Annual Report - 2015

Water Licence 3BM-PEL1419

Hamlet of Kugaaruk, Nunavut

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

March 24, 2016

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Building Nunavut Together
Nunavuliuqatigiingniq
Bâtir le Nunavut ensemble

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

Kugaaruk Water Licence: 3BM-PEL 1419 — 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: Annual Report 2015 - Hamlet of Kugaaruk Water Licence 3BM-PEL 1419

Dear Mr. Karan,

The Hamlet of Kugaaruk 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 and directed under the compliance of Water Licence No. 3BM-PEL1419. Copies of required tests reports are attached herewith.

The Licensee has undertaken some effective steps for waste management during the summer and fall which has led improvement to sewage & solid waste facilities and effluent discharge. Facilities 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
salam@gov.nu.ca<mailto:salam@gov.nu.ca>

Enclosure: Annual Report 2015 NWB Form, effluent water sample results, compliance Part B-H
Cc: John Ivey, Senor Administrative Officer, Hamlet of Kugaaruk, NU
Baba Pedersen, Resource management Officer, AANDC

EXECUTIVE SUMMARY:

This Annual Report 2015 for the Hamlet of Kugaaruk (the Licensee) to the Nunavut Water Board (NWB) has been prepared to meet the requirements of the Nunavut Water Board Licence 3BM-PEL1419, Part B. General Conditions, through part H, Conditions to the Monitoring program. Tis report covers the period from 01 January to 31 December 2015.

Water intake from Kugajuk River through twin intake pumps, treated in cartage filters ranging 20 micron through 1 micron sizes, followed by UV system and chlorination before and after filtration and then supplied to household tank by hamlet operated water trucks. Quantity of water uses during this period is about 29,053 m3, within the allowable limit (45,000 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 stays 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 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 (earth-sand).

Sewage leak at the south-west side of sewage lagoon reported as Spill and working with the action plan by a consultant for remediation and facility uses in compliance with environmental and other regulation.

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 treatment plant and pump house are in full operation for water intake and supply
- No modification to sewage waste disposal, wetland or solid waste site during 2015
- Sewage lagoon leak at the south-west side reported as spills and unauthorized discharge. Beside that no other unauthorized discharge or disposal to effluent or waste.
- O&M manuals for water system updated and sewage & solid waste facilities manuals active
- Sewage lagoon leak inspection carried and working with action plan for short and long term
- Monitoring stations remains active as marked and updated by the AANDC Inspector, signage were placed in English. Scope remains for standard Official languages of Nunavut.
- No device Meter was used for volume measurement, however, truck-fill measurement uses
- Spill at sewage lagoon was reported and updated the Spill Contingency Plan.
- Plan of Compliance updated and implemented as requested by the Board.

Part C: Water Use:

- Water drawn from the Kugajuk River and annual intake quantity about **29,054** cubic metres which is within the allowable annual limit **45,000** cubic metres.
- Erosion protection measure was carried by soil-gravel berm beside the new treatment plant
- Intake screen inside river with clearance from bed and allowance frozen layer on top 3 m working well as planned and installed. No material removed from river 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 29,000 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 PEL-3-1 and test result shows contaminants parameters within allowable limits (FC: 10,000 CFU/dl; BOD_5:120; TSS: 180; P^H: 6-9; Oil & grease: none).
- Freeboard at sewage lagoon remained more than1.0 m since a leak at south-west side and decanted twice into secondary cell 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 (PEL- 4) within limiting values (BOD: 45; TSS:45; 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 gated and fenced around, and facilitated for leachate run-off at the downstream where sampling stations marked for water sample 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. Noted burned batteries were housed in the seacan and continued putting new candidate waste batteries.
- Light materials, paper, paper boards and loose materials segregated and reduced by slow burning inside the burning facility (metal dome type) and pushed down burn ashes under the cover materials inside the facility.
- Animal carcass buried under sand-pit inside the facility, but more cells requires for future.
- Some wooden planks repurposed for paint drums staging, side protection and easy runoff drainage downwards from the facility.

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

- No modifications to sewage or solid waste facilities and operational plan since developed and approved since completed in 2010; the lagoon capacity increased to 46,600 m3
- O&M manual for new WTP was submitted including as-built drawing and Training manual.
- Geotechnical and facility status study incorporated with the Leak Assessment project, the inspection has completed and draft report received. Remedial action plan under review.

Part H: Monitoring Program

- Annual monitoring of sewage and solid waste effluent has been carried during the summer and fall. Samples were taken from monitoring stations where available tested at Taiga Laboratory, Yellowknife (CALA approved). Test results are included with this report.
- Some stations re-fixed with GPS reading as recorded earlier years
- Monitoring wells at locations PEL-7 through PLE-10 as shown in O&M manual for ground water-flow monitoring from upstream to downstream for spring and summer thaw are optional as proposed. Therefore no effective samples were taken from these stations. Samples from other stations as found available, were tested for parameters incorporated to hydrocarbon, benzene or ethylene and test results within satisfactory limits of parameters.

Annual Report - 2015

Water Licence 3BM-PEL 1419

Hamlet of Kugaaruk, NU

ANNUAL REPORT

YEAR BEING REPORTED: 2015

The following information is compiled pursuant to the requirements of Part B, Item 1 of Water Licence **3BM-PEL1419** issued to the **Hamlet of Kugaaruk**

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	2,400,572.25	Same
February	2,230,481.00	Same
March	2,583,587.40	Same
April	2,408,891.10	Same
May	2,437,618.10	Same
June	2,205,345.80	Same
July	2,380,287.60	Same
August	2,453,506.40	Same
September	2,401,551.70	Same
October	2,483,077.40	Same
November	2,586,708.20	Same
December	2,521,883.60	Same
ANNUAL TOTAL	**29,052,156.35**	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**;

- Operational Training and warranty works carried to the new water treatment plant which includes filters changes and sizes, UV tube, chlorine mixing & dosing and pump operational schedule, but no maintenance activities to the intake system
- Turn-around area graded for water truck and free of stagnant on parking area.
- The treatment plant include filters from 10-micron to 1-micron in two train series, UV system for turbidity reduction and salinity control device for intake.
- Alternate to the line power, backup generator retains in the existing plant building including two previous pumps as redundant.

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

- Sewage lagoon leak continued at the south-east side where the berm meets with the existing bedrock. The quantity of leak is not much but it move downward on grassy-gravel surface when summer thaws. Beside this leak point, no other area born with unauthorised discharge, or any facility including solid waste site.
- Sewage Spill Report was made, acknowledged the action plan, but not require any further work since a remedial project in plan and processing for implementation.
- The consultant has inspected the leak on July 20-23, verified the status of the facility to guide a remedial measure for long term usability of the facility. A draft report for remedial action plan received by CGS and action plan under review. According to the report, the leak is not a threat to lagoon breaching, nor a major risk of containment, but continuous leak will make the facility non-compliance to guidelines and requirements to Water Licence.
- A remedial measure is under review process including the funding source.

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

Warranty items including filters system, site protection, drainage and intakes where minor deficiencies plus operation training were carried for the treatment plant and integrated old treatment building. No other new restoration or abandonment to the existing facility for water intake or treatment process or waste disposal 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;

The requested Dam Safety Inspection was carried in Aug 2014 by exp consultants for a follow up to lagoon berm safety and sludge management including lagoon bathometry for sludge blanket on lagoon bottom and report has been submitted to the Board. The current Water Licence was issued before receiving the report and therefore it was not updated in the Licence. Sludge removal be required once the blanket thickness reach or exceed 0.3 m and recommended within 5 years of operation which is not required as of current status.

The filed inspection, status and containment information of the sewage lagoon are already updated through this submission; a remedial action plan is underway with funding source.

AANDC inspection report of previous year noted the operation of solid waste facility is not in full compliance to the plan, specifically handling with hazardous materials such as waste oil, waste batteries, abandon vehicles, unused paints and electronic items. These materials are basic source of parameters of metallic components. The QA/QC plan was updated with the action plan which included segregation, isolation, containment, signage and securement until a proper handing or shipping out. Metal seacan was placed on site and waste batteries, paint drums and waste oil were secured inside.

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

Water collection, treatment and distribution Operation & Maintenance (O&M) manual was submitted in February 2014 including as-built drawings. QA/QC plan was updated as requested. No other documents requested before Nov 2015.

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

- Water intake and treatment system changes from previous approved version and manual for new WTP has been updated with the Board.
- The O&M manual of Sewage Treatment Facility remains effective since Oct 2010 and used for annual operation and monitoring.
- QA/QC plan of solid waste, Spill Contingency plan and multi-year Compliance Plan remain active since 2014, and monitoring plan updated as requested. No changes of these manuals.

x ADDITIONAL INFORMATION THAT THE LICENSEE DEEMS USEFUL

Training (including video show) on operation and maintenance of the treatment plant has been carried by the consultant in bringing operators in comfortable position.

FOLLOW-UP REGARDING INSPECTION/COMPLIANCE CONCERNS:

Lagoon leak and metal waste reduction are current concern which need funding source. Hamlet has set facilities operational budget which include waste segregation, securement and possible shipping out to stay in compliance. The licensee is aware of the fencing and gate to the solid waste facility and the sewage lagoon, which were not included during the projects plan and implementation. The Licensee is trying to accommodate some funding arrangement to support these activities if are helpful in monitoring these facilities.

