Annual Report -2017

Water Licence: 3BM-PEL 1419

Hamlet of Kugaaruk, NU

Date: March 01, 2018




Submitted to:

Nunavut Water Board (NWB)

Annual Report-2017

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March 01, 2018

Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1L0
Attention: Karen Kharatyan, PhD,
Manager of Licensing

RE: Annual Report 2017 - Hamlet of Kugaaruk Water Licence 3BM-PEL 1419

Dear Karen,

The Hamlet of Kugaaruk is pleased to submit to Nunavut Water Board the Annual Report 2017 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 appended herewith.

The Licensee has made some effective measures for waste management during the summer which has led improvement to waste facilities and effluent discharge. Facilities monitoring program were carried in June-September as of each year as required in the Licence. Samples test result had shown a control on contamination parameters within allowable limits.

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

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

Best Regards,

John Ivey,
Senor Administrative Officer,
Hamlet of Kugaaruk, NU

Cc: Baba Pedersen, Resource Management Officer, AANDC

EXECUTIVE SUMMARY:

Annual Report 2017 for the Hamlet of Kugaaruk (the Licensee) to the Nunavut Water Board (NWB) has been prepared to meet requirements of the Licence 3BM-PEL1419, General Conditions, through Conditions to Monitoring program. This report covers the period January 01 to December 31, 2017.

Raw water intake from the Kugajuk River through twin intake pumps, treated by Cartage filters ranging 20 micron through 1 micron sizes, followed by UV system, chlorination and supplied to household tanks by hamlet operated water trucks. Quantity of water uses during this period is about **35,202** m3, with an increase of 5.55% from the previous year 33,350 m3, but within the allowable limit of 45,000 m3.

Raw sewage water collected from household sewage tanks using hamlet operated vacuum trucks, hauled to community sewage lagoon and discharged at the designated point. Raw sewage stayed inside the lagoon during the period Oct - June for almost 9 months almost frizzed up where they received primary treatment naturally. Annual decanting carried longer time twice in July and September to reduce quantity inside and thus reduced probability of leaking through the south-east berm. Samples were collected before, during and after decanting and tested at Taiga Laboratory.

Household wastes collected using hamlet operated covered truck and hauled to community waste dump site. Wastes from private user and commercial users are hauled by their trucks and dump at the community waste facility under hamlet administration. Major cleanup to the solid waste facility was made during fall and including waste fuel drums, and unknown drums was carried by the hamlet operators during the summer and fall which made the facility almost empty to receive new dumps. But, it wasn't possible to clean the metal dump site that needs heavy equipment, loader, packer and grader. No separate facility for spills and contamination materials, but only to store inside the liner cell using containers but no remediation or treatment within the facility. Waste oil, waste paint drums and waste batteries were replaced into C-cans and waiting for shipping out.

The sewage lagoon berm continued leaking at the south-west side in 2-location, samples were collected and tested from leaked sewage water to verify the effluent quality. Consultant has visited the site, addressed the berm remedial options and has chosen the best cost-effective option of full liner lagoon with possible increase in berm height to maintain the capacity. Design in progress and possible contractor hiring by spring 2018 and remedial construction major works by end of 2018.

General Conditions:

- The water consumptions shown in the NWB Form by monthly record, and sewage volume estimated as maximum percentage of possible water volume, measured on daily basis.
- No modification to sewage waste disposal, wetland or solid waste site during this period except the electrical repairs to Pendant switch for water truck fill facility.
- No other unauthorized discharge to sewage or solid waste effluent, but the reported leak at the south-east berm of sewage lagoon.
- No changes to O&M manuals for water system, sewage & solid waste facilities.
- Monitoring stations were updated as directed by the inspector, and signs were placed.
- No device Meter for water volume measurement, but the truck-fill has considered precise
- No changes to Spill Contingency Plans for sewage and solid waste management as approved.
- Plan of Compliances were followed in summer & winter as approved and will be continued.
- Water drawn from the Kugajuk River and annual intake about **35,202** cubic metres which is within the allowable annual limit **45,000** cubic metres. Water supply to household tanks by using 2-water truck driven by hamlet operators 7 days a week.
- Some measure to erosion protection at the river bank has been carried, but a full berm was not possible near the water intake pipes; selected materials and rip-rap would be required.

Waste Disposal

- Sewage waste both grey and the black are combined from urinal, toilet flush, bath & kitchen water stored in the household tank and collected in average 3-4 days by vacuum truck to discharge into the lagoon.
- Amount of sewage generated during this period is less than 33,440 m3, where sewage water is calculated considering 90-95 % of water supply by truck.
- All sewage and solid waste disposal done to the designated location and effluent samples were tested for parameters content. Test results included in this report.
- Freeboard at sewage lagoon remained more than1.0 m and decanted twice using a pump.
- The existing wetland and control pond facilities used for final polishing and remediation of sewage water. Test results shown the effluent at end of pipe (PEL- 4) within limiting values.

Non-hazardous domestic Solid Waste:

- Residents store household waste at the prescribed bins by the hamlet, and hamlet operated trucks hauled them to the dump site at least 3 days a week. Hazardous waste separated from regular waste and secured inside the C-can for shipping out. Remaining general waste were burnt locally and buried inside trenches by pushing down.
- Waste batteries were secured inside the C-can in wooden boxes wrap with plastic sheets.
- Paper board, cloth, light wood product and loose materials were reduced by slow burning time to time and animal carcass buried under sand-pit inside the facility.

Modification, construction, operation, A&R

- No modifications to sewage or solid waste facilities and operational plan during this year. The lagoon capacity 46,600 m3 is within required threshold as designed about 1.5 times of the volume of sewage water production annually. Decanting helped the lagoon ability for annual sewage storage for at least 9-10 months inside when frozen.
- No changes to O&M manual for water treatment and supply; operators training carried through in-house and externally with experts and organization for general compliances.
- Dillon Consulting has reviewed the sewage facility design & operation , and working on remedial measures including improvement of the lagoon structure.

