Annual Report -2018

Water Licence: 3BM-KUG 1520

Hamlet of Kugluktuk, NU

Date: March 25, 2019

Submitted to:

Nunavut Water Board

ᑲᑐᑎᓗᒍ ᓄᓇᕗᑦ ᐱᕈᖅᐸᓪᓕᐊᑎᓪᓕᕗᑦ
Building *Nunavut* Together
*Nunavu*liuqatigiingniq
Bâtir le *Nunavut* ensemble

ᓄᓇᓕᖕ ᓂᒐᕙᒪᒃ ᑯᓂᓪ ᓗ ᐱᕕᑦ ᓯᕿᖅᑎᒃ ᑯᑦ
Department of Community and Government Services
Nunalingni Kavamatkunnilu Pivikhaqautikkut
Ministère des Services Communautaires et gouvernementaux

Kugluktuk Water Licence: 3BM-KUG 1520 — Annual Report 2018

March 25, 2019

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

Attention: Richard Dwyer, Manager of Licensing

RE: 3BM-KUG 1520 - Annual Report 2018, Hamlet of Kugluktuk

Dear Richard,

The Hamlet of Kugluktuk is pleased to submit the "**Annual Report 2018**" of water uses and sewage solid waste disposal as required and directed under the compliance of Water Licence 3BM-KUG-1520. Copies of required tests reports are included.

The Licensee has continued monitoring and sampling water, sewage effluent, solid waste run-off as identified in the Licence. Samples were tested at the CALA accredited Taiga Laboratory, most of those results shown excellent remediation of contamination parameters that are within allowable limits of BOD, TSS, E-coli toxicity and trace metals components as determined in the compliance requirements prior to discharge to water body. We summarized 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.

CGS is submitting this report on behalf of the Hamlet of Kugluktuk (the Licensee).

Best Regards,

Shah Alam, P. Eng. E.P.
Municipal Planning Engineer,
Government of Nunavut
Community and Government Services
Kitikmeot Region, Cambridge Bay, Nu
Phone: 867-983-4156, fax: 867-983-4124
salam@gov.nu.ca<mailto:salam@gov.nu.ca>

Cc: Baba Pedersen, Resource Management Officer, AANDC

EXECUTIVE SUMMARY:

This Annual Report 2018 for the Hamlet of Kugluktuk has been prepared to meet requirements of the Nunavut Water Board Licence 3BM-KUG 1520, Part B General Conditions, through part H to the monitoring program. This report covers the period from 01 January to 31 December 2018.

The community potable water intake from Coppermine River through twin intake pump were treated at the treatment plant through coagulation, sedimentation, filtration, UV and chlorination and then truck-fill supply by hamlet operated water trucks. Water intake also carried using old pumphouse alternately when high salinity in water at the main pumphouse location. A mobile shack system also integral part of the ice water intake when necessary, it was not uses for this duration. The reservoir is uses for water storage temporarily for sedimentation and re-intake to treatment plant when high turbidity and salinity in water happened. Quantity of water was drawn from all sources during this period approximately **65,500m3** which is about 85 % of the allowable limit **77,000** annually.

Raw sewage combined with grey water were collected from household sewage tanks using hamlet operated vacuum trucks, hauled and discharged at the sewage lagoon using the sewage dropping pad. Raw sewage stayed inside the lagoon during the period Sep - June for almost 10 months where they received primary treatment naturally and settled the sludge on lagoon bed. Sewage water starts melting with summer freshet and heavier sludge deposits on lagoon bed – thus isolating the sewage components. Annual decanting carried during July-Sep to reduce water quantity inside and sludge blanket rested on lagoon bed. Samples were collected from decanting point of monitoring station KUG-3A and tested at Taiga Laboratory Yellowknife for parameters compliance. Water samples were sent to EHO lab in Cambridge Bay for EC and FC test monthly basis and whenever necessary. No issues or concern during this period.

