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Nunalingni Kavamatkunillu Pivikhaqautikkut
Department of Community Government Services
Ministère des Services communautaires et gouvernementaux

Richard Dwyer
Licensing Administrator
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0

Dated: Sep. 01, 2009

Sub: 3BM-ARC0810 Hamlet of Arctic Bay Licence terms and conditions

Dear Richard,
In response to your e-mail of dated July 15, 2009, I am submitting an update of the following as per term and condition of Water Licence # 3MB-RC0810.

- Part B item 10 Plan of compliance
- Part B item 15 SNP reports
- Part D item 10 Final Discharge Point of the existing Sewage Disposal Facility Report
- Part F item 1 Operation and Maintenance Manual
- Part H item 16 Instrumentation Monitoring $ Surveillance Plan for inclusion in the O&M Manual

Please find attached Appendix A (Part B item 10 and 15 and Part D item 10) and Appendix B (Part F item 1 and Part H item H).

If you have any question, please contact me at any time.

Thanks.

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Jack Okeef, Project Officer, GN-CGS, Baffin Region

PART F

OPERATION AND MAINTENANCE MANUAL

Operations and Maintenance Manual for the Wastewater Treatment Facility Hamlet of Arctic Bay

Prepared for:

Department of Community Government and Services
Government of Nunavut

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September 2009

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Operations and Maintenance Manual

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Hamlet of Arctic Bay

Chapter 1 – Manual Document Control

Draft

Manual Document Control

Year of Completion: _____, 20XX

Date	Details
_____, 20XX	Initial Release

Draft

Operations and Maintenance Manual

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Operations and Maintenance Manual

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Chapter 3 – Background and Design Data

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Introduction

Arctic Bay is a small, arctic community located on a low gravel beach near the water on the northern shore of Adams Sound on the Borden Peninsula, an uneven, undulating plateau dissected by numerous river valleys. The annual snowfall in Arctic Bay is about 72 centimetres and the annual rainfall is about 5 centimetres. Temperatures in the summer range between 2 and 10°C and in winter between -24°C and -36°C. (NRC, 2008) Permafrost is present in the soil, it recedes to approximately 1 m below the surface in the summer time.

The purpose of this Operations and Maintenance Manual (O&M Manual) is to assist the Hamlet of Arctic Bay (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 Hamlet's existing wastewater treatment facility is located approximately 2 km to the east of the community. It is a comprised of a single cell lagoon, ice pack storage area and wetlands, as shown in Figure 1. The sewage treatment system is bordered to the north by the Hamlet's solid waste disposal site and to the south by the Road to the Nanisivik airport. The existing lagoon was constructed in 1976. It is an unlined earth lagoon with a reported capacity of approximately 21,000 m^3 and was designed to hold sewage for 365 days with manual discharge. In 2003 the sewage system was expanded to include an ice pack area and modifications to improve the efficiency of the wetlands. Works were based on a project plan prepared by Dillon Consulting Ltd. and presented in the reported entitled *Arctic Bay – Wetlands Treatment Facility: Proposed Project Plan* dated 2002.

In 2002 and 2003 effluent tests carried out by Indian and Northern Affairs cited problems with the effluent quality from the facility. In addition, effluent samples taken in September 2004 did not comply with the requirements under the Hamlet's water licence.

The proposed sewage lagoon will be constructed in a small valley overlooking the existing lagoons and Admiralty Inlet to the south and Victor Bay to the north. The vegetated area between the new lagoon and Victor Bay will be incorporated into the sewage treatment process. A new access road will be constructed from the existing sewage lagoons to the new lagoon.

The justification for the project is based on the need of the Hamlet of Arctic Bay to operate a new sewage lagoon that is structurally sound and has the necessary capacity to accommodate the projected growth of the community over the next 20 years. In addition, it is necessary to decommission the existing sewage lagoons the berms of which are failing.

The project will not have long term negative effects on the environment or wildlife. Most effects are related to construction activities and are short term and all effects can be mitigated by applying suitable mitigation measures.

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 2029.

