Operations and Maintenance Manual
for the
Wastewater Treatment Facility
Hamlet of Kimmirut

Prepared for:

Department of Community Government and Services
Government of Nunavut

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Hamlet of Kimmirut

Chapter 1 – Manual Document Control

Manual Document Control

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Chapter 2 – Index

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Chapter 3 – Background and Design Data

Introduction

Kimmirut is a small Inuit community located at the south end of Baffin Island. It has an arctic climate with January and July mean temperatures of -20°C high, -27°C low and 12.2°C high, 3.9°C low respectively. The annual precipitation is made of approximately 20.2 cm of rainfall and 210.1 cm of snowfall for a total precipitation of approximately 41.2 cm and prevailing winds from the north and south at 9 – 18 knots (NWT data book).

The purpose of this Operations and Maintenance Manual (O&M Manual) is to assist the Hamlet of Kimmirut (Hamlet) staff with the proper operation and maintenance of the wastewater treatment facility. This manual will outline the description on how the facility is to be operated and maintained and outline the required testing and maintenance operations.

The wastewater treatment facility is located approximately 1.5 kms to the west of the end of the airport runway and shown on Figure 1. The proposed facility includes a natural wetlands for the main treatment process. In addition, there are two sewage lagoons and an icepack storage area, primarily for retention purposes. The natural wetlands comprises an area in excess of 20 ha and discharges to a series of small lakes to the south and ultimately drains into Tulsit Lake. Discharge from the lagoons and the wetland to the natural environment is intermittent with discharge beginning in late spring and extending through the summer and early fall.

The Hamlet's water supply is Lake Fundo which is hydraulically uphill from the wetlands area. Water distribution and sewer collection within the Hamlet is on a trucked system.

General

The proposed sewage treatment facility must meet the long term needs of the Hamlet, as well as the regulatory requirements of the Hamlet's water licence. The Water and Sewage's Facility Capital Program Standards and Criteria indicate the design horizon for sewage lagoons is to be between 15 - 20. As per the direction of the Community and Government Service, Government of Nunavut, the design horizon for this project shall be the year 2028.

Sewage Treatment

The wastewater treatment system for the Hamlet of Kimmirut includes a system of two sewage lagoon cells, an ice pack area and a natural wetland. As described in Chapter 6 - Operating Procedures the operations of the treatment system varies during the year.

The wastewater treatment system utilizes the natural wetland as the main method of treatment. The two lagoons and ice pack area are primarily needed for retaining the sewage until the wetlands is active and can provide the required levels of sewage treatment required. The lagoons do contribute to the treatment of the sewage through sedimentation and from bio-chemical oxidation.

As monitoring the performance of natural wetlands is difficult, the Hamlet of Kimmirut's water license has set the compliance point for the wastewater treatment system as the end of the lower lagoon. This point represents the last point of measurement and control for the system. The water license further recognizes the treatment potential of the natural wetland and has set the compliance criteria recognizing the treatment the effluent will receive through the wetland.

Population Projections

The Nunavut Bureau of Statistics population projections provide projected populations of the Nunavut communities to the year 2020. As a planning horizon for this facility is past the current population projections available form the Nunavut Bureau of Statistics, the population projection from 2020 to 2028 were estimated using the average annual growth rate for the Hamlet between the year 2000 and 2020 of 2.28%. The table below summarizes the population projections over the life of the facility.

Table 3.1 - Population Projections

Planning Year	Year	Population	Planning Year	Year	Population
	2000	450	7	2015	636
	2001	461	8	2016	649
	2002	474	9	2017	662
	2003	485	10	2018	675
	2004	496	11	2019	688
	2005	506	12	2020	706
	2006	519	13	2021	722
	2007	530	14	2022	739
0	2008	546	15	2023	755
1	2009	560	16	2024	773
2	2010	573	17	2025	790
3	2011	589	18	2026	808
4	2012	601	19	2027	827
5	2013	612	20	2028	846
6	2014	624			

The design population for the end of the design horizon, 2028, is projected to be 846 persons.

Sewage Generation

Sewage generation rates are generally assumed to be equal to the water consumption rates for a community, with the water consumption rate being the total of the residential and non-residential

water consumption. The Water and Sewage Facility Capital Program Standards and Criteria provide the following design values and formulae for estimating the water consumption and therefore the sewage generation rates for communities.

The residential water usage (RWU) for a community is based on the method of water delivery and sewage collection in the community. The per capita water usage rates for the different methods of water delivery and sewage collection are summarized in the Table 3.2.