Municipal waste including residential and commercial, were collected from the house hold waste bins by hamlet operated dump trucks, hauled to municipal solid waste site and disposed at the solid waste facility by the operators. Loose wastes were reduced by slow burning inside trenches at lower gradient, buried burn ashes and compacted down with grader and covered with sand-gravels time to time when low wind and on working days. Other materials were packed with hamlet operated grader and packers and hided under sand gravels layer to down gradient.

The lagoon leak still continuous across the berm and earthen buttress at lower toe relatively lower flow rate than before. Such continuous leak is a concern for the berm structure and non-compliance to the lagoon containment requirements. The licensee has been in discussion with GN for effective remedial solution including several options suggested by the consultant. GN CGS is aware of it and looking for funding source to support the lagoon repair works, but no confirmation for 2019-2020. The lagoon was built with HDPE liner on bottom bed and sides, some bubbles developed to the base liner at location causes island type floats which could not be eliminated in several steps by CGS. A full repair to leak and bubbles are necessary to comply with the lagoon containment.

Part B: General Conditions

- Annual water consumptions are recorded daily basis and sewage quantity estimated from daily sewage disposal in the lagoon. No device Meter was used for volume measurement but only estimated by truck amount; however, this estimate is considered precise for the water, sewage and round up for solid waste quantities.
- The old water treatment plant building still standing there as a backup to the newly built water treatment plant and operating at least 2 trucks fill weekly to keep process active. The new water treatment process included sedimentation, coagulation flocculation (when needed), sand filtration, UV and chlorination.
- Water intake from the Coppermine River by using twin intake pumps (one at a time) and mobile ice shack as needed when salt intrusion in water and high turbidity. Intake screen set up underwater with clearance to river bottom and at least 2.5m below the river water surface for assumed ice thickness in winter.
- Water reservoir uses for temporary sedimentation of turbidity and salinity in water (when needed) and redirect to water treatment plant for regular treatment process.
- Sewage carried to the sewage lagoon from the household tanks using hamlet operated vacuum trucks 7 days a week and disposed at the designated drop off point. Raw sewage stayed inside the lagoon almost 8-9 months frozen and received the primary treatment naturally and allowing sludge built up at lagoon bottom and sewage water on top.
- Sewage water decanted from the lagoon to wetland (KUG-3A) using a mechanical pump during late July-early Sep 2018 and emptied about 85% of sewage water from lagoon.
- O&M manuals for sewage and waste approved and effective since 2007, update version wasn't need as no change of operation and compliance. O&M manual for sewage lagoon has not changes since 2009. O&M manual for new water treatment plant in progress.
- As-built drawing for new water system in progress; however construction design drawing and documents has been updated with the Board before construction took place.
- Water and sewage effluent sampling carried during June – Sep as available for sampling as described in the compliance plan. Samples were tested at Taiga lab, Yellowknife.
- No erosion, slumping or adverse sign of salt and high turbidity noticed for water intake during this period and not required the mobile shack or reservoir uses.

Part C: Water Use:

- Water drawn from the Coppermine River using one of the twin pumps alternate and switching from new pump house to old pump house as needed. The annual quantity of about 65,500 cubic metres within allowable limit of 77,000 cubic metres.
- Water intake through net screen secured under water with clearance to river bed and about 2.5 m below the top water surface to avoid freezing layer and free from fish and debris ingress; thus protect intake from any larger particles bringing with water.

Part D: Waste Disposal

- Raw sewage collected from household sewage tank by hamlet operated vacuum trucks 7 days a week and discharged raw sewage into the lagoon at designated location. Raw sewage stayed inside about 8-9 months frozen until decanting using a mechanical pump.
- Decanting took place over 5-6 week during the period of July 24 – mid September with some days off in between to facilitate the wetland polishing up decanted water.
- Samples of effluent water collected during the period July - August and tested at Taiga laboratory, Yellowknife. Samples results are attached with this report for information.

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

- Modification for water intake mobile shack and expected installation of the new mobile shack in spring – summer 2019. The new mobile shack and accessories are part of the new water treatment project and design was approved and submitted.
- Berm slumping and cracks repair carried with the earthen buttress works, but no changes of operation or A&R plan. Sludge removal can be carried together with the leak repair plan. Other than normally sludge removal plan only when sludge thickness comes to a minimum 2 feet on lagoon bed.