Monitoring Program

- Annual monitoring of water source, sewage and solid waste effluent were carried by the hamlet operators including some part-time resources; mostly during the summer and fall. Samples were collected from monitoring stations (as available) as part of QA/QC plan implementation and tested for parameters at Taiga Laboratory in Yellowknife

ANNUAL REPORT

YEAR BEING REPORTED: 2017

The following information is compiled pursuant to the requirements of Part B, Item 1 of Water Licence **3BM-PEL 1419** issued to the **Hamlet of Kugaaruk**
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i) - iii) tabular summaries of all data generated under the "Monitoring Program"; monthly and annual quantities in cubic metres of freshwater obtained from all sources; monthly and annual quantities in cubic metres of each and all wastes discharged;

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

Month Reported	Quantity of Water Obtained from all sources (litres)	Quantity of Sewage Waste Discharged
January	3,021,525.30	Same
February	2,760,072.70	Same
March	3,037,023.30	Same
April	2,901,172.60	Same
May	2,910,960.50	Same
June	2,739,558.50	Same
July	3,171,192.10	Same
August	3,036,510.80	Same
September	2,819,486.80	Same
October	3,149,541.50	Same
November	2,816,866.10	Same
December	2,837,543.20	Same
ANNUAL TOTAL	35,201,453.40	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;

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Water Supply:

- Electrical connection to truckfill control Pendant outside the WTP building had issues on non-responding sometimes which was fixed by the Hamlet operator.

Solid waste facility:

- Major clean-up to solid waste facility was done by Hamlet operators.
- Loose debris were stockpiled and were burnt using the burn-pit, pushed down ashes and debris inside trenches and covered with local soil-gravels, graded the facility to outwards.
- Unauthorized waste fuel drums were removed from the site and empty drums were crushed and bundled.

Sewage Lagoon facility:

- Replaced the burnt out decanting pump with new one by the Hamlet. Decanting carried until end of September for the 2nd time to keep water level as low as possible thus indirectly lower the hydrostatic pressure on lagoon berm to minimize leaking volume.

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

- Leak continued at the south-east side of the lagoon and spreading wide area and moves downward on grassy-gravel surface during spring and summer thaws. The leak point is visually observing more from the south-east corner section where current lagoon berm was built up with the inclined slopped bedrock. Beside this point two other traced leak points also observed about 15-20 m distance towards south. All these leak points are seen close near to the berm vertical section with the previous bedrock berm. No other leak reported at the west or north side berm of the lagoon.

- The Department of Community and Government services has awarded a contract to Dillon Consultant for the design and inspection services of the remedial works of the lagoon. The consultant has visited the site and submitted alternative options for design of works and contractor hiring by May and major works completion by October 2018.

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

No facility abandoned during this year, but anticipated restoration completion of the lagoon structure and berm by the end of 2018. Metal frame gate was installed at Solid waste facility and tightened with side fence.

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;

Issues of the sewage lagoon leak have been ongoing; the Board and other organizations were acknowledged the issue and plan for remediation. Study and inspection report revealed the necessity for its improvement and therefore, a full upgrading of the lagoon structure is planned for next fiscal year 2018.
Among many alternative, full HDPE liner cell on base and on sides has been identified as the best option which is estimated over $4M cost by the GN. A budget has been placed by the GN to continue the improvement work. Before this budget, another $125K also was spent by GN to assess the issue and estimate the cost.

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

No specific request by the Board or other organization, but to monitor the leak effluent quality to stay in compliance as part of the Licence.

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

No change or update to approved O&M manual, but a plan for more cleanup of metal dump site and secure gate placement in coming year. The Licensee will need a funding support to do it, and to install at least 2-more liner cell inside the facility for contaminated and spill materials storage, used tire placement and animal carcass management. The existing fence would be required some activities in terms of tightening, securement and expansion at the front entrance upto the proposed gate.

ADDITIONAL INFORMATION THAT THE LICENSEE DEEMS USEFUL:

Trace debris and burnt metal parts from Kugaaruk school were placed inside the metal dump site finding no other facilities, and would be required either buried locally after broken in pieces or be shipped out by the contractor.

FOLLOW-UP REGARDING INSPECTION/COMPLIANCE CONCERNS:

Appendix A:

Water Test Results: Taiga Lab

Hamlet of Kugaaruk, NU

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170164

- FINAL REPORT -

Prepared For: Hamlet of Kugaaruk

Address: Box 205
Kugaaruk, NU,X0B 1K0

Attn: **John Ivey** **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: Monday, May 01, 2017
Print Date: ***Tuesday, May 02, 2017***

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170164

- CERTIFICATE OF ANALYSIS -

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

Client Project: Kugaaruk Water Supply
Sample Type: Freshwater
Received Date: 04-Apr-17
Sampling Date: 02-Apr-17
Sampling Time: 11:00
Location: WTP - Source Water
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Nitrogen, Dissolved	0.22	0.06	mg/L	04-Apr-17	ISO/TR 11905:1997(E)	
Nitrogen, Total	0.23	0.06	mg/L	04-Apr-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	2.6	0.5	mg/L	07-Apr-17	SM5310:B	
Organic Carbon, Total	2.7	0.5	mg/L	07-Apr-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	67.9	0.4	mg/L	04-Apr-17	SM2320:B	
Colour, Apparent	12	5	CU	04-Apr-17	SM2120:B	
pH	7.13		pH units	04-Apr-17	SM4500-H:B	
Solids, Total Dissolved	119	10	mg/L	06-Apr-17	SM2540:C	
Solids, Total Suspended	< 3	3	mg/L	06-Apr-17	SM2540:D	
Turbidity	0.52	0.05	NTU	04-Apr-17	SM2130:B	
Major Ions						
Calcium	19.5	0.1	mg/L	04-Apr-17	SM4110:B	
Chloride	25.2	0.7	mg/L	04-Apr-17	SM4110:B	