Kugaaruk is geographically not in the best location of annual barge arrival, and therefore not in smooth planning for hazardous shipping out. The current plan is to secure those hazardous items inside seacan and then ship out with certified handler.

The Licensee is planning to manage the solid waste facility with additional resources in the coming summer which may include bulk metal and vehicle parts reduction.

Wastewater/Sewage parameters

Sample date: July 31, 2015

Parameter	MAC Limits	units	Results of sample taken on July 31, 2015						
			PEL-3-1	PEL-3-2	PEL-4	PEL-5	PEL-6	PEL 8-1	PEL 8-2
Alkalinity $CaCo_3$		mg/L	400	267	135	33.4	27.1	126	
Conductivity		µS/cm	1170	723	529	127	111	551	
P^H	6-9		7.42	8.41	7.62	7.36	7.28	8.16	
TSS	180/45	mg/L	30	99	3	3	3	4	
Ammonia N2		mg/L							
BOD	120/45	mg/L							
CBOD		mg/L							
Organic carbon		mg/L	129	36.7	20.9				
Nitrate N2		mg/L	0.15	0.32	3.98	0.12	0.08	0.13	
Nitrite as N2		mg/L	0.02	0.09	0.17	0.01	0.01	0.02	
Calcium		mg/L	21.1	51.6	22.3	10.4	7.3	48.6	
Chloride		mg/L	85.7	67.5	62	14.2	14	49.4	
Hardness		mg/L	97.6	176	91.7	35.7	26.6	165	
Magnesium		mg/L	10.9	11.4	8.7	2.4	2	10.7	
Potassium		mg/L	29	18.4	13.1	1	0.9	5.5	
Sodium		mg/L	65.7	59	52	11	11.5	50.5	
Sulphate		mg/L	2	10	8	6	5	82	
Fecal Coliform	$1x10^4$	CFU/100mL							
Oil and Grease	None	µg/L	none	none	none	none	none	None	
Aluminium		µg/L							
Arsenic	100	µg/L							
Cadmium	10	µg/L							
Chromium	100	µg/L							
Cobalt	50	µg/L							
Copper	200	µg/L							
Iron		µg/L							
Lead	50	µg/L							
Manganese		µg/L							
Nickel	200	µg/L							
Zinc	500	µg/L							
Mercury	0.6	µg/L							
PCB	1000	µg/L							
Phenols	20	µg/L	0.8	0.07	0.006				
Hexane									

Appendix: A

Pages from Water Licence: Part B-H

Water Licence 3BM PEL 1419

Hamlet of Kugaaruk, NU

NUNAVUT WATER BOARD
WATER LICENCE RENEWAL

Licence No. **3BM-PEL1419**

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 KUGAARUK

(Licensee)

P.O BOX 205 KUGAARUK, NUNAVUT, X0B 1K0

(Mailing Address)

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

Licence Number/Type:	3BM-PEL1419 TYPE "B"
Water Management Area:	GULF OF BOOTHIA WATERSHED (34)
Location:	KUGAARUK KITIKMEOT REGION, NUNAVUT
Classification:	MUNICIPAL UNDERTAKING
Purpose:	DIRECT WATER USE AND DEPOSIT OF WASTE
Quantity of Water use not to Exceed:	45,000 CUBIC METRES PER ANNUM OR 170 CUBIC METRES PER DAY
Date of Licence Issuance:	MAY 14, 2014
Expiry of Licence:	MAY 13, 2019

This Licence renewal issued and recorded at Gjoa Haven, Nunavut includes and is subject to the annexed conditions.

Thomas Kabloona,
Nunavut Water Board, Chair

Monitoring Stations:

Monitoring Station	Description	Status
PEL-1	Raw water supply intake at the Kugajuk river	Active
PEL-2	Raw sewage from pump-out truck	Active (volume)
PEL-3-1	Discharge from sewage disposal facility	Active
PEL 3-2	Discharge into secondary cell outside of sewage lagoon	
PEL-4	Final discharge point of the wetland treatment area	Active
PEL-5	Down gradient of Solid waste facility	Active (new)
PEL-6	Run-off from solid waste disposal facility	Active
PEL-7	Monitoring well located up gradient of solid waste facility	Active
PEL-8-1	Monitoring well located down gradient of solid waste facility	Active when thaw
PEL-8-2	Monitoring well located down gradient of solid waste facility	Active when thaw

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 15;
   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. Any updates or revisions for manuals and plans *(i.e., Operations and Maintenance, Abandonment and Restoration, QA/QC*) as required by changes in operation and/or technology;
   i. a summary of any studies, reports and plans requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned;
   j. 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@nwb-oen.ca

(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 Kusugak River 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 forty-five thousand (45,000) 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 Sewage Disposal Facilities or as otherwise approved by the Board.

2. The Licensee shall provide notice to an Inspector at least ten (10) days prior to initiating any decant of the Sewage Disposal Facilities

3. All Effluent discharged from the Sewage Disposal Facilities at Monitoring Program Station PEL-3 shall meet the following effluent quality standards:

Parameter	Maximum Concentration of any Grab
Faecal Coliforms	1×10^4 CFU/dl
BOD_5	120 mg/L
Total Suspended Solids	180mg/L
Oil and grease	No visible sheen
PH	Between 6 and 9

4. 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.

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

6. All effluent discharged from the Wetland Treatment Area at its Final Discharge Point, Monitoring Program Station PEL-4 shall meet the following effluent quality standards:

Parameter	Maximum Concentration of any Grab
Faecal Coliforms	1×10^4 CFU/dl
BOD_5	45 mg/L
Total Suspended Solids	45 mg/L
Oil and grease	No visible sheen
PH	Between 6 and 9

7. All Effluent discharged from the Wetland Treatment Area Final Discharge Point (PEL-4), shall be demonstrated to be Not Acutely Toxic under the following tests to be conducted once annually approximately mid-way through discharge:

    i. Acute lethality to Rainbow Trout, *Oncorhynchus mykiss* (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13); and

ii. Acute lethality to the crustacean, *Daphnia magna* (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14).

8. 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.

9. The Licensee shall segregate and store all hazardous materials and/or hazardous waste within the Solid Waste Disposal Facility in a manner as to prevent the deposit of deleterious substances into any water until such a time as proper disposal arrangements are made.

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

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. 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. 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 sediment and erosion control measures prior to and during activities carried out under this Part, to prevent impacts to water resulting from the release of sediment and to 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 of 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.

8. 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 F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board for approval, within six (6) months of issuance of the Licence, a "*Water Collection and Distribution Operation and Maintenance (O&M) Manual*", 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"*. These Manuals shall provide details regarding, at a minimum, the water system, pump-house, intake line, treatment plant.

2. The Licensee shall submit to the Board for review within ninety (90) days of issuance of the Licence, an updated Environmental Emergency Contingency Plan for Water, Sewage and Solid Waste Operations. The updated Plan is to take into consideration at a minimum, the comments received during the review of the previous Plan approved by the Board on January 22, 2010, and information regarding the new water treatment plant.

3. The Licensee shall implement the Plan entitled: "Hamlet of Kugaaruk, NU Sewage Treatment Facility Operation and Maintenance Manual" (STF O&M Manual) updated October 27, 2010 that was originally approved by the Board.

4. The Licensee shall implement the Plan entitled: "Hamlet of Kugaaruk, NU Solid Waste Facility Operation and Maintenance Manual" (SWF O&M Manual) updated October 27, 2010 that was originally approved by the Board.

5. An inspection of all engineered facilities related to the management of water and waste shall be carried by an Engineer (Civil, Municipal or Geotechnical) before commissioning any facility. The Engineer's report shall be submitted to the Board within sixty (60) days of the inspection, including a Cover Letter from the Licensee outlining an

implementation plan addressing each of the Engineer's recommendations.

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

7. 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 appropriately approved Spill Contingency Plan for the Hamlet of Kugaaruk. 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 within six (6) months of issuance of the Licence, an Abandonment and Restoration Plan for the existing pump-house to be replaced with a new pump-house.

2. The Licensee shall submit to the Board for approval, an Abandonment and Restoration Plan at least six (6) 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.

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

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

5. 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.

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

Monitoring Program Station Number	Description	Frequency	Status
PEL-1	Raw Water Supply intake at the Kugajuk River	Daily	Active (Volume)
PEL-2	Raw Sewage from pump-out truck	Daily	Active (Volume)
PEL-3-1	Effluent Discharge from Lagoon to Settlement Pond	Monthly (June/July to August/September)	Active (Quality)
PEL-3-2	Effluent Discharge from Settlement Pond to Wetland	Monthly (June/July to August/September)	Active (Quality)
PEL-4	Effluent Final Discharge Point from Wetland to Ocean	Monthly (June/July to August/September)	Active (Quality)
PEL-6	Run-off from the Solid Waste Disposal Facility	During periods of run-off or seepage	Active (Quality)
PEL-7	Monitoring well located up gradient of the Solid Waste Disposal Facility (Metal Dump)	Once during ground thaw	Active (Quality)

PEL-8-1	Monitoring well located up gradient of the Solid Waste Disposal Facilities	Once during ground thaw	Active (Quality)
PEL-8-2	Monitoring well located down gradient of the Solid Waste Disposal Facilities	Once during ground thaw	Active (Quality)
PEL-9-1	Monitoring well located down gradient of the Solid Waste Disposal Facility (Metal Dump)	Once during ground thaw	Active (Quality)
PEL-9-2	Monitoring well located down gradient of the Solid Waste Disposal Facility (Metal Dump)	Once during ground thaw	Active (Quality)
PEL-10-1	Monitoring well (optional) located down gradient of the Solid Waste Disposal Facilities	Once during ground thaw	Active (Quality)
PEL-10-2	Monitoring well (optional) located down gradient of the Solid Waste Disposal Facilities	Once during ground thaw	Active (Quality)

2. 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 PEL-1.

