OPERATION AND MAINTENACE MANUAL FOR THE RESOLUTE BAY AIRPORT EXISTING SEWAGE LAGOON

APRIL 2016

RESOLUTE AIRPORT SEWAGE LAGOON
BAFFIN REGION
DEPARTMENT OF ECONOMIC DEVELOPMENT AND TRANSPORTATION
GOVERNMENT OF NUNAVUT

TABLE OF CONTENTS

Page No.

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

Resolute Bay Airport is located on the South coast of Cornwallis Island, a part of the Queen Elizabeth Islands, at approximately Latitude $74^0$43N, Longitude $94^0$58'W. Resolute Bay has been historically divided into two administrative parts: The airport and its support structures and agencies, and approximately five km away, the Hamlet where people live and work. Somewhere in between are various buildings and facilities, the most notable being the huge South Camp Fuel Tank farm. At present the Airport site and surrounding buildings and facilities are under the aegis of the GN Department of Economic Development and Transportation (GN-ED&T). The Ground consists of gravel caused by frost shatter and sand/gravel raised beaches. The active layer of permafrost rarely exceeds 1.4m, and in most often in the vicinity of only 0.50m at its greatest depth. Interestingly, the summer here is very short. The weather warms up only long enough to provide approximately one and a half months where the permafrost can begin to thaw.

The Water licence number NWB 3YRB 0308 was issued to ED&T on November 30, 2003 and it expired on November 30, 2008. This Water licence had originally included the water supply, the sewage lagoon and the solid waste site. However, the removal of water from Strip Lake located adjacent to the Airport was discontinued long time ago due to the presence of contaminants in the water. Since that time, a private contractor, now ATCO, have been delivering treated drinking water by trucks to the Airport and its neighborhood facilities collecting treated water directly from the Hamlet's Signal Hill Water Treatment Plant. At present the sewage is being collected by ATCO as well and dump into the sewage Lagoon. ATCO buys roughly 5M liters water from the Hamlet and sales to the Airport facilities. ATCO also charges the users for sewage collection. The individual looks after their garbage to the Municipal dump site.

A renewal application was submitted to NWB on dated November 28, 2008 and public review was completed with some comments. The activities of this file were put on hold until the Utilidor licensed number 3BM-RUT 1520 was renewed on March 30, 2015.It was initially planned to build the WWTP and redirect the entire waste water into the Plant. Ultimately the construction of the Proposed WWTP is delayed. As a result the existing Airport Sewage lagoon is required to keep active.

During this development, Transport Canada received a standalone water licence number 1BR-RBL 1419 dated July 11, 2014 to remediate the existing Landfill site located next to the sewage lagoon and this was originally part of the Airport Water Licence number NWB YRB 0308. Finally Airport sewage lagoon currently consists of four small cells remain alone under the Water licence number NWB YRB 0308. This development took place because historically, the airport site is a direct legacy of the Canadian Armed Forces and Transport Canada. "Upon division of the Northwest Territories in 1999, the Airport was transferred to the Government of Nunavut (GN). A condition of the transfer agreement between the GNWT and TC (and later the GN) required TC to address any instances of Environmental contamination and Environmental regulatory non- compliance that were as a result of activities prior to the transfer date (Jacques Whitford, 2006, p.2)."

Due in part to the dichotomy and in part to the distance between the two locals, there has historically been a separate Water licence for Resolute Airport.

Initially these were two cell lagoons built under capacity without liner and were non engineered facilities at the time of transfer to GNWT (Dillon's Report 1996). Due to current population ranges from 250 to

600, these lagoons become full each year. Two times decanting was conducted: at the beginning of summer and at the beginning of winter. Even though over flow takes place in the middle of each winter.

The sewage effluent gets treated during summer in the 2km long wetland prior to arriving to the receiving body which is the Ocean.

Once a Waste water Treatment Plant is built as the part of the Utilidor system second phase rehabilitation Program, the entire sewage of the Community will be directed into the Mechanical treatment plant. As soon as that the mechanical treatment plant is built and commissioned, these sewage lagoons will be no longer required and these shall be abandoned and decommissioned.

Finally this O&M manual is designed only to operate the existing Airport Sewage Lagoon.

1.1 Purpose

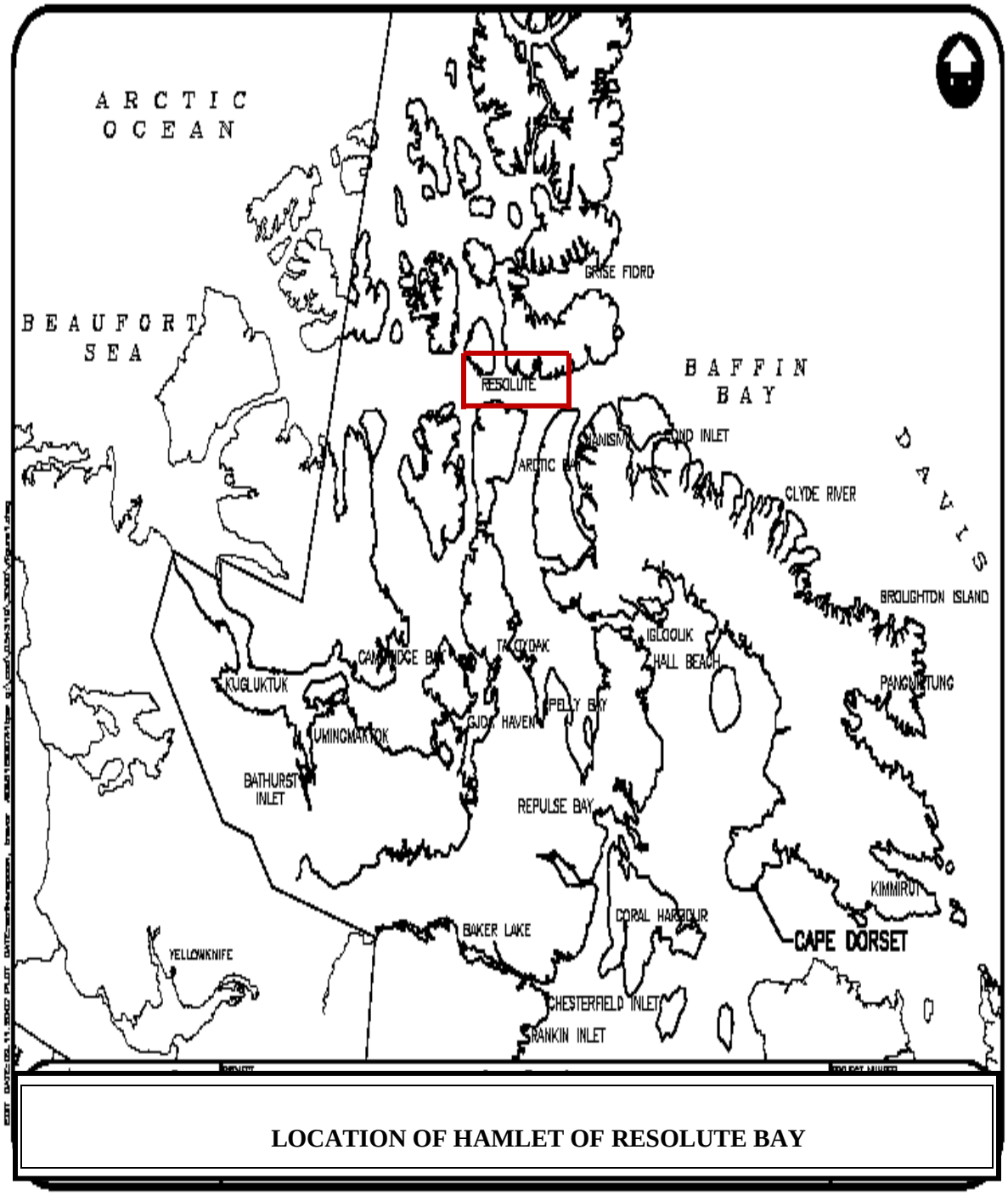
The purpose of this manual is to establish existing operation and maintenance protocol for the management of the sewage treatment system for Resolute Bay Airport Sewage Lagoon. Information presented in this manual has been developed based on the document "Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage." This document fulfills Parts B, D, F and H of the Water License NWB3YRB0308.