Table 3.2 - Residential Water Usage

Service Method	Residential Water Usage (RWU)
Trucked water and sewage	90 lpcd
Piped water and sewage	225 lpcd
Piped water supply and truck sewage pump out	110 lpcd
Trucked water delivery and individual septic fields	100 lpcd

The Hamlet of Kimmirut has a trucked water and sewage system, therefore the RWU for the community from table 3.2 is equal to 90 lpcd.

Non-residential water usage by a community tends to increase with increases in the population. To determine the Total Community Water Usage (TCWU, the Residential Water Usage is adjusted based on population to provide a Total Water Usage Per Capital. The daily water consumption by the community is equal to the population multiplied by the Total Water Usage Per Capital. The Total Water Usage Per Capital, including residential and non residential activities are estimated based on the equations in Table 3.3 – Total Community Water Usage.

Table 3.3 - Total Community Water Usage

Community Population	Total Water Use Per Capita
0 – 2000	RWU x (1.0 + 0.00023 x Population)
2000 – 10,000	RWU x [-1.0 + {0.323 x Ln(Population)}]
Over 10,000	RWU x 2.0

For a population of 846, the total sewage generated per capita is 107.5 lpcd. For the design population of 846 and a sewage generation rate of 107.5 lpcd, the daily sewage generation is equal to 90,945 lpd and a yearly sewage generation rate for the year 2028 is 33,195 m^3.

Influent Characteristics

The characteristics of sewage generated in a community are heavily dependent on the type of installation and sanitary facilities. The Hamlet of Kimmirut water and sewage systems utilize holding tanks and truck delivery and collection systems. The waste generated from this arrangement is considered to be “Moderately Diluted Wastewater”, as per the Cold Climate

Utility Manual. Table 3.4 - Characteristics of Basic Wastewater Categories is an excerpt from the Cold Climate Utilities Manual, summarizing the characteristics of moderately diluted wastewater.

Table 3.4 –Waste Water Characteristics

Parameter	Units	Moderately Diluted
BOD_5	mg/L	460
COD	mg/L	1000
Suspended Solids	mg/L	490
Total Nitrogen	mg/l as N	--
Phosphorus	mg/L as P	--

Regulatory Requirements

The proposed sewage treatment facility will be required to meet the effluent quality standards as set out in the Hamlet's water licence. The effluent quality standards set out in the water licence are summarized in the Table 3.5 - Effluent Quality Standards.

Table 3.5 – Effluent Quality Standards

Parameters	Maximum Average Concentration
BOD_5	*To be set in the Hamlet's Water License*
Total suspended solids (TSS)	*To be set in the Hamlet's Water License*
Faecal coliforms	1×10^6 CFU/dl
Oil and grease	No visible sheen
pH	6 and 9

Seasonal Climatic Conditions

Table 3.6 summarizes the Seasonal Climatic Conditions for Kimmirut. The data presented is extrapolated from the Climatic Normals for Iqaluit, as historical data for Kimmirut is not available.

Table 3.6 – Monthly Precipitation

Month	Precipitation Rate	Average Daily Maximum Temperature	Average Daily Minimum Temperature
January	21 mm	-22.5 °C	-30.6 °C
February	15 mm	-23.8 °C	-32.2 °C
March	22 mm	-18.8 °C	-28.6 °C
April	28 mm	-9.9 °C	-19.6 °C
May	27 mm	-0.9 °C	-7.8 °C
June	35 mm	6.8 °C	0.3 °C
July	59 mm	11.6 °C	3.7 °C
August	66 mm	10.3 °C	3.3 °C
September	55 mm	4.7 °C	-0.4 °C
October	37 mm	-2.0 °C	-7.7 °C
November	29 mm	-8.9 °C	-16.7 °C
December	18 mm	-18.5 °C	-26.9 °C

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Chapter 4 – Schematic and Functional Data

Operational Plan

The wastewater treatement facility includes, the existing sewage lagoon (referred to as the Upper Lagoon), a second lagoon (referred to as the Lower Lagoon) created at the bottom of the gulch and the wetlands.

The following details the proposed operations of the sewage treatment system for Kimmirut.

October 1– May 15 – Over Winter Storage

Sewage trucks discharge to the Gulch where the sewage begins to freeze and form the ice pack. The Upper Lagoon and Lower Lagoon are empty.

