has shown excellent control on contamination parameters within allowable limit comprising BOD, TSS, E-coli and Toxicity components.

We summarize those conditions and requirements outlined **in Part B through part H**.

We hope that Nunavut Water Board will find this report and enclosed test results valuable to Annual Report in operating the Water Licence for water, sewage and solid waste facilities.

Best Regards,

Shah Alam, P. Eng., E.P.
Municipal Planning Engineer,
Community and Government Services
Kitikmeot Region, Cambridge Bay, Nu
Phone: 867-983-4156, fax: 867-983-4123
E. mail: salam@gov.nu.ca

Enclosure: Annual Report 2015 NWB Form, effluent and water sample results, compliance Part B-H
Cc: David Stockley, Senor Administrative Officer (SAO), Gjoa Haven
Baba Pedersen, Resource management Officer, AANDC

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EXECUTIVE SUMMARY:

This Annual Report 2015 for the Hamlet of Gjoa Haven (the Licensee) to the Nunavut Water Board (NWB) has been prepared to meet requirements of the Nunavut Water Board Licence 3BM-GJO 1318, Part B General Conditions, through part H conditions to the monitoring program. This report covers the period from 01 January to 31 December 2015.

Water intake from Swan Lake through twin intake pumps, delivered by 6 inch HDPE buried line to the treatment plant building 3 km away where it treated in pressure filters followed by chlorination before truck fill and supplied to household tank by hamlet operated water trucks. Quantity of water uses during this period is about **43,705** m3, within the allowable limit (62,000 annually).

Sewage waste collected from household sewage tanks using hamlet operated vacuum trucks, hauled to community sewage lagoon and discharge at the designated dropping point. Raw sewage stayed inside the lagoon during the period Oct through June for almost 9 months freezing where these receive primary treatment naturally. Annual decanting carried during July - August to reduce quantity inside and make room for new candidate sewage waste. Samples collected from defined designated monitoring stations and tested at Taiga Laboratory Yellowknife.

Batteries, waste oil and waste paint drums replaced inside the seacan placed at Solid waste facility – plan for shipping out from site with certified handler. Non-hazardous waste disposed at the Solid waste facility using hamlet operated truck and pushed down with local cover materials.

Issues on old sewage facility decommissioning carried with rectification to discharged effluent, sludge and demolition of berm. Berm materials were sampled and approved for reuse for back fill and decommission done as per plan and approval.

Water system upgrade and SCADA monitoring repair:

Buried water line insulation damaged to some portion and the line suffered winter freeze up partly during last 2-3 winters. It required continued excess water releasing from the buried line outside when the storage tank is full and no truck fill outside. This damaged line was replaced with new 6 inch HDPE insulated pipe during the last summer. With this replacement, water intake and supply efficiency increased but no changes to system, structure or program.

Mechanical upgrading also done to water system during the fiscal years 2014-2015 which included:

- Replacement of intake pumps and regulating valves at intake pumphouse (IPH)
- Water recirculation pressure pumps at IPH and 2- Heat Exchanger stations.
- Replacement of boilers with higher heat supply efficiency
- Replaced shell-in-tube heat exchangers at IPH and water treatment plant (WTP)

Plan for SCADA upgrading to water system control is in summer 2016, a construction tender out for such works which may include the PLC reprograming to provide correct information on time for water intake, flow rate, body temperature and any information helpful to secure service and facility.

Part B: General Conditions:

- Tabular Form of Annual water consumption and sewage disposal are filled in NWB Form
- Quantities were measured on daily basis of water distribution and sewage disposal
- New engineered lagoon is in operation for community sewage management. All drawings, documents and related information were updated with the Board including O&M manual.
- No modification to sewage waste wetland or solid waste site during 2015
- No unauthorized discharge or disposal to effluent or waste during this period.
- O&M manuals for water system and solid waste facilities manuals remains active
- Monitoring stations remains active as marked and updated the location with sign for the new station GJO-3A which is replaced from old lagoon location to new lagoon location of decanting. Scope remains for facility signage in standard Official languages of Nunavut.
- No device Meter was used for volume measurement, however, truck-fill measurement uses
- Plan of Compliance updated and implemented as requested by the Board.

Part C: Water Use:

- Water drawn from the Swan Lake and annual intake quantity about **43,705** cubic metres which is within the allowable annual limit **62,000** cubic metres.
- Intake system is free of erosion since pipe sides were protected by gravels along the bank
- Intake screen inside the lake intake point with clearance from bed and allowance frozen layer on top by 3m plus. No material removed from lake or intake bed near the screen.

Part D: Waste Disposal

- The municipal sewage waste contains both grey and black water; urinal& toilet flush water mix with bath & kitchen water in the same tank. Combined sewage stay inside the house tank for average 3-4 days before collecting by vacuum truck to discharge into the lagoon.
- Amount of sewage generated during this period (01 Jan - 31 Dec) is less than 42,000 m3. Quantity of sewage is calculated considering 90-95 % of water supply by truck.
- All sewage and solid waste disposal done to the designated location of sewage lagoon and waste facility using hamlet operated trucks. Sewage and effluent samples were taken from location Station GJO-3A and Final Discharge Point (end-of-pipe) GJO-4, test result shown contaminants parameters within allowable limits (FC: 10,000 CFU/dl; BOD_5:80; TSS: 100; P^H: 6-9; Oil & grease: none for station GJO-4). Results are attached including a summary.
- Freeboard at sewage lagoon remained more than1.0 m since it was decanted twice into wetland using a mechanical pump.
- The existing wetland area and facilities used for effluent treatment and remediation. Test results shown the effluent from Final Discharge Point (GJO-4) within limiting values (BOD: 80; TSS:100; 10,000 CFU/dl; P^H: 6-9) and not acutely toxic to Rainbow Trout or crustacean fish food.

Non-hazardous domestic Solid Waste:

- All solid wastes disposed in the approved waste facility which is fenced around and leachate run-off at the downstream where sampling stations marked for water collection. It requires some works to segregate hazardous waste from regular waste and secure to confined or containment-the Licensee will be more diligent in coming year to implement this plan as required and requested by the inspector. Batteries were housed in the seacan.
- Light materials, paper, paper boards and loose materials segregated and reduced by slow burning inside (trench) and pushed down burn ashes under the cover materials inside.
- Animal carcass buried under sand-pit inside the facility, but more cells requires in future.
- Broken house parts, metal frames and washing-dryers, fuel tanks, sewage tanks etc. need to be reduced or break which are under the plan for future years with additional resources.

Part E-G: Modification, construction, operation, A&R

- No modifications to sewage or solid waste facilities and operational plan since developed.
- Pipe replacement and mechanical upgrading completed- report with **'as-built'** drawing is included in this Annual Report as referred in **Part E, Item 4** of the water licence. Plan for upgrading to SCADA control and reprogramming PLCs are included here to acknowledge the Board. These upgrading and maintenance work did not cause any erosion to the water system, however on time backfilling with selected materials closed the possibilities of erosion along the buried line.
- Operation and maintenance Plan (O&M) for sewage and solid waste facilities were active since submitted Aug 15, 2013 and were approved by the Board. Revised O&M manual with inclusion of new Sewage facility submitted to the Board on Sep 30, 2014. No maintenance or repair works to these facilities during this period.
- No spills occurred during this period. No reclamation to facilities and therefore, no activities related to vegetation growth or seed deposition carried.

Part H: Monitoring Program

- Annual monitoring of sewage and solid waste effluent has been carried during the summer and fall by the Licensee and the consultant engaged for old sewage facility decommission. Samples were taken from monitoring stations where available as indicated in Part H of the licence, tested at Taiga Laboratory, Yellowknife (CALA approved). Test results are included with this report.
    - Station GJO-4 noted as the Final Discharge point from wetland to ocean; therefore, parameters constraints are mostly applicable for sample taken from this station.
    - Station GJO-2 represents the location where sewage effluent mixes with Solid waste run off before polishing by wetland. Therefore, parameters on metal components are basically increased compare to the outfall of sewage effluent from lagoon, but after polishing on wetland through sunlight, Oxygen and air, the final result shown excellent remediation as required to DFO regulation.

Annual Report - 2015

Water Licence 3BM-GJO 1318

Hamlet of Gjoa Haven, NU

ANNUAL REPORT 2015 – Water Licence: 3BM-GJO1318

YEAR BEING REPORTED: 2015

The following information is compiled pursuant to the requirements of Part B, Item 1 of Water Licence 3BM-GJO1318 issued to the Hamlet of Gjoa Haven.