Part H: Monitoring Program

- Annual sampling of sewage & waste effluent carried from station KUG-2, KUG-3A, KUG-4 and KUG-5 during July – August and results attached with this report.
- Monitoring of water, sewage and sold waste facilities mostly required during spring through fall, other times visual observation and protection of facilities in service.
- Hands on training for sampling from specified location, sampling techniques and samples storage, shipping and testing requirements were part of the monitoring program by the operators, as determined in the compliance plan. Adjustments of sampling sports made based on best representation while samples were collected. Monitoring locations were marked with signs and recorded by GPS locator.

Monitoring Stations of sewage and solid waste sample collection

Sampling Station	Description	Comments
KUG-1	Raw Water source intake location at Coppermine River	Volume of water intake annually
KUG-2	Discharge point of run-off effluent from Solid Waste facility.	Monitoring station, outside of solid waste facility
KUG-3A	Discharge point of sewage disposal from the lagoon to wetland	Sampling point at sewage lagoon inside
KUG-3	Raw Sewage disposal location from truck to lagoon	To estimate volume of sewage
KUG-4	Effluent outfall from wetland	Before meeting to Coronation Gulf
KUG-5	Effluent discharge and run-off from land farm	Sampling point outside of land farm collection sump

ANNUAL REPORT-2016

YEAR BEING REPORTED: 2018

The following information is compiled pursuant to the requirements of Part B, Item 1 of Water Licence **3BM-KUG1520** issued to **Kugluktuk.**

.

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 Fluid Manager 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	6,680,498.30	same
February	4,696,978.70	same
March	5,529,117.70	same
April	5,515,643.30	same
May	5,297,618.60	same
June	5,165,544.50	same
July	5,518,915.10	same
August	5,816,811.20	same
September	5,508,163.70	same
October	5,768,404.20	same
November	5,529,367.00	same
December	5,452,678.90	same
ANNUAL TOTAL	**65,479,741.20**	same

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

Water Supply:

- Two existing tanks (TW1 and TW2) of treated water storage at the old WTP were added to the new treatment plant that results total three tanks for water storage. The new plant has started operation since Dec 31, 2017 with treatment processes of Roughing Sand filtration, Slow Sand filtration and coagulation, flocculation (adding alum and PAC as needed when turbidity is high in raw water) to refine the turbidity in 3-Logs process followed by chlorination before the truckfill
- Two UV process added after the Slow Sand filtration before water delivery to storage tanks. Truckfill are connected for water delivery from tank TW3 and other two tanks TW1 and TW2 in series with TW3.
- The existing charge tank remains active as integral part of the new WTP to hold intake water before sending to treatment process.
- A new mobile shake for ice water intake has been prepared and ready for uses with fix to mobile location along the river bank suitable at a reachable distance from the shoreline when high salt wedge in river bed water, mostly during Nov-May before the ice breaks up. The ice shake water contains less turbidity then the river bed intake and thus reduces load on filtration system and alum PAC in the treatment process.
- One intake screen was raised inside the river bed to reduce salinity and turbidity coming into the water. The other intake screen was found missing from location and collected to reinstall inside the river bed at intake point.

Sewage and Solid waste:

- Slumping and erosion protection at sewage drop off pad protection done using salvaged concrete sections putting horizontally on ground supported by 6- pieces RCC sections (salvaged) by bore-holes. Truck turn-around side protection carried by using salvaged concrete blocks and RCC pile bollard salvaged from Hamlet Mechanic Garage demolition.
- Lagoon leak monitoring at the buttress toe by grading and draining sewage water outwards but leak still continuous at a relatively lower flow rate.
- Reduced soil layer from the landfarm containment and used as solid waste cover materials
- Improvement works to metal dump facility by excavating trances, pushing and packing broken metal pieces and drainage for run-off.