The daily average temperature for October, as published in the Canadian Climate Normals 1971-2000 by Environment Canada for Iqaluit is -4.9 °C. It is reported that the number of days with a minimum temperature of greater than 0 °C is one, and the number of days with a maximum temperature of less than 0°C is twenty. It therefore is concluded that freeze up has started by October 1st, and sewage discharged to the gulch will freeze and form the ice pack.

May 16 – June 15 - Spring Melt Begins

The truck discharge point is changed from the gulch to the Upper Lagoon. The Upper Lagoon has 5,914m^3 capacity, the equivalent of approximately 65 days of the sewage not considering precipitation and runoff.

The daily average temperature for May as published in the Canadian Climate Normals 1971-2000 by Environment Canada for Iqaluit is -4.4 °C. The report states that the number of days with a minimum temperature of greater than 0 °C is one and a half, and the number of days with a maximum temperature of greater than 0 °C is fourteen. The daily average temperature for June, as published in the Canadian Climate Normals 1971-2000 for Iqaluit is 3.6 °C. The report states that the number of days with a minimum temperature of greater than 0 °C is 17, and the number of days with a maximum temperature of greater than 0 °C is twenty nine. It is therefore concluded that spring melt will begin in mid to late May.

The ice pack and accumulated snow begins to melt and drain towards the Lower Lagoon, where it is retained. Based on a 2 month spring runoff, mid May until mid July, the Lower Lagoon should have capacity to retain half of the estimated flow from the ice pack and spring runoff. It is estimated that it will take approximately 1 month to fill the Lower Lagoon.

There is no discharge to the wetlands.

June 16 – July 15 – Earlier Summer Operations - Discharge Begins

The sewage trucks continue to discharge to the Upper Lagoon which has filled and begins to operate as a detention lagoon with continuous release of sewage over the spillway.

The Lower Lagoon has filled and begins to operate as a detention lagoon with a continuous release of sewage over the spillway. Effluent from the Lower Lagoon is released to the wetlands for further treatment.

The ice pack and snow accumulation finishes melting.

July 15 – August 31 – Summer Operations

The sewage trucks continue to discharge to the Upper Lagoon which operates as a long detention lagoon with a continuous release rate equal to the inflow.

The Lower Lagoon is drained during this period to provide a continuous release of effluent to the wetlands over the optimal period for treatment. The release rate would be controlled by pumping.

September 1 – September 30 – Fall Operations

The sewage trucks continue to discharge to the Upper Lagoon. The operating level of the Upper Lagoon is lowered by pumping to a level equivalent to 15 days storage which allows for storage of the sewage generated in last 2 weeks of September until the subsequent year.

The Lower Lagoon is emptied.

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Chapter 5 – Component Details

Berm Construction

.1 Existing Berm Rehabilitation – Upper Lagoon

As per the recommendations of the geotechnical report, the existing earth berm will be upgraded to flatten the downstream of the dyke to a 3H:1V slope. The height of the berm will be increased from 97m to 98.5m with a spillway elevation of 97.5 m. This will provide 7,900 m^3 of storage between the spillway elevation of 97.5m and the top of the dead zone of 95m, meeting the storage requirements set out above in Section 4.3.1 of 7,457 m^3. The elevation of the top of the berm will be 98.5 to provide the 1.0 m of freeboard as per the Canadian Dam Safety Guidelines.

The crest width of the top of the berm will be increased from the current 2.5 m width to 4 m.

.2 New Berm Construction – Lower Lagoon

The berm to be constructed to create the Lower Lagoon will be constructed similar to the berm at the Upper Lagoon, with side slopes of 3H:1V and a crest width of 4 m. The berm will incorporate an overflow spillway at an elevation of 71.4m to prevent uncontrolled overtopping of the berm and allow for continuous discharge during spring melt and runoff. The elevation of the top of the berm will be 72.4 m to provide the 1 m freeboard as recommended by the Canadian Dam Safety Guidelines. The lagoon will also incorporate an approximately 1 m deep dead storage to allow for accumulation of sludge with the top of the dead zone being at elevation 68 m. The total volume provided in the Lower lagoon shall be 20,700 m^3 meeting the requirements as set out in Section 4.3.2 of 20,530 m^3.

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Chapter 6 – Operating Procedures

Normal Operating Procedures

.1 Berm Maintenance and Inspections

The earth berms which form the Upper and Lower lagoons are greater than XX metres high and therefore fall under the requirements of the Canadian Dam Safety Guidelines. According the Canadian Dam Safety Guidelines …

.2 Sludge Management

Effluent quality will guide when a sludge management program is implemented. Monitoring of the effluent from the lagoon will indicate when the performance of the lagoon starts to degrade. Degradation of the performance of a lagoon is normally caused by sludge accumulation and will be the indicator to desludge the lagoon.