ReportDate: Monday, May 01, 2017
Print Date: ***Tuesday, May 02, 2017***

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Taiga Batch No.: 170164

- CERTIFICATE OF ANALYSIS -

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

Fluoride	< 0.1	0.1	mg/L	04-Apr-17	SM4110:B	
Hardness	88.5	0.7	mg/L	04-Apr-17	SM4110:B	
Magnesium	9.7	0.1	mg/L	04-Apr-17	SM4110:B	
Nitrate as Nitrogen	0.06	0.01	mg/L	04-Apr-17	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	04-Apr-17	SM4110:B	
Potassium	1.2	0.1	mg/L	04-Apr-17	SM4110:B	
Sodium	11.5	0.1	mg/L	04-Apr-17	SM4110:B	
Sulphate	9	1	mg/L	04-Apr-17	SM4110:B	
Microbiology						
Coliforms, Total		1.0	MPN/100ml		SM9223:B	105
Escherichia coli		1.0	MPN/100ml		SM9223:B	105
Subcontracted Organics						
Cyanide, Weak Acid Dissociable	< 0.0010	0.001	mg/L	13-Apr-17	APHA4500-CN	
Phenols, Total	< 0.0010	0.001	mg/L	25-Apr-17	AB ENV.06537	
Trace Metals, Total						
Aluminum	3.8	0.6	µg/L	13-Apr-17	EPA200.8	
Arsenic	< 0.2	0.2	µg/L	13-Apr-17	EPA200.8	
Barium	4.4	0.1	µg/L	13-Apr-17	EPA200.8	
Beryllium	< 0.1	0.1	µg/L	13-Apr-17	EPA200.8	
Cadmium	< 0.05	0.05	µg/L	13-Apr-17	EPA200.8	
Chromium	0.1	0.1	µg/L	13-Apr-17	EPA200.8	
Cobalt	< 0.1	0.1	µg/L	13-Apr-17	EPA200.8	
Copper	16.4	0.2	µg/L	13-Apr-17	EPA200.8	
Iron	118	5	µg/L	13-Apr-17	EPA200.8	
Lead	0.9	0.1	µg/L	13-Apr-17	EPA200.8	

ReportDate: Monday, May 01, 2017
Print Date: *Tuesday, May 02, 2017*

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4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
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Taiga Batch No.: 170164

- CERTIFICATE OF ANALYSIS -

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

Manganese	36.2	0.1	µg/L	13-Apr-17	EPA200.8
Mercury	< 0.01	0.01	µg/L	13-Apr-17	EPA200.8
Molybdenum	0.2	0.1	µg/L	13-Apr-17	EPA200.8
Nickel	0.7	0.1	µg/L	13-Apr-17	EPA200.8
Selenium	< 0.3	0.3	µg/L	13-Apr-17	EPA200.8
Silver	< 0.1	0.1	µg/L	13-Apr-17	EPA200.8
Zinc	56.9	0.4	µg/L	13-Apr-17	EPA200.8

ReportDate: Monday, May 01, 2017
Print Date: *Tuesday, May 02, 2017*

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4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170164

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Truck fill **Taiga Sample ID:** 002

Client Project: Kugaaruk Water Supply
Sample Type: Treated Water
Received Date: 04-Apr-17
Sampling Date: 02-Apr-17
Sampling Time: 11:30
Location: WTP - Treated Water
Report Status: **Final**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Nitrogen, Dissolved	0.23	0.06	mg/L	04-Apr-17	ISO/TR 11905:1997(E)	
Nitrogen, Total	0.23	0.06	mg/L	04-Apr-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	2.5	0.5	mg/L	07-Apr-17	SM5310:B	
Organic Carbon, Total	2.6	0.5	mg/L	07-Apr-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	67.1	0.4	mg/L	04-Apr-17	SM2320:B	
Colour, Apparent	8	5	CU	04-Apr-17	SM2120:B	
Conductivity, Specific (@25C)	231	0.4	µS/cm	04-Apr-17	SM2510:B	
pH	7.27		pH units	04-Apr-17	SM4500-H:B	
Solids, Total Dissolved	131	10	mg/L	06-Apr-17	SM2540:C	
Solids, Total Suspended	< 3	3	mg/L	06-Apr-17	SM2540:D	
Turbidity	0.43	0.05	NTU	04-Apr-17	SM2130:B	
Major Ions						
Calcium	18.7	0.1	mg/L	05-Apr-17	SM4110:B	
Chloride	25.3	0.7	mg/L	05-Apr-17	SM4110:B	
Fluoride	< 0.1	0.1	mg/L	05-Apr-17	SM4110:B	

ReportDate: Monday, May 01, 2017
Print Date: ***Tuesday, May 02, 2017***

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170164

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Truck fill **Taiga Sample ID:** 002

Hardness	85.0	0.7	mg/L	05-Apr-17	SM4110:B
Magnesium	9.3	0.1	mg/L	05-Apr-17	SM4110:B
Nitrate as Nitrogen	0.10	0.01	mg/L	05-Apr-17	SM4110:B
Nitrite as Nitrogen	< 0.01	0.01	mg/L	05-Apr-17	SM4110:B
Potassium	1.0	0.1	mg/L	05-Apr-17	SM4110:B
Sodium	11.9	0.1	mg/L	05-Apr-17	SM4110:B
Sulphate	9	1	mg/L	05-Apr-17	SM4110:B
Microbiology					
Coliforms, Fecal	< 1	1	CFU/100mL	04-Apr-17	SM9222:D
Coliforms, Total	< 1.0	1.0	MPN/100ml	04-Apr-17	SM9223:B
Escherichia coli	< 1.0	1.0	MPN/100ml	04-Apr-17	SM9223:B
Organics					
Bromodichloromethane	< 0.005	0.005	mg/L	07-Apr-17	EPA8260B
Bromoform	< 0.005	0.005	mg/L	07-Apr-17	EPA8260B
Chloroform	< 0.005	0.005	mg/L	07-Apr-17	EPA8260B
Dibromochloromethane	< 0.005	0.005	mg/L	07-Apr-17	EPA8260B
Trihalomethanes, Total	< 0.005	0.005	mg/L	07-Apr-17	EPA8260B
Subcontracted Organics					
Cyanide, Weak Acid Dissociable	< 0.0010	0.001	mg/L	13-Apr-17	APHA4500-CN
Phenols, Total	< 0.0010	0.001	mg/L	25-Apr-17	AB ENV.06537
Trace Metals, Total					
Aluminum	5.4	0.6	µg/L	13-Apr-17	EPA200.8
Arsenic	< 0.2	0.2	µg/L	13-Apr-17	EPA200.8
Barium	4.4	0.1	µg/L	13-Apr-17	EPA200.8
Beryllium	< 0.1	0.1	µg/L	13-Apr-17	EPA200.8

ReportDate: Monday, May 01, 2017
Print Date: *Tuesday, May 02, 2017*

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Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170164

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Truck fill **Taiga Sample ID:** 002