3. The Licensee shall measure and record in cubic metres the daily, monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Program Station PEL-2 for all purposes.

4. The Licensee shall sample at Monitoring Program Stations PEL-3-1, PEL-3-2 and PEL-4 once at the beginning, middle and near the end of discharge. Samples shall be analyzed for the following parameters:

BOD	Faecal Coliforms
pH	Conductivity
Total Suspended Solids	Oil and Grease (visual)
Nitrate-Nitrite	Ammonia Nitrogen
Chloride	Sulphate
Sodium	Potassium
Magnesium	Calcium
Total Hardness	Total Alkalinity

Total Phenols	Total Manganese
Total Arsenic	Total Aluminum
Total Cadmium	Total Cobalt
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel
Total Zinc	Total Organic Carbon

5. The Licensee shall sample at Monitoring Program Station PEL-6 annually during periods of runoff or seepage. Samples shall be analyzed for the following parameters:

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

TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)

6. The Licensee shall sample at Monitoring Program Stations PEL-7, PEL-8-1, PEL-8-2, PEL-9-1, PEL-9-2, PEL-10-1 and PEL-10-2 as determined by SWF O&M Manual, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample; Samples shall be analyzed for the following parameters:

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

TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)

7. The Licensee shall report all results of acute toxicity testing as required under Part D, Item 7 within the Annual Report as per Part B, Item 1.

8. Additional monitoring stations, 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 submit to the Board for information, within ninety (90) days of issuance of the Licence, a Quality Assurance/Quality Control Plan that conforms to the guidance document *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 QAQC Plan* INAC (1996). The Plan shall be acceptable to an accredited laboratory and include a covering letter from the accredited laboratory confirming acceptance of the Plan for analyses to be performed under the Licence.

12. The Licensee shall measure and record the annual quantities of sewage solids removed from the Sewage Disposal Facility.

13. 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.

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

Appendix: B

Effluent samples results

Water Licence 3BM PEL 1419

Hamlet of Kugaaruk, NU

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

Taiga Batch No.:
150639

- FINAL REPORT -

Prepared For: Hamlet of Kugaaruk

Address: Box 205
Kugaaruk, NU,X0B 1K0

Attn: **Gord Dinney** **Facsimile: 867-769-6069**

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: Wednesday, August 19, 2015
Print Date: ***Wednesday, August 19, 2015***

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

Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-1 **Taiga Sample ID:** 001

Client Project: KUGA-2015-07
Sample Type: Water
Received Date: 04-Aug-15
Sampling Date: 31-Jul-15
Sampling Time:
Location: Kugaaruk, NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	95.3	0.005	mg/L	13-Aug-15	SM4500-NH3:G	
Biochemical Oxygen Demand		2	mg/L		SM5210:B	105
Organic Carbon, Total	129	0.5	mg/L	08-Aug-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	400	0.4	mg/L	04-Aug-15	SM2320:B	
Conductivity, Specific (@25C)	1170	0.4	µS/cm	04-Aug-15	SM2510:B	
pH	7.42		pH units	04-Aug-15	SM4500-H:B	
Solids, Total Suspended	30	3	mg/L	05-Aug-15	SM2540:D	
Major Ions						
Calcium	21.1	0.1	mg/L	04-Aug-15	SM4110:B	
Chloride	85.7	0.7	mg/L	04-Aug-15	SM4110:B	
Hardness	97.6	0.7	mg/L	04-Aug-15	SM4110:B	
Magnesium	10.9	0.1	mg/L	04-Aug-15	SM4110:B	
Nitrate as Nitrogen	0.15	0.01	mg/L	04-Aug-15	SM4110:B	

ReportDate: Wednesday, August 19, 2015
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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-1 **Taiga Sample ID:** 001

Nitrite as Nitrogen	0.02	0.01	mg/L	04-Aug-15	SM4110:B	
Potassium	29.0	0.1	mg/L	04-Aug-15	SM4110:B	
Sodium	65.7	0.1	mg/L	04-Aug-15	SM4110:B	
Sulphate	2	1	mg/L	04-Aug-15	SM4110:B	
Microbiology						
Coliforms, Fecal		1	CFU/100mL		SM9222:D	105
Organics						
Oil and Grease, visible	Non-visible			05-Aug-15	Visual Exam	
Subcontracted Organics						
Phenols, Total	0.8140	0.001	mg/L	10-Aug-15	AB ENV.06537	
Trace Metals, Total						
Aluminum	27.8	5	µg/L	18-Aug-15	EPA200.8	
Arsenic	< 0.2	0.2	µg/L	18-Aug-15	EPA200.8	
Cadmium	< 0.1	0.1	µg/L	18-Aug-15	EPA200.8	
Chromium	0.2	0.1	µg/L	18-Aug-15	EPA200.8	
Cobalt	< 0.1	0.1	µg/L	18-Aug-15	EPA200.8	
Copper	16.5	0.2	µg/L	18-Aug-15	EPA200.8	
Iron	97	5	µg/L	18-Aug-15	EPA200.8	
Lead	0.2	0.1	µg/L	18-Aug-15	EPA200.8	
Manganese	24.4	0.1	µg/L	18-Aug-15	EPA200.8	
Mercury	< 0.01	0.01	µg/L	18-Aug-15	EPA200.8	
Nickel	0.5	0.1	µg/L	18-Aug-15	EPA200.8	
Zinc	10.9	5	µg/L	18-Aug-15	EPA200.8	

ReportDate: Wednesday, August 19, 2015
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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-2 **Taiga Sample ID:** 002

Client Project: KUGA-2015-07
Sample Type: Water
Received Date: 04-Aug-15
Sampling Date: 31-Jul-15
Sampling Time:
Location: Kugaaruk, NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	17.7	0.005	mg/L	13-Aug-15	SM4500-NH3:G	
Biochemical Oxygen Demand		2	mg/L		SM5210:B	105
Organic Carbon, Total	36.7	0.5	mg/L	08-Aug-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	267	0.4	mg/L	04-Aug-15	SM2320:B	
Conductivity, Specific (@25C)	723	0.4	µS/cm	04-Aug-15	SM2510:B	
pH	8.41		pH units	04-Aug-15	SM4500-H:B	
Solids, Total Suspended	99	3	mg/L	05-Aug-15	SM2540:D	
Major Ions						
Calcium	51.6	0.1	mg/L	04-Aug-15	SM4110:B	
Chloride	67.5	0.7	mg/L	04-Aug-15	SM4110:B	
Hardness	176	0.7	mg/L	04-Aug-15	SM4110:B	
Magnesium	11.4	0.1	mg/L	04-Aug-15	SM4110:B	
Nitrate as Nitrogen	0.32	0.01	mg/L	04-Aug-15	SM4110:B	
Nitrite as Nitrogen	0.09	0.01	mg/L	04-Aug-15	SM4110:B	
Potassium	18.4	0.1	mg/L	04-Aug-15	SM4110:B	

ReportDate: Wednesday, August 19, 2015
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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-2 **Taiga Sample ID:** 002

Sodium	59.0	0.1	mg/L	04-Aug-15	SM4110:B	
Sulphate	10	1	mg/L	04-Aug-15	SM4110:B	
Microbiology						
Coliforms, Fecal		1	CFU/100mL		SM9222:D	105
Organics						
Oil and Grease, visible	Non-visible			05-Aug-15	Visual Exam	
Subcontracted Organics						
Phenols, Total	0.0073	0.001	mg/L	10-Aug-15	AB ENV.06537	
Trace Metals, Total						
Aluminum	42.6	5	µg/L	18-Aug-15	EPA200.8	
Arsenic	2.1	0.2	µg/L	18-Aug-15	EPA200.8	
Cadmium	0.2	0.1	µg/L	18-Aug-15	EPA200.8	
Chromium	0.4	0.1	µg/L	18-Aug-15	EPA200.8	
Cobalt	2.4	0.1	µg/L	18-Aug-15	EPA200.8	
Copper	11.8	0.2	µg/L	18-Aug-15	EPA200.8	
Iron	185	5	µg/L	18-Aug-15	EPA200.8	
Lead	0.9	0.1	µg/L	18-Aug-15	EPA200.8	
Manganese	366	0.1	µg/L	18-Aug-15	EPA200.8	
Mercury	0.02	0.01	µg/L	18-Aug-15	EPA200.8	
Nickel	3.4	0.1	µg/L	18-Aug-15	EPA200.8	
Zinc	8.2	5	µg/L	18-Aug-15	EPA200.8	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-4 **Taiga Sample ID:** 003