Prior to disposal, the sludge must be tested to ensure the disposal method chosen is safe and environmentally responsible. The sludge must meet the CCME guidelines as follows, or the requirements of the Solid Waste Disposal Facility

Sludge removed from the lagoons can be disposed of in a separate cell constructed at the landfill site. The sludge will be covered with granular material and allowed to freeze.

Inorganics

Parameter	CCME – Industrial ug/g	Parameter	CCME – Industrial ug/g
Antimony	40	Lead	600
Arsenic	12	Mercury	50
Barium	2000	Molybdenum	40
Beryllium	8	Nickel	50
Cadmium	22	Selenium	3.9
Chromium	87	Silver	40
Chromium VI	1.4	Thallium	1
Cobalt	300	Vanadium	130
Copper	91	Zinc	360

VOCs

Parameter	CCME – Industrial ug/g	Parameter	CCME – Industrial ug/g
Acetone	nv	Trans-1,3-Dichloropropylene	50
Benzene	5	Ethylbenzene	20
Bromodichloromethane	nv	Ethylene Dibromide	
Bromoform	nv	Methyl Ethyl Ketone	
Bromomethane	nv	Methylene Chloride	
Carbon Tetrachloride	50	Methyl Isobutyl Ketone	
Chlorobenzene	10	Methyl-t-Butyl Ether	
Chloroform	50	Styrene	50
Dibromochloromethane	nv	1,1,1,2-Tetrachloroethane	nv
1,2-Dichlorobenzene	10	1,1,2,2-Tetrachloroethane	50
1,3-Dichlorobenzene	10	Toluene	1
1,4-Dichlorobenzene	10	Tetrachloroethylene	1
1,1-Dichloroethane	50	1,1,1-Trichloroethane	50
Cis-1,2-Dichloroethylene	50	1,1,2-Trichloroethane	50
Trans-1,2-Dichloroethylene	50	Trichloroethylene	31
1,2-Dichloropropane	50	Vinyl Chloride	nv
Cis-1,3-Dichloropropylene	50	Total Xylenes	20

BTEX, CCME PETROLEUM HYDROCARBONS

Parameter	CCME – Industrial ug/g	Parameter	CCME – Industrial ug/g
F1 (C6-C10)	310	F4 (C34-C50)	3300
F1 (C6-C10) - BTEX	nv	F1 (C6-C10)	310
F2 (C10-C16)	760	F1 (C6-C10) - BTEX	nv
F3 (C16-C34)	170		

Note: nv = no value
1. Criteria refers to Ministry of Environment "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act" March 9, 2004
2. This table represents a summary of the data presented in the Laboratory Certificate of Analysis for convenience purposes only
3. This summary is to be use in conjunction with, not as a replacement of the Laboratory Certificate of Analysis which contains all QA/QC information
4. Criteria in brackets apply to medium and fine textured soils
5. Guideline flagging accuracy only guaranteed when result units correspond with guideline units on spreadsheet.

QA/ QC Program

.1 Monitoring

Monitoring the operation of the system will be accomplished through the establishment of five sampling points. Sampling will provide information regarding the performance of the system and help identify any degradation to the treatment provided. Table 6.1 provides coordinates of the sampling points (which will be confirmed upon construction by hand held GPS units).

Table 6.1 – Monitoring Points

Monitoring Program Station Number	Description	Latitude	Longitude
KIM-4	Upper Lagoon Spillway	N62°50'49.74"	W69°54'26.64"
KIM-5	Upper Lagoon Pump Discharge	N62°50'49.74"	W69°54'24.84"
KIM-6	Lower Lagoon Spillway	N62°50'36.24"	W69°54'32.76"
KIM-7	Lower Lagoon Pump Discharge	N62°50'36.24"	W69°54'30.24"
KIM-8	End of Wetlands	N62°50'5.64"	W69°54'31.50"

.2 Sampling Frequency

The following outlines the Sampling Testing and Compliance requirements of the Wastewater Disposal Facility.

Table 6.2 – Sampling Frequency

Monitoring Program Station Number	Description	Frequency
KIM-4	Upper Lagoon Spillway	Water Quality: Twice Annually - Start of overflow/start of decanting
KIM-5	Upper Lagoon Pump Discharge	Water Quality: Twice Annually - Start of overflow/start of decanting
KIM-6	Lower Lagoon Spillway	Water Quality: Twice Annually - Start and end of decanting
KIM-7	Lower Lagoon Pump Discharge	Water Quality: Twice Annually - Start and end of decanting
KIM-8	Surface water at the end of the Wetland Area	Water Quality: Monthly during periods of flow from spring to freezeup.