Cadmium	< 0.05	0.05	µg/L	13-Apr-17	EPA200.8
Chromium	0.1	0.1	µg/L	13-Apr-17	EPA200.8
Cobalt	< 0.1	0.1	µg/L	13-Apr-17	EPA200.8
Copper	2.5	0.2	µg/L	13-Apr-17	EPA200.8
Iron	102	5	µg/L	13-Apr-17	EPA200.8
Lead	0.1	0.1	µg/L	13-Apr-17	EPA200.8
Manganese	29.5	0.1	µg/L	13-Apr-17	EPA200.8
Mercury	< 0.01	0.01	µg/L	13-Apr-17	EPA200.8
Molybdenum	0.2	0.1	µg/L	13-Apr-17	EPA200.8
Nickel	0.4	0.1	µg/L	13-Apr-17	EPA200.8
Selenium	< 0.3	0.3	µg/L	13-Apr-17	EPA200.8
Silver	< 0.1	0.1	µg/L	13-Apr-17	EPA200.8
Zinc	5.0	0.4	µg/L	13-Apr-17	EPA200.8

ReportDate: Monday, May 01, 2017
Print Date: *Tuesday, May 02, 2017*

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170164

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Truck fill **Taiga Sample ID:** 002

- DATA QUALIFERS -

Data Qualifier Descriptions:

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

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

SM - Standard Methods for the Examination of Water and Wastewater

EPA - United States Environmental Protection Agency

ReportDate: Monday, May 01, 2017

Print Date: *Tuesday, May 02, 2017*

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170545

- PRELIMINARY REPORT -

Prepared For: Hamlet of Kugaaruk

Address: Box 205
Kugaaruk, NU,X0B 1K0

Attn: **John Ivey** **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:
Print Date: *Wednesday, July 26, 2017*

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

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

Client Project: Kugaaruk Water
Sample Type: Raw Water
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:00
Location: Kugaaruk, NU
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Nitrogen, Dissolved	0.24	0.06	mg/L	14-Jul-17	ISO/TR 11905:1997(E)	
Nitrogen, Total	0.24	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	2.7	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	2.7	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	42.6	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	11	5	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	130	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	7.84		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Dissolved	73	10	mg/L	17-Jul-17	SM2540:C	
Solids, Total Suspended	< 3	3	mg/L	17-Jul-17	SM2540:D	
Turbidity	0.59	0.05	NTU	14-Jul-17	SM2130:B	
Major Ions						
Calcium	11.7	0.1	mg/L	15-Jul-17	SM4110:B	

ReportDate:
Print Date: *Wednesday, July 26, 2017*

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

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

Chloride	11.2	0.7	mg/L	15-Jul-17	SM4110:B
Fluoride	< 0.1	0.1	mg/L	15-Jul-17	SM4110:B
Hardness	49.2	0.7	mg/L	15-Jul-17	SM4110:B
Magnesium	4.8	0.1	mg/L	15-Jul-17	SM4110:B
Nitrate+Nitrite as Nitrogen	0.07	0.01	mg/L	15-Jul-17	SM4110:B
Potassium	0.5	0.1	mg/L	15-Jul-17	SM4110:B
Sodium	4.9	0.1	mg/L	15-Jul-17	SM4110:B
Sulphate	3	1	mg/L	15-Jul-17	SM4110:B
Microbiology					
Coliforms, Fecal	< 1	1	CFU/100mL	14-Jul-17	SM9222:D
Subcontracted Organics					
Cyanide, Weak Acid Dissociable		0.005	mg/L		APHA4500-CN
Phenols, Total		0.001	mg/L		AB ENV.06537
Trace Metals, Total					
Aluminum	19.6	0.6	µg/L	20-Jul-17	EPA200.8
Arsenic	< 0.2	0.2	µg/L	20-Jul-17	EPA200.8
Beryllium	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Cadmium	< 0.04	0.04	µg/L	20-Jul-17	EPA200.8
Chromium	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Cobalt	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Copper	1.7	0.2	µg/L	20-Jul-17	EPA200.8
Iron	42	5	µg/L	20-Jul-17	EPA200.8
Lead	0.3	0.1	µg/L	20-Jul-17	EPA200.8
Manganese	1.8	0.1	µg/L	20-Jul-17	EPA200.8
Mercury	< 0.01	0.01	µg/L	20-Jul-17	EPA200.8

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Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

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

Nickel	0.2	0.1	µg/L	20-Jul-17	EPA200.8
Selenium	< 0.3	0.3	µg/L	20-Jul-17	EPA200.8
Silver	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Zinc	1.0	0.4	µg/L	20-Jul-17	EPA200.8

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Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

Client Sample ID: WTP-1 **Taiga Sample ID:** 002

Client Project: Kugaaruk Water
Sample Type: Treated Water
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:00
Location: Kugaaruk, NU
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Nitrogen, Dissolved	0.27	0.06	mg/L	14-Jul-17	ISO/TR 11905:1997(E)	
Nitrogen, Total	0.25	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	3.0	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	3.1	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	63.7	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	10	5	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	204	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	7.65		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Dissolved	120	10	mg/L	17-Jul-17	SM2540:C	
Solids, Total Suspended	< 3	3	mg/L	17-Jul-17	SM2540:D	
Turbidity	0.38	0.05	NTU	14-Jul-17	SM2130:B	
Major Ions						
Calcium	17.2	0.1	mg/L	15-Jul-17	SM4110:B	
Chloride	18.8	0.7	mg/L	15-Jul-17	SM4110:B	
Fluoride	< 0.1	0.1	mg/L	15-Jul-17	SM4110:B	

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Taiga Environmental Laboratory
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Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