To assist personnel that operate the existing sewage lagoon with proper operation and maintenance procedures, the following requirements are addressed in this O&M manual:

1. Proper operation and maintenance procedures for the sewage treatment system to provide effective treatment and operation of the facility;
2. Monitoring program description;
3. Appropriate methods and procedures for wastewater sampling, and;
4. A spill contingency plan.

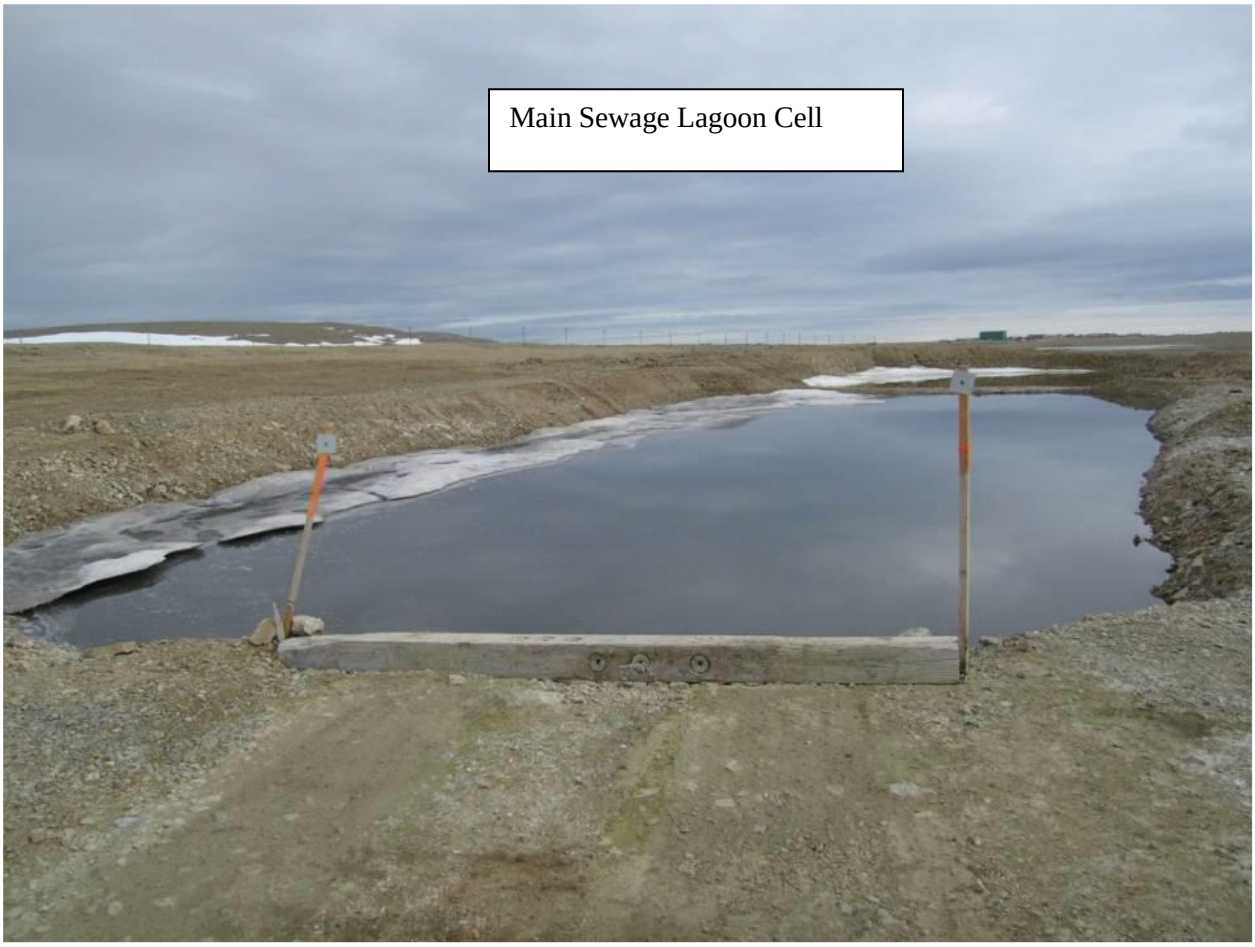
1.2 Site Setting

Resolute Bay Airport is located on the south coast of Cornwallis Island, a part of the Queen Elizabeth Islands, at approximately Latitude $74^{0}43$'N, Logitude $94^{0}58$'W. Resolute Bay historically has been divided into two administrative parts: the airport and its support structures and agencies, and, approximately 7km away, the Hamlet where the people live and work. Somewhere in between are various buildings and facilities, the most notable being the huge South Camp Fuel Tank farm.



LOCATION OF HAMLET OF RESOLUTE BAY

Figure 1: Map of Nunavut



ATCO, a private contractor of Resolute Bay, uses trucked services for both water delivery and sewage collection. Wastewater is treated using constructed four retention Lagoon cells which are non- engineered and operated without any O&M manual. It is noted that the licence # NWB 3YRB 0308 no longer encompasses drinking water source and waste management site. The future new and amendment licence will deal only sewage lagoon alone.

1.3 Population Projection

Presently, the population of the Hamlet of Resolute Bay is approximately 265 in 2015 people. In summer this population is raised to about 600 (mostly Canadian forces) and has maximum impact on the airport facilities especially sewage lagoons which have capacity issues.

1.4 Contact List

The Hamlet of Resolute Bay has a Maintenance Management Operation System (MMOS) already in place but airport might not have anything for the waste water treatment process. However, Regular maintenance will be conducted as outlined in this manual whereas specific work orders for sewage treatment facility and system will be passed through to the Airport MMOS. A list of the individuals that are responsible for the operation and maintenance of the sewage treatment system (sewage Lagoon) are as follows:

Regional Airport Manager (N): Steve Piercey; Ph.: 867 252-3923; Fax 867-252-3684;
E-mail: spiercey@gov.nu.ca
Director of Nunavut Airports: Todd McRay, Ph: 868-645-8203; Fax-867-645-8246;
E-mail: tmckay@gov.nu.ca.