--

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

- Sewage lagoon is continuously leaking (currently at a reduced rate) even after buttress works at the leak section, which is considered unauthorised discharge from the lagoon.
- Some untreated water discharged from the new water treatment plant during filter media washing to achieve desired turbidity level in water but actual quantity was not recorded.
- No other unauthorised discharged of water, sewage effluent or solid waste in this period.

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

- On Nov 10, 2018, fire sparked from the heat trace of water intake line at old IPH. Fire damaged part of the heat trace at T-junction of intake line with pump house control line. It required repair of damaged portion of intake line, pumphouse control line including heat trace, insulation, inner and outside conduits and electrical connection details.
- Installation of the mobile shake and pipe connection along the river bank for alternative ice water intake sometime in spring-summer 2019.

  Improvement restoration to berm protection at the east side leak affected area, localized slumping, ponding and depression repaired completed in 2016 -17 using locally collected materials by a GN contract.

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**;

- Inspector has a concern of continuous sewage leak from the lagoon and no effective steps of full containment of sewage water inside until the mechanical decanting which may lead more slumping of berm due to losing more fine materials from berm structure.

  The licensee is proposing few options to analyze the leak source and remediation process in coming years. Use of trace materials inside the lagoon and observing whether leaks are coming from underneath or above of the liner of the lagoon can give some idea of taking some remedial measures. Such study can be considered with funding arrangement by GN.
- The land farm facility is over borne than its capacity which needs reduction of some soils

  The community of Kugluktuk does not have a separate facility for spills and contaminated soil remediation, but a liner cell inside the area of solid waste facility, where spills materials has been stored over the years from different dumpers. There is no separate pond for run-off or soil washed water collection, but a sump at down gradient to the solid waste which connects to the main outfall of solid waste when water flows. Samples are taken from both locations for parameters testing when flow available, otherwise, those runoff dries locally. There is a need of a sludge drying pad (sludge collection from lagoon) and possible location also on the foot print of old sewage dump area which is close by the solid waste facility. A feasibility study will be needed to find multiple wastes management within the same area and operational scope

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

- The Board has requested for update of the previously approved O&M manual 2007 of the solid waste facility but so specific date or time mentioned.
- The Board requires as-built drawings of all structures, process and O&M manual within 90 days of the starts of the WTP operation and at least 90 days ahead of any plan of modification or construction.
- Uncontrolled bubbles at the sewage lagoon remediation in plan with leak repair.

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

The new Water Treatment Plant (WTP) substantially completed and continued operation. The old treatment plant has only filtration and chlorination scope and truckfill outside for any emergency needed. Two existing treated water storage tanks connected with the new WTP only for water storage and recirculation with UV system. The O&M manual draft received and reviewed, waiting for final completion. The old Water treatment plant still remains active as a backup for new plant, and therefore the existing O&M manual has not changed.

ADDITIONAL INFORMATION THAT THE LICENSEE DEEMS USEFUL:

Group of 3 operators from hamlet has joined Water Treatment Plant Operators training arranged by CGS hired trainer under the project to help getting level of certification and carry out plant operation. Module of the training comprises both theoretical and in hand operation of water treatment process and maintenance and control of coagulation, PAC and chlorine solution. Next session of operators training expected in April 2019.

FOLLOW-UP REGARDING INSPECTION/COMPLIANCE CONCERNS:

The new Water treatment plant uses only sand filter media mix in proportion of sizes, but not required the cartage filters and therefore, expected savings of operational cost to the Hamlet. Also, quality of water is fully compliance as expected and turbidity levels mostly stays less than 0.3 NTU. Such quality water supply to the community has increased the service value of the people and commercial business owners.