.3 Sampling Parameters

Samples should be analyzed for the following parameters:

Biochemical Oxygen Demand – BOD_5	Faecal Coliforms
Total Suspended Solids	pH
Conductivity	Nitrate-Nitrite
Oil and Grease (visual)	Total Phenols
Magnesium	Calcium
Sodium	Potassium
Chloride	Sulphate
Total Hardness	Total Alkalinity
Ammonia Nitrogen	Total Zinc
Total Cadmium	Total Iron
Total Cobalt	Total Manganese
Total Chromium	Total Nickel
Total Copper	Total Lead
Total Aluminum	Total Arsenic
Total Mercury	Total Organic Carbon (TOC)q

.4 Compliance Point

The end of the Lower Lagoon as the last point of measurement and control shall be considered the compliance point for the waste waster treatment system. Depending on the operating condition this shall be either the Lower Lagoon Spillway (KIM-6), or when in operation, the Lower Lagoon Pump Discharge (KIM-7).

To meet the objective of an effluent quality at the end of the wetlands of 45 mg/L BOD5 and 45 mg/L TSS, the effluent released from the Lower Lagoon must meet the criteria list in Table 6.3. This criteria recognizes the treatment ability of the wetlands. It also accounts for the dilution of the effluent from precipitation. IN the event of a non compliant sample, precipitation records should be reviewed to determine if the levels of precipitation had deviated from the normal, resulting in a lower level of dilution.

Table 6.3 – Effluent Criteria at the Compliance Point

Parameter	Maximum Average Concentration
BOD_5	120 mg/L
Total Suspended Solids (TSS)	180 mg/L

Faecal Coliforms	1 x 10^6 CFU/100mL
Oil and Grease	No visible sheen
pH	Between 6 and 9

.5 Laboratory Requirements

All analyses shall be performed by a laboratory certified by the Canadian Association of Environmental Analytical Laboratories (CAEAL), or as otherwise approved by an Analyst.

.6 Sampling Procedures

The sampling procedures should be as per "Guidelines on Sampling and Analytical Methods for use at Contaminated Sites in Ontario" as summarized in the appendix.

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Chapter 7 – Spill Contingency Plan

Draft
Spill Response Plan
Wastewater Treatment Facility
Kimmirut, Nunavut

Prepared for:

Hamlet of Kimmirut, Nunavut
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Appendices

1.0 Introduction

Trow Associates Inc. was retained by Hamlet of Kimmirut (Hamlet) in Nunavut to prepare a Spill Response Plan (SRP) as part of the permitting process for the ongoing management of the Hamlet's wastewater treatment facility. This SRP also demonstrates the Hamlet's stewardship in environmental management.

The purpose of the SRP is to address potential environmental spill incidents that may occur during the routine operation of wastewater facility. The SRP is designed to be protective of the local natural environment.

The SRP includes a review of appropriate government acts and regulations, the identification of foreseeable spill scenarios, spill response procedures and general health, safety and emergency response requirements necessary when conducting activities that may require contact with the subsurface materials. The SRP does not replace any Health & Safety protocols, procedures, etc. already established by the Hamlet but rather is intended to be complimentary to existing protocols.

Situations may arise during the site work that are beyond the scope of the safety procedures stated in this document. In such a situation, it may be necessary to stop on-site work until a revised procedure or SRP is prepared to reflect the changing conditions.

It is recommended that all persons involved with on-site operations read the SRP. If there are any questions regarding any aspect to this document, individuals are encouraged to contact Trow for additional information or clarification.

2.0 Site Description

The wastewater treatment facility for which this SRP was developed, are shown on Figure 1 (in Appendix A). The facility is best described as borrow pits that contain no permanent or semi-permanent structures. As such, no potential contaminants are likely to be stored at the pits.

3.0 Regulations

The Environmental Protection Act (R-068-93) requires that all spill response plans include:

- The name, address and job title of the owner or person in charge, management or control of the facility;
- The name, job title and 24-hour telephone number for the person(s) responsible for activating the spill response plan;
- A description of the facility, a description of the type and amount of contaminants normally stored at the facility and a site map of the facility;
- The steps to be taken to report, contain, clean up and dispose of contaminants in the case of a spill;
- The means by which the spill response plan is activated;
- A description of the training provided to employees to respond to a spill;
- An inventory of and the location of response and clean-up equipment available to implement the spill response plan;
- The date the spill response plan was prepared.