2 BACKGROUND

2.1 General

2.1.1 Sewage Treatment Facility

Wastewater in Resolute Airport and its associated facilities is being treated by 4 cells non- engineered sewage lagoon system. The total capacity of all the lagoons is very inadequate to satisfy the demand. This lagoon treatment process is aeration in nature. This is a retention lagoon. A one meter free board is impossible to maintain all the time in order to protect structural integrity. Ten days advance notice is provided to the AANDC inspector prior to start decanting.
The Lagoon structure is vulnerable. This facility is under capacity and less effectively treating wastewater produced by the Community daily. The location Map is shown in Fig-1 as follows:

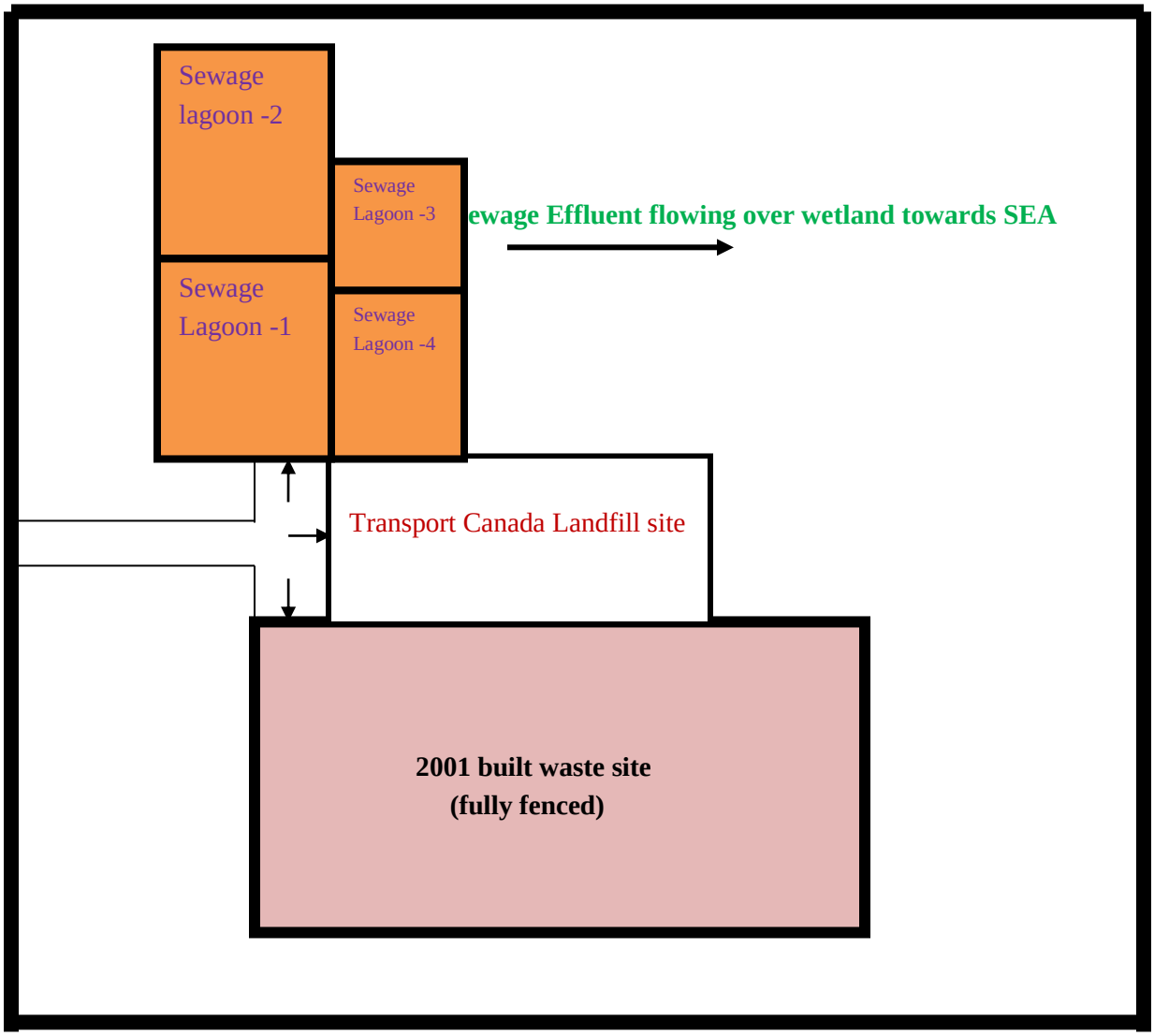


Fig.-1

2.1.2 Sewage Collection and Transport

The Airport has 20 users like Polar continental, ATCO hotel, Airport itself etc. The entire wastewater of these facilities is collected and transported to the sewage lagoon by ATCO vacuum truck. The sewage collection service operates 5 days a week. With one truck operating, about 4 to 5 trips are made to the sewage lagoon per day.

2.2 Sewage Production

It is approximated, for smaller operation in the North, such as, where water distribution is provided by trucks, that the sewage generation is equal to the water consumption. Therefore, the daily and annual sewage generation volume is approximately equivalent to the water consumption volumes. Airport and its associated facilities consume drinking water in average about 5M litres and the same amount is considered to be discharged into the Sewage lagoon.

Physical, chemical and biological characteristics of sewage are referred to as its composition. It is assumed that raw wastewater has a typical average concentration of 625 mg/L for BOD_5 and 900 mg/L for TSS. For domestic waste, average raw FC concentration is about 2×10^9 FCU per 100 mL.

3 SEWAGE DISPOSAL SYSTEM

3.1 Manual Organization

This section of the manual presents the operation and maintenance procedures that are associated with the wastewater treatment facility that designated operators assigned to the system should be aware of concerning the facility and system.

3.2 Equipment

The equipment required to operate the Resolute Bay Airport sewage treatment system consists of one sewage collection truck only. The Airport authority uses Bull Dozer and Font end loader to maintain the dykes as required.

3.3 Site Personnel

The overall responsibility of the waste disposal site as well as the overseeing of the operation and maintenance personnel is the Manager of GN-ED&T Resolute Airport Manager, whereas ATCO is only the user of this facility.

3.4 Operational Procedures

These procedures must be carried out frequently to ensure efficient operation of the treatment system. Daily operation procedures /should be carried out frequently to ensure smooth operation of the treatment system.

3.4.1 Basic Operations

1. Wastewater is collected from holding tanks at each residence and commercial building by sewage (vacuum) trucks.
2. Sewage (vacuum) trucks pump the wastewater out of the holding tanks and transport to the sewage treatment area.

3. Throughout the year, the wastewater is discharged into the lagoon through the offload chute located at the truck pad. The sewage truck backs up to the lagoon (bollards are placed for safety purposes) and the valve is opened. Wastewater is discharged into the lagoon over the splash pad.

4. The wastewater cannot remain in the lagoons for 12 months because these are under capacity and flow arrangement is made to prevent structural failure. The retention period is minimum to satisfy the effluent quality to the water licence requirement.

5. Twice decanting occurs, just after summer starts and before winter starts.

At least 10 days' notice to the AANDC prior to decanting is sometimes followed.

The effluent discharged from the existing Sewage Disposal Facility at sampling station YRB-3 should meet the following effluent quality standards as listed in **Table 3**. One meter free board is maintained all the time for structural integrity of the dykes.