Client Project: KUGA-2015-07
Sample Type: Water
Received Date: 04-Aug-15
Sampling Date: 31-Jul-15
Sampling Time:
Location: Kugaaruk, NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	9.54	0.005	mg/L	13-Aug-15	SM4500-NH3:G	
Biochemical Oxygen Demand		2	mg/L		SM5210:B	105
Organic Carbon, Total	20.9	0.5	mg/L	08-Aug-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	135	0.4	mg/L	04-Aug-15	SM2320:B	
Conductivity, Specific (@25C)	529	0.4	µS/cm	04-Aug-15	SM2510:B	
pH	7.62		pH units	04-Aug-15	SM4500-H:B	
Solids, Total Suspended	< 3	3	mg/L	05-Aug-15	SM2540:D	
Major Ions						
Calcium	22.3	0.1	mg/L	04-Aug-15	SM4110:B	
Chloride	62.0	0.7	mg/L	04-Aug-15	SM4110:B	
Hardness	91.7	0.7	mg/L	04-Aug-15	SM4110:B	
Magnesium	8.7	0.1	mg/L	04-Aug-15	SM4110:B	
Nitrate as Nitrogen	3.98	0.01	mg/L	04-Aug-15	SM4110:B	
Nitrite as Nitrogen	0.17	0.01	mg/L	04-Aug-15	SM4110:B	
Potassium	13.1	0.1	mg/L	04-Aug-15	SM4110:B	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-4 **Taiga Sample ID:** 003

Sodium	52.0	0.1	mg/L	04-Aug-15	SM4110:B	
Sulphate	8	1	mg/L	04-Aug-15	SM4110:B	
Microbiology						
Coliforms, Fecal		1	CFU/100mL		SM9222:D	105
Organics						
Oil and Grease, visible	Non-visible			05-Aug-15	Visual Exam	
Subcontracted Organics						
Phenols, Total	0.0065	0.001	mg/L	10-Aug-15	AB ENV.06537	
Trace Metals, Total						
Aluminum	43.5	5	µg/L	18-Aug-15	EPA200.8	
Arsenic	2.1	0.2	µg/L	18-Aug-15	EPA200.8	
Cadmium	0.1	0.1	µg/L	18-Aug-15	EPA200.8	
Chromium	0.5	0.1	µg/L	18-Aug-15	EPA200.8	
Cobalt	1.3	0.1	µg/L	18-Aug-15	EPA200.8	
Copper	4.4	0.2	µg/L	18-Aug-15	EPA200.8	
Iron	198	5	µg/L	18-Aug-15	EPA200.8	
Lead	0.4	0.1	µg/L	18-Aug-15	EPA200.8	
Manganese	134	0.1	µg/L	18-Aug-15	EPA200.8	
Mercury	0.02	0.01	µg/L	18-Aug-15	EPA200.8	
Nickel	3.3	0.1	µg/L	18-Aug-15	EPA200.8	
Zinc	< 5.0	5	µg/L	18-Aug-15	EPA200.8	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-5 **Taiga Sample ID:** 004

Client Project: KUGA-2015-07
Sample Type: Water
Received Date: 04-Aug-15
Sampling Date: 31-Jul-15
Sampling Time: 9:00
Location: Kugaaruk, NU
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-Aug-15	SM4500-NH3:G	
Biochemical Oxygen Demand		2	mg/L		SM5210:B	105
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	33.4	0.4	mg/L	04-Aug-15	SM2320:B	
Conductivity, Specific (@25C)	127	0.4	µS/cm	04-Aug-15	SM2510:B	
pH	7.36		pH units	04-Aug-15	SM4500-H:B	
Solids, Total Suspended	< 3	3	mg/L	05-Aug-15	SM2540:D	
Major Ions						
Calcium	10.4	0.1	mg/L	04-Aug-15	SM4110:B	
Chloride	14.2	0.7	mg/L	04-Aug-15	SM4110:B	
Hardness	35.7	0.7	mg/L	04-Aug-15	SM4110:B	
Magnesium	2.4	0.1	mg/L	04-Aug-15	SM4110:B	
Nitrate as Nitrogen	0.12	0.01	mg/L	04-Aug-15	SM4110:B	
Nitrite as Nitrogen	0.01	0.01	mg/L	04-Aug-15	SM4110:B	
Potassium	1.0	0.1	mg/L	04-Aug-15	SM4110:B	
Sodium	11.0	0.1	mg/L	04-Aug-15	SM4110:B	

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

Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-5 **Taiga Sample ID:** 004

Sulphate	6	1	mg/L	04-Aug-15	SM4110:B	
Microbiology						
Coliforms, Fecal		1	CFU/100mL		SM9222:D	105
Organics						
Oil and Grease, visible	Non-visible			05-Aug-15	Visual Exam	
Subcontracted Organics						
Acenaphthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Acenaphthylene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Anthracene	< 0.000010	0.00001	mg/L	10-Aug-15	EPA3510	
Benzene		0.0005	mg/L		EPA 5021	111
Benzo(a)anthracene	< 0.000015	0.000015	mg/L	10-Aug-15	EPA3510	
Benzo(a)pyrene	< 0.000010	0.00001	mg/L	10-Aug-15	EPA3510	
Benzo(bj)fluoranthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Benzo(g,h,i)perylene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Benzo(k)fluoranthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Chrysene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Dibenzo(a,h)anthracene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Ethylbenzene		0.0005	mg/L		EPA 5021	111
F2: C10-C16		0.25	mg/L		EPA3510	16
F3: C16-C34		0.25	mg/L		EPA3510	16
F4: C34-C50		0.25	mg/L		EPA3510	16
Fluoranthene	< 0.000020	0.00002	mg/L	10-Aug-15	EPA3510	
Fluorene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Indeno(1,2,3-cd)pyrene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Naphthalene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	

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

Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-5 **Taiga Sample ID:** 004

Phenanthrene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Phenols, Total		0.001	mg/L		AB ENV.06537	16
Pyrene	< 0.000020	0.00002	mg/L	10-Aug-15	EPA3510	
Toluene		0.0005	mg/L		EPA 5021	111
Xylenes		0.0005	mg/L		EPA 5021	111
Trace Metals, Total						
Arsenic	< 0.2	0.2	µg/L	18-Aug-15	EPA200.8	
Cadmium	0.2	0.1	µg/L	18-Aug-15	EPA200.8	
Chromium	0.4	0.1	µg/L	18-Aug-15	EPA200.8	
Copper	1.8	0.2	µg/L	18-Aug-15	EPA200.8	
Iron	90	5	µg/L	18-Aug-15	EPA200.8	
Lead	0.6	0.1	µg/L	18-Aug-15	EPA200.8	
Mercury	< 0.01	0.01	µg/L	18-Aug-15	EPA200.8	
Nickel	0.3	0.1	µg/L	18-Aug-15	EPA200.8	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-6 **Taiga Sample ID:** 005

Client Project: KUGA-2015-07
Sample Type: Water
Received Date: 04-Aug-15
Sampling Date: 31-Jul-15
Sampling Time: 9:30
Location: Kugaaruk, NU
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-Aug-15	SM4500-NH3:G	
Biochemical Oxygen Demand		2	mg/L		SM5210:B	105
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	27.1	0.4	mg/L	04-Aug-15	SM2320:B	
Conductivity, Specific (@25C)	111	0.4	µS/cm	04-Aug-15	SM2510:B	
pH	7.28		pH units	04-Aug-15	SM4500-H:B	
Solids, Total Suspended	< 3	3	mg/L	05-Aug-15	SM2540:D	
Major Ions						
Calcium	7.3	0.1	mg/L	04-Aug-15	SM4110:B	
Chloride	14.0	0.7	mg/L	04-Aug-15	SM4110:B	
Hardness	26.6	0.7	mg/L	04-Aug-15	SM4110:B	
Magnesium	2.0	0.1	mg/L	04-Aug-15	SM4110:B	
Nitrate as Nitrogen	0.08	0.01	mg/L	04-Aug-15	SM4110:B	
Nitrite as Nitrogen	0.01	0.01	mg/L	04-Aug-15	SM4110:B	
Potassium	0.9	0.1	mg/L	04-Aug-15	SM4110:B	
Sodium	11.5	0.1	mg/L	04-Aug-15	SM4110:B	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-6 **Taiga Sample ID:** 005

Sulphate	5	1	mg/L	04-Aug-15	SM4110:B	
Microbiology						
Coliforms, Fecal		1	CFU/100mL		SM9222:D	105
Organics						
Oil and Grease, visible	Non-visible			05-Aug-15	Visual Exam	
Subcontracted Organics						
Acenaphthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Acenaphthylene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Anthracene	< 0.000010	0.00001	mg/L	10-Aug-15	EPA3510	
Benzene		0.0005	mg/L		EPA 5021	111
Benzo(a)anthracene	< 0.000015	0.000015	mg/L	10-Aug-15	EPA3510	
Benzo(a)pyrene	< 0.000010	0.00001	mg/L	10-Aug-15	EPA3510	
Benzo(bj)fluoranthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Benzo(g,h,i)perylene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Benzo(k)fluoranthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Chrysene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Dibenzo(a,h)anthracene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Ethylbenzene		0.0005	mg/L		EPA 5021	111
F2: C10-C16		0.25	mg/L		EPA3510	16
F3: C16-C34		0.25	mg/L		EPA3510	16
F4: C34-C50		0.25	mg/L		EPA3510	16
Fluoranthene	< 0.000020	0.00002	mg/L	10-Aug-15	EPA3510	
Fluorene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Indeno(1,2,3-cd)pyrene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Naphthalene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-6 **Taiga Sample ID:** 005