Client Sample ID: WTP-1 **Taiga Sample ID:** 002

Hardness	75.3	0.7	mg/L	15-Jul-17	SM4110:B
Magnesium	7.8	0.1	mg/L	15-Jul-17	SM4110:B
Nitrate+Nitrite as Nitrogen	0.14	0.01	mg/L	15-Jul-17	SM4110:B
Potassium	0.8	0.1	mg/L	15-Jul-17	SM4110:B
Sodium	9.1	0.1	mg/L	15-Jul-17	SM4110:B
Sulphate	6	1	mg/L	15-Jul-17	SM4110:B
Microbiology					
Coliforms, Fecal	< 1	1	CFU/100mL	14-Jul-17	SM9222:D
Organics					
Bromodichloromethane	0.006	0.005	mg/L	25-Jul-17	EPA8260B
Bromoform	< 0.005	0.005	mg/L	25-Jul-17	EPA8260B
Chloroform	0.006	0.005	mg/L	25-Jul-17	EPA8260B
Dibromochloromethane	< 0.005	0.005	mg/L	25-Jul-17	EPA8260B
Trihalomethanes, Total	0.014	0.005	mg/L	25-Jul-17	EPA8260B
Subcontracted Organics					
Cyanide, Weak Acid Dissociable		0.005	mg/L		APHA4500-CN
Phenols, Total		0.001	mg/L		AB ENV.06537
Trace Metals, Total					
Aluminum	17.3	0.6	µg/L	20-Jul-17	EPA200.8
Arsenic	< 0.2	0.2	µg/L	20-Jul-17	EPA200.8
Beryllium	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Cadmium	< 0.04	0.04	µg/L	20-Jul-17	EPA200.8
Chromium	0.1	0.1	µg/L	20-Jul-17	EPA200.8
Cobalt	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Copper	5.4	0.2	µg/L	20-Jul-17	EPA200.8

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Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

Client Sample ID: WTP-1 **Taiga Sample ID:** 002

Iron	36	5	µg/L	20-Jul-17	EPA200.8
Lead	0.9	0.1	µg/L	20-Jul-17	EPA200.8
Manganese	3.2	0.1	µg/L	20-Jul-17	EPA200.8
Mercury	< 0.01	0.01	µg/L	20-Jul-17	EPA200.8
Nickel	0.4	0.1	µg/L	20-Jul-17	EPA200.8
Selenium	< 0.3	0.3	µg/L	20-Jul-17	EPA200.8
Silver	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Zinc	51.7	0.4	µg/L	20-Jul-17	EPA200.8

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Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Truck-1 **Taiga Sample ID:** 003

Client Project: Kugaaruk Water
Sample Type: Truck Supply
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:00
Location: Kugaaruk, NU
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Nitrogen, Dissolved	0.22	0.06	mg/L	14-Jul-17	ISO/TR 11905:1997(E)	
Nitrogen, Total	0.18	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	2.5	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	2.5	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	42.5	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	6	5	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	134	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	7.86		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Dissolved	77	10	mg/L	17-Jul-17	SM2540:C	
Solids, Total Suspended	< 3	3	mg/L	17-Jul-17	SM2540:D	
Turbidity	0.37	0.05	NTU	14-Jul-17	SM2130:B	
Major Ions						
Calcium	11.6	0.1	mg/L	15-Jul-17	SM4110:B	
Chloride	12.5	0.7	mg/L	15-Jul-17	SM4110:B	
Fluoride	< 0.1	0.1	mg/L	15-Jul-17	SM4110:B	

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Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Truck-1 **Taiga Sample ID:** 003

Hardness	49.2	0.7	mg/L	15-Jul-17	SM4110:B	
Magnesium	4.9	0.1	mg/L	15-Jul-17	SM4110:B	
Nitrate+Nitrite as Nitrogen	0.06	0.01	mg/L	15-Jul-17	SM4110:B	
Potassium	0.5	0.1	mg/L	15-Jul-17	SM4110:B	
Sodium	6.0	0.1	mg/L	15-Jul-17	SM4110:B	
Sulphate	3	1	mg/L	15-Jul-17	SM4110:B	
Microbiology						
Coliforms, Fecal	< 1	1	CFU/100mL	14-Jul-17	SM9222:D	
Organics						
Bromodichloromethane		0.005	mg/L		EPA8260B	111
Bromoform		0.005	mg/L		EPA8260B	111
Chloroform		0.005	mg/L		EPA8260B	111
Dibromochloromethane		0.005	mg/L		EPA8260B	111
Trihalomethanes, Total		0.005	mg/L		EPA8260B	111
Subcontracted Organics						
Cyanide, Weak Acid Dissociable		0.005	mg/L		APHA4500-CN	
Phenols, Total		0.001	mg/L		AB ENV.06537	
Trace Metals, Total						
Aluminum	12.6	0.6	µg/L	20-Jul-17	EPA200.8	
Arsenic	< 0.2	0.2	µg/L	20-Jul-17	EPA200.8	
Beryllium	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8	
Cadmium	0.05	0.04	µg/L	20-Jul-17	EPA200.8	
Chromium	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8	
Cobalt	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8	
Copper	1.9	0.2	µg/L	20-Jul-17	EPA200.8	

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Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Truck-1 **Taiga Sample ID:** 003

Iron	23	5	µg/L	20-Jul-17	EPA200.8
Lead	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Manganese	1.6	0.1	µg/L	20-Jul-17	EPA200.8
Mercury	< 0.01	0.01	µg/L	20-Jul-17	EPA200.8
Nickel	0.1	0.1	µg/L	20-Jul-17	EPA200.8
Selenium	< 0.3	0.3	µg/L	20-Jul-17	EPA200.8
Silver	< 0.1	0.1	µg/L	20-Jul-17	EPA200.8
Zinc	6.9	0.4	µg/L	20-Jul-17	EPA200.8

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Taiga Batch No.: 170545

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Truck-1 **Taiga Sample ID:** 003

- DATA QUALIFERS -

Data Qualifier Descriptions:

111 *Vial contained air bubble, analysis not possible*

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

SM - Standard Methods for the Examination of Water and Wastewater

EPA - United States Environmental Protection Agency

ReportDate:

Print Date: *Wednesday, July 26, 2017*

Appendix B:

Sewage and waste Effluent Test Results 2017

Hamlet of Kugaaruk, NU

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170546

- PRELIMINARY REPORT -

Prepared For: Hamlet of Kugaaruk

Address: Box 205
Kugaaruk, NU,X0B 1K0

Attn: **John Ivey** **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:
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Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Leak Sewage **Taiga Sample ID:** 001

Client Project: Kugaaruk Sewage and Solid Waste
Sample Type: Sewage Effluent
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:30
Location: Sewage Lagoon, Wetland, Solid Waste, Metal Dump
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Biochemical Oxygen Demand	137	2	mg/L	14-Jul-17	SM5210:B	
CBOD	142	2	mg/L	14-Jul-17	SM5210:B	
Nitrogen, Total	96.9	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	77.1	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	102	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	437	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	457	5	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	1210	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	7.61		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Dissolved	406	10	mg/L	17-Jul-17	SM2540:C	
Solids, Total Suspended	44	3	mg/L	17-Jul-17	SM2540:D	
Major Ions						
Calcium	40.7	0.1	mg/L	15-Jul-17	SM4110:B	