Table -1: Effluent Quality Limits for the current Sewage Disposal Facility

Part D: Conditions applying to wastewater disposal (Licence # NWB 3YRB 0308)

Parameter	Units	Maximum Average Concentration
Fecal Coliforms, FC	CFU/100 mL	1×10^6
5 Day Biological Oxygen Demand, BOD_5	mg/L	120
Total Suspended Solids, TSS	mg/L	180
Oil and Grease	-	No visible sheen
pH		6 - 9

3.4.2 Decanting Procedure

The overflow is always controlled. The steps involved with mechanical decanting the lagoon cell are as follows:

- 10 (ten) day's notice is given to the AANDC inspector prior to start decanting.
- Monitoring flow rate is not possible to record for leaving discharge from the Lagoon.
- Monitor for erosion of the dyke at the end of the discharge and repair as required.
- Check daily for erosion, blockages and other problems that may occur on the upstream slope of the berm. Apply necessary procedures to fix problem during decanting.
- Monitor effluent samples at the beginning, at the middle and at the end of decanting process.

3.4.3 Service Disruption Contingency

In the event of any disruption in the service of the lagoon, for instance, the road to the lagoon is inaccessible; the Resolute Airport authority does not have any emergency sewage disposal site.

The Resolute Airport Authority (RAA) will notify AANDC when the emergency situation arises. In case of spill, spill hotline is notified.

The Resolute Airport Authority representing GN-ED&T Director of Nunavut Airports will be the responsible party for the actions taken under this emergency procedure.

3.4.4 Sampling Procedures and Requirements

A key component to the operation and maintenance of the sewage treatment system is a sampling program.

The proposed sampling program will help to monitor the treatment while verifying compliance with regulations. As well, it will model the treatment process which with help to understand the behavior of the lagoon for future development and expansion of the system.

It is important such a sampling program be implemented by the ATCO as a part of the contract for annual monitoring program. GN-ED&T that operates the system are to be trained on the proper operation and procedure methods used in the sampling program. In addition, quality and safety training will also be included which will ensure that the high quality data will be obtained.

All sampling, sample preservation and analyses will be in accordance with methods described in the current edition of *Standard Methods for the Examination of Water and Wastewater*. In addition, a document has been attached in **Appendix A** of this manual that provides guidelines and procedures to follow when sampling wastewater.

To obtain meaningful results from the analysis, the following five factors are of particular importance:

- Sample collection at designated time and location;
- Correct usage of container/sample bottle for parameter being tested;
- Correct labeling of sample bottles and filling out record/field sheet;
- Correct procedure for field sampling;
- Proper and timely shipment of samples to the laboratory.

It is critical, from a quality perspective, that sample collection be performed from an area of higher concentration to an area of lower concentration of contaminants. Therefore, a sample will be collected at various locations along the system to monitor the effluent quality at various stages of treatment. Descriptions of each sampling location of the sewage treatment system for the Monitoring Program are listed in **Table 2** below in page 13 and shown in **Figure 2** on page 13.

Table 2: Sampling Station Locations

Monitoring Program Station Number	Description of Monitoring Program Station
YRB-2	Raw sewage at Truck offload point; N74^{0}40.408' and W94^{0}55.256'
YRB-3	Effluent discharge from the Final Discharge Point of the Sewage disposal Facilities
	N72^{0}41.973' and W77^{0}55.902'

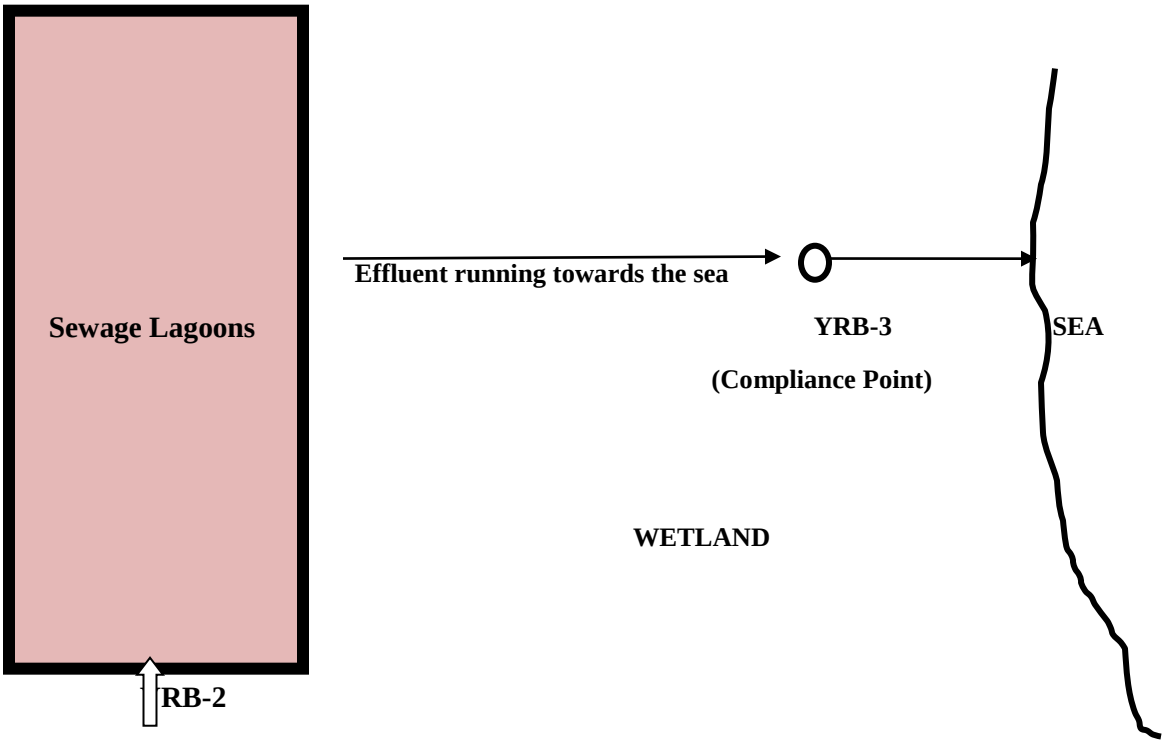


Figure 2: Sampling Locations

By obtaining samples at the location proposed above, effluent treatment rates can be monitored. According to the water licence, wastewater samples will be taken from location YRB-2 and YRB-3 three times in summer. These wastewater samples will undergo the same analysis which will include the following set of parameters as listed on the following page.

Table-3: Parameters to be tested
Part H; item 2: WL NWB YRB 0308

Biochemical Oxygen Demand, BOD_5	
Total Suspended Solids, TSS	Fecal Coliforms, FC

pH	Conductivity
Oil and Grease (Visual)	Ammonia Nitrogen, NH_3-N
Nitrate-Nitrite	Total Phenols
Potassium, K	Calcium, Ca
Total Arsenic, As	Sodium, Na
Total Chromium, Cr	Sulphate, SO_4
Total Copper, Cu	Total Cadmium, Cd
Total Lead, Pb	Total Mercury, Hg
Total Manganese, Mn	Total Nickel, Ni
	Total Zinc, Zn

Samples from the truck will provide quality of the raw sewage before it enters the lagoon. This data will assist with monitoring the water quality of these areas by comparing the results of both raw and treated wastewater samples. These samples will be taken four times in summer months. No flow meter exists in the sewage truck to record discharge volume.

The samples will be shipped to the Caduceon laboratory in Ottawa, ON. and analyzed using the same test method/procedure. This sampling program will be conducted over several years to collect sufficient data for trend analysis. All lab results for the monitoring program will be submitted to NWB along with the annual report. Note that any other additional sampling during the year will be at the request of the regulatory agencies.