Sewage Treatment

The wastewater treatment system for the Hamlet of Arctic Bay includes a sewage lagoon cell and a natural wetland.

The wastewater treatment system utilizes the sewage lagoon as the main method of treatment, with the wetlands providing additional treatment prior to the release to the environment.

As monitoring the performance of natural wetlands is difficult, the Hamlet of Arctic Bay's water license has set the compliance point for the wastewater treatment system at the discharge of the 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 population projections for this project will be based on "Nunavut: Community Population Projections" as published by the Nunavut Bureau of Statistics. The Nunavut Bureau of Statistics population projections provide projected populations of the Nunavut communities to the year 2020. As a planning horizon for this project is past the current population projections available from the Nunavut Bureau of Statistics, the population projection from 2020 to 2029 are estimated using the average annual growth rate for the Hamlet between the year 2000 and 2020 of 2.04%. The table below summarizes the population projections to the year 2029.

Table 2.1 - Population Projections

Planning Year	Year	Population	Planning Year	Year	Population
	2000	730	6	2015	1019
	2001	747	7	2016	1033
	2002	763	8	2017	1049
	2003	782	9	2018	1065
	2004	801	10	2019	1078
	2005	819	11	2020	1094
	2006	837	12	2021	1116
	2007	855	13	2022	1139
	2008	876	14	2023	1162
0	2009	894	15	2024	1186
1	2010	916	16	2025	1210
2	2011	939	17	2026	1235
3	2012	960	18	2027	1260
4	2013	980	19	2028	1286
5	2014	1003	20	2029	1312

The design population for the end of the design horizon, 2029, is projected to be 1312 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 Arctic Bay 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

The daily water consumption, and therefore the sewage generated by the community, is equal to the population multiplied by the Total Water Usage Per Capital. Based on the design population of 1312 for the year 2029, and a total water usage per capita rate of 117 lpcd, the daily sewage generation rate is equal to 153,504 lpd. This is equal to a yearly sewage generation rate of 56,029 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 Arctic Bay water and sewage system's 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	--

'Canadian Society for Civil Engineering, 1986, *Cold Climate Utilities Manual*

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	*100mg/L*
Total suspended solids (TSS)	*120mg/L*
Faecal coliforms	1 x 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 Arctic Bay. The data presented is extracted from the climatic normal's from the National Climate Data and Information Archive posted by Environment Canada.

Table 3.6 – Monthly Precipitation

Month	Precipitation Rate	Average Daily Maximum Temperature	Average Daily Minimum Temperature
January	8 mm	-26.1 °C	-32.1°C
February	4 mm	-27.5 °C	-33.1°C
March	7 mm	-24.8 °C	-30.8°C
April	10 mm	-16.6°C	-23.4°C
May	17 mm	-7.8°C	-13.5°C
June	23 mm	1.9°C	-2.8°C
July	35 mm	7.4°C	2.5°C
August	41 mm	3.7°C	-0.8°C
September	43 mm	-3.7°C	-7.4°C
October	31 mm	-12.5°C	-17.2°C
November	16 mm	-19.9 °C	-25.4°C
December	7 mm	-23.7 °C	-29.4°C

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Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Arctic Bay

Chapter 4 – Schematic and Functional Data

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Operational Plan

The sewage lagoon system for Arctic Bay is a single cell storage lagoon providing the capacity to store the sewage generated by the Hamlet over one-year.

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

September 15 – August 15 – Detention Lagoon Storage

Sewage trucks discharge to the lagoon over an eleven month period, beginning with the decanted lagoon. During this period the lagoon acts as a long term detention lagoon.

August 15 – September 15 - Discharge Operations

Mid-August the wetlands have melted and are now considered active. The 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.

Discharge will be done with a six inch portable priming assisted centrifugal pump driven by a liquid cooled diesel engine. The pump will be stored until the decanting period has begun where it will be transported and connected to the decanting infrastructure. The pump will be in operation for an average eight hour day for approximately four weeks, the entire decanting period.