Phenanthrene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Phenols, Total		0.001	mg/L		AB ENV.06537	16
Pyrene	< 0.000020	0.00002	mg/L	10-Aug-15	EPA3510	
Toluene		0.0005	mg/L		EPA 5021	111
Xylenes		0.0005	mg/L		EPA 5021	111
Trace Metals, Total						
Arsenic	< 0.2	0.2	µg/L	18-Aug-15	EPA200.8	
Cadmium	0.2	0.1	µg/L	18-Aug-15	EPA200.8	
Chromium	0.3	0.1	µg/L	18-Aug-15	EPA200.8	
Copper	1.2	0.2	µg/L	18-Aug-15	EPA200.8	
Iron	85	5	µg/L	18-Aug-15	EPA200.8	
Lead	< 0.1	0.1	µg/L	18-Aug-15	EPA200.8	
Mercury	< 0.01	0.01	µg/L	18-Aug-15	EPA200.8	
Nickel	0.3	0.1	µg/L	18-Aug-15	EPA200.8	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-1 **Taiga Sample ID:** 006

Client Project: KUGA-2015-07
Sample Type: Water
Received Date: 04-Aug-15
Sampling Date: 31-Jul-15
Sampling Time: 9:30
Location: Kugaaruk, NU
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	0.054	0.005	mg/L	13-Aug-15	SM4500-NH3:G	
Biochemical Oxygen Demand		2	mg/L		SM5210:B	105
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	126	0.4	mg/L	04-Aug-15	SM2320:B	
Conductivity, Specific (@25C)	551	0.4	µS/cm	04-Aug-15	SM2510:B	
pH	8.16		pH units	04-Aug-15	SM4500-H:B	
Solids, Total Suspended	4	3	mg/L	05-Aug-15	SM2540:D	
Major Ions						
Calcium	48.6	0.1	mg/L	04-Aug-15	SM4110:B	
Chloride	49.4	0.7	mg/L	04-Aug-15	SM4110:B	
Hardness	165	0.7	mg/L	04-Aug-15	SM4110:B	
Magnesium	10.7	0.1	mg/L	04-Aug-15	SM4110:B	
Nitrate as Nitrogen	0.13	0.01	mg/L	04-Aug-15	SM4110:B	
Nitrite as Nitrogen	0.02	0.01	mg/L	04-Aug-15	SM4110:B	
Potassium	5.5	0.1	mg/L	04-Aug-15	SM4110:B	
Sodium	50.5	0.1	mg/L	04-Aug-15	SM4110:B	

ReportDate: Wednesday, August 19, 2015
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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-1 **Taiga Sample ID:** 006

Sulphate	82	1	mg/L	04-Aug-15	SM4110:B	
Microbiology						
Coliforms, Fecal		1	CFU/100mL		SM9222:D	105
Organics						
Oil and Grease, visible	Non-visible			05-Aug-15	Visual Exam	
Subcontracted Organics						
Acenaphthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Acenaphthylene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Anthracene	< 0.000010	0.00001	mg/L	10-Aug-15	EPA3510	
Benzene		0.0005	mg/L		EPA 5021	111
Benzo(a)anthracene	< 0.000015	0.000015	mg/L	10-Aug-15	EPA3510	
Benzo(a)pyrene	< 0.000010	0.00001	mg/L	10-Aug-15	EPA3510	
Benzo(bj)fluoranthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Benzo(g,h,i)perylene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Benzo(k)fluoranthene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Chrysene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Dibenzo(a,h)anthracene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Ethylbenzene		0.0005	mg/L		EPA 5021	111
F2: C10-C16		0.25	mg/L		EPA3510	16
F3: C16-C34		0.25	mg/L		EPA3510	16
F4: C34-C50		0.25	mg/L		EPA3510	16
Fluoranthene	< 0.000020	0.00002	mg/L	10-Aug-15	EPA3510	
Fluorene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Indeno(1,2,3-cd)pyrene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Naphthalene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-1 **Taiga Sample ID:** 006

Phenanthrene	< 0.000050	0.00005	mg/L	10-Aug-15	EPA3510	
Phenols, Total		0.001	mg/L		AB ENV.06537	16
Pyrene	< 0.000020	0.00002	mg/L	10-Aug-15	EPA3510	
Toluene		0.0005	mg/L		EPA 5021	111
Xylenes		0.0005	mg/L		EPA 5021	111
Trace Metals, Total						
Arsenic	0.4	0.2	µg/L	18-Aug-15	EPA200.8	
Cadmium	0.2	0.1	µg/L	18-Aug-15	EPA200.8	
Chromium	0.4	0.1	µg/L	18-Aug-15	EPA200.8	
Copper	2.1	0.2	µg/L	18-Aug-15	EPA200.8	
Iron	379	5	µg/L	18-Aug-15	EPA200.8	
Lead	0.3	0.1	µg/L	18-Aug-15	EPA200.8	
Mercury	< 0.01	0.01	µg/L	18-Aug-15	EPA200.8	
Nickel	1.6	0.1	µg/L	18-Aug-15	EPA200.8	

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Taiga Batch No.: 150639

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-1 **Taiga Sample ID:** 006

- DATA QUALIFERS -

Data Qualifier Descriptions:

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

111 *Vial contained air bubble, analysis not possible*

16 *Test requested but no sample bottle received*

*** 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: Wednesday, August 19, 2015

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

Taiga Batch No.: 150866

- FINAL REPORT -

Prepared For: Hamlet of Kugaaruk

Address: Box 205
Kugaaruk, NU,X0B 1K0

Attn: **Robert Moretti** **Facsimile: 867-769-6069**

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: Wednesday, October 07, 2015
Print Date: ***Wednesday, October 07, 2015***

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

Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-1 **Taiga Sample ID:** 001

Client Project:
Sample Type: Water
Received Date: 18-Sep-15
Sampling Date: 18-Sep-15
Sampling Time: 10:00
Location: Kugaaruk
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	86.3	0.005	mg/L	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	210	2	mg/L	19-Sep-15	SM5210:B	
Organic Carbon, Total	144	0.5	mg/L	26-Sep-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	399	0.4	mg/L	21-Sep-15	SM2320:B	
Conductivity, Specific (@25C)	1180	0.4	µS/cm	21-Sep-15	SM2510:B	
pH	7.45		pH units	21-Sep-15	SM4500-H:B	
Solids, Total Suspended	22	3	mg/L	23-Sep-15	SM2540:D	
Major Ions						
Calcium	20.7	0.1	mg/L	21-Sep-15	SM4110:B	
Chloride	76.5	0.7	mg/L	21-Sep-15	SM4110:B	
Hardness	93.2	0.7	mg/L	21-Sep-15	SM4110:B	
Magnesium	10.1	0.1	mg/L	21-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.10	0.01	mg/L	21-Sep-15	SM4110:B	

ReportDate: Wednesday, October 07, 2015
Print Date: ***Wednesday, October 07, 2015***

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-1 **Taiga Sample ID:** 001

Nitrite as Nitrogen	< 0.01	0.01	mg/L	21-Sep-15	SM4110:B
Potassium	28.0	0.1	mg/L	21-Sep-15	SM4110:B
Sodium	62.0	0.1	mg/L	21-Sep-15	SM4110:B
Sulphate	1	1	mg/L	21-Sep-15	SM4110:B
Microbiology					
Coliforms, Fecal	100000	10000	CFU/100mL	19-Sep-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			21-Sep-15	Visual Exam
Subcontracted Organics					
Phenols, Total	1.120	0.001	mg/L	25-Sep-15	AB ENV.06537
Trace Metals, Total					
Aluminum	154	5	µg/L	05-Oct-15	EPA200.8
Arsenic	0.9	0.2	µg/L	05-Oct-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	05-Oct-15	EPA200.8
Chromium	0.7	0.1	µg/L	05-Oct-15	EPA200.8
Cobalt	0.7	0.1	µg/L	05-Oct-15	EPA200.8
Copper	68.2	0.2	µg/L	05-Oct-15	EPA200.8
Iron	552	5	µg/L	05-Oct-15	EPA200.8
Lead	1.1	0.1	µg/L	05-Oct-15	EPA200.8
Manganese	154	0.1	µg/L	05-Oct-15	EPA200.8
Mercury	0.03	0.01	µg/L	05-Oct-15	EPA200.8
Nickel	2.6	0.1	µg/L	05-Oct-15	EPA200.8
Zinc	54.9	5	µg/L	05-Oct-15	EPA200.8

ReportDate: Wednesday, October 07, 2015
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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-2 **Taiga Sample ID:** 002