3.4.5 Sludge Monitoring Plan

The sludge blanket will be monitored as part of the annual discharge procedure. Approximately 10 year's interval, a study may be undertaken to determine the need and frequency for sludge removal and disposal over the lifetime of the lagoon. It is recommended for storage the sludge blanket at the bed of the lagoon for the life time of operation of the lagoon. If the lab test results from the lagoon discharge quality, specifically BOD and TSS analyses, become non-compliance, then sludge removal study can be conducted earlier.

Sludge in sewage lagoon should be sampled more often if required. The purpose of the sampling is to ensure that the sludge remains of a quality suitable for land disposal. Sampling shall consist of a sample collected from the center point of a grid no less than 10 m by 10 m. Sufficient samples shall be taken to describe the entire sewage lagoon. Results from the sludge analysis are to be reported upon completion of the test and in the annual report.

3.4.6 Geotechnical Reviews

A Dam Safety review is to be completed by a qualified Engineer, considering Municipal Engineer and will be executed annually in each summer following GN-CGS report card.

The review is to include a site inspection report of the existing lagoons under operation based on the following items:

- Site inspection of all berms and structures of the lagoon.
- Safety review to include the operation of all discharge and back up equipment and procedures,
- Maintenance review to verify that all facilities required for safety of the dam and monitoring systems are maintained in satisfactory condition.
- Review of the surveillance and monitoring program and methods to verify that the monitoring program will detect any unsafe conditions in a timely manner.
- Review the level of emergency preparedness to verify that it is appropriate for the facility.
- Review previous report to verify that recommendations have been complied with.

The report generated from the geotechnical review will be submitted as a part of the annual report to the Nunavut Water Board.

3.4.7 Record Keeping and Reporting

Records of all activities and operation should be kept to assist in the planning of annual operations and maintenance as well as the evaluation of the effectiveness of the sewage treatment facility. These records should be kept in the Resolute Airport office and be maintained by the facility's supervisor. Sample O&M log sheet for the Resolute Bay Airport Sewage Treatment System is available in the Resolute Airport office.

Sampling, Record keeping and reporting requirements are listed in the water license which is attached in **Appendix A** of this document. Based on the record keeping and reporting requirements listed in Part B of the water license, the following information and data should be recorded and be included in the annual report that is submitted to the Board:

- Monthly and annual quantities in cubic meters (m^3) of raw sewage offloaded from sewage trucks for the existing Sewage Disposal Facility.
- Number of days of use for the existing Sewage Disposal Facility.
- Number of trips to the Sewage Disposal Facilities;
- Start and end date for discharge of lagoon;
- Date and description of maintenance activities carried out on the Sewage Disposal Facility and
- Date, volume and description of any spills that have occurred.

3.4.8 Health and Safety

Due to the potential health hazards associated with municipal wastewater, it is imperative, for those personnel working in this area, to be familiar with and execute all safety precautions involved with the various work tasks associated with the system.

- Equipment is to be kept clean.
- Wear protective clothing such as gloves and boots at all times.
- Work cloths should not be worn home.

- Hands to be washed frequently; as a minimum before eating and after work.
- Personnel should receive appropriate vaccinations and ensure they are kept up-to-date.

3.5 Maintenance Procedures

In the proceeding sections, maintenance procedures for the different areas of the wastewater treatment infrastructure are discussed and should be carried out to ensure the system runs efficiently.

3.5.1 Sewage Trucks and Holding Tanks

The most important part of the sewage treatment system and process is the collection and transport of the wastewater from the residences and buildings to the lagoon cell. Therefore, it is crucial that the sewage truck be kept in good repair. Procedures for truck and tank maintenance are as follows:

- Repairs should be completed immediate and take high priority;
- Full tank sewage trucks should not rest for long periods of time, especially during the winter;
- Holding tanks should be kept in good working order and prevented from freezing in the winter.

3.5.2 Access Road and Truck Pad

Basic road maintenance such as those listed below must be performed on a regular basis to ensure that the site is accessible at all times. Road and truck pad be graded smooth and reshaped at least twice (2) per year;

- Snow, when necessary during the winter, to be removed to provide unrestricted access to discharge point;
- During snow removal, care is to be taken not to damage berms and surrounding areas;
- Any spilled and/or frozen wastewater should be removed with the snow to appropriate disposal site;
- Discharged point should be monitored for potential erosion problems.

3.5.3 Drainage

The truck pad at the sewage discharge point should be graded such that any wastewater spilled during the offloading procedure will flow into the lagoon cell and sewage treatment system. During the winter months, it is important to monitor the discharge pipe as this may be problems with flow during periods of extreme low temperatures. Wastewater remaining in the pipe may freeze, causing blockage and/or buildup which can potentially damage or break the structures.

3.6 Operation and Maintenance Summary

Daily, weekly, monthly and yearly activities and procedures that are required by the operator and maintenance personnel are summarized in **Table 6** shown as follows.

Table 6: Summary of Operation and Maintenance Tasks

Frequency	Description of Task
Daily	▪ Collection, transportation and disposal of wastewater and/or sewage from residential and commercial holding tanks to the truck discharge point at the sewage treatment lagoon. ▪ Immediate cleaning of any spills. ▪ Clearing of snow from access road and truck turn-around pad as required during winter. ▪ Maintaining O&M information records
Weekly	▪ Inspection of berms, dykes and drainage courses. ▪ Monitoring of area surrounding thermistor. ▪ Conduct weekly monitoring program (if required). ▪ Maintaining O&M information records
Monthly	▪ Maintenance of access road and truck pad if required. ▪ Monitoring and recording of thermistor readings for monitoring program. ▪ Confirm location and readability of signs. ▪ Conduct monthly monitoring program (if required). ▪ Maintaining O&M information
Yearly	▪ Perform annual decanting of lagoon cell in fall. ▪ Conduct geotechnical review of geothermal monitoring program. ▪ Grading and reshaping of access road and truck pad. ▪ Conduct annual monitoring program (if required). ▪ Maintaining O&M information records

4 SPILL CONTINGENCY PLAN

4.1 Community Contact Information

Todd McRay: Director of Nunavut Operations: E-mail: tmcray@gov.nu.ca

Steve Piercey: Regional Airport Manager (N): E-mail: spiercey@gov.nu.ca

4.2 Distribution List

This plan and most recent revisions will be distributed to:

Ralph Ruediger	Director of Community Development, GN-CGS
Todd McRay	Director of Nunavut Airport Operations
Steve Piercey	Regional Airport Manager (N)
Timoon Toonoo	Director of Community Support, GN-CGS
Bhabesh Roy	Municipal Planning Engineer, GN- CGS
Angela	Senior Administrative Officer

Phyllis Beaulieu	Manager of Licensing, Nunavut Water Board
Erik Allen	Manager, Nunavut AANDC field operations

4.3 Purpose and Scope

The purpose of this plan is to outline response actions for potential spills of any size, including a worst case scenario for the Resolute Airport Sewage Lagoon. The plan identifies key response personnel and their roles and responsibilities in the event of a spill, as well as the equipment and other resources available to clean up a spill. It details spill response procedures that will minimize potential health and safety hazards, environmental damage and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to a spill.

4.4 Community Environmental Policy

The Resolute Airport has no formal Environmental policy for this sewage Lagoon; however, the Department of Economic Development and Transportation (ED&T) of Government of Nunavut is committed to operating in an environmentally sensitive manner, and complying with requirements of the Nunavut Water Board.