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i) - iii) tabular summaries of all data generated under the "Monitoring Program"; monthly and annual quantities in cubic metres of freshwater obtained from all sources; monthly and annual quantities in cubic metres of each and all wastes discharged;

Attached are quantities of water used as reported in our On Tap Water Delivery System and the estimated discharge of sewage waste based on quantities used.

Month Reported	Quantity of Water Obtained from all sources (litres)	Quantity of Sewage Waste Discharged
January	3,628,643.00	Same
February	3,473,077.90	Same
March	3,931,248.80	Same
April	3,657,116.70	Same
May	3,539,833.00	Same
June	3,412,766.90	Same
July	3,515,164.80	Same
August	3,644,619.84	Same
September	3,324,203.40	Same
October	3,775,196.20	Same
November	3,971,817.90	Same
December	3,704,126.00	Same
ANNUAL TOTAL	**43,704,297.14**	Same

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

Water system:

- Buried water line insulation damaged to about 1200m length and the line suffered winter freeze up partly during last 2-3 winters. To continue water flow in the buried line, water intake required to continue and excess water be released outside when the storage tank is full inside the treatment plant. This damaged line portion was replaced with new 6 inch HDPE insulated pipe during the last summer. With this replacement, water intake, supply or treatment structure were not modified or affected, but increased the efficiency.
- Mechanical upgrading also done to water system during the fiscal years 2014-2015 which included:
    - Replacement of intake pumps and regulating valves at intake pumphouse (IPH)
    - Water recirculation pressure pumps at IPH and 2- Heat Exchanger stations.
    - Replacement of boilers with higher heat supply efficiency
    - Replaced shell-in-tube heat exchangers at IPH and water treatment plant (WTP)

Waste disposal:

- Warranty maintenance to berm and fence for the engineered lagoon carried that including the truck turnaround area protection, sewage drop-off pad and decanting liner pad. A new decanting structure with new pump installed at the lagoon decanting location.
- The old lagoon decommissioned and filled with berm materials. Effluent discharged on wetland and sludge dried on site and covered with berm materials. The decommissioned place remains protected and no further uses of the land piece, but a possible sludge dry cell for the new lagoon in future if needed.
- No changes to solid waste facility structure: fence, gate or monitoring stations. A trench for loose burning facility added near the metal dump area and covered with sand-gravel once burning completed.

v. a list of unauthorized discharges and summary of follow-up action taken;

- No unauthorised discharge or disposal during this period. Rectification to effluent discharge and sludge management done for old sewage facility as requested.
- Metal dumps and damaged vehicle parts, broken housing units, animal carcass etc. were collected from outside and replaced inside the solid waste facility at designated location.
- The old lagoon facility has been decommissioned and portion of wetland filled with berm materials from any water stagnant.

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

- Old sewage facility has been abandoned and decommissioned. Sewage disposal and treatment system program transferred to new lagoon, operation by the licensee.
- SCADA upgrading to system control and water intake & delivery in summer 2016.
- Two re-heat stations remained in same locations with same scopes, but old re-heat exchangers were replaced with higher heat supply system.

vii. a summary of any studies requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned;

- Effluent form new lagoon decant flows over on wetland mostly covering station points GJO-2 and GJO-4 and almost no runoff close near to solid waste facility. Therefore, very less possibility of effluent entering into the solid waste area and thus minimized the issue of mixing leachate in solid waste facility, but only runoff on wetland. Request from AANDC inspector in previous years for wetland study specifically streamline is not required after the use of the new lagoon facility. Also, new lagoon development included the wetland review which was submitted before.
- With a funding assurance, a plan to assess the status and upgrade the solid waste facility in future. Facilities will be required for sewage sludge drying and hazardous storage liner cell. Land farm facility would be required for community spills (if any) management.

viii. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported; and

- Excess water release from buried line was required when the line freeze up to continue the flow and water body temperature. It is requires to be informed to the inspector and submit records to review water requirements to the water licence. During this fiscal year, it was not required to release excess water since buried line worked perfectly without a freezing situation and water body temperature remained mostly steady.

ix. Updates or revisions to the approved Operation and Maintenance Plans.

- O&M manual for new sewage facility and sewage management plan updated before.
- No changes to water System O&M manual and the QA/QC plan since the program remained unchanged with the improvement of buried line and intake pumps.
  Water drawn from Swan Lake by using twin intake system (alternately), sent to treatment plant by 3 km long buried line, treat through high pressure filtration and chlorination before drawing by hamlet operated water truck. Water delivered to house hold tank by truck in regular hours 5 days a week and as needed on week end and after hours.
- No changes to Solid waste O&M manual. Improvement to facility operation done by waste segregation, isolation and loose materials reduction.

ADDITIONAL INFORMATION THAT THE LICENSEE DEEMS USEFUL:

- Auto parts and metal reduction carried by Summer Hill in the previous year using sea cans shipping to down south. This special program has created more space for new candidate auto parts; more waste reduction can be planned with new funding.
- Fencing to waste site and gate for securement in plan with leachate runoff containment inside to ensure compliance to guidelines and requirements outlined in the Licence.
- Tender out for SCADA upgrading and control system improvement to water system and expecting to be carried this work in summer 2016.
- Log sheets of Pump house and treatment plant operation covering Chlorine and Turbidity level in treated water are recording for everyday and at least test for every truckfill, reports sent to CGS every weekly/monthly. Report also include information on facility operation, maintenance, water flow, chlorine dosing, water drawn quantity, filters changes, water temperature etc.
- Water sent to EHO in Cambridge Bay every week for EC and FC test.

FOLLOW-UP REGARDING INSPECTION/COMPLIANCE CONCERNS:

- Earlier submitted compliance plan has been updated. New lagoon with about 1.5 times of annual volume of raw sewage will maintain sufficient holding time for primary remediation of sewage effluent inside before decanting out.
- Water titration carried with samples from water source (Swan Lake) and from treated water (treatment plant) on Sep 10, 2015. Result shown parameters in water are good standing and within compliance to Canadian Drinking Water Regulation.

Part- 'H'

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

Sewage and solid waste effluent samples

Parameter	MAC Limit Sewage Effluent	units	July 05, 2015 GJO-3	July 05, 2015 GJO-3A	July 08, 2015 GJO - 4	July 08, 2015 GJO -2
Alkalinity		mg/L	182	184	240	275
Conductivity		µS/cm	662	674	870	2410
P^H	6-9		7.24	7.21	7.3	7.04
TSS	*100	mg/L	36	25	32	586
Ammonia as N2		mg/L	36.1	36.4	45	5.22
BOD	*80	mg/L	125	116	132	217
Organic Carbon	*80	mg/L	71.2	70.7	79.7	192
Nitrate as N2		mg/L	<0.01	<0.01	0.11	0.18
Nitrite as N2		mg/L	<0.01	<0.01	0.19	0.07
Calcium		mg/L	13.3	13.2	16	294
chloride	250	mg/L	71.7	72.7	97.5	215
Hardness ($CaCO_3$)	500	mg/L	81.9	81.8	94.9	929
Magnesium		mg/L	11.8	11.9	13.3	47.3
Potassium		mg/L	12.6	12.3	16.5	45.8
Sodium	200	mg/L	46.3	46.8	60.8	174
Sulphate	500	mg/L	8	8	10	795
Fecal Coliform	10^6	CFU/100mL	1.7×10^5	2.9×10^5	1.7×10^5	10000
Oil and Grease	5000	µg/L	None	None	None	None
Aluminium	1000	µg/L	76.3	117	79.6	285
Arsenic	1000	µg/L	0.8	0.9	1.1	10
Cadmium	100	µg/L	0.3	0.4	0.3	2.4
Chromium	100	µg/L	0.8	0.9	1.3	5.1
Cobalt	50	µg/L	<0.1	<0.1	0.3	8.7
Copper	200	µg/L	50.6	61.2	47	166
Iron	1000	µg/L	182	215	350	23500
Lead	50	µg/L	0.4	0.5	0.7	52.8
Manganese		µg/L	15.5	15.6	35.6	998
Nickel	200	µg/L	1.1	1.3	1.7	30.2
Zinc	500	µg/L	68.2	84.1	64.6	2030
Mercury (Hg)	0.6	µg/L	0.01	0.03	0.02	0.16
Phenols	20	µg/L	0.23	0.25	0.31	0.17
Benzene		µg/L				

* Parameters MAC value as identified in the Water Licence.