4.0 Contacts & Regulatory Authorities

The following table includes the contact information for the persons responsible for the facilities. The persons listed below should be contacted in the event of a spill at any of the facilities under their supervision.

Table 1: Municipal Contacts

Name	Job Title	24-Hour Telephone #
Joe Smith	(eg. Facility Manager)	867-
John Smith	(eg. Facility Owner)	867-

In each instance that a spill is identified, the Hamlet of Kimmirut and the Emergency Spill Hotline should be contacted as soon as possible. A NT-NU Spill Report Form (Appendix B) should also be completed and faxed to the Emergency Spill Hotline. The necessity to contact the other agencies will be contingent upon direction from the Emergency Spill Hotline.

Hamlet of Kimmirut: Phone: 867- Fax: 867-

Emergency Spill Hotline: Phone: 867 920-8130, Fax 867 873-6924

In addition to the local contacts described above, the following table summarizes the additional regulatory authorities that have a vested interest in the event of a spill.

Table 1 Additional Agencies

Agency	Legislation	Contact Phone #
Nunavut Water Board	Nunavut Waters and Surface Right Tribunal Act	(867) 360-6338 Fax: (867) 360-6369
Nunavut Impact Review Board	Nunavut Land Claims Agreement Act	(867) 983-2593
Environment Canada	Canadian Environmental Protection Act, 1999	(867) 975-4464
Transport Canada (Coast Guard)	Transportation of Dangerous Goods Act	(867) 979-5269 Officer in charge: (876) 979-5260 Fax: (867) 979-4260
Department of Fisheries and Oceans	Fisheries Act	(867) 645-2871

5.0 Potential Contaminants and Spill Scenarios

Potential spill scenarios are dependant on the types and volumes of materials that are being used on the sites and the activities being carried out. For the purpose of this SRP, spill sizes are described as small (<10 litres), medium (>10 litres and <100 litres) or large (>100 litres).

The materials (potential contaminants) that are anticipated to be used on the site include gasoline, diesel fuel, hydraulic oil, motor oil and other lubricants, antifreeze and coolants. Spills may be the result of any of the following occurrences:

- Leaks or ruptures of storage tanks;
- Valve or line failure in systems, vehicles or operating equipment;
- Heat expansion due to overfilling;
- Improper storage;
- Vehicular accidents;
- Spill during transfer of liquid; and/or,
- Vandalism.

6.0 Reportable Spill Quantities

In the event of a spill, the following table is to be used as a guide to determine if the spill should be reported to the proper authorities. Any spilled quantities that exceed the specified amounts must be reported to the **Emergency Spills Hotline**. Spills of any quantity that occur near or into fish-bearing waters or sensitive environment, wildlife or habitat must be reported. In addition, spills of any quantity that pose an immanent threat to human health or life or listed species at risk or critical habitat must also be reported. It is recommended that any spill of significant size be reported and the advice received should be followed.

Table 2
Reportable Quantities[1]

Item	TDGA[2] Class	Contaminant	Amount Spilled
1	2	Explosives	Any amount
2	2.1	Compressed Gas (flammable)	Any amount of gas from containers with capacity greater than 100 kg
3	2.2	Compressed Gas (non-corrosive, non-flammable)	Any amount of gas from containers with capacity greater than 100 kg
4	2.3	Compressed Gas (toxic)	Any amount
5	2.4	Compressed Gas (corrosive)	Any amount
6	3.1, 3.2, 3.3	Flammable Liquid	100 L
7	4.1	Flammable Solid	25 kg
8	4.2	Spontaneously Combustible Solids	25 kg
9	4.3	Water Reactant Solids	25 kg
10	5.1	Oxidizing Substances	50 L or 50 kg
11	5.2	Organic Peroxides	1 L or 1 kg
12	6.1	Poisonous Substances	5 L or 5 kg
13	6.2	Infectious Substances	Any amount
14	7	Radioactive	Any amount
Item	**TDGA Class**	**Contaminant**	**Amount Spilled**

15	8	Corrosive Substances	5 L or 5 kg
16	9.1(in part)	Misc. products or Substances Excluding PCB Mixtures	50 L or 50 kg
17	9.2	Environmentally Hazardous	1 L or 1 kg
18	9.3	Dangerous Wastes	5 L or 5 kg
19	9.1(in part)	PCB Mixtures of 5 or More Parts Per Million	0.5 L or 0.5 kg
20	None	Other Contaminants	100 L or 100 kg

Notes:

1) Environmental Protection Act, Consolidation of Spill Contingency Planning and Reporting Regulations

2) TDGA Class – Transportation of Dangerous Goods Class under the *Transportation of Dangerous Goods Act*.