4.5 Project Description

This spill contingency plan will be used by the Resolute Bay Airport, for activities associated with Airport operations. These include:

- Operation of the existing the four cell non-engineered sewage disposal site

4.6 Personnel training

The Contractor (ATCO) personnel that are taking responsibility for the sewage disposal are required to be trained in Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods Act and Regulation (TDGA and TDGR) as well as First Aid. In addition, personnel should ensure that proper vaccinations of employees are kept current and that they are familiar with the response plan. It is good practice to obtain copies of a list of procedures and equipment that are to be used for such emergencies in all sewage trucks and the common work area.

In all response cases, personnel should place their own safety as the highest priority. The procedures that should be taken in the likelihood of a potential fire or spill are described in the following sections.

It is noted that ATCO is a private contractor stationed at Resolute Bay only user of the Sewage Lagoons but they have no other responsibility or obligations for maintenance of these lagoons.

4.7 Fire

A contingency plan should be developed by the Hamlet of Resolute Bay Fire Department to describe the response and action protocols to be implemented in the case of a fire. Special precautions should be used in the case of waste burning as it can produce harmful, poisonous gases. If an uncontrolled fire occurs, the following procedure should be implemented:

- Immediately evacuate area and go to community's designated meeting place.
- Keep all personnel up-wind from the source.

- Notify the Hamlet Fire Department at (867)- 252-3019

4.8 Spill Contingency

A spill contingency plan has been developed by the Resolute Bay Airport authority that identifies the procedures to follow when a spill of any hazardous material has occurred. Similar procedures can be used for the case of sewage spills.

Below, in the subsequent sections, the measures that are to be implemented if a spill or uncontrolled release of a substance occurs during the collection and transportation of wastewater are described for the following areas:

- Initial Response
- Containment Procedures
- Spot Spills
- Spills in Proximity to a Water body

4.8.1 Initial Response

If a spill occurs, the first person at the scene will:

1. Perform an initial assessment to identity immediate danger.
2. Identify the material spilled and verify the nature of the hazard by corresponding to the Material Safety Data Sheets (MSDS) so to apply appropriate safety procedures.
3. If possible and safe to do so, cut off and/or stop the source of the spill.
4. Control danger to the human life without further assistance, if possible. If, for instance, the spill creates a fire, explosion or other hazard, remove all potential ignition sources.
5. Obtain immediately assistance from others and start to contain and/or clean up the spill.
6. Contact the Resolute Airport Manager to notify them of the spill as they will contact relevant regulators and community residents of the occurrence.
7. Mark off the spill site as to warn the public of the incident and to prevent access.

Once the Resolute Airport Manager or ant ED&T staff has been contacted and have arrived on site, he/she will immediately ensure that:

1. Necessary arrangements for first aid and removal of injured personnel have been made. Where possible, necessary action will be taken to secure the site to protect human safety.
2. If not already done and is safe to do so, take the appropriate action to stop the flow or release of material/substance as well as to contain or prevent the spread of the spilled material if at all possible.
3. Contact the 24 Hour Spill Line at (867) 920-8130 to report spill and obtain additional assistance.
4. Contact the Manger of Resolute Airport, ED&T and also Hamlet's Senior Administrative Officer.
5. If required, notify the Fire Department at (867) 980-4422 and RCMP Detachment at (867) 980-1111.

4.8.2 Containment Procedures

Response personnel will immediately start to contain the spill to ensure that the spill does not spread and contaminant other areas and/or environment. The following actions might also be taken if relevant to the spill situation:

1. If the source of the spill is coming from a leaking fuel truck, then pump fuel into a suitable container or another tank until the tank is dry.
2. Culverts that have been potentially affected by the spill should be blocked off to minimize travel of the substance.
3. Dig a basin or construct a berm to stop and contain the pathway and flow of the spill.
4. Apply absorbent materials to contain and recover small volumes of spilled substance.
5. Spilled substance and/or material are to be collected and transported to an approved waste disposal facility in the appropriate matter.

4.8.3 Spot Spills

Spot spills are those that involve a small volume of substance in a controlled material over a small, contained surface area. For spot spills involving hazardous materials, the following steps may be taken by personnel:

- Immediately take action to clean up spill by implementing proper or suitable handling and containment procedures for the material spilled.
- Report spill to the Resolute Airport Manager of ED&T.
- Determine suitable methods for removal of contaminated soils and restoring site of the spill. Consult environmental and government agencies for assistance.
- Flag and record locations and information of spot spills for future reference and monitoring.
- In the case of a spot sewage spill, place lime over the sewage, collect and transport the material to the solid waste facility for proper disposal.

4.8.4 Spills in Proximity to a Water body

If a spill occurs in close proximity to a water body, take necessary actions to prevent the spill entering the nearby water body. Similar containment procedures discussed above in Section 4.9.2 can be used to assist with the likelihood of spills located near water bodies.

4.9 Existing Preventative Measures

The community is concerned about the environment and the possibility of a spill occurring and takes precautions when working with hazardous materials; however, no formal preventative measures are in place.

4.10 Additional Copies

Several copies of this plan will be kept in the GN-ED&T Regional Airport Manager (N) and Hamlet Office.

4.11 Process for Staff Response to Media and Public Inquires

All media enquiries are directed to the GN-ED&T Director of Nunavut Operations.

5 RESPONSE ORGANIZATION

5.1 Response Personnel

The following table lists the personnel who will be involved in the spill response. Contact information is also provided.

Table 10. Response Personnel Contact Information

Name	Contact Information
Director of Nunavut Airports, GN-ED&T	Ph-867 645-8203;Fax-867 645-8246; e-mail: tmckay@gov.nu.ca
Regional Airport Manager (N), GN-ED&T	Ph- 867-252-3923;Fax -867-252-3684; e-mail: spiercey@gov.nu.ca

5.2 Flowchart of Response Organization and Communication Lines

The following flowchart outlines the chain of communication to be followed, upon discovery of a spill or release by an employee of the community.