Community: Kugluktuk 2018

Test type	Parameters			June 13 2018		
		Units	MAC	KUG-1 Raw Water	New WTP Treated	Old WTP Treated
Physicals	Colour	TCU	<=15	16	< 5	18
	pH		7.0 - 10.5	7.72	8.04	7.73
	Turbidity	NTU	<=5	1.81	1.17	2.05
	TDS			22	36	22
	TSS			< 3	< 3	< 3
	Alkalinity			28.7	46.2	28.3
	Conductivity			72.4	106	79.2
Nutrients	Dissolve C	mg/L	45	2.2	2.0	2.6
	Total C	mg/L		2.2	1.9	2.5
	P, Total	mg/L		0.5	0.7	0.5
Organics	Cyanide	mg/L	0.2	< .0050	< 0.0050	< 0.005
	THMs	mg/L	0.1		< 0.005	
	Phenol, Tot				< 0.0010	< 0.0010
	Bromo-CH4				< 0.005	
Major Ions	Nitrate N	mg/L		0.07	0.11	0.16
	Hardness	mg/L		30.5	47.3	32.1
	Chloride	mg/L	<=250	2.7	2.2	4.8
	Fluoride	mg/L		< 0.1	< 0.1	< 0.1
	Sodium	mg/L	<=200	1.8	2.1	3.1
	Sulphate	mg/L	<=500	3	4	3
	Magnesium			3.7	4.4	3.8
	Calcium			6.1	11.7	6.6
Microbiology	Total Coli	CFU	none	5.2	< 1.0	8.5
	E. Coli	CFU	none	< 1.0	< 1.0	< 1.0
Metals(T)	Aluminium	µg/L	<100	69.2	47	83.5
	Arsenic	µg/L	100	< 0.2	0.5	0.2
	Barium	µg/L	1	< 0.1		
	Cadmium	µg/L	5	< 0.1	< 0.04	< 0.1
	Chromium	µg/L	50	0.2	< 0.1	< 0.1
	Copper	µg/L	<=1000	2.5	24.7	113
	Iron	µg/L	<=300	74	7	0.7
	Lead	µg/L	10	0.2	4.3	113
	Manganese	µg/L	<=50	3.7	0.2	3.9
	Selenium	µg/L	50	< 0.5	< 0.3	< 0.5
	Uranium	µg/L	20			
	Zinc	µg/L	<=5000	< 5.0	25.5	7.2
	Mercury	µg/L	1	< 0.01	< 0.01	< 0.01
	Nickel	µg/L		0.4	0.3	0.4