Client Project:
Sample Type: Water
Received Date: 18-Sep-15
Sampling Date: 18-Sep-15
Sampling Time: 10:00
Location: Kugaaruk
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	80.8	0.005	mg/L	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	147	2	mg/L	19-Sep-15	SM5210:B	
Organic Carbon, Total	115	0.5	mg/L	26-Sep-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	395	0.4	mg/L	21-Sep-15	SM2320:B	
Conductivity, Specific (@25C)	1130	0.4	µS/cm	21-Sep-15	SM2510:B	
pH	7.49		pH units	21-Sep-15	SM4500-H:B	
Solids, Total Suspended	34	3	mg/L	23-Sep-15	SM2540:D	
Major Ions						
Calcium	23.2	0.1	mg/L	21-Sep-15	SM4110:B	
Chloride	74.4	0.7	mg/L	21-Sep-15	SM4110:B	
Hardness	99.9	0.7	mg/L	21-Sep-15	SM4110:B	
Magnesium	10.2	0.1	mg/L	21-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.10	0.01	mg/L	21-Sep-15	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	21-Sep-15	SM4110:B	
Potassium	26.6	0.1	mg/L	21-Sep-15	SM4110:B	

ReportDate: Wednesday, October 07, 2015
Print Date: ***Wednesday, October 07, 2015***

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-2 **Taiga Sample ID:** 002

Sodium	60.9	0.1	mg/L	21-Sep-15	SM4110:B
Sulphate	2	1	mg/L	21-Sep-15	SM4110:B
Microbiology					
Coliforms, Fecal	13600	100	CFU/100mL	19-Sep-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			21-Sep-15	Visual Exam
Subcontracted Organics					
Phenols, Total	1.150	0.001	mg/L	25-Sep-15	AB ENV.06537
Trace Metals, Total					
Aluminum	144	5	µg/L	05-Oct-15	EPA200.8
Arsenic	0.9	0.2	µg/L	05-Oct-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	05-Oct-15	EPA200.8
Chromium	0.7	0.1	µg/L	05-Oct-15	EPA200.8
Cobalt	0.7	0.1	µg/L	05-Oct-15	EPA200.8
Copper	64.4	0.2	µg/L	05-Oct-15	EPA200.8
Iron	559	5	µg/L	05-Oct-15	EPA200.8
Lead	1.1	0.1	µg/L	05-Oct-15	EPA200.8
Manganese	182	0.1	µg/L	05-Oct-15	EPA200.8
Mercury	0.02	0.01	µg/L	05-Oct-15	EPA200.8
Nickel	2.7	0.1	µg/L	05-Oct-15	EPA200.8
Zinc	49.8	5	µg/L	05-Oct-15	EPA200.8

ReportDate: Wednesday, October 07, 2015
Print Date: *Wednesday, October 07, 2015*

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

Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-4 **Taiga Sample ID:** 003

Client Project:
Sample Type: Water
Received Date: 18-Sep-15
Sampling Date: 18-Sep-15
Sampling Time: 10:00
Location: Kugaaruk
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	39.6	0.005	mg/L	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	8	2	mg/L	19-Sep-15	SM5210:B	
Organic Carbon, Total	28.8	0.5	mg/L	26-Sep-15	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	331	0.4	mg/L	21-Sep-15	SM2320:B	
Conductivity, Specific (@25C)	939	0.4	µS/cm	21-Sep-15	SM2510:B	
pH	7.63		pH units	21-Sep-15	SM4500-H:B	
Solids, Total Suspended	3	3	mg/L	23-Sep-15	SM2540:D	
Major Ions						
Calcium	32.5	0.1	mg/L	21-Sep-15	SM4110:B	
Chloride	67.2	0.7	mg/L	21-Sep-15	SM4110:B	
Hardness	131	0.7	mg/L	21-Sep-15	SM4110:B	
Magnesium	12.1	0.1	mg/L	21-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.52	0.01	mg/L	21-Sep-15	SM4110:B	
Nitrite as Nitrogen	0.02	0.01	mg/L	21-Sep-15	SM4110:B	
Potassium	21.2	0.1	mg/L	21-Sep-15	SM4110:B	

ReportDate: Wednesday, October 07, 2015
Print Date: ***Wednesday, October 07, 2015***

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

Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-4 **Taiga Sample ID:** 003

Sodium	58.1	0.1	mg/L	21-Sep-15	SM4110:B
Sulphate	2	1	mg/L	21-Sep-15	SM4110:B
Microbiology					
Coliforms, Fecal	10	10	CFU/100mL	19-Sep-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			21-Sep-15	Visual Exam
Subcontracted Organics					
Phenols, Total	0.0162	0.001	mg/L	25-Sep-15	AB ENV.06537
Trace Metals, Total					
Aluminum	41.9	5	µg/L	05-Oct-15	EPA200.8
Arsenic	1.8	0.2	µg/L	05-Oct-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	05-Oct-15	EPA200.8
Chromium	0.3	0.1	µg/L	05-Oct-15	EPA200.8
Cobalt	2.2	0.1	µg/L	05-Oct-15	EPA200.8
Copper	8.5	0.2	µg/L	05-Oct-15	EPA200.8
Iron	715	5	µg/L	05-Oct-15	EPA200.8
Lead	0.6	0.1	µg/L	05-Oct-15	EPA200.8
Manganese	563	0.1	µg/L	05-Oct-15	EPA200.8
Mercury	0.02	0.01	µg/L	05-Oct-15	EPA200.8
Nickel	4.0	0.1	µg/L	05-Oct-15	EPA200.8
Zinc	11.7	5	µg/L	05-Oct-15	EPA200.8

ReportDate: Wednesday, October 07, 2015
Print Date: *Wednesday, October 07, 2015*

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-5 **Taiga Sample ID:** 004

Client Project:
Sample Type: Water
Received Date: 18-Sep-15
Sampling Date: 18-Sep-15
Sampling Time: 10:00
Location: Kugaaruk
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	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	3	2	mg/L	19-Sep-15	SM5210:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	23.3	0.4	mg/L	21-Sep-15	SM2320:B	
Conductivity, Specific (@25C)	142	0.4	µS/cm	21-Sep-15	SM2510:B	
pH	7.20		pH units	21-Sep-15	SM4500-H:B	
Solids, Total Suspended	< 3	3	mg/L	23-Sep-15	SM2540:D	
Major Ions						
Calcium	9.2	0.1	mg/L	21-Sep-15	SM4110:B	
Chloride	21.2	0.7	mg/L	21-Sep-15	SM4110:B	
Hardness	33.5	0.7	mg/L	21-Sep-15	SM4110:B	
Magnesium	2.5	0.1	mg/L	21-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.12	0.01	mg/L	21-Sep-15	SM4110:B	
Nitrite as Nitrogen	0.01	0.01	mg/L	21-Sep-15	SM4110:B	
Potassium	1.0	0.1	mg/L	21-Sep-15	SM4110:B	
Sodium	12.5	0.1	mg/L	21-Sep-15	SM4110:B	

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-5 **Taiga Sample ID:** 004

Sulphate	8	1	mg/L	21-Sep-15	SM4110:B
Microbiology					
Coliforms, Fecal	< 1	1	CFU/100mL	19-Sep-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			21-Sep-15	Visual Exam
Subcontracted Organics					
Acenaphthene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Anthracene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Benzene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
Benzo(a)anthracene	< 0.000010	0.000010	mg/L	24-Sep-15	EPA3510
Benzo(a)pyrene	< 0.000005	0.000005	mg/L	24-Sep-15	EPA3510
Benzo(bj)fluoranthene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Benzo(g,h,i)perylene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Benzo(k)fluoranthene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Chrysene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Dibenzo(a,h)anthracene	< 0.000005	0.000005	mg/L	24-Sep-15	EPA3510
Ethylbenzene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
F1: C6-C10	< 0.10	0.1	mg/L	23-Sep-15	CCME CWS PHC
F2: C10-C16	< 0.10	0.10	mg/L	23-Sep-15	EPA3510
F3: C16-C34	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
F4: C34-C50	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
Fluoranthene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Fluorene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Hydrocarbons, Total Extractable	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
Indeno(1,2,3-cd)pyrene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510

ReportDate: Wednesday, October 07, 2015
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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-5 **Taiga Sample ID:** 004

Naphthalene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Phenanthrene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Phenols, Total	< 0.0010	0.001	mg/L	25-Sep-15	AB ENV.06537
Pyrene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Toluene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
Xylenes	< 0.00071	0.00071	mg/L	23-Sep-15	EPA 5021
Trace Metals, Total					
Arsenic	< 0.2	0.2	µg/L	05-Oct-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	05-Oct-15	EPA200.8
Chromium	0.1	0.1	µg/L	05-Oct-15	EPA200.8
Copper	0.7	0.2	µg/L	05-Oct-15	EPA200.8
Iron	48	5	µg/L	05-Oct-15	EPA200.8
Lead	< 0.1	0.1	µg/L	05-Oct-15	EPA200.8
Mercury	< 0.01	0.01	µg/L	05-Oct-15	EPA200.8
Nickel	0.2	0.1	µg/L	05-Oct-15	EPA200.8

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-6 **Taiga Sample ID:** 005

Client Project:
Sample Type: Water
Received Date: 18-Sep-15
Sampling Date: 18-Sep-15
Sampling Time: 10:00
Location: Kugaaruk
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Ammonia as Nitrogen	1.68	0.005	mg/L	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	6	2	mg/L	19-Sep-15	SM5210:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	168	0.4	mg/L	21-Sep-15	SM2320:B	
Conductivity, Specific (@25C)	473	0.4	µS/cm	21-Sep-15	SM2510:B	
pH	7.45		pH units	21-Sep-15	SM4500-H:B	
Solids, Total Suspended	6	3	mg/L	23-Sep-15	SM2540:D	
Major Ions						
Calcium	57.2	0.1	mg/L	21-Sep-15	SM4110:B	
Chloride	16.6	0.7	mg/L	21-Sep-15	SM4110:B	
Hardness	168	0.7	mg/L	21-Sep-15	SM4110:B	
Magnesium	6.2	0.1	mg/L	21-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.11	0.01	mg/L	21-Sep-15	SM4110:B	
Nitrite as Nitrogen	0.01	0.01	mg/L	21-Sep-15	SM4110:B	
Potassium	5.1	0.1	mg/L	21-Sep-15	SM4110:B	
Sodium	21.9	0.1	mg/L	21-Sep-15	SM4110:B	