The lagoon will be decanted to the northwest through the natural wetlands and ultimately effluent will be released to Victor Bay.

The sewage trucks continue to discharge to the Lagoon which operates as a long detention lagoon with a continuous release rate greater then the inflow during this period.

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Hamlet of Arctic Bay

Chapter 5 – Component Details

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Berm Construction

.1 New Berm Construction

The proposed berm design is to have a 3H:1V slope. The berm crest width will be 4 m, except where the top of the berm is utilized for access, either for the decanting process or discharging of the sewer trucks, where it will be 5 m wide to better accommodate vehicles. As per the recommendations of the geotechnical report and geothermal analysis, the berms will be constructed with a liner on the upstream slope to provide an impermeable boundary, with an ice dam providing secondary containment and ensuring the liner is keyed into an impermeable surface, i.e. the permafrost.

.2 Stream Crossing and Access Road

To access the site it is required that a new access road, approximately 1.25km long, be constructed from the road to the existing lagoon to the new site. The access road will be comprised of a 7.0m driving surface and a 0.5 m shoulder on each side for a total width of 8.0 m. Due to the relatively steep slope that the proposed road must traverse, it will be required to be aligned across the slope and switch back to the top of the steep section. This proposed alignment provides a maximum grade of approximately 10.4%, and is required to cross a drainage path twice.

To accommodate the stream crossings, two 900 mm diameter CSP culverts are proposed for each crossing. The culvert crossings shall be installed to ensure the culvert inverts are properly buried and in inlets and outlets has sufficient erosion protect.

The stream crossings shall be protected during construction through the installation of silt fencing between the stream and any proposed work.

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Chapter 6 – Operating Procedures

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Normal Operating Procedures

.1 Berm Maintenance and Inspections

The earth berms of the lagoon are greater than 5 metres high and therefore fall under the requirements of the Canadian Dam Safety Guidelines, and as such should include ongoing monitoring for stability and reporting as required by the guideline.

Berm monitoring will be vital during the first operational year to ensure proper freeze-back of the permafrost into the base soils and berm core. Temperatures will be recorded every three months by a data logger using installed thermistors along the crest of the berm to model the progressive frost, and to ensure that anticipated levels of freeze-back are achieved. The thermistors are installed with sensors going down to a final depth of 10.0m. The permafrost is expected to be re-established after the first year reducing the monitoring requirement to monthly periods throughout the summer season only. The monitoring will trace the lower limit of the active permafrost revealing an early warning if the permafrost does not recover. See Thermistor detail in Appendices.

In addition, a series of standpipes will also be installed to monitor for seepage. The standpipes should be monitored yearly, early to mid fall, for the presence of seepage. See Seepage Detail in Appendices.

.2 Sludge Management

It is anticipated that the sewage lagoon will not require desludging during its 20 year design life, as the available storage for sludge is greater then the quantity estimated to be generated.

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 two 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
ARC-1	Raw Wastewater Discharge Location	73° 02' 27.17"	85° 05' 10.73"
ARC-2	Lagoon Pump Discharge	73° 02' 34.07"	85° 05' 42.96"
ARC-3	End of Wetlands	73° 02' 52.88"	85° 07' 05.36"

.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
ARC-1	Raw Wastewater Discharge Location	Water Quality: Monthly
ARC-2	Lagoon Pump Discharge	Water Quality: Twice Annually - Start and end of decanting
ARC-3	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 water license has set the lagoon discharge as the compliance point for the new wastewater facility as it is the last point of measurement and control.

The effluent released from the Lagoon must meet the criteria list in Table 6.3. This criteria recognizes the treatment ability of the wetlands.

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 for Laboratory Accreditation (CALA), or as otherwise approved by an Analyst.

.6 Sampling Procedures

The sampling procedures should be as per "Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licenses in Collecting Representatives water samples in the field" as summarized in the appendix.