7.0 Spill Response Procedures

The following section describes the appropriate spill response procedures that should be followed in the event of a spill to various media (bedrock, gravel, soil, water, ice or snow).

7.1 Spills on Land

For spills on land (soil, gravel, sand, rock, and vegetation), the following procedure should be followed;

1. Extinguish all sources of ignition (i.e., shut off engines, no smoking).
2. If possible, identify the spilled material.
3. Make sure the area is safe for entry and the spill does not represent a threat to the health or safety of the responder or others at the spill site.
4. Assess whether the spill can be readily stopped or brought under control and if safe and possible, stop the source of the spill (i.e., plug hole, close valve, install upright container) or place tarp under spill source and build up tarp edges to contain spill.
5. If the spill is sufficiently large that it cannot be controlled with the materials at hand, the spill should be reported immediately.
6. Stop spilled liquids from spreading or entering waterways using absorbent materials or a soil dyke down slope from the spill.
7. Contact facility supervisor and report the spill.
8. If possible with materials at hand, clean up remaining spilled material and store in a secure container for disposal. Do not flush area with water.
9. If possible, pump any contained liquid into drums.
10. Complete a Spill Reporting Sheet.
11. **Contact: Emergency Spill Hotline: Phone: 867 920-8130, Fax 867 873-6924** for additional advice.

7.2 Spills on Water

For spills on water, the following procedure should be followed

1. Extinguish all sources of ignition (i.e., shut off engines, no smoking).
2. If possible, identify the spilled material.

3. Make sure the area is safe for entry and the spill does not represent a threat to the health or safety of the responder or others at the spill site.

4. Assess whether the spill can be readily stopped or brought under control and if safe and possible, stop the source of the spill (i.e., plug hole, close valve, upright container).

5. If the spill is sufficiently large that it cannot be controlled with the materials at hand, spill report the spill immediately.

6. Use sorbant booms to contain spill for recovery, place sorbant sheets on water within boomed perimeter. For narrow waterways, place one or more booms across the waterway, down stream of the spill location and anchor boom ends on each bank. Store saturated sorbant sheets and booms in drums for disposal.

7. Contact facility supervisor and report the spill.

8. If possible with materials at hand, clean up remaining spilled material and store in a secure container.

9. Complete a Spill Reporting Sheet.

10. **Contact: Emergency Spill Hotline: Phone: 867 920-8130, Fax 867 873-6924** for additional advice.

7.3 Spills on Snow and Ice

Spills on ice present the potential for immediate access of the contaminants to water therefore, immediate response to the spill is essential. For spills on snow and ice, the following procedure should be followed:

1. Extinguish all sources of ignition (i.e., shut off engines, no smoking).

2. If possible, identify the spilled material.

3. Make sure the area is safe for entry (i.e., ice thickness) and the spill does not represent a threat to the health or safety of the responder or others at the spill site.

4. If the spill is sufficiently large that it cannot be controlled with the materials at hand, the spill should be reported immediately.

5. Assess whether the spill can be readily stopped or brought under control and if safe and possible, stop the source of the spill (i.e. plug hole, close valve, install upright container) or place tarp under spill source and build up tarp edges to contain spill.

6. Stop spilled liquids from spreading or entering waterways using absorbent materials or a snow/soil dyke.

7. Contact facility supervisor and report the spill.

8. If possible with materials at hand, clean up remaining spilled material and store in a secure container (i.e., drum, polyethylene bags). Store impacted snow in drums for disposal.

9. **Contact: Emergency Spill Hotline: Phone: 867 920-8130, Fax 867 873-6924** for additional advice.

7.4 Additional Spill Delineation/Monitoring

As a result of a large spill in which not all of the spilled material can be readily recovered as described above, additional delineation in the form of a subsurface investigation (i.e., test pits, boreholes, monitoring wells) may be required to determine the lateral and vertical extents of the impacts to the subsurface soil and/or groundwater. The additional delineation/monitoring information will be used to develop an appropriate remediation plan. In such cases, a qualified environmental consultant should be retained to provide advice with respect to how to proceed with the additional assessment.

8.0 Spill Kit and Training Requirements

The following section presents the recommended minimum requirements for the content and number of spill kits that should be present.