Appendix: A

Pages from Water Licence

- Part B: General Conditions
- Part C: Conditions for Water use
- Part D: Conditions to Waste Disposal
- Part E: Conditions to Modification and Construction
- Part F: Conditions to operation and maintenance
- Part G: Conditions to abandonment and restoration
- Part H: Conditions to Monitoring Program

Water Licence 3BM GJO1318

Hamlet of Gjoa Haven, NU

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

c. For the purpose of enforcing this Licence and with respect to the use of water and deposit or discharge of waste 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.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report on the Appurtenant Undertaking with the Board no later than March 31st of the year following the calendar year being reported, containing the following information:

   a. tabular summaries of all data generated under the "Monitoring Program";
   b. summary of modifications to the "Monitoring Program" in accordance with Part H, Item 12;
   c. the daily, monthly and annual quantities in cubic metres of freshwater obtained from all sources;
   d. the daily, monthly and annual quantities in cubic metres of each and all waste discharged; including the hazardous and non-hazardous waste accepted at the Solid Waste Facilities;
   e. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;
   f. a list of unauthorized discharges and summary of follow-up action taken;
   g. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;
   h. a summary of any studies, reports and plans (e.g., Operation and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned;
   i. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported.

2. The Licensee shall notify the NWB of any changes in operating plans or conditions associated with this project at least thirty (30) days prior to any such change.

3. 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.

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

5. The Licensee shall install flow meters or other such devices, or implement suitable methods required for the measuring of water volumes as required under Part H, Item 1.

6. The Licensee shall, post the necessary signs, where possible, to identify the stations of the "Monitoring Program". All signage postings shall be in the Official Languages of Nunavut, and shall be located and maintained to the satisfaction of an Inspector.

7. The Licensee shall immediately report to the 24-Hour Spill Report Line at (867) 920-8130, any spills of Waste, which are reported to, or observed by the Licensee, within the municipal boundaries or in the areas of the Water Supply or Waste Disposal Facilities.

8. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted, cannot be undertaken without subsequent written Board approval and/or direction. The Board may alter or modify a Plan if necessary to achieve the legislative objectives and will notify the Licensee in writing of acceptance, rejection or alteration of the Plan.

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

10. The Licensee shall review the Plans referred to in this Licence, as required by changes in operation and/or technology, and modify the Plan accordingly. Revisions to the Plans shall be submitted in the form of an Addendum to be included with the Annual Report.

11. 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 conditions 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.

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

(a) 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

(b) Inspector Contact:
Manager of Field Operations, AANDC
Nunavut District, Nunavut Region
P.O. Box 100

Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

13. 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.

14. The Licensee shall ensure that any document(s) or correspondence submitted by the Licensee to the NWB is received and acknowledged by the Manager of Licensing.

15. This Licence is assignable as provided for in Section 44 of the *Act*.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all freshwater processed by the Water Supply Facilities and/or used for municipal purposes from Swan Lake or as otherwise approved by the Board in writing.

2. The annual quantity of water use for all purposes under this Licence shall not exceed sixty-two thousand (62,000) cubic metres per year or one hundred seventy (170) cubic metres per day.

3. Where the use of water is of a sufficient volume that the source Water body may be drawn down, the Licensee shall submit to the Board for approval in writing the following: the volume required a hydrological overview of the water body, details of impacts, and proposed mitigation measures.

4. The Licensee shall maintain the Water Supply Facilities to the satisfaction of the Inspector.

5. The Licensee shall equip all water intake hoses with a screen of 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.

6. The Licensee shall not remove any material from below the ordinary High Water Mark of any water body unless approved by the Board in writing.

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

8. Sediment and erosion control measures shall be implemented prior to and maintained as required during Hamlet operations, to prevent entry of sediment into water.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all Sewage to the current Sewage Disposal Facilities or as otherwise approved by the Board.

2. All Effluent discharged from the Sewage Disposal Facilities at Monitoring Program Station GJO-4 shall meet the following effluent quality standards:

Parameter	Maximum Concentration of any Grab
Faecal Coliforms	1×10^4 CFU/dl
BOD_5	80 mg/L
Total Suspended Solids	100 mg/L
Oil and grease	No visible sheen
PH	Between 6 and 9

3. A Freeboard limit of at least 1.0 metre, or as recommended by a qualified geotechnical Engineer and as approved by the Board in writing, shall be maintained at all dams, dykes, or structures intended to contain, withhold, divert or retain water or wastes.

4. The Licensee shall provide at least ten (10) days notification to an Inspector, prior to initiating any decant of the Sewage Lagoon.

5. The Sewage Disposal Facility shall be maintained and operated, in such a manner as to prevent structural failure.

6. The Licensee shall dispose of and permanently contain all Solid Wastes at the Solid Waste Disposal Facility or as otherwise approved by the Board in writing.

7. The Licensee shall implement measures to prevent hazardous materials and/or leachate from the Solid Waste Disposal Facility from entering water.

8. Licensee shall submit, within 30 days after the discharge point is identified and at least 60 days prior to discharging Effluent, the following information for any new Final Discharge Points or changes made to existing Final Discharge Points during the term of the licence:

    a. Plans, specifications and a general description of each Final Discharge Point together with its specific geo-referenced location;
    b. A description of how the additional Final Discharge Point is designed and maintained.

9. The Licensee shall use material that is free of contaminants for construction, operation, and maintenance activities and that is obtained from approved sources and has been demonstrated not to be potentially acid generating and metal leaching.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for approval, for construction drawings stamped and signed by a qualified engineer registered in Nunavut, sixty (60) days prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

2. The Licensee may, without written consent from the Board, carry out Modifications to the Water Supply Facilities and Waste Disposal Facilities 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. such Modifications do not place the Licensee in contravention of the Licence or the *Act*;
    c. such Modifications are consistent with the NIRB Screening Decision;
    d. 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
    e. the Board has not rejected the proposed Modifications.

3. The Modifications for which all of the conditions referred to in Part E, Item 2(a) through (d), have not been met, may only be carried out upon written approval from the Board.

4. The Licensee shall, within ninety (90) days of completion of Modification or Construction of facilities and/or infrastructure associated with the project, submit to the Board a Construction Summary Report along with stamped as-built plans and drawings, providing explanation to reflect any deviations from for construction drawings taking into account construction and field decisions and how they may affect the performance of engineered facilities.

5. 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.

6. The Licensee shall implement and maintain erosion control measures during activities carried out under this Part, to prevent impacts to water resulting from the release of sediment and minimize erosion.

7. With respect to earthworks, the deposition of debris or sediment into or onto any water body is prohibited. These materials shall be disposed a distance of at least thirty-one (31) metres from the ordinary High Water Mark in such a fashion that they do not enter the water.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Board has approved the Plan entitled "Hamlet of Gjoa Haven Sewage Treatment Facility Operation and Maintenance (O&M) Plan" dated August 15, 2013 that was submitted as additional information with the Application.

2. The Board has approved the Plan entitled "Hamlet of Gjoa Haven, Nunavut Solid Waste Treatment Facility Operation and Maintenance (O&M) Plan" dated August 15, 2013 that was submitted as additional information with the Application.

3. If, during the period of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall:

    a. employ the appropriate Spill Contingency Plan as provided in the Operation and Maintenance Plan. Take whatever steps are immediately practicable to protect human life, health and the environment;
    b. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the AANDC Manager of Field Operations at (867) 975-4295; and
    c. 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 any preventative measures to be implemented.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit to the Board for approval, an Abandonment and Restoration Plan at least three (3) months prior to abandoning any facilities or 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 and waste disposal sites and facilities;
    c. abandoned water and waste facilities;
    d. petroleum and chemical storage areas;
    e. any site affected by waste spills;
    f. leachate prevention;
    g. an implementation schedule;
    h. maps delineating all disturbed areas, and site facilities;
    i. consideration of altered drainage patterns;
    j. type and source of cover materials;
    k. future area use;
    l. hazardous wastes; and

m. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

2. The Licensee shall complete all restoration work within the time schedule specified in the Plan, or as subsequently revised and approved by the Board.

3. The Licensee shall carry out progressive reclamation of any components of the project no longer required for the Licensee's operations.

4. In order to promote growth of vegetation and the needed microclimate for seed deposition, all disturbed surfaces shall be prepared by ripping, grading, or scarifying the surface to conform to the natural topography.

5. Areas that have been contaminated by hydrocarbons shall be reclaimed to meet objectives as outlined in the Government of Nunavut's Environmental Guideline for Site Remediation, January 2002. The use of reclaimed soils for the purpose of back fill or general site grading may be carried out only upon consultation and approval by the Government of Nunavut, Department of Environment and an Inspector.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Board has approved the Plan entitled "Environmental Monitoring Program – Sample Collection Training Program" dated August 13, 2013 that was submitted as additional information with the Application.