ReportDate: Wednesday, October 07, 2015
Print Date: ***Wednesday, October 07, 2015***

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-6 **Taiga Sample ID:** 005

Sulphate	41	1	mg/L	21-Sep-15	SM4110:B	
Microbiology						
Coliforms, Fecal	32	1	CFU/100mL	19-Sep-15	SM9222:D	
Organics						
Oil and Grease, visible	Non-visible			21-Sep-15	Visual Exam	
Subcontracted Organics						
Acenaphthene		0.00005	mg/L		EPA3510	107
Anthracene		0.00001	mg/L		EPA3510	107
Benzene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021	
Benzo(a)anthracene		0.000010	mg/L		EPA3510	107
Benzo(a)pyrene		0.000005	mg/L		EPA3510	107
Benzo(bj)fluoranthene		0.00005	mg/L		EPA3510	107
Benzo(g,h,i)perylene		0.00002	mg/L		EPA3510	107
Benzo(k)fluoranthene		0.00001	mg/L		EPA3510	107
Chrysene		0.00002	mg/L		EPA3510	107
Dibenzo(a,h)anthracene		0.000005	mg/L		EPA3510	107
Ethylbenzene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021	
F1: C6-C10	< 0.10	0.1	mg/L	23-Sep-15	CCME CWS PHC	
F2: C10-C16	< 0.10	0.10	mg/L	23-Sep-15	EPA3510	
F3: C16-C34	< 0.25	0.25	mg/L	23-Sep-15	EPA3510	
F4: C34-C50	< 0.25	0.25	mg/L	23-Sep-15	EPA3510	
Fluoranthene		0.00002	mg/L		EPA3510	107
Fluorene		0.00002	mg/L		EPA3510	107
Hydrocarbons, Total Extractable	< 0.25	0.25	mg/L	23-Sep-15	EPA3510	
Indeno(1,2,3-cd)pyrene		0.00001	mg/L		EPA3510	107

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-6 **Taiga Sample ID:** 005

Naphthalene		0.00005	mg/L		EPA3510	107
Phenanthrene		0.00005	mg/L		EPA3510	107
Phenols, Total	0.0056	0.001	mg/L	25-Sep-15	AB ENV.06537	
Pyrene		0.00001	mg/L		EPA3510	107
Toluene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021	
Xylenes	< 0.00071	0.00071	mg/L	23-Sep-15	EPA 5021	
Trace Metals, Total						
Arsenic	1.0	0.2	µg/L	05-Oct-15	EPA200.8	
Cadmium	< 0.1	0.1	µg/L	05-Oct-15	EPA200.8	
Chromium	0.5	0.1	µg/L	05-Oct-15	EPA200.8	
Copper	6.6	0.2	µg/L	05-Oct-15	EPA200.8	
Iron	1370	5	µg/L	05-Oct-15	EPA200.8	
Lead	2.5	0.1	µg/L	05-Oct-15	EPA200.8	
Mercury	< 0.01	0.01	µg/L	05-Oct-15	EPA200.8	
Nickel	2.0	0.1	µg/L	05-Oct-15	EPA200.8	

ReportDate: Wednesday, October 07, 2015
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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-1 **Taiga Sample ID:** 006

Client Project:
Sample Type: Water
Received Date: 18-Sep-15
Sampling Date: 18-Sep-15
Sampling Time: 10:00
Location: Kugaaruk
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	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	< 2	2	mg/L	19-Sep-15	SM5210:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	31.4	0.4	mg/L	21-Sep-15	SM2320:B	
Conductivity, Specific (@25C)	149	0.4	µS/cm	21-Sep-15	SM2510:B	
pH	7.44		pH units	21-Sep-15	SM4500-H:B	
Solids, Total Suspended	6	3	mg/L	23-Sep-15	SM2540:D	
Major Ions						
Calcium	12.0	0.1	mg/L	21-Sep-15	SM4110:B	
Chloride	19.0	0.7	mg/L	21-Sep-15	SM4110:B	
Hardness	41.3	0.7	mg/L	21-Sep-15	SM4110:B	
Magnesium	2.7	0.1	mg/L	21-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.13	0.01	mg/L	21-Sep-15	SM4110:B	
Nitrite as Nitrogen	0.01	0.01	mg/L	21-Sep-15	SM4110:B	
Potassium	1.0	0.1	mg/L	21-Sep-15	SM4110:B	
Sodium	11.5	0.1	mg/L	21-Sep-15	SM4110:B	

ReportDate: Wednesday, October 07, 2015
Print Date: ***Wednesday, October 07, 2015***

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-1 **Taiga Sample ID:** 006

Sulphate	8	1	mg/L	21-Sep-15	SM4110:B
Microbiology					
Coliforms, Fecal	< 1	1	CFU/100mL	19-Sep-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			21-Sep-15	Visual Exam
Subcontracted Organics					
Acenaphthene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Anthracene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Benzene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
Benzo(a)anthracene	< 0.000010	0.000010	mg/L	24-Sep-15	EPA3510
Benzo(a)pyrene	< 0.000005	0.000005	mg/L	24-Sep-15	EPA3510
Benzo(bj)fluoranthene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Benzo(g,h,i)perylene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Benzo(k)fluoranthene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Chrysene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Dibenzo(a,h)anthracene	< 0.000005	0.000005	mg/L	24-Sep-15	EPA3510
Ethylbenzene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
F1: C6-C10	< 0.10	0.1	mg/L	23-Sep-15	CCME CWS PHC
F2: C10-C16	< 0.10	0.10	mg/L	23-Sep-15	EPA3510
F3: C16-C34	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
F4: C34-C50	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
Fluoranthene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Fluorene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Hydrocarbons, Total Extractable	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
Indeno(1,2,3-cd)pyrene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-1 **Taiga Sample ID:** 006

Naphthalene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Phenanthrene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Phenols, Total	< 0.0010	0.001	mg/L	25-Sep-15	AB ENV.06537
Pyrene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Toluene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
Xylenes	< 0.00071	0.00071	mg/L	23-Sep-15	EPA 5021
Trace Metals, Total					
Arsenic	< 0.2	0.2	µg/L	05-Oct-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	05-Oct-15	EPA200.8
Chromium	1.4	0.1	µg/L	05-Oct-15	EPA200.8
Copper	1.5	0.2	µg/L	05-Oct-15	EPA200.8
Iron	725	5	µg/L	05-Oct-15	EPA200.8
Lead	3.0	0.1	µg/L	05-Oct-15	EPA200.8
Mercury	< 0.01	0.01	µg/L	05-Oct-15	EPA200.8
Nickel	0.9	0.1	µg/L	05-Oct-15	EPA200.8

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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-2 **Taiga Sample ID:** 007

Client Project:
Sample Type: Water
Received Date: 18-Sep-15
Sampling Date: 18-Sep-15
Sampling Time: 10:00
Location: Kugaaruk
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	22-Sep-15	SM4500-NH3:G	
Biochemical Oxygen Demand	2	2	mg/L	19-Sep-15	SM5210:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	149	0.4	mg/L	21-Sep-15	SM2320:B	
Conductivity, Specific (@25C)	720	0.4	µS/cm	21-Sep-15	SM2510:B	
pH	8.07		pH units	21-Sep-15	SM4500-H:B	
Solids, Total Suspended	< 3	3	mg/L	23-Sep-15	SM2540:D	
Major Ions						
Calcium	56.5	0.1	mg/L	21-Sep-15	SM4110:B	
Chloride	79.9	0.7	mg/L	21-Sep-15	SM4110:B	
Hardness	197	0.7	mg/L	21-Sep-15	SM4110:B	
Magnesium	13.7	0.1	mg/L	21-Sep-15	SM4110:B	
Nitrate as Nitrogen	0.23	0.01	mg/L	21-Sep-15	SM4110:B	
Nitrite as Nitrogen	0.02	0.01	mg/L	21-Sep-15	SM4110:B	
Potassium	7.0	0.1	mg/L	21-Sep-15	SM4110:B	
Sodium	71.7	0.1	mg/L	21-Sep-15	SM4110:B	

ReportDate: Wednesday, October 07, 2015
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Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-2 **Taiga Sample ID:** 007