8.1 Spill Kit

Each spill kit should be inspected regularly to ensure that it contains, as a minimum, the following:

- 1 – 205 litre, open top steel drum with a lid, bolting ring and gasket;
- 1 Spark proof shovel;
- 1 package of 10 disposable 5 mil polyethylene bags (approx. 65 cm x 100 cm);
- 4 – 12.5 cm (approx. 5") x 3 m (approx. 10') sorbant (oil-absorbing) booms;
- 10 kg bag of sorbant particulate;
- 1 bail of 50 cm x 50 cm (approx.) sorbant sheet (100 Sheets/bail);
- 1 x 5m x 5m approx. plastic tarp;
- 2 pairs of oil resistant gloves; and,
- 2 pairs of splash protective goggles.

8.2 Additional Spill Response Supplies

In addition to the materials contained in the spill kits, an inventory of the following supplies should be available for use if required.

- 10 – 205 litre, open top steel drum with a lid, bolting ring and gasket;
- 2 Spark proof shovels;
- 5 packages of 10 disposable 5 mil polyethylene bags (approx. 65 cm x 100 cm);
- 10 – 12.5 cm x 3 m sorbant (oil-absorbing) booms;
- 5 x 10 kg bags of sorbant particulate;
- 5 bails of 50 cm x 50 cm (approx.) sorbant sheet (100 Sheets/bail);
- 2 pairs of oil resistant gloves; and,

- 2 pairs of splash protective goggles.

8.3 Spill Kit Locations

The spill kit, with the exception of the shovel, can be contained within the 205 L drum which should be sealed securely to protect the contents. The drum should also be accessible without the use of tools (i.e., bolt ring only finger tight). The bolt ring should be inspected regularly to ensure that it turns freely and lubricated if it does not.

8.4 Training

To ensure the effectiveness of the SRP the following actions should be followed:

1. The SRP should be up dated as required and reviewed, as a minimum, on an annual basis.

2. The SRP should be distributed to the personnel on the site.

3. The personnel should be informed of the locations of all potentially hazardous materials and their associated Material Safety Data Sheets (MSDS).

4. The personnel should be trained in the use of the MSDS and the techniques and materials used to contain and remediate spilled materials.

5. The personnel should be informed as to the importance of first response with respect to the protection of human health and safety, the environment, property, wildlife and the ecosystem by reducing the impact of spills.

9.0 General Safety Practices and Site Rules

The following is a list of site rules that should be followed to maintain safe working conditions during a spill response:

1. Eating, drinking, chewing gum and smoking are prohibited in contaminated or potentially contaminated areas, or where the possibility for the transfer of contamination exists. This would include areas of active excavation.

2. Personnel who have worked on-site shall wash their hands and face thoroughly with soap and water and remove themselves from the spill area prior to eating, drinking or smoking.

3. All field crew workers should be aware of potentially dangerous situations that they should avoid (i.e. the presence of strong, irritating or nauseating odours). Field crew workers should also be familiar with the physical characteristics of the site including:

    - wind direction in relation to areas of known contamination;
    - accessibility to equipment and vehicles;
    - communications; and,
    - site access.

Table 3
Outside Emergency Contacts

Agency	Function	Phone Number
Ambulance	medical emergency	(867) 979-4422
Hospital	medical emergency	(867) 979-7350
Fire	fire, accident or rescue	(867) 979-4422
Police	security, vandalism	(867) 979-5211
Hamlet of Kimmirut	On-site Supervisor	(867) 975-8502

10.0 Closure

This Spill Response Plan has been prepared for information purposes for the use of the Hamlet of Kimmirut. It does not replace, nor is intended to replace, the general provision of the applicable Federal and Territorial statutes regarding workplace safety or any protocols previously established by Hamlet of Kimmirut. Instead, it may be used to augment any existing Spill Response Plans.

Trow Associates Inc.

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Appendix A: Figures

Appendix B:
NT-NU Spill Report Form

Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Kimmirut

Chapter 8 – Maintenance

To be completed after commissioning

Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Kimmirut

Chapter 9 – Testing and Certification Data

To be completed after commissioning

Operating Conditions

Inspection Requirements

Warranties

Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Kimmirut

Chapter 10 – Manufacturing Data and Service Information

To be completed after commissioning

This chapter includes all manufacturers' service manuals, part lists, operating and maintenance instructions, performance curves, special shop drawings and other applicable data.

Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Kimmirut

Chapter 11 – Appendix

To be completed after commissioning

Photographs

Record Drawings