2. The Licensee shall maintain Monitoring Program Stations at the following locations:

Monitoring Program Station Number	Description	Frequency	Status
GJO-1	Raw Water Supply at Swan Lake	Monthly	Active (Volume)
GJO-2	Effluent Final Discharge Point from Solid Waste Disposal Facility	Monthly (May to August)	Active (Quality)
GJO-3	Raw Sewage at truck offload point	Monthly	Active (Volume)
GJO-4	Effluent Final Discharge Point from Sewage Disposal Facility	Monthly (May to August)	Active (Quality)
GJO-5	Solid Waste leachate retention inside berm	Sample collected when decanting requires	Active (Quality)

3. The Licensee shall measure and record, in cubic metres, the daily, monthly and annual quantities of water extracted for all purposes at Monitoring Program Station GJO-1.

4. The Licensee shall sample monthly at Monitoring Station GJO-2 and GJO-4 during the months of May to August, inclusive. Sample shall be analyzed for the following parameters:

BOD	Faecal Coliforms
pH	Conductivity
Total Suspended Solids	Ammonia Nitrogen
Nitrate-Nitrite	Oil and Grease (visual)
Total Phenols	Sulphate
Sodium	Potassium
Magnesium	Calcium
Total Arsenic	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel
Total Zinc	

5. The Licensee shall measure and record in cubic metres the daily, monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Station GJO-3 for all purposes.

6. The Licensee shall provide the GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) of all locations where sources of water are utilized for all purposes.

7. The Licensee shall sample before decanting at Monitoring Station GJO-5. Samples shall be analyzed for the parameters stated in Part H, Item 4.

8. Additional sampling and analysis may be requested by an Inspector.

9. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of *Standard Methods for the Examination of Water and Wastewater*, or by such other methods approved by the Board in writing.

10. All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

11. The Licensee shall annually review the QA/QC Plan and modify it as necessary. Revised QA/QC Plans shall be submitted to the Board with a current approval letter from an accredited lab and shall meet the standards set out in Part H, Item 9 and Part H, Item 10 of the Licence.

12. 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 otherwise requested by an Inspector.

13. Modifications to the Monitoring Program including the Monitoring Program Stations and parameters may be made only upon written approval of the Board.

Appendix: B-1

Effluent Samples Results: Taiga Lab

Water Licence 3BM GJO 1318

Hamlet of Gjoa Haven, NU

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150466

- FINAL REPORT -

Prepared For: Dillon Consulting Ltd.

Address: Suite 303 - 4920 47 St.
Box 1409
Yellowknife,NT
X1A 2L8

Attn: **Andrea Cleland** **Facsimile: (867) 873-3328**

Final report has been reviewed and approved by:

Glen Hudy
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) to ISO/IEC 17025 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: Tuesday, July 14, 2015
Print Date: ***Tuesday, July 14, 2015***

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA3-2015-002 **Taiga Sample ID:** 001

Client Project: 11-5029
Sample Type: Sewage
Received Date: 06-Jul-15
Sampling Date: 05-Jul-15
Sampling Time: 9:30
Location: Gjoa Haven
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	36.1	0.005	mg/L	08-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	125	2	mg/L	06-Jul-15	SM5210:B	
Organic Carbon, Total	71.2	0.5	mg/L	09-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	182	0.4	mg/L	06-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	662	0.4	µS/cm	06-Jul-15	SM2510:B	
pH	7.24		pH units	06-Jul-15	SM4500-H:B	
Solids, Total Suspended	36	3	mg/L	06-Jul-15	SM2540:D	
Major Ions						
Calcium	13.3	0.1	mg/L	07-Jul-15	SM4110:B	
Chloride	71.7	0.7	mg/L	07-Jul-15	SM4110:B	
Hardness	81.9	0.7	mg/L	07-Jul-15	SM4110:B	
Magnesium	11.8	0.1	mg/L	07-Jul-15	SM4110:B	
Nitrate as Nitrogen	< 0.01	0.01	mg/L	07-Jul-15	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	07-Jul-15	SM4110:B	

ReportDate: Tuesday, July 14, 2015
Print Date: ***Tuesday, July 14, 2015***

Taiga Environmental Laboratory
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Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA3-2015-002 **Taiga Sample ID:** 001

Potassium	12.6	0.1	mg/L	07-Jul-15	SM4110:B
Sodium	46.3	0.1	mg/L	07-Jul-15	SM4110:B
Sulphate	8	1	mg/L	07-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	170000	10000	CFU/100mL	06-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			07-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	0.2350	0.001	mg/L	08-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	76.3	5	µg/L	12-Jul-15	EPA200.8
Arsenic	0.8	0.2	µg/L	12-Jul-15	EPA200.8
Cadmium	0.3	0.1	µg/L	12-Jul-15	EPA200.8
Chromium	0.8	0.1	µg/L	12-Jul-15	EPA200.8
Cobalt	< 0.1	0.1	µg/L	12-Jul-15	EPA200.8
Copper	50.6	0.2	µg/L	12-Jul-15	EPA200.8
Iron	182	5	µg/L	12-Jul-15	EPA200.8
Lead	0.4	0.1	µg/L	12-Jul-15	EPA200.8
Manganese	15.5	0.1	µg/L	12-Jul-15	EPA200.8
Mercury	0.01	0.01	µg/L	12-Jul-15	EPA200.8
Nickel	1.1	0.1	µg/L	12-Jul-15	EPA200.8
Zinc	68.2	5	µg/L	12-Jul-15	EPA200.8

ReportDate: Tuesday, July 14, 2015
Print Date: *Tuesday, July 14, 2015*

Taiga Environmental Laboratory
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Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA3A-2015-003 **Taiga Sample ID:** 002

Client Project: 11-5029
Sample Type: Sewage
Received Date: 06-Jul-15
Sampling Date: 05-Jul-15
Sampling Time: 9:30
Location: Gjoa Haven
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	36.4	0.005	mg/L	08-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	116	2	mg/L	06-Jul-15	SM5210:B	
Organic Carbon, Total	70.7	0.5	mg/L	09-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	184	0.4	mg/L	06-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	674	0.4	µS/cm	06-Jul-15	SM2510:B	
pH	7.21		pH units	06-Jul-15	SM4500-H:B	
Solids, Total Suspended	25	3	mg/L	06-Jul-15	SM2540:D	
Major Ions						
Calcium	13.2	0.1	mg/L	07-Jul-15	SM4110:B	
Chloride	72.7	0.7	mg/L	07-Jul-15	SM4110:B	
Hardness	81.8	0.7	mg/L	07-Jul-15	SM4110:B	
Magnesium	11.9	0.1	mg/L	07-Jul-15	SM4110:B	
Nitrate as Nitrogen	< 0.01	0.01	mg/L	07-Jul-15	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	07-Jul-15	SM4110:B	
Potassium	12.3	0.1	mg/L	07-Jul-15	SM4110:B	

ReportDate: Tuesday, July 14, 2015
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Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA3A-2015-003 **Taiga Sample ID:** 002

Sodium	46.8	0.1	mg/L	07-Jul-15	SM4110:B
Sulphate	8	1	mg/L	07-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	290000	10000	CFU/100mL	06-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			07-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	0.2540	0.001	mg/L	08-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	117	5	µg/L	12-Jul-15	EPA200.8
Arsenic	0.9	0.2	µg/L	12-Jul-15	EPA200.8
Cadmium	0.4	0.1	µg/L	12-Jul-15	EPA200.8
Chromium	0.9	0.1	µg/L	12-Jul-15	EPA200.8
Cobalt	< 0.1	0.1	µg/L	12-Jul-15	EPA200.8
Copper	61.2	0.2	µg/L	12-Jul-15	EPA200.8
Iron	215	5	µg/L	12-Jul-15	EPA200.8
Lead	0.5	0.1	µg/L	12-Jul-15	EPA200.8
Manganese	15.6	0.1	µg/L	12-Jul-15	EPA200.8
Mercury	0.03	0.01	µg/L	12-Jul-15	EPA200.8
Nickel	1.3	0.1	µg/L	12-Jul-15	EPA200.8
Zinc	84.1	5	µg/L	12-Jul-15	EPA200.8

ReportDate: Tuesday, July 14, 2015
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Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA6-2015-006 **Taiga Sample ID:** 003