Sulphate	90	1	mg/L	21-Sep-15	SM4110:B
Microbiology					
Coliforms, Fecal	40	1	CFU/100mL	19-Sep-15	SM9222:D
Organics					
Oil and Grease, visible	Non-visible			21-Sep-15	Visual Exam
Subcontracted Organics					
Acenaphthene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Anthracene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Benzene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
Benzo(a)anthracene	< 0.000010	0.000010	mg/L	24-Sep-15	EPA3510
Benzo(a)pyrene	< 0.000005	0.000005	mg/L	24-Sep-15	EPA3510
Benzo(bj)fluoranthene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Benzo(g,h,i)perylene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Benzo(k)fluoranthene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Chrysene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Dibenzo(a,h)anthracene	< 0.000005	0.000005	mg/L	24-Sep-15	EPA3510
Ethylbenzene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
F1: C6-C10	< 0.10	0.1	mg/L	23-Sep-15	CCME CWS PHC
F2: C10-C16	< 0.10	0.10	mg/L	23-Sep-15	EPA3510
F3: C16-C34	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
F4: C34-C50	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
Fluoranthene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Fluorene	< 0.000020	0.00002	mg/L	24-Sep-15	EPA3510
Hydrocarbons, Total Extractable	< 0.25	0.25	mg/L	23-Sep-15	EPA3510
Indeno(1,2,3-cd)pyrene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510

ReportDate: Wednesday, October 07, 2015
Print Date: *Wednesday, October 07, 2015*

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

Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-2 **Taiga Sample ID:** 007

Naphthalene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Phenanthrene	< 0.000050	0.00005	mg/L	24-Sep-15	EPA3510
Phenols, Total	0.0034	0.001	mg/L	25-Sep-15	AB ENV.06537
Pyrene	< 0.000010	0.00001	mg/L	24-Sep-15	EPA3510
Toluene	< 0.00050	0.0005	mg/L	23-Sep-15	EPA 5021
Xylenes	< 0.00071	0.00071	mg/L	23-Sep-15	EPA 5021
Trace Metals, Total					
Arsenic	0.3	0.2	µg/L	05-Oct-15	EPA200.8
Cadmium	< 0.1	0.1	µg/L	05-Oct-15	EPA200.8
Chromium	0.2	0.1	µg/L	05-Oct-15	EPA200.8
Copper	3.2	0.2	µg/L	05-Oct-15	EPA200.8
Iron	130	5	µg/L	05-Oct-15	EPA200.8
Lead	0.2	0.1	µg/L	05-Oct-15	EPA200.8
Mercury	0.01	0.01	µg/L	05-Oct-15	EPA200.8
Nickel	2.0	0.1	µg/L	05-Oct-15	EPA200.8

ReportDate: Wednesday, October 07, 2015
Print Date: *Wednesday, October 07, 2015*

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

Taiga Batch No.: 150866

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-8-2 **Taiga Sample ID:** 007

*** 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

Comments *107 - Sample damaged/broken during shipment to subcontracting laboratory, analysis not possible.*

ReportDate: Wednesday, October 07, 2015
Print Date: ***Wednesday, October 07, 2015***

Stantec Consulting Ltd.
ATTN: KENNETH JOHNSON
10160 112 St.
Edmonton AB T5K 2L6

Date Received: 23-JUL-15
Report Date: 30-JUL-15 16:03 (MT)
Version: FINAL

Client Phone: 780-984-9085

Certificate of Analysis

Lab Work Order #: L1647361

Project P.O. #: NOT SUBMITTED
Job Reference: 110126041
C of C Numbers: 14-440551
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1647361-1 BERM TOE							
Sampled By: CLIENT on 23-JUL-15 @ 10:00							
Matrix: GRAB							
Miscellaneous Parameters							
Ammonia, Total (as N)	85.5		0.050	mg/L		30-JUL-15	R3235336
Biochemical Oxygen Demand	177		2.0	mg/L		24-JUL-15	R3234788
MPN - Fecal Coliforms	17000	DLA	100	MPN/100mL		24-JUL-15	R3232836
Total Suspended Solids	12.7		3.0	mg/L		25-JUL-15	R3232874
L1647361-2 BERM TOE DUPLICATE							
Sampled By: CLIENT on 23-JUL-15 @ 10:00							
Matrix: GRAB							
Miscellaneous Parameters							
Ammonia, Total (as N)	84.3		0.050	mg/L		30-JUL-15	R3235336
Biochemical Oxygen Demand	193		2.0	mg/L		24-JUL-15	R3234788
MPN - Fecal Coliforms	14000	DLA	100	MPN/100mL		24-JUL-15	R3232836
Total Suspended Solids	13.1		3.0	mg/L		25-JUL-15	R3232874
L1647361-3 DOWNSTREAM BERM							
Sampled By: CLIENT on 23-JUL-15 @ 10:00							
Matrix: GRAB							
Miscellaneous Parameters							
Ammonia, Total (as N)	51.9		0.050	mg/L		30-JUL-15	R3235336
Biochemical Oxygen Demand	115		2.0	mg/L		24-JUL-15	R3234788
MPN - Fecal Coliforms	1700	DLA	100	MPN/100mL		24-JUL-15	R3232836
Total Suspended Solids	29.8		3.0	mg/L		25-JUL-15	R3232874
L1647361-4 DOWNSTREAM BERM DUPLICATE							
Sampled By: CLIENT on 23-JUL-15 @ 10:00							
Matrix: GRAB							
Miscellaneous Parameters							
Ammonia, Total (as N)	48.6		0.050	mg/L		30-JUL-15	R3235336
Biochemical Oxygen Demand	123		2.0	mg/L		24-JUL-15	R3234788
MPN - Fecal Coliforms	2300	DLA	100	MPN/100mL		24-JUL-15	R3232836
Total Suspended Solids	19.9		3.0	mg/L		25-JUL-15	R3232874

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BOD-ED	Water	Biochemical Oxygen Demand (BOD)	APHA 5210 B-5 day Incub.-O2 electrode
FCOLI-MPN-ED	Water	Thermotolerant Coliforms by MPN	APHA 9223B, 2004 Enzyme Substrate Method
Analysis is carried out using procedures adapted from APHA 9223 "Enzyme Substrate Coliform Test". Fecal Coliform (Thermotolerant) bacteria are determined by mixing sample with a mixture of hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18-24 hours and the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.			
NH3-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

14-440551

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1647361 Report Date: 30-JUL-15

Client: Stantec Consulting Ltd.
10160 112 St.
Edmonton AB T5K 2L6
Contact: KENNETH JOHNSON

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BOD-ED	**Water**							
Batch R3234788								
WG2135712-2 LCS								
Biochemical Oxygen Demand			99.8		%		85-115	24-JUL-15
WG2135712-3 MB								
Biochemical Oxygen Demand			<2.0		mg/L		2	24-JUL-15
FCOLI-MPN-ED	**Water**							
Batch R3232836								
WG2135850-1 MB								
MPN - Fecal Coliforms			<1		MPN/100mL		1	24-JUL-15
NH3-CFA-ED	**Water**							
Batch R3235336								
WG2139580-2 LCS								
Ammonia, Total (as N)			100.2		%		85-115	30-JUL-15
WG2139580-8 LCS								
Ammonia, Total (as N)			102.4		%		85-115	30-JUL-15
WG2139580-1 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	30-JUL-15
WG2139580-6 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	30-JUL-15
SOLIDS-TOTSUS-ED	**Water**							
Batch R3232874								
WG2136431-6 DUP		**L1647361-1**						
Total Suspended Solids		12.7	13.7		mg/L	7.6	20	25-JUL-15
WG2136431-2 LCS								
Total Suspended Solids			98.8		%		85-115	25-JUL-15
WG2136431-5 LCS								
Total Suspended Solids			100.4		%		85-115	25-JUL-15
WG2136431-1 MB								
Total Suspended Solids			<3.0		mg/L		3	25-JUL-15
WG2136431-4 MB								
Total Suspended Solids			<3.0		mg/L		3	25-JUL-15

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 14 - 440551

Page 1 of 1

Report To	KENNETH JOHNSON	**Report Format / Distribution**	**Select Service Level Below** (Rush Turnaround Time (TAT) is not available for all tests)
Company:	STANTEC	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3pm)
Contact:	KEN JOHNSON	Quality Control (QC) Report with Report ☐ Yes ☐ No	P ☐ Priority (2-4 business days if received by 3pm)
Address:	10160 112 ST EDMONTON	☑ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 business days if received by 3pm)
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency if received by 10am – contact ALS for surcharge.
Phone:	780 904 9085	Email 1 or Fax KENNETH.JOHNSON@STANTEC.COM	Specify Date Required for E2,E or P:
		Email 2	**Analysis Request**
Invoice To	Same as Report To ☑ Yes ☐ No	**Invoice Distribution**	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax	
Contact:		Email 2	
Project Information		**Oil and Gas Required Fields (client use)**	
ALS Quote #:		Approver ID:	Cost Center:
Job #:	1101 26041	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	L1647361	**ALS Contact:**	**Sampler:**

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BOD	TSS	FECAL COL	AMMONIA	Number of Containers
	BERM TOE	23-OCT	10:00	GRAB	✓	✓	✓	✓	
	BERM TOE DUPLICATE				✓	✓	✓	✓	
	DOWNSTREAM BERM				✓	✓	✓	✓	
	DOWNSTREAM BERM DUPLICATE				✓	✓	✓	✓	

L1647361-COFC

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ Yes ☑ No

Are samples for human drinking water use?
☐ Yes ☑ No

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐			SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐		Custody seal intact	Yes ☐	No ☐	
Cooling Initiated	☐						

INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C		
12.4°C				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
				23/10/2015	9:58pm			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1 If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

White Paper Co 604 951-3600