Kugluktuk Water: Turbidity Reading Log: October 2018

Date	Time	RW	RW	RF#1	RF#2	RF#3	RF W	SSF#1	SSF#2	SSF#3	SSF W
		NTU	(^{0}C)	NTU	NTU	NTU	(^{0}C)	NTU	NTU	NTU	(^{0}C)
02-Oct-18	9:11AM	3.96	9.6	2.99	2.01	1.08	9	0.09	0.1	0.04	9
03-Oct-18	9:00AM	6.9	8.9	2.92	2	1	9	0.09	0.1	0.04	9
04-Oct-18	9:35AM	8.3	1.7	3.29	2.54	1.89	9	0.13	0.3	0.12	9
05-Oct-18	9:00AM	4.9	1.8	2.88	2.41	1.22	9	0.15	0.27	0.07	9
06-Oct-18	10:30AM	2.9	1.6	2.44	2.14	1.28	9	0.17	0.17	0.08	9
07-Oct-18	11:00AM	5.8	2.4	1.1	1.23	1.13	9	0.14	0.11	0.07	9
08-Oct-18	9:35AM	3.9	1.6	1.02	1.15	1.05	9	0.09	0.09	0.06	9
09-Oct-18	10:45AM	6	2.9	1.09	1.19	1.1	6	0.14	0.17	0.12	8
10-Oct-18	9:25AM	6.78	21.2	3.43	2.37	1.79	8	0.15	0.16	0.43	7
11-Oct-18	9:10AM	4.81	13.6	2.18	2.5	1.66	9	0.14	0.1	0.14	7
12-Oct-18	9:10AM	4.49	14.6	2.08	2.57	1.75	9	0.18	0.17	0.05	7
13-Oct-18	10:56AM	20.56	14.7				9	0.44	0.5	0.11	7
14-Oct-18	11:00AM	40.2	15	2.86	3.06	3.08	8	0.29	0.21	0.28	7
15-Oct-18	9:30AM	17.2	3.3	3.03	4.43	3.83	9	0.2	0.11	0.11	7
16-Oct-18	9:25AM	11.9	9.9	3.23	4.28	3.74	9	0.21	0.36	0.16	7
17-Oct-18	9:20AM	21.3	1.9	3.2	4.2	3.7	9	0.1	1.14	0.54	7
18-Oct-18	9:05AM			3.5	4.4	3.9	9	0.09	3.02	0.29	7
19-Oct-18	9:10AM			3.5	4.4	3.9	17	0.08	3.8	0.28	7
20-Oct-18	9:00AM			3.4	4.4	3.9	17	0.08	3.8	0.28	7
21-Oct-18	1:00PM	8.39	1.3	3.2	2.07	3.38	17	1.73	2.96	1.3	7
22-Oct-18	9:40AM			2.43	3.01	3.01	9	1.05	0.75	0.91	9
23-Oct-18	8:50AM	4.34	1.6	1.15	1.88	1.61	9	0.66	0.54	0.88	9
24-Oct-18	9:04AM	3.34	13.1	1.81	4.81	2.11	10	0.69	0.56	0.61	9
25-Oct-18	8:38AM		13.1	1.13	1.98	1.99	15	1.52	0.4	0.6	15
26-Oct-18	9:30AM	8.84	1.3	1.69	1.48	2.81	9	0.46	0.33	0.31	9
27-Oct-18	12:05PM	12.85	3				8	0.45	0.28	0.13	9
28-Oct-18	12:00PM	11.4	14.3				9	1.28	0.98	0.3	9
29-Oct-18	9:25AM	7.63	13.9	1.53	3.58	3.25	9	1.02	6.53	0.96	8
30-Oct-18		6.5	14.5					1.33	0.21	0.12	
31-Oct-18	9:25AM	11.13	4.9	1.86	2.72	3.17	9	1.26	0.84	0.12	8

Abreviation: RW: Raw Water; RF: Roughing Filter; SSF: Slow Sand Filter

Turbidity Reading Log: November 2018

RW	RF#1	RF#2	RF#3	RF W	SSF#1	SSF#2	SSF#3	SSF W
(^{0}C)	NTU	NTU	NTU	(^{0}C)	NTU	NTU	NTU	(^{0}C)
4.4	2.68	2.95	3.33	8	1.3	0.85	0.28	9
4.1	1.34	2.38	2.66	8	1.08	0.76	0.14	9
1.7	1.26	2.32	2.6	8	0.96	0.67	0.18	9
3.2	1.25	2.3	2.6	8	0.93	0.65	0.17	9
	1.28	2.36	2.67	8	0.99	0.64	0.18	9
3.9	1.3	2.46	2.9	8	0.82	0.53	0.2	9
4.7	4.7	3.56	4	8	0.88	0.46	1.1	7
10	4.39	3.74	4.25	14	1.49	1.72	1.32	13
3.1	3.32	2.69	3.47	6	0.68	0.65	0.68	7
13.6	3.39	2.01	2.68	10	0.31`	0.4	0.55	5
10.6	1.68	1.82	3.24	7	0.17	5.17	0.25	7
11.2	1.44	1.56	2.28	7	0.3	0.15	0.26	7
	1.39	0.76	1.11	11	0.13	0.12	0.13	16
7.2	0.93	0.47	0.7	13	0.09	0.1	0.12	12
6	0.88	0.68	0.79	7	0.08	0.07	0.1	7
11	2.13	3.1	2.51	11	0.17	0.15	0.14	15
9.2	2.28	1.9	2.62	7	0.25	0.25	0.36	7
2.4	1.72	1.43	1.84	8	0.21	0.22	0.34	6
1.2				7	0.17	0.17	0.21	6
1.7	2.31	1.52	2.01	9	0.21	0.28	0.48	7
2.2	2.29	1.62	2.23	6	0.17	0.2	0.24	6
1.1	2.18	1.55	2.11	6	0.12	0.16	0.22	6
1.1	1.91	1.63	2.07	6	0.24	0.27	0.42	6
2.2	1.8	1.61	2.04	6	0.17	0.22	0.31	6
1	1.92	1.83	2.31	7	0.21	0.21	0.34	6
1.1	1.37	1.24	1.43	7	0.22	0.22	0.34	6
1.5	1.3	1.18	1.36	7	0.23	0.16	0.31	7
13.5	1.67	1.72	1.67	9	0.17	0.15	0.26	8
2.7	1.26	0.91	0.78	8	0.09	0.11	0.14	6
12.5	1.65	1.5	1.24	9	0.08	3.57	0.1	7