Client Project: 11-5029
Sample Type: Sewage
Received Date: 06-Jul-15
Sampling Date: 05-Jul-15
Sampling Time: 9:30
Location: Gjoa Haven
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	< 0.005	0.005	mg/L	08-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	< 2	2	mg/L	06-Jul-15	SM5210:B	
Organic Carbon, Total	0.7	0.5	mg/L	09-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	0.5	0.4	mg/L	06-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	0.4	0.4	µS/cm	06-Jul-15	SM2510:B	
pH	6.01		pH units	06-Jul-15	SM4500-H:B	
Solids, Total Suspended	< 3	3	mg/L	06-Jul-15	SM2540:D	
Major Ions						
Calcium	0.4	0.1	mg/L	07-Jul-15	SM4110:B	
Chloride	< 0.7	0.7	mg/L	07-Jul-15	SM4110:B	
Hardness	1.5	0.7	mg/L	07-Jul-15	SM4110:B	
Magnesium	0.1	0.1	mg/L	07-Jul-15	SM4110:B	
Nitrate as Nitrogen	< 0.01	0.01	mg/L	07-Jul-15	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	07-Jul-15	SM4110:B	
Potassium	< 0.1	0.1	mg/L	07-Jul-15	SM4110:B	

ReportDate: Tuesday, July 14, 2015
Print Date: ***Tuesday, July 14, 2015***

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Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA6-2015-006 **Taiga Sample ID:** 003

Sodium	< 0.1	0.1	mg/L	07-Jul-15	SM4110:B
Sulphate	< 1	1	mg/L	07-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	< 1	1	CFU/100mL	06-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			07-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	< 0.0010	0.001	mg/L	08-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	1.3	0.6	µg/L	12-Jul-15	EPA200.8
Arsenic	< 0.2	0.2	µg/L	12-Jul-15	EPA200.8
Cadmium	0.40	0.05	µg/L	12-Jul-15	EPA200.8
Chromium	< 0.1	0.1	µg/L	12-Jul-15	EPA200.8
Cobalt	< 0.1	0.1	µg/L	12-Jul-15	EPA200.8
Copper	< 0.2	0.2	µg/L	12-Jul-15	EPA200.8
Iron	< 5	5	µg/L	12-Jul-15	EPA200.8
Lead	< 0.1	0.1	µg/L	12-Jul-15	EPA200.8
Manganese	< 0.1	0.1	µg/L	12-Jul-15	EPA200.8
Mercury	< 0.01	0.01	µg/L	12-Jul-15	EPA200.8
Nickel	< 0.1	0.1	µg/L	12-Jul-15	EPA200.8
Zinc	< 0.4	0.4	µg/L	12-Jul-15	EPA200.8

ReportDate: Tuesday, July 14, 2015
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Taiga Environmental Laboratory
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Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA7-2015-007 **Taiga Sample ID:** 004

Client Project: 11-5029
Sample Type: Sewage
Received Date: 06-Jul-15
Sampling Date: 05-Jul-15
Sampling Time: 9:30
Location: Gjoa Haven
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	141	0.005	mg/L	08-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	618	2	mg/L	06-Jul-15	SM5210:B	
Organic Carbon, Total	661	0.5	mg/L	09-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	821	0.4	mg/L	06-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	2730	0.4	µS/cm	06-Jul-15	SM2510:B	
pH	7.53		pH units	06-Jul-15	SM4500-H:B	
Solids, Total Suspended	98	3	mg/L	06-Jul-15	SM2540:D	
Major Ions						
Calcium	69.1	0.1	mg/L	07-Jul-15	SM4110:B	
Chloride	309	0.7	mg/L	07-Jul-15	SM4110:B	
Hardness	389	0.7	mg/L	07-Jul-15	SM4110:B	
Magnesium	52.6	0.1	mg/L	07-Jul-15	SM4110:B	
Nitrate as Nitrogen	< 0.01	0.01	mg/L	07-Jul-15	SM4110:B	
Nitrite as Nitrogen	4.05	0.01	mg/L	07-Jul-15	SM4110:B	
Potassium	65.8	0.1	mg/L	07-Jul-15	SM4110:B	

ReportDate: Tuesday, July 14, 2015
Print Date: ***Tuesday, July 14, 2015***

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Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA7-2015-007 **Taiga Sample ID:** 004

Sodium	228	0.1	mg/L	07-Jul-15	SM4110:B
Sulphate	83	1	mg/L	07-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	< 100	100	CFU/100mL	06-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			07-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	0.1130	0.001	mg/L	08-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	1610	5	µg/L	12-Jul-15	EPA200.8
Arsenic	14.9	0.2	µg/L	12-Jul-15	EPA200.8
Cadmium	0.3	0.1	µg/L	12-Jul-15	EPA200.8
Chromium	3.2	0.1	µg/L	12-Jul-15	EPA200.8
Cobalt	4.0	0.1	µg/L	12-Jul-15	EPA200.8
Copper	79.2	0.2	µg/L	12-Jul-15	EPA200.8
Iron	7880	5	µg/L	12-Jul-15	EPA200.8
Lead	3.8	0.1	µg/L	12-Jul-15	EPA200.8
Manganese	227	0.1	µg/L	12-Jul-15	EPA200.8
Mercury	0.05	0.01	µg/L	12-Jul-15	EPA200.8
Nickel	23.9	0.1	µg/L	12-Jul-15	EPA200.8
Zinc	195	5	µg/L	12-Jul-15	EPA200.8

ReportDate: Tuesday, July 14, 2015
Print Date: *Tuesday, July 14, 2015*

Taiga Environmental Laboratory
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Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150466

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA7-2015-007 **Taiga Sample ID:** 004

*** 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: Tuesday, July 14, 2015

Print Date: *Tuesday, July 14, 2015*

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150497

- FINAL REPORT -

Prepared For: Dillon Consulting Ltd.

Address: Suite 303 - 4920 47 St.
Box 1409
Yellowknife,NT
X1A 2L8

Attn: **Andrea Cleland** **Facsimile: (867) 873-3328**

Final report has been reviewed and approved by:

Glen Hudy
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) to ISO/IEC 17025 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: Thursday, July 23, 2015
Print Date: ***Thursday, July 23, 2015***

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA4-2015-004 **Taiga Sample ID:** 001

Client Project: 11-5029
Sample Type: Sewage
Received Date: 09-Jul-15
Sampling Date: 08-Jul-15
Sampling Time: 10:15
Location: Sewage & Solid Waste
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	45.0	0.005	mg/L	13-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	132	2	mg/L	09-Jul-15	SM5210:B	
Organic Carbon, Total	79.7	0.5	mg/L	13-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	240	0.4	mg/L	09-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	870	0.4	µS/cm	09-Jul-15	SM2510:B	
pH	7.30		pH units	09-Jul-15	SM4500-H:B	
Solids, Total Suspended	32	3	mg/L	10-Jul-15	SM2540:D	
Major Ions						
Calcium	16.0	0.1	mg/L	09-Jul-15	SM4110:B	
Chloride	97.5	0.7	mg/L	09-Jul-15	SM4110:B	
Hardness	94.9	0.7	mg/L	09-Jul-15	SM4110:B	
Magnesium	13.3	0.1	mg/L	09-Jul-15	SM4110:B	
Nitrate as Nitrogen	0.11	0.01	mg/L	09-Jul-15	SM4110:B	
Nitrite as Nitrogen	0.19	0.01	mg/L	09-Jul-15	SM4110:B	

ReportDate: Thursday, July 23, 2015
Print Date: ***Thursday, July 23, 2015***

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA4-2015-004 **Taiga Sample ID:** 001

Potassium	16.5	0.1	mg/L	09-Jul-15	SM4110:B
Sodium	60.8	0.1	mg/L	09-Jul-15	SM4110:B
Sulphate	10	1	mg/L	09-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	170000	10000	CFU/100mL	09-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			22-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	0.3150	0.001	mg/L	13-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	79.6	5	µg/L	17-Jul-15	EPA200.8
Arsenic	1.1	0.2	µg/L	17-Jul-15	EPA200.8
Cadmium	0.3	0.1	µg/L	17-Jul-15	EPA200.8
Chromium	1.3	0.1	µg/L	17-Jul-15	EPA200.8
Cobalt	0.3	0.1	µg/L	17-Jul-15	EPA200.8
Copper	47.0	0.2	µg/L	17-Jul-15	EPA200.8
Iron	350	5	µg/L	17-Jul-15	EPA200.8
Lead	0.7	0.1	µg/L	17-Jul-15	EPA200.8
Manganese	35.6	0.1	µg/L	17-Jul-15	EPA200.8
Mercury	0.02	0.01	µg/L	17-Jul-15	EPA200.8
Nickel	1.7	0.1	µg/L	17-Jul-15	EPA200.8
Zinc	64.6	5	µg/L	17-Jul-15	EPA200.8

ReportDate: Thursday, July 23, 2015
Print Date: *Thursday, July 23, 2015*

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA2-2015-001 **Taiga Sample ID:** 002