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Leak Sewage **Taiga Sample ID:** 001

Chloride	76.7	0.7	mg/L	15-Jul-17	SM4110:B
Hardness	147	0.7	mg/L	15-Jul-17	SM4110:B
Magnesium	11.1	0.1	mg/L	15-Jul-17	SM4110:B
Nitrate as Nitrogen	0.38	0.01	mg/L	15-Jul-17	SM4110:B
Nitrite as Nitrogen	0.11	0.01	mg/L	15-Jul-17	SM4110:B
Potassium	25.8	0.1	mg/L	15-Jul-17	SM4110:B
Sodium	60.0	0.1	mg/L	15-Jul-17	SM4110:B
Sulphate	12	1	mg/L	15-Jul-17	SM4110:B
Microbiology					
Coliforms, Fecal	6200	100	CFU/100mL	14-Jul-17	SM9222:D
Trace Metals, Total					
Aluminum	126	5	µg/L	21-Jul-17	EPA200.8
Arsenic	3.2	0.2	µg/L	21-Jul-17	EPA200.8
Barium	10.9	0.1	µg/L	21-Jul-17	EPA200.8
Cadmium	0.2	0.1	µg/L	21-Jul-17	EPA200.8
Chromium	0.6	0.1	µg/L	21-Jul-17	EPA200.8
Cobalt	3.1	0.1	µg/L	21-Jul-17	EPA200.8
Copper	37.3	0.2	µg/L	21-Jul-17	EPA200.8
Iron	1440	5	µg/L	21-Jul-17	EPA200.8
Lead	11.5	0.1	µg/L	21-Jul-17	EPA200.8
Manganese	794	0.1	µg/L	21-Jul-17	EPA200.8
Mercury	0.02	0.01	µg/L	21-Jul-17	EPA200.8
Nickel	5.0	0.1	µg/L	21-Jul-17	EPA200.8
Silver	0.3	0.1	µg/L	21-Jul-17	EPA200.8
Zinc	18.9	5	µg/L	21-Jul-17	EPA200.8

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: Leak Sewage **Taiga Sample ID:** 001

ReportDate:
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Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL 10-1 **Taiga Sample ID:** 002

Client Project: Kugaaruk Sewage and Solid Waste
Sample Type: Solid Waste Run-off
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:30
Location: Sewage Lagoon, Wetland, Solid Waste, Metal Dump
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Biochemical Oxygen Demand	8	2	mg/L	14-Jul-17	SM5210:B	
CBOD	8	2	mg/L	14-Jul-17	SM5210:B	
Nitrogen, Total	6.89	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	21.9	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	26.1	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	289	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	280	5	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	876	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	7.78		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Dissolved	535	10	mg/L	17-Jul-17	SM2540:C	
Solids, Total Suspended	17	3	mg/L	17-Jul-17	SM2540:D	
Major Ions						
Calcium	109	0.1	mg/L	15-Jul-17	SM4110:B	
Chloride	39.4	0.7	mg/L	15-Jul-17	SM4110:B	

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL 10-1 **Taiga Sample ID:** 002

Hardness	313	0.7	mg/L	15-Jul-17	SM4110:B
Magnesium	10.2	0.1	mg/L	15-Jul-17	SM4110:B
Nitrate as Nitrogen	0.44	0.01	mg/L	15-Jul-17	SM4110:B
Nitrite as Nitrogen	< 0.01	0.01	mg/L	15-Jul-17	SM4110:B
Potassium	12.6	0.1	mg/L	15-Jul-17	SM4110:B
Sodium	56.5	0.1	mg/L	15-Jul-17	SM4110:B
Sulphate	113	1	mg/L	15-Jul-17	SM4110:B
Microbiology					
Coliforms, Fecal	< 100	100	CFU/100mL	14-Jul-17	SM9222:D
Organics					
Benzene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Ethylbenzene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Toluene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Xylenes	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Trace Metals, Total					
Aluminum	382	5	µg/L	21-Jul-17	EPA200.8
Arsenic	1.8	0.2	µg/L	21-Jul-17	EPA200.8
Barium	29.8	0.1	µg/L	21-Jul-17	EPA200.8
Cadmium	0.2	0.1	µg/L	21-Jul-17	EPA200.8
Chromium	1.7	0.1	µg/L	21-Jul-17	EPA200.8
Cobalt	1.3	0.1	µg/L	21-Jul-17	EPA200.8
Copper	14.9	0.2	µg/L	21-Jul-17	EPA200.8
Iron	5660	5	µg/L	21-Jul-17	EPA200.8
Lead	9.2	0.1	µg/L	21-Jul-17	EPA200.8
Manganese	991	0.1	µg/L	21-Jul-17	EPA200.8

ReportDate:
Print Date: *Wednesday, July 26, 2017*

Taiga Environmental Laboratory
4601-52nd Ave., Box 1320, Yellowknife, NT. X1A 2L9
Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL 10-1 **Taiga Sample ID:** 002

Mercury	< 0.01	0.01	µg/L	21-Jul-17	EPA200.8
Nickel	4.5	0.1	µg/L	21-Jul-17	EPA200.8
Silver	< 0.1	0.1	µg/L	21-Jul-17	EPA200.8
Zinc	278	5	µg/L	21-Jul-17	EPA200.8

ReportDate:
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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

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

Client Project: Kugaaruk Sewage and Solid Waste
Sample Type: Metal Dump Run-off
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:30
Location: Sewage Lagoon, Wetland, Solid Waste, Metal Dump
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Biochemical Oxygen Demand	< 2	2	mg/L	14-Jul-17	SM5210:B	
CBOD	< 2	2	mg/L	14-Jul-17	SM5210:B	
Nitrogen, Total	0.19	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	3.1	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	3.2	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	37.3	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	30	5	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	162	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	7.48		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Suspended	14	3	mg/L	17-Jul-17	SM2540:D	
Major Ions						
Calcium	13.9	0.1	mg/L	15-Jul-17	SM4110:B	
Chloride	16.3	0.7	mg/L	15-Jul-17	SM4110:B	
Hardness	45.0	0.7	mg/L	15-Jul-17	SM4110:B	