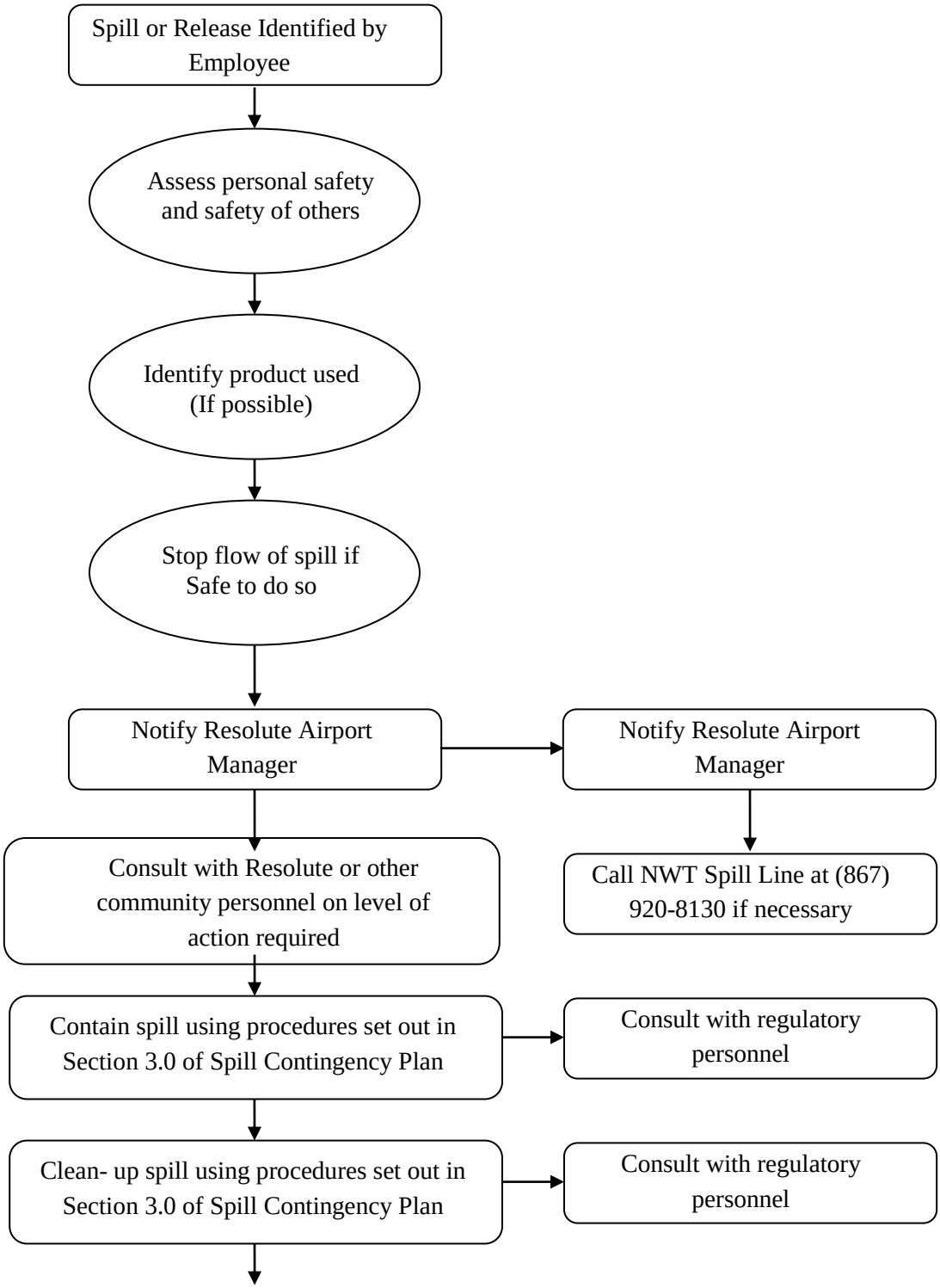


Figure 4: Flowchart of Spill Communication Lines

5.3 Summary of Available Communication Equipment

The following equipment is available in the community for communication purposes:

- Telephone with land line
- Computers with internet connection in Resolute Airport Office
- Fax machine

6 ACTION PLAN

6.1 Potential Environmental Impacts of Spill

Generally, for the hazardous materials discussed below, environmental impacts are lower during the winter, as snow is a natural sorbent and ice forms a barrier lining for eliminating soil or water contamination. Spills can be more readily recovered when identified and reported.

Gasoline:

Environmental Impacts:

- Harmful to wildlife and aquatic life
- Not readily biodegradable
- Has potential to bio accumulate in environment
- Volatilizes easily
- Runoff into water bodies must be avoided

Worst Case Scenario: All fuel drums open simultaneously and contents pour onto ground and surrounding environment.

Diesel:

Environmental Impacts:

- Harmful to wildlife and aquatic life
- Not readily biodegradable
- Has potential to bio accumulate in environment
- Burns slowly (more readily contained than volatile fuels)
- Runoff into water bodies must be avoided

Worst Case Scenario: All fuel drums open simultaneously and contents pour onto ground and surrounding environment.

Waste Oil and Miscellaneous Oils and Grease:
Environmental Impacts:

- Harmful to wildlife and aquatic life
- Not readily biodegradable
- Has potential to bio accumulate in environment
- Runoff into water bodies must be avoided

Worst Case Scenario: All storage drums open simultaneously and contents pour onto ground and surrounding environment.

Sewage:
Environmental Impacts:

- Human health hazard, and unsightly appearance
- High nutrient concentrations could negatively impact water bodies and runoff into water bodies must be avoided

Worst Case Scenario: Full sewage truck releases all of its contents onto ground and surrounding environment.

6.2 Procedures

6.2.1 Procedures for Initial Actions

The following list of actions should be followed by the first person on the scene:

- Ensure safety of all personnel
- Identify the product spilled
- Assess the hazards and risks to persons in the vicinity of the spill
- If possible, without further assistance, control the danger to human life
- If it is safe to do so, and if possible, stop the spill (i.e. shut off pump, replace cap, tip drum upward, etc.)
- Gather information on the status of the situation, including:
    - Estimated size of spill
    - Estimated migration route
- Contact GN-ED&T Resolute Airport Manager, as per flowchart in Figure 3.

6.2.2 Spill Reporting Procedures

Spills should be reported immediately to the GN-ED&T Resolute Airport Manager, who will notify the GN-ED&T Director of Nunavut Airports. Together they will determine if the spill is to be reported to the NWT 24-Hour Spill Line at 867-920-8130.

Copies of the Spill Report form are available in each spill kit and at the back of this manual. The form will be filled out by the Public Works Foreman (or designate), and faxed or emailed to the NWT Spill Line. Contact information is as follows:

Territorial 24-Hour Spill Line
Phone: (867) 920-8130
Fax: (867) 873-6924
Email: spills@gov.nt.ca

6.2.3 Procedures for the Protection of Human Health and Safety

Following a spill, the health and safety of workers as well as the general public is a priority. Actions taken will depend on the type of spill.

- ***In the event of a chemical spill***: Restrict public access to the spill area. Workers involved in the clean-up of the spill should wear personal protective equipment (PPE).
- ***In the event of a flammable or combustible material spill***: Evacuate adjacent buildings and restrict public access to the spill area. Remove sources of ignition if safe to do so (no smoking, flares, sparks or flames in the area). Never walk through or touch the spilled material. De-energize electrical equipment from a remote location if safe to do so. If ignition sources cannot be removed safely, evacuate the area immediately and report the spill situation. All equipment used when handling the material must be grounded. Only spark-arresting equipment should be used during clean-up of the spill. PPE should also be worn by workers involved in the clean-up. Refer to the product Material Safety Data Sheet (MSDS) for further instruction.
- ***In the event of a sewage spill***: Restrict public access (including pets and animals) to the spill area.

6.2.4 Procedures for Containing and Controlling Spill

General procedures noted below will be used to contain and control all spills. Specific procedures for spills on land, water, snow and ice follow.

- First anticipate what will be affected by the spill.
- Assess direction and speed of spill, and any factors that could affect these.
- Determine best location for containing spill.

Spills on Land:

Dykes and trenches can be constructed to contain spills on land. Soil surrounding the spill area can be dug out, and piled up, to create a barrier for the spill. A plastic tarp can be placed at the base of the dyke, so that the pooled material can be removed with sorbent materials. Conversely, trenches can be excavated to permafrost, which will provide a natural containment of the spill. Once the material is contained, it can be pumped out, or removed by using sorbent materials. If the spill is moving very slowly, such structures may not be necessary and the material can be removed before migrating away from the spill location.