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Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Arctic Bay

Chapter 7 – Spill Contingency Plan

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Trow

Draft
Spill Response Plan
Wastewater Treatment Facility
Arctic Bay, Nunavut

Prepared for:

Hamlet of Arctic Bay, Nunavut
X0A 0A0

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Appendix A: Figures
Appendix B: NT-NU Spill Report Form

1.0 Introduction

Trow Associates Inc. was retained by Hamlet of Arctic Bay (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 system for the Hamlet of Arctic Bay includes a sewage lagoon cell and a natural wetland within an existing valley.

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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.

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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 Arctic Bay 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 Arctic Bay: Phone: 867-934-8830

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.

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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.*

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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.

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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 Arctic Bay	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 Arctic Bay. 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 Arctic Bay. Instead, it may be used to augment any existing Spill Response Plans.

Trow Associates Inc.

Chris Kimmerly, M.Sc.
Senior Geoscientist
Environmental Science & Engineering Services

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Project Manager
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Appendix A: Figures

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Appendix B:
NT-NU Spill Report Form

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Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Arctic Bay

Chapter 8 – Maintenance

Draft

To be completed after commissioning

Draft

Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Arctic Bay

Chapter 9 – Testing and Certification Data

Draft

To be completed after commissioning

Operating Conditions

Inspection Requirements

Warranties

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Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Arctic Bay

Chapter 10 – Manufacturing Data and Service Information

Draft

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.

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Operations and Maintenance Manual

for the

Wastewater Treatment Facility

Hamlet of Arctic Bay

Chapter 11 – Appendix

Draft

To be completed after commissioning

Record Drawings

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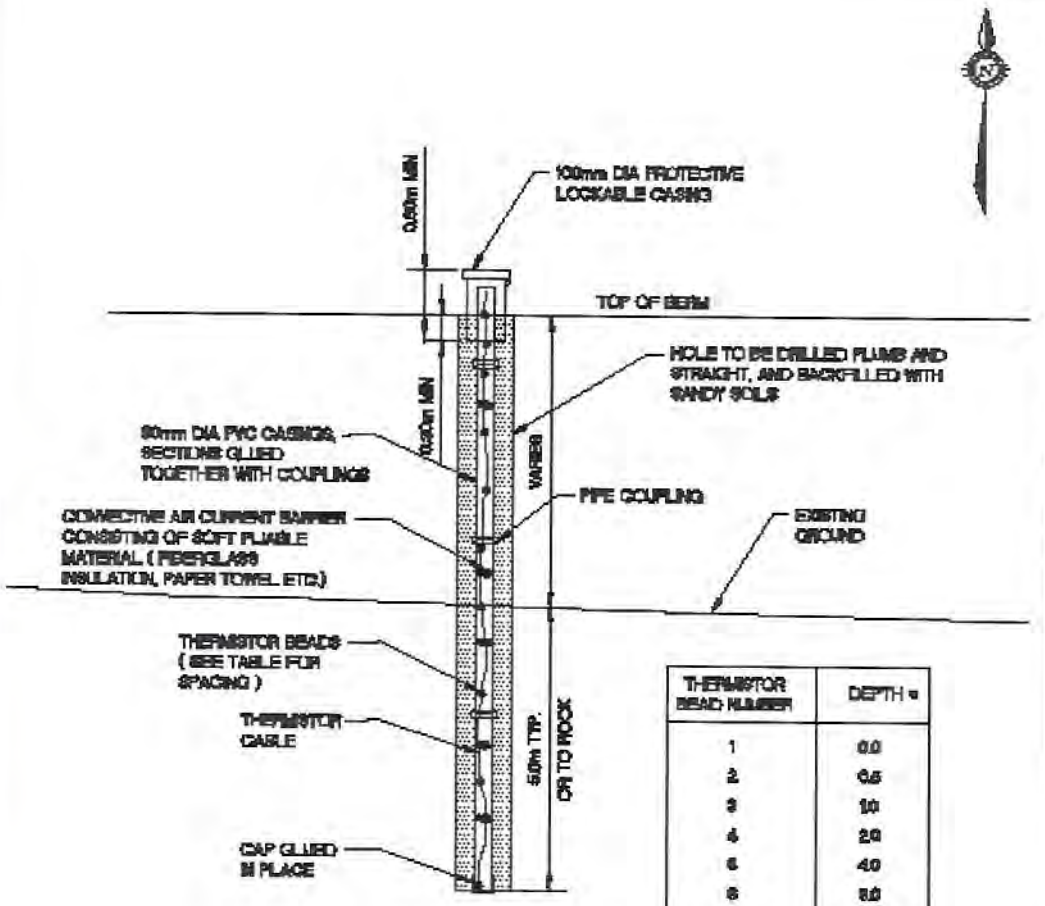