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

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

Magnesium	2.5	0.1	mg/L	15-Jul-17	SM4110:B
Nitrate as Nitrogen	0.12	0.01	mg/L	15-Jul-17	SM4110:B
Nitrite as Nitrogen	< 0.01	0.01	mg/L	15-Jul-17	SM4110:B
Potassium	1.3	0.1	mg/L	15-Jul-17	SM4110:B
Sodium	12.1	0.1	mg/L	15-Jul-17	SM4110:B
Sulphate	13	1	mg/L	15-Jul-17	SM4110:B
Microbiology					
Coliforms, Fecal	< 1	1	CFU/100mL	14-Jul-17	SM9222:D
Organics					
Benzene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Ethylbenzene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Toluene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Xylenes	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Trace Metals, Total					
Aluminum	207	5	µg/L	21-Jul-17	EPA200.8
Arsenic	< 0.2	0.2	µg/L	21-Jul-17	EPA200.8
Barium	8.0	0.1	µg/L	21-Jul-17	EPA200.8
Cadmium	< 0.1	0.1	µg/L	21-Jul-17	EPA200.8
Chromium	0.4	0.1	µg/L	21-Jul-17	EPA200.8
Cobalt	0.1	0.1	µg/L	21-Jul-17	EPA200.8
Copper	1.5	0.2	µg/L	21-Jul-17	EPA200.8
Iron	243	5	µg/L	21-Jul-17	EPA200.8
Lead	1.0	0.1	µg/L	21-Jul-17	EPA200.8
Manganese	6.2	0.1	µg/L	21-Jul-17	EPA200.8
Mercury	< 0.01	0.01	µg/L	21-Jul-17	EPA200.8

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

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

Nickel	0.4	0.1	µg/L	21-Jul-17	EPA200.8
Silver	< 0.1	0.1	µg/L	21-Jul-17	EPA200.8
Zinc	9.4	5	µg/L	21-Jul-17	EPA200.8

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-2 **Taiga Sample ID:** 004

Client Project: Kugaaruk Sewage and Solid Waste
Sample Type: Sewage Water
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:30
Location: Sewage Lagoon, Wetland, Solid Waste, Metal Dump
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Biochemical Oxygen Demand	204	2	mg/L	14-Jul-17	SM5210:B	
CBOD	170	2	mg/L	14-Jul-17	SM5210:B	
Nitrogen, Total	107	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	101	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	153	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	385	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	732	10	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	1150	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	7.54		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Dissolved	361	10	mg/L	17-Jul-17	SM2540:C	
Solids, Total Suspended	45	3	mg/L	17-Jul-17	SM2540:D	
Turbidity	40.5	0.05	NTU	14-Jul-17	SM2130:B	
Major Ions						
Calcium	20.3	0.1	mg/L	15-Jul-17	SM4110:B	

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-2 **Taiga Sample ID:** 004

Chloride	73.6	0.7	mg/L	15-Jul-17	SM4110:B	
Hardness	92.1	0.7	mg/L	15-Jul-17	SM4110:B	
Magnesium	10.0	0.1	mg/L	15-Jul-17	SM4110:B	
Nitrate as Nitrogen	0.06	0.01	mg/L	15-Jul-17	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	15-Jul-17	SM4110:B	
Potassium	24.6	0.1	mg/L	15-Jul-17	SM4110:B	
Sodium	55.3	0.1	mg/L	15-Jul-17	SM4110:B	
Sulphate	4	1	mg/L	15-Jul-17	SM4110:B	
Microbiology						
Coliforms, Fecal	20000	10000	CFU/100mL	14-Jul-17	SM9222:D	
Organics						
Benzene		0.002	mg/L		EPA8260B	16
Ethylbenzene		0.002	mg/L		EPA8260B	16
Toluene		0.002	mg/L		EPA8260B	16
Xylenes		0.002	mg/L		EPA8260B	16
Subcontracted Organics						
Phenols, Total		0.001	mg/L		AB ENV.06537	
Trace Metals, Total						
Aluminum	140	5	µg/L	21-Jul-17	EPA200.8	
Arsenic	0.7	0.2	µg/L	21-Jul-17	EPA200.8	
Barium	4.1	0.1	µg/L	21-Jul-17	EPA200.8	
Cadmium	< 0.1	0.1	µg/L	21-Jul-17	EPA200.8	
Chromium	0.7	0.1	µg/L	21-Jul-17	EPA200.8	
Cobalt	0.6	0.1	µg/L	21-Jul-17	EPA200.8	
Copper	76.9	0.2	µg/L	21-Jul-17	EPA200.8	

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-2 **Taiga Sample ID:** 004

Iron	518	5	µg/L	21-Jul-17	EPA200.8
Lead	1.1	0.1	µg/L	21-Jul-17	EPA200.8
Manganese	100	0.1	µg/L	21-Jul-17	EPA200.8
Mercury	0.01	0.01	µg/L	21-Jul-17	EPA200.8
Nickel	2.2	0.1	µg/L	21-Jul-17	EPA200.8
Silver	0.8	0.1	µg/L	21-Jul-17	EPA200.8
Zinc	57.8	5	µg/L	21-Jul-17	EPA200.8

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-1 **Taiga Sample ID:** 005

Client Project: Kugaaruk Sewage and Solid Waste
Sample Type: Sewage Effluent
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:30
Location: Sewage Lagoon, Wetland, Solid Waste, Metal Dump
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Biochemical Oxygen Demand	21	2	mg/L	14-Jul-17	SM5210:B	81
CBOD	21	2	mg/L	14-Jul-17	SM5210:B	81
Nitrogen, Total	32.7	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	21.8	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	33.1	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	215	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	974	10	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	569	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	8.89		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Dissolved	291	10	mg/L	17-Jul-17	SM2540:C	
Solids, Total Suspended	91	3	mg/L	17-Jul-17	SM2540:D	
Major Ions						
Calcium	41.4	0.1	mg/L	15-Jul-17	SM4110:B	
Chloride	46.4	0.7	mg/L	15-Jul-17	SM4110:B	