Spills on Water:

Spills on water are considered the most serious types of spills, as there is often no containment of the spilled material and water quality and aquatic life are negatively impacted. Booms and weirs can be installed to contain the spill. Booms are designed to float, and are made of absorbent material to soak up the spilled fuel. They are deployed from the shore or a boat, to create a circle around the spill. Weirs are installed across a stream, to prevent further migration. Plywood or other materials found onsite can be used. Barriers made of fence or netting can be used as well, with sorbent material placed at the base of the barrier. Once contained, the fuel can be removed by absorbent materials, pumped out or allowed to volatilize.

Spills on Snow:

Snow acts as a natural sorbent for spilled fuel. Impacted snow is easily visible, and can be shoveled into empty drums or barrels for proper disposal. If the spill is migrating down a hill, a snow dyke can be constructed to contain the spill. A plastic tarp can be placed at the base of the dyke, where spilled fuel is expected to pool. The collected fuel and impacted snow ban be removed with absorbent materials, pumped out, or shoveled into barrels for disposal.

Spills on Ice:

Ice is considered impermeable to fuel, so these spills are generally easy to clean up. Small spills can be cleaned up by placing absorbent materials on top of the ice. Impacted snow and slush can then be removed by shovels, and placed in barrels for disposal. For larger spills, dykes of snow and trenches can be constructed to contain the spill. Pooled fuel can then be removed by adsorbent materials or pumped out. Impacted snow and slush can be shoveled into barrels for disposal.

Worst Case Scenarios:

Worst case scenarios include a dyke or trench overflowing and a large spill on water that cannot be contained with materials available in the community. In the first case, a trench or collection pit could be constructed downstream to collect the fuel. In the second case, an emergency response team would need to be called, with appropriate equipment to deal with the spill.

6.2.5 Procedures for Transferring, Storing and Managing Spill Related Wastes

Spills are generally cleaned up starting at the outer limit of the spill, and working towards the point of the spill. Sorbent materials and hand tools such as cans and shovels are used for smaller spills. Larger spills can be contained with the use of a pump and/or heavy equipment.

Spill wastes include used absorbent materials and containers of impacted water and snow. Sorbent materials should be placed in plastic bags for proper disposal. The containers of impacted water and snow should be sealed and stored until disposal at an approved facility can be arranged.

Following a spill, all used materials need to be properly washed and/or replaced.

6.2.6 Procedures for Restoring Affected Areas

Once a spill has been contained, community personnel will consult with regulatory personnel assigned to the file to determine the level of clean-up required. Regulatory personnel may request that a site specific study be conducted, to ensure appropriate clean-up levels are met.

7 RESOURCE INVENTORY

7.1 On-site Resources

It is recommended that the Resolute Bay Airport or Hamlet of Resolute Bay retains one spill kit and the spill kit should contain the followings:

- 30 socks/booms (3” x 4’)
- 30 pillows (2L)
- 24 dispersal bags
- 4 pairs gloves
- 2 pairs goggles
- 6 pairs Tyke coveralls
- 4 shovels
- 2 spill signs
- 2 repair putty
- 1 Emergency Response Guidebook
- 1 Safety and Compliance Directory
- 1 Spill Response Pocket Guide

This response kit is designed to contain and collect up to 56 gallons of spilled oil. Additional volumes will be accommodated with the use of absorbent products that will be maintained in inventory in sufficient quantities.

The following heavy equipment is also available in the community for spill containment:

- Loader
- Dozer

7.2 Off-site Resources

The following resources are available for assistance if needed:

Territorial 24-Hour Spill Line	(867) - 920-8130
Aboriginal and Northern affair Canada (AANDC)	(867) - 669-2761
GN – Emergency Measures Officer	(888) - 624-4043
RCMP (Resolute Bay)	(867) - 252-1111
Environment Canada (Emergency) Yellowknife	(867) - 669-4725
GN Environmental Health Office	(867) - 975-4815
Health Center	(867) – 252-3844
First Air	(867) –252-3981
Ken Borek	(867) - 252-3845

Training Schedule and Recordkeeping:

Training will be conducted on an as-needed basis. Records will be kept in the Resolute Airport office.

APPENDIX:

Appendix- A: Guidelines of water, wastewater and Leachate Sampling and testing
Appendix- B: Spill Reporting Form

REFERENCE:

- Dillon Consulting Limited. "P lake Sewage Lagoon System", produced for Department of Community and Government Services, Government of Nunavut, January 2006.

USERS:

- Environment Canada
- ATCO Airport Hotel
- ATCO Warehouse
- Arco Maintenance shop
- First Air Cargo Shed
- Resolute Airport Terminal
- Resolute Airport Maintenance Shop
- Kenn Borek Staff House
- Knn Borek Hanger
- Nav Canada Complex
- Nunavut Power Plant
- Nunavut Power Staff House
- Natural Resources Complex
- Natural Resources Hanger
- Natural Resources Lab
- Canadian Forces Arctic Training Center
- RCMP Detachment
- RCMP Force Housing 2 units
- Hamlet Arena
- SIBuilding

APPENDIX-A

GUIDELINES FOR WATER, WASTEWATER AND LEACHATE SAMPLING AND TESTING

Guide Lines for Water, Wastewater and Leachate sampling
Baffin Communities

Drinking water:

Monthly Sampling: (Bacteria analysis)

1. Collect five samples (**200 ml each**) from five different locations and send to Iqaluit Health Lab though your local health center. One of the five samples should be raw water sample.
   Once in month for Resolute Bay.

Annual Sampling: (Bacteria and Chemical Analysis)

2. Send samples to Caducean Environmental Lab, Ottawa, Ontario.

   Caducean Environmental Lab
   Gord Murphy, Lab Supervisor
   2378 Holly Lane
   Ottawa, ON, K1V 7V1
   Ph-613-526-0123
   Fax-613-526-1244

Precautions of Sampling:

1. Be careful not to let the mouth of the bottle or lid touch anything including sampler's fingers.
2. Do not overfill the bottle or rinse out
3. Fill the bottle to the 200ml line from water tap, valve or water truck delivery hose nozzle. When sampling from a water tap, remove screen, aerator or other attachment from tap and allow the cold water to run for 2-3 minutes before collecting. Do not dip into the filled water truck tank to take a sample.
4. Ensure each bottle label information is filled for:
   - Date and time sample was taken
   - Sample point location
   - Sampler's name

5. Persons' name and contact address where to send sample Test results and invoice.
6. Samples must arrive at the Labs either Iqaluit or Ottawa within 24 hrs. from the time of sampling.

Wastewater:

1. Collect five treated samples from the first point of discharge of Sewage (end of pipe).
2. Collect Five raw samples directly from the truck discharge

Leachate:

1. Collect five leachate samples from the land fill site

Sample bottles specifications for Wastewater and leachate:

Five samples should be taken from a point in five different bottles:

Bottle 1: **500 ml**

Bottle 2: **100 ml**

Bottle3: **1000 ml**

Bottle 4: **250 ml**

All the wastewater and Leachate samples will be sent to Caducean Lab, Ottawa, ON.

Precautions of sampling:

1. Use hand gloves
2. Ensure each bottle level information is filled:
    1. -Date and time sample taken
    2. -Location with GPS coordinates
    3. -Sampler's name
3. Person's name and contact information where to send sample Test Results and invoice.
4. Samples must be arrived Ottawa Lab within 24 hours from the time of sampling.

APPENDIX- B:

SPILL REPORTING FORM

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR	REPORT NUMBER -
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME	☐ UPDATE # TO THE ORIGINAL SPILL REPORT	
C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)		