Client Project: 11-5029
Sample Type: Sewage
Received Date: 09-Jul-15
Sampling Date: 08-Jul-15
Sampling Time: 10:15
Location: Sewage & Solid Waste
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	5.22	0.005	mg/L	13-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	217	2	mg/L	09-Jul-15	SM5210:B	
Organic Carbon, Total	192	0.5	mg/L	13-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	275	0.4	mg/L	09-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	2410	0.4	µS/cm	09-Jul-15	SM2510:B	
pH	7.04		pH units	09-Jul-15	SM4500-H:B	
Solids, Total Suspended	586	3	mg/L	10-Jul-15	SM2540:D	
Major Ions						
Calcium	294	0.1	mg/L	09-Jul-15	SM4110:B	
Chloride	215	0.7	mg/L	09-Jul-15	SM4110:B	
Hardness	929	0.7	mg/L	09-Jul-15	SM4110:B	
Magnesium	47.3	0.1	mg/L	09-Jul-15	SM4110:B	
Nitrate as Nitrogen	0.18	0.01	mg/L	09-Jul-15	SM4110:B	
Nitrite as Nitrogen	0.07	0.01	mg/L	09-Jul-15	SM4110:B	
Potassium	45.8	0.1	mg/L	09-Jul-15	SM4110:B	

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA2-2015-001 **Taiga Sample ID:** 002

Sodium	174	0.1	mg/L	09-Jul-15	SM4110:B
Sulphate	795	1	mg/L	09-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	10000	1000	CFU/100mL	09-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			22-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	0.1700	0.001	mg/L	13-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	285	5	µg/L	17-Jul-15	EPA200.8
Arsenic	10.0	0.2	µg/L	17-Jul-15	EPA200.8
Cadmium	2.4	0.1	µg/L	17-Jul-15	EPA200.8
Chromium	5.1	0.1	µg/L	17-Jul-15	EPA200.8
Cobalt	8.7	0.1	µg/L	17-Jul-15	EPA200.8
Copper	166	0.2	µg/L	17-Jul-15	EPA200.8
Iron	23500	5	µg/L	17-Jul-15	EPA200.8
Lead	52.8	0.1	µg/L	17-Jul-15	EPA200.8
Manganese	998	0.1	µg/L	17-Jul-15	EPA200.8
Mercury	0.16	0.01	µg/L	17-Jul-15	EPA200.8
Nickel	30.2	0.1	µg/L	17-Jul-15	EPA200.8
Zinc	2030	5	µg/L	17-Jul-15	EPA200.8

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA9-2015-009 **Taiga Sample ID:** 003

Client Project: 11-5029
Sample Type: Sewage
Received Date: 09-Jul-15
Sampling Date: 08-Jul-15
Sampling Time: 10:15
Location: Sewage & Solid Waste
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	< 0.005	0.005	mg/L	13-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	2	2	mg/L	09-Jul-15	SM5210:B	
Organic Carbon, Total	0.9	0.5	mg/L	13-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	0.5	0.4	mg/L	09-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	< 0.4	0.4	µS/cm	09-Jul-15	SM2510:B	
pH	5.86		pH units	09-Jul-15	SM4500-H:B	
Solids, Total Suspended	< 3	3	mg/L	10-Jul-15	SM2540:D	
Major Ions						
Calcium	0.1	0.1	mg/L	09-Jul-15	SM4110:B	
Chloride	< 0.7	0.7	mg/L	09-Jul-15	SM4110:B	
Hardness	< 0.7	0.7	mg/L	09-Jul-15	SM4110:B	
Magnesium	< 0.1	0.1	mg/L	09-Jul-15	SM4110:B	
Nitrate as Nitrogen	< 0.01	0.01	mg/L	09-Jul-15	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	09-Jul-15	SM4110:B	
Potassium	< 0.1	0.1	mg/L	09-Jul-15	SM4110:B	

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA9-2015-009 **Taiga Sample ID:** 003

Sodium	< 0.1	0.1	mg/L	09-Jul-15	SM4110:B
Sulphate	< 1	1	mg/L	09-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	< 1	1	CFU/100mL	09-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			22-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	< 0.0010	0.001	mg/L	13-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	1.4	0.6	µg/L	17-Jul-15	EPA200.8
Arsenic	< 0.2	0.2	µg/L	17-Jul-15	EPA200.8
Cadmium	0.46	0.05	µg/L	17-Jul-15	EPA200.8
Chromium	< 0.1	0.1	µg/L	17-Jul-15	EPA200.8
Cobalt	< 0.1	0.1	µg/L	17-Jul-15	EPA200.8
Copper	< 0.2	0.2	µg/L	17-Jul-15	EPA200.8
Iron	< 5	5	µg/L	17-Jul-15	EPA200.8
Lead	< 0.1	0.1	µg/L	17-Jul-15	EPA200.8
Manganese	< 0.1	0.1	µg/L	17-Jul-15	EPA200.8
Mercury	< 0.01	0.01	µg/L	17-Jul-15	EPA200.8
Nickel	< 0.1	0.1	µg/L	17-Jul-15	EPA200.8
Zinc	< 0.4	0.4	µg/L	17-Jul-15	EPA200.8

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA8-2015-008 **Taiga Sample ID:** 004

Client Project: 11-5029
Sample Type: Sewage
Received Date: 09-Jul-15
Sampling Date: 08-Jul-15
Sampling Time: 10:15
Location: Sewage & Solid Waste
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	5.54	0.005	mg/L	13-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	213	2	mg/L	09-Jul-15	SM5210:B	
Organic Carbon, Total	173	0.5	mg/L	13-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	268	0.4	mg/L	09-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	2400	0.4	µS/cm	09-Jul-15	SM2510:B	
pH	7.09		pH units	09-Jul-15	SM4500-H:B	
Solids, Total Suspended	75	3	mg/L	10-Jul-15	SM2540:D	
Major Ions						
Calcium	281	0.1	mg/L	09-Jul-15	SM4110:B	
Chloride	206	0.7	mg/L	09-Jul-15	SM4110:B	
Hardness	889	0.7	mg/L	09-Jul-15	SM4110:B	
Magnesium	45.2	0.1	mg/L	09-Jul-15	SM4110:B	
Nitrate as Nitrogen	0.15	0.01	mg/L	09-Jul-15	SM4110:B	
Nitrite as Nitrogen	0.07	0.01	mg/L	09-Jul-15	SM4110:B	
Potassium	43.6	0.1	mg/L	09-Jul-15	SM4110:B	

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA8-2015-008 **Taiga Sample ID:** 004

Sodium	166	0.1	mg/L	09-Jul-15	SM4110:B
Sulphate	762	1	mg/L	09-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	11000	1000	CFU/100mL	09-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			22-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	0.1670	0.001	mg/L	13-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	144	5	µg/L	17-Jul-15	EPA200.8
Arsenic	9.4	0.2	µg/L	17-Jul-15	EPA200.8
Cadmium	2.4	0.1	µg/L	17-Jul-15	EPA200.8
Chromium	4.6	0.1	µg/L	17-Jul-15	EPA200.8
Cobalt	8.9	0.1	µg/L	17-Jul-15	EPA200.8
Copper	160	0.2	µg/L	17-Jul-15	EPA200.8
Iron	23300	5	µg/L	17-Jul-15	EPA200.8
Lead	50.7	0.1	µg/L	17-Jul-15	EPA200.8
Manganese	1010	0.1	µg/L	17-Jul-15	EPA200.8
Mercury	0.16	0.01	µg/L	17-Jul-15	EPA200.8
Nickel	30.6	0.1	µg/L	17-Jul-15	EPA200.8
Zinc	1990	5	µg/L	17-Jul-15	EPA200.8

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA5-2015-005 **Taiga Sample ID:** 005

Client Project: 11-5029
Sample Type: Sewage
Received Date: 09-Jul-15
Sampling Date: 08-Jul-15
Sampling Time: 10:15
Location: Sewage & Solid Waste
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	6.99	0.005	mg/L	13-Jul-15	SM4500-NH3:G	
Biochemical Oxygen Demand	202	2	mg/L	09-Jul-15	SM5210:B	
Organic Carbon, Total	179	0.5	mg/L	13-Jul-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	269	0.4	mg/L	09-Jul-15	SM2320:B	
Conductivity, Specific (@25C)	2430	0.4	µS/cm	09-Jul-15	SM2510:B	
pH	7.08		pH units	09-Jul-15	SM4500-H:B	
Solids, Total Suspended	88	3	mg/L	10-Jul-15	SM2540:D	
Major Ions						
Calcium	304	0.1	mg/L	09-Jul-15	SM4110:B	
Chloride	215	0.7	mg/L	09-Jul-15	SM4110:B	
Hardness	965	0.7	mg/L	09-Jul-15	SM4110:B	
Magnesium	49.9	0.1	mg/L	09-Jul-15	SM4110:B	
Nitrate as Nitrogen	0.15	0.01	mg/L	09-Jul-15	SM4110:B	
Nitrite as Nitrogen	0.07	0.01	mg/L	09-Jul-15	SM4110:B	
Potassium	45.7	0.1	mg/L	09-Jul-15	SM4110:B	