Abreviation: RW: Raw Water; RF: Roughing Filter; SSF: Slow Sand Filter

Sewage Effluent Results: Kugluktuk 2018

Parameters	Units	MAC Limits	July 10th 2018			September 11, 2018			
			Solid Waste KUG-2	Sewage Disposal KUG-3	Outfall Wetland KUG-4	Solid waste KUG-2	Sewage Decant KUG -3	Outfall Final KUG-4	Land farm runoff KUG-5
Alkalinity	mg/L		383	240	62.8	279	219	130	
Conductivity	µS/cm		1060	741	357	1030	690	640	
P^h	p^h	6-9	7.16	7.38	7.53	7.61	7.44	7.62	7.88
TSS	mg/L	180	86	20	< 3	34	162	40	
Ammonia as N_2	mg/L		0.109	56.3	0.158	0.247	21.4	21.6	
BOD_5	mg/L	120	8	149	4	10	63	18	
CBOD	mg/L		8	147	5	9	62	15	
Dissolved, C	mg/L								
Total, C	mg/L								
Nitrate as N_2	mg/L	45	0.61	0.39	0.71	0.69	0.46	1.26	
Nitrite as N_2	mg/L	3	< 0.01	< 0.01	0.08	<0.01	<0.01	<0.01	
Calcium	mg/L	32	137	13.6	14.4	122	11.7	15.6	
Chloride	mg/L	100	97.4	43.8	65.5	123	48	94.1	
Hardness	mg/L	500	499	91.9	94.0	389	58.3	140	
Magnesium	mg/L		38.0	14.1	14.1	20.6	7.1	24.5	
Potassium	mg/L		3.4	54.9	2.4	6.1	12.6	11.7	
Sodium	mg/L	200	27.8	41.1	37.3	27	36.8	67.7	
Sulphate	mg/L	500	39	14	8	67	15	20	
Fecal Coliform	CFU/100mL	$1x10^6$	3	$1.31x10^5$	$2.2x10^1$	186	$1.26 x10^6$	$1.27 x10^4$	
Oil Grease vis	Visibility		non-visible	non-visible	non-visible	non vis	non-vis	non-vis	
Benzene		370							<0.002
Ehtylbenzene		2							<0.002
Toluene		90							<0.002
Xylenes									<0.002
Total Cyanide			< 0.0050	< 0.0050					
Total Phenols			0.0205	0.4490					0.004
Aluminium	µg/L	200	245	211		1590	159	62.5	
Arsenic	µg/L	25	3.4	0.6		1.5	0.8	0.9	0.6
Cadmium	µg/L	5	< 0.1	< 0.1		0.1	<0.1	<0.1	<0.04
Chromium	µg/L	50	0.6	0.7		2.5	0.6	0.5	0.2
Cobalt	µg/L	50	6.4	0.6		2.9	0.7	0.9	0.7
Copper	µg/L	200	2.2	40.5		10.3	40.3	11.3	0.6
Iron	µg/L	500	14900	549		3310	753	1760	
Lead	µg/L	10	0.8	0.7		3.2	0.6	0.2	<0.1
Manganese	µg/L	50	5870	43.3		1130	58.6	234	
Nickel	µg/L	200	5.4	2.4		5.4	2.7	3.1	5.8
Zinc	µg/L	500	7.6	45.4		277	37.9	6.9	
Mercury	µg/L	1							0.01