BERM CORE DETECTION
THERMISTOR DETAIL
SCALE NTS

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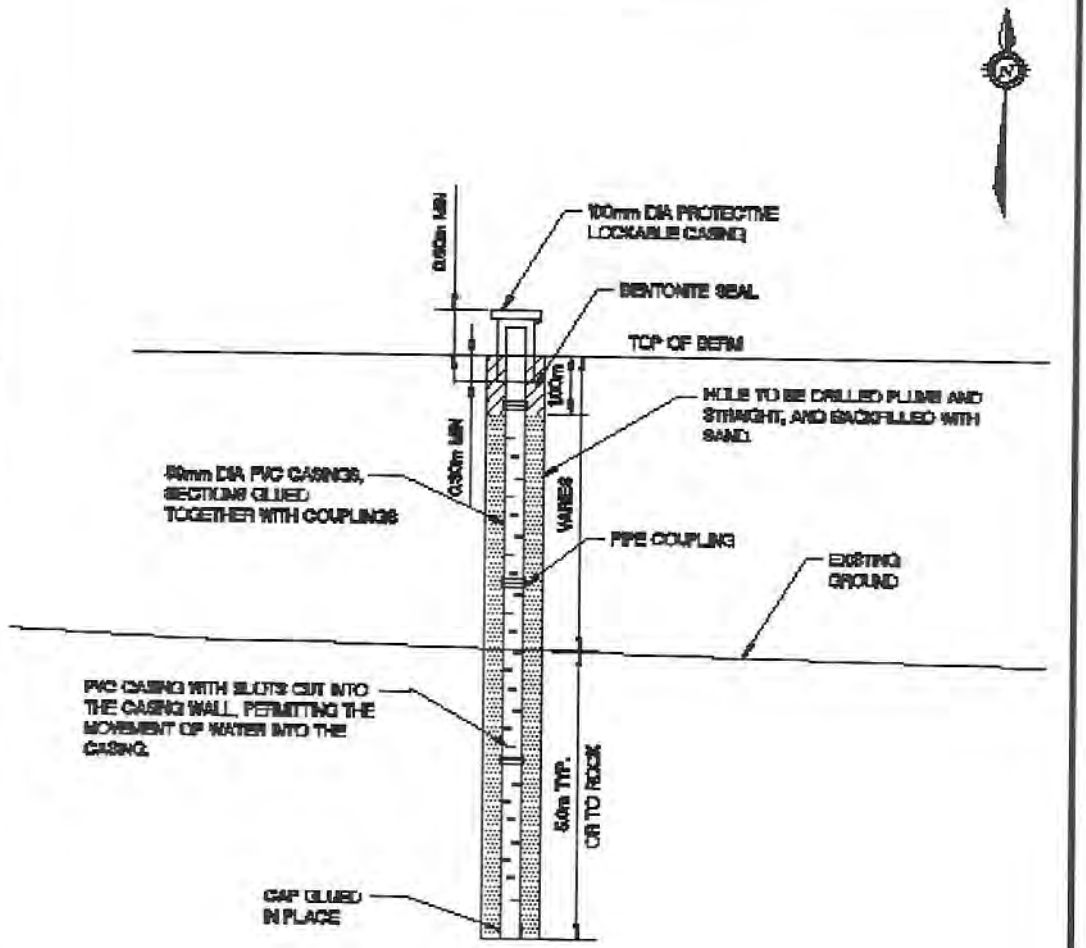

SEEPAGE MONITORING CASING
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