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA5-2015-005 **Taiga Sample ID:** 005

Sodium	177	0.1	mg/L	09-Jul-15	SM4110:B
Sulphate	843	1	mg/L	09-Jul-15	SM4110:B
Microbiology					
Coliforms, Fecal	8000	1000	CFU/100mL	09-Jul-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			22-Jul-15	Visual Exam
Subcontracted Organics					
Phenols, Total	0.1510	0.001	mg/L	13-Jul-15	AB ENV.06537
Trace Metals, Total					
Aluminum	210	5	µg/L	17-Jul-15	EPA200.8
Arsenic	8.8	0.2	µg/L	17-Jul-15	EPA200.8
Cadmium	2.8	0.1	µg/L	17-Jul-15	EPA200.8
Chromium	4.9	0.1	µg/L	17-Jul-15	EPA200.8
Cobalt	8.0	0.1	µg/L	17-Jul-15	EPA200.8
Copper	200	0.2	µg/L	17-Jul-15	EPA200.8
Iron	25600	5	µg/L	17-Jul-15	EPA200.8
Lead	52.1	0.1	µg/L	17-Jul-15	EPA200.8
Manganese	993	0.1	µg/L	17-Jul-15	EPA200.8
Mercury	0.17	0.01	µg/L	17-Jul-15	EPA200.8
Nickel	30.6	0.1	µg/L	17-Jul-15	EPA200.8
Zinc	2360	5	µg/L	17-Jul-15	EPA200.8

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Taiga Batch No.: 150497

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJOA5-2015-005 **Taiga Sample ID:** 005

*** 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: Thursday, July 23, 2015

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Taiga Batch No.: 150817

- FINAL REPORT -

Prepared For: Hamlet of Gjoa Haven

Address: P.O. Box 200
Gjoa Haven,NU
X0B 1J0

Attn: **Shawn Stuckey** **Facsimile: (867(360-6309**

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) to ISO/IEC 17025 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: Thursday, October 01, 2015
Print Date: ***Thursday, October 01, 2015***

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Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150817

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJO-4 **Taiga Sample ID:** 001

Client Project: GJO2015-09
Sample Type: Sewage
Received Date: 11-Sep-15
Sampling Date: 10-Sep-15
Sampling Time: 10:00
Location: Gjoa Haven,NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	15.0	0.005	mg/L	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	4	2	mg/L	11-Sep-15	SM5210:B	
Inorganics - Physicals						
Conductivity, Specific (@25C)	1120	0.4	µS/cm	11-Sep-15	SM2510:B	
pH	7.40		pH units	11-Sep-15	SM4500-H:B	
Solids, Total Suspended	4	3	mg/L	21-Sep-15	SM2540:D	
Major Ions						
Calcium	36.3	0.1	mg/L	11-Sep-15	SM4110:B	
Magnesium	28.9	0.1	mg/L	11-Sep-15	SM4110:B	
Nitrate as Nitrogen	3.99	0.01	mg/L	11-Sep-15	SM4110:B	
Nitrite as Nitrogen	0.08	0.01	mg/L	11-Sep-15	SM4110:B	
Potassium	21.0	0.1	mg/L	11-Sep-15	SM4110:B	
Sodium	119	0.1	mg/L	11-Sep-15	SM4110:B	
Sulphate	12	1	mg/L	11-Sep-15	SM4110:B	
Microbiology						

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Taiga Batch No.: 150817

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJO-4 **Taiga Sample ID:** 001

Coliforms, Fecal	200	100	CFU/100mL	11-Sep-15	SM9222:D
Subcontracted Organics					
Phenols, Total	0.0108	0.001	mg/L	24-Sep-15	AB ENV.06537
Trace Metals, Total					
Arsenic	7.2	0.2	µg/L	24-Sep-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	24-Sep-15	EPA200.8
Chromium	0.8	0.1	µg/L	24-Sep-15	EPA200.8
Copper	8.5	0.2	µg/L	24-Sep-15	EPA200.8
Iron	1870	5	µg/L	24-Sep-15	EPA200.8
Lead	0.4	0.1	µg/L	24-Sep-15	EPA200.8
Mercury	0.02	0.01	µg/L	24-Sep-15	EPA200.8
Nickel	11.1	0.1	µg/L	24-Sep-15	EPA200.8
Zinc	< 5.0	5	µg/L	24-Sep-15	EPA200.8

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Taiga Batch No.: 150817

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJO-6 **Taiga Sample ID:** 002

Client Project: GJO2015-09
Sample Type: Sewage
Received Date: 11-Sep-15
Sampling Date: 10-Sep-15
Sampling Time: 10:00
Location: Gjoa Haven,NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	6.37	0.005	mg/L	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	5	2	mg/L	11-Sep-15	SM5210:B	
Inorganics - Physicals						
Conductivity, Specific (@25C)	895	0.4	µS/cm	11-Sep-15	SM2510:B	
pH	7.69		pH units	11-Sep-15	SM4500-H:B	
Solids, Total Suspended	5	3	mg/L	21-Sep-15	SM2540:D	
Major Ions						
Calcium	44.9	0.1	mg/L	11-Sep-15	SM4110:B	
Magnesium	31.9	0.1	mg/L	11-Sep-15	SM4110:B	
Nitrate as Nitrogen	2.84	0.01	mg/L	11-Sep-15	SM4110:B	
Nitrite as Nitrogen	0.10	0.01	mg/L	11-Sep-15	SM4110:B	
Potassium	10.6	0.1	mg/L	11-Sep-15	SM4110:B	
Sodium	84.8	0.1	mg/L	11-Sep-15	SM4110:B	
Sulphate	18	1	mg/L	11-Sep-15	SM4110:B	
Microbiology						
Coliforms, Fecal	110	10	CFU/100mL	11-Sep-15	SM9222:D	

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Taiga Batch No.: 150817

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJO-6 **Taiga Sample ID:** 002

Subcontracted Organics					
Phenols, Total	0.0045	0.001	mg/L	24-Sep-15	AB ENV.06537
Trace Metals, Total					
Arsenic	5.1	0.2	µg/L	24-Sep-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	24-Sep-15	EPA200.8
Chromium	0.6	0.1	µg/L	24-Sep-15	EPA200.8
Copper	8.6	0.2	µg/L	24-Sep-15	EPA200.8
Iron	2120	5	µg/L	24-Sep-15	EPA200.8
Lead	1.1	0.1	µg/L	24-Sep-15	EPA200.8
Mercury	0.02	0.01	µg/L	24-Sep-15	EPA200.8
Nickel	8.3	0.1	µg/L	24-Sep-15	EPA200.8
Zinc	5.8	5	µg/L	24-Sep-15	EPA200.8

ReportDate: Thursday, October 01, 2015
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Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150817

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJO-7 **Taiga Sample ID:** 003

Client Project: GJO2015-09
Sample Type: Sewage
Received Date: 11-Sep-15
Sampling Date: 10-Sep-15
Sampling Time: 10:00
Location: Gjoa Haven,NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	0.962	0.005	mg/L	18-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	3	2	mg/L	11-Sep-15	SM5210:B	
Inorganics - Physicals						
Conductivity, Specific (@25C)	669	0.4	µS/cm	11-Sep-15	SM2510:B	
pH	8.02		pH units	11-Sep-15	SM4500-H:B	
Solids, Total Suspended	4	3	mg/L	21-Sep-15	SM2540:D	
Major Ions						
Calcium	33.6	0.1	mg/L	11-Sep-15	SM4110:B	
Magnesium	22.9	0.1	mg/L	11-Sep-15	SM4110:B	
Nitrate as Nitrogen	2.63	0.01	mg/L	11-Sep-15	SM4110:B	
Nitrite as Nitrogen	0.09	0.01	mg/L	11-Sep-15	SM4110:B	
Potassium	4.5	0.1	mg/L	11-Sep-15	SM4110:B	
Sodium	73.8	0.1	mg/L	11-Sep-15	SM4110:B	
Sulphate	18	1	mg/L	11-Sep-15	SM4110:B	
Microbiology						
Coliforms, Fecal	20	1	CFU/100mL	11-Sep-15	SM9222:D	

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- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJO-7 **Taiga Sample ID:** 003