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-1 **Taiga Sample ID:** 005

Hardness	137	0.7	mg/L	15-Jul-17	SM4110:B
Magnesium	8.1	0.1	mg/L	15-Jul-17	SM4110:B
Nitrate as Nitrogen	1.36	0.01	mg/L	15-Jul-17	SM4110:B
Nitrite as Nitrogen	0.34	0.01	mg/L	15-Jul-17	SM4110:B
Potassium	14.2	0.1	mg/L	15-Jul-17	SM4110:B
Sodium	38.8	0.1	mg/L	15-Jul-17	SM4110:B
Sulphate	9	1	mg/L	15-Jul-17	SM4110:B
Microbiology					
Coliforms, Fecal	< 100	100	CFU/100mL	14-Jul-17	SM9222:D
Subcontracted Organics					
Phenols, Total		0.001	mg/L		AB ENV.06537
Trace Metals, Total					
Aluminum	114	5	µg/L	21-Jul-17	EPA200.8
Arsenic	1.9	0.2	µg/L	21-Jul-17	EPA200.8
Barium	6.1	0.1	µg/L	21-Jul-17	EPA200.8
Cadmium	0.1	0.1	µg/L	21-Jul-17	EPA200.8
Chromium	0.4	0.1	µg/L	21-Jul-17	EPA200.8
Cobalt	1.5	0.1	µg/L	21-Jul-17	EPA200.8
Copper	19.6	0.2	µg/L	21-Jul-17	EPA200.8
Iron	333	5	µg/L	21-Jul-17	EPA200.8
Lead	0.8	0.1	µg/L	21-Jul-17	EPA200.8
Manganese	339	0.1	µg/L	21-Jul-17	EPA200.8
Mercury	0.01	0.01	µg/L	21-Jul-17	EPA200.8
Nickel	2.8	0.1	µg/L	21-Jul-17	EPA200.8
Silver	< 0.1	0.1	µg/L	21-Jul-17	EPA200.8

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-3-1 **Taiga Sample ID:** 005

Zinc	10.2	5	µg/L	21-Jul-17	EPA200.8

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-4 **Taiga Sample ID:** 006

Client Project: Kugaaruk Sewage and Solid Waste
Sample Type: Sewage Effluent
Received Date: 14-Jul-17
Sampling Date: 13-Jul-17
Sampling Time: 10:30
Location: Sewage Lagoon, Wetland, Solid Waste, Metal Dump
Report Status: **Preliminary**

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
Inorganics - Nutrients						
Biochemical Oxygen Demand	4	2	mg/L	14-Jul-17	SM5210:B	
CBOD	2	2	mg/L	14-Jul-17	SM5210:B	
Nitrogen, Total	24.0	0.06	mg/L	15-Jul-17	ISO/TR 11905:1997(E)	
Organic Carbon, Dissolved	15.1	0.5	mg/L	24-Jul-17	SM5310:B	
Organic Carbon, Total	16.3	0.5	mg/L	25-Jul-17	SM5310:B	
Inorganics - Physicals						
Alkalinity, Total (as CaCO3)	170	0.4	mg/L	14-Jul-17	SM2320:B	
Colour, Apparent	95	5	CU	14-Jul-17	SM2120:B	
Conductivity, Specific (@25C)	645	0.4	µS/cm	14-Jul-17	SM2510:B	
pH	7.59		pH units	14-Jul-17	SM4500-H:B	
Solids, Total Dissolved	274	10	mg/L	17-Jul-17	SM2540:C	
Solids, Total Suspended	6	3	mg/L	17-Jul-17	SM2540:D	
Major Ions						
Calcium	25.2	0.1	mg/L	15-Jul-17	SM4110:B	
Chloride	72.1	0.7	mg/L	15-Jul-17	SM4110:B	

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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-4 **Taiga Sample ID:** 006

Hardness	102	0.7	mg/L	15-Jul-17	SM4110:B
Magnesium	9.5	0.1	mg/L	15-Jul-17	SM4110:B
Nitrate as Nitrogen	2.63	0.01	mg/L	15-Jul-17	SM4110:B
Nitrite as Nitrogen	0.14	0.01	mg/L	15-Jul-17	SM4110:B
Potassium	14.6	0.1	mg/L	15-Jul-17	SM4110:B
Sodium	54.1	0.1	mg/L	15-Jul-17	SM4110:B
Sulphate	10	1	mg/L	15-Jul-17	SM4110:B
Microbiology					
Coliforms, Fecal	100	10	CFU/100mL	14-Jul-17	SM9222:D
Organics					
Benzene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Ethylbenzene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Toluene	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Xylenes	< 0.002	0.002	mg/L	24-Jul-17	EPA8260B
Subcontracted Organics					
Phenols, Total		0.001	mg/L		AB ENV.06537
Trace Metals, Total					
Aluminum	40.9	5	µg/L	21-Jul-17	EPA200.8
Arsenic	1.6	0.2	µg/L	21-Jul-17	EPA200.8
Barium	1.9	0.1	µg/L	21-Jul-17	EPA200.8
Cadmium	< 0.1	0.1	µg/L	21-Jul-17	EPA200.8
Chromium	0.2	0.1	µg/L	21-Jul-17	EPA200.8
Cobalt	1.2	0.1	µg/L	21-Jul-17	EPA200.8
Copper	3.2	0.2	µg/L	21-Jul-17	EPA200.8
Iron	203	5	µg/L	21-Jul-17	EPA200.8

ReportDate:
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Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-4 **Taiga Sample ID:** 006

Lead	0.3	0.1	µg/L	21-Jul-17	EPA200.8
Manganese	235	0.1	µg/L	21-Jul-17	EPA200.8
Mercury	< 0.01	0.01	µg/L	21-Jul-17	EPA200.8
Nickel	2.9	0.1	µg/L	21-Jul-17	EPA200.8
Silver	< 0.1	0.1	µg/L	21-Jul-17	EPA200.8
Zinc	< 5.0	5	µg/L	21-Jul-17	EPA200.8

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Tel: (867)-767-9235 Fax: (867)-920-8740

Taiga Batch No.: 170546

- CERTIFICATE OF ANALYSIS -

Client Sample ID: PEL-4 **Taiga Sample ID:** 006

- DATA QUALIFERS -

Data Qualifier Descriptions:

16 *Test requested but no sample bottle received*

81 *Results are inconclusive due to insufficient depletion of sample, minimum 2 mg/L required over 5 days.*

*** 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:

Print Date: *Wednesday, July 26, 2017*

Appendix C:

Part B-H of Water Licence: 3BM-PEL1419

Date of issuance: May 14, 2014

Date of expiry: May 13, 2019

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.