Subcontracted Organics					
Phenols, Total	0.0016	0.001	mg/L	24-Sep-15	AB ENV.06537
Trace Metals, Total					
Arsenic	2.4	0.2	µg/L	24-Sep-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	24-Sep-15	EPA200.8
Chromium	0.4	0.1	µg/L	24-Sep-15	EPA200.8
Copper	9.9	0.2	µg/L	24-Sep-15	EPA200.8
Iron	294	5	µg/L	24-Sep-15	EPA200.8
Lead	0.5	0.1	µg/L	24-Sep-15	EPA200.8
Mercury	< 0.01	0.01	µg/L	24-Sep-15	EPA200.8
Nickel	6.0	0.1	µg/L	24-Sep-15	EPA200.8
Zinc	< 5.0	5	µg/L	24-Sep-15	EPA200.8

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Taiga Batch No.: 150817

- CERTIFICATE OF ANALYSIS -

Client Sample ID: GJO-7 **Taiga Sample ID:** 003

*** 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: Thursday, October 01, 2015

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Appendix: B-2

Water Samples Results: Taiga Lab

Water Titration:

- Raw Water from Swan Lake Intake
- Treated Water from treatment Plant

Water Licence 3BM GJO1318

Hamlet of Gjoa Haven, NU

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.:
150818

- FINAL REPORT -

Prepared For: Hamlet of Gjoa Haven

Address: P.O. Box 200
Gjoa Haven,NU
X0B 1J0

Attn: **Shawn Stuckey** **Facsimile: (867(360-6309**

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) to ISO/IEC 17025 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.

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Tel: (867)-765-6645 Fax: (867)-873-2652

Taiga Batch No.: 150818

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Raw Water **Taiga Sample ID:** 001

Client Project:
Sample Type: Water
Received Date: 11-Sep-15
Sampling Date: 10-Sep-15
Sampling Time: 10:45
Location:
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Organic Carbon, Dissolved	4.4	0.5	mg/L	17-Sep-15	SM5310:B	
Organic Carbon, Total	4.7	0.5	mg/L	18-Sep-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	97.8	0.4	mg/L	11-Sep-15	SM2320:B	
Colour, Apparent	11	5	CU	11-Sep-15	SM2120:B	
pH	8.18		pH units	11-Sep-15	SM4500-H:B	
Solids, Total Dissolved	244	10	mg/L	22-Sep-15	SM2540:C	
Solids, Total Suspended	< 3	3	mg/L	22-Sep-15	SM2540:D	
Turbidity	0.63	0.05	NTU	14-Sep-15	SM2130:B	
Major Ions						
Chloride	79.9	0.7	mg/L	11-Sep-15	SM4110:B	
Fluoride	< 0.1	0.1	mg/L	11-Sep-15	SM4110:B	
Hardness	129	0.7	mg/L	11-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.15	0.01	mg/L	11-Sep-15	SM4110:B	

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Taiga Batch No.: 150818

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Raw Water **Taiga Sample ID:** 001

Sodium	43.9	0.1	mg/L	11-Sep-15	SM4110:B
Sulphate	10	1	mg/L	11-Sep-15	SM4110:B
Microbiology					
Coliforms, Total	< 1.0	1.0	MPN/100ml	11-Sep-15	SM9223:B
Escherichia coli	< 1.0	1.0	MPN/100ml	11-Sep-15	SM9223:B
Subcontracted Organics					
Bromodichloromethane	< 0.0010	0.001	mg/L	17-Sep-15	SW-846
Bromoform	< 0.0050	0.005	mg/L	17-Sep-15	SW-846
Chloroform	< 0.0010	0.001	mg/L	17-Sep-15	SW-846
Cyanide, Weak Acid Dissociable	< 0.0010	0.001	mg/L	23-Sep-15	APHA4500-CN
Dibromochloromethane	< 0.0010	0.001	mg/L	17-Sep-15	SW-846
Trihalomethanes, Total	< 0.0050	0.005	mg/L	17-Sep-15	SW-846
Trace Metals, Total					
Aluminum	4.3	0.6	µg/L	24-Sep-15	EPA200.8
Arsenic	0.4	0.2	µg/L	24-Sep-15	EPA200.8
Barium	4.0	0.1	µg/L	24-Sep-15	EPA200.8
Cadmium	< 0.05	0.05	µg/L	24-Sep-15	EPA200.8
Chromium	< 0.1	0.1	µg/L	24-Sep-15	EPA200.8
Copper	< 0.2	0.2	µg/L	24-Sep-15	EPA200.8
Iron	6	5	µg/L	24-Sep-15	EPA200.8
Lead	< 0.1	0.1	µg/L	24-Sep-15	EPA200.8
Manganese	5.9	0.1	µg/L	24-Sep-15	EPA200.8
Mercury	< 0.01	0.01	µg/L	24-Sep-15	EPA200.8
Selenium	0.3	0.3	µg/L	24-Sep-15	EPA200.8
Uranium	0.2	0.1	µg/L	24-Sep-15	EPA200.8

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Taiga Batch No.: 150818

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Raw Water **Taiga Sample ID:** 001

Zinc	< 0.4	0.4	µg/L	24-Sep-15	EPA200.8

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Taiga Batch No.: 150818

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Treated Water **Taiga Sample ID:** 002

Client Project:
Sample Type: Water
Received Date: 11-Sep-15
Sampling Date: 10-Sep-15
Sampling Time: 11:00
Location:
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Organic Carbon, Dissolved	4.4	0.5	mg/L	17-Sep-15	SM5310:B	
Organic Carbon, Total	4.3	0.5	mg/L	18-Sep-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	98.5	0.4	mg/L	11-Sep-15	SM2320:B	
Colour, Apparent	5	5	CU	11-Sep-15	SM2120:B	
pH	8.11		pH units	11-Sep-15	SM4500-H:B	
Solids, Total Dissolved	241	10	mg/L	22-Sep-15	SM2540:C	
Solids, Total Suspended	< 3	3	mg/L	22-Sep-15	SM2540:D	
Turbidity	0.36	0.05	NTU	14-Sep-15	SM2130:B	
Major Ions						
Chloride	84.8	0.7	mg/L	11-Sep-15	SM4110:B	
Fluoride	< 0.1	0.1	mg/L	11-Sep-15	SM4110:B	
Hardness	134	0.7	mg/L	11-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.12	0.01	mg/L	11-Sep-15	SM4110:B	
Sodium	45.4	0.1	mg/L	11-Sep-15	SM4110:B	
Sulphate	10	1	mg/L	11-Sep-15	SM4110:B	

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Taiga Batch No.: 150818

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Treated Water **Taiga Sample ID:** 002

Microbiology					
Coliforms, Total	< 1.0	1.0	MPN/100ml	11-Sep-15	SM9223:B
Escherichia coli	< 1.0	1.0	MPN/100ml	11-Sep-15	SM9223:B
Subcontracted Organics					
Bromodichloromethane	0.0142	0.001	mg/L	17-Sep-15	SW-846
Bromoform	0.0218	0.005	mg/L	17-Sep-15	SW-846
Chloroform	0.0065	0.001	mg/L	17-Sep-15	SW-846
Cyanide, Weak Acid Dissociable	< 0.0010	0.001	mg/L	23-Sep-15	APHA4500-CN
Dibromochloromethane	0.0372	0.001	mg/L	17-Sep-15	SW-846
Trihalomethanes, Total	0.0797	0.005	mg/L	17-Sep-15	SW-846
Trace Metals, Total					
Aluminum	159	0.6	µg/L	24-Sep-15	EPA200.8
Arsenic	0.4	0.2	µg/L	24-Sep-15	EPA200.8
Barium	4.1	0.1	µg/L	24-Sep-15	EPA200.8
Cadmium	< 0.05	0.05	µg/L	24-Sep-15	EPA200.8
Chromium	0.2	0.1	µg/L	24-Sep-15	EPA200.8
Copper	18.3	0.2	µg/L	24-Sep-15	EPA200.8
Iron	32	5	µg/L	24-Sep-15	EPA200.8
Lead	0.5	0.1	µg/L	24-Sep-15	EPA200.8
Manganese	3.8	0.1	µg/L	24-Sep-15	EPA200.8
Mercury	< 0.01	0.01	µg/L	24-Sep-15	EPA200.8
Selenium	0.4	0.3	µg/L	24-Sep-15	EPA200.8
Uranium	0.3	0.1	µg/L	24-Sep-15	EPA200.8
Zinc	66.6	0.4	µg/L	24-Sep-15	EPA200.8

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Taiga Batch No.: 150818

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Treated Water **Taiga Sample ID:** 002

*** 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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