

**Appendix H – Operations and Maintenance
Manual, Sewage and Solid Waste Facility**

Hamlet of Paulatuk

Operation and Maintenance Manual

Sewage and Solid Waste Disposal Facilities

DILLON CONSULTING LIMITED
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1.0 INTRODUCTION

1.1 Purpose

This manual has been produced to assist the Hamlet of Paulatuk personnel in the proper operation and maintenance of the Hamlet's sewage and solid waste disposal facilities. The "Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities" (MACA, 1996) and the "Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories" (MACA, 2003) were referred to during the preparation of this manual.

At the end of this manual, several photos have been included to portray various components of the solid waste and sewage disposal systems in Paulatuk. These photos are found in Appendix A.

1.2 Site Setting

The community of Paulatuk, Northwest Territories is located at the south end of Darnley Bay on the Arctic Coast. It is located at 69°21'N and 124°04'W, and is situated approximately 400km east of Inuvik and 855km northwest of Yellowknife. The mean temperature is 18.8°C in July and -29.4°C in January. Precipitation in the community averages 224mm annually. Paulatuk is located in an area of continuous permafrost with soils that are predominantly sandy, glacial till and marine sands and silts. The community has an airport, but no road access. Supplies are shipped in annually via barge on the ocean, or by plane.

1.3 Population Projection

The population projection for the Hamlet up to the year 2019 was obtained from the GNWT Bureau of Statistics (www.stats.gov.nt.ca). This information is displayed in Table 1; the figures were revised in July 2000, so the population noted up to and including the year 2000 was the actual population.

Table 1: Paulatuk Population Projection

Year	1991	1996	1997	1998	1999	2000	2004	2009	2014	2019
Population	271	297	299	307	309	323	318	342	375	411

1.4 Contact List

The individuals responsible for the operation of the sewage waste disposal facilities in Paulatuk are the following:

Tom Caines	Senior Administrative Officer	(867) 580-3531
Keith Dodge	Municipal Foreman	(867) 580-3039
Gilbert Ruben	Municipal Employee	(867) 580-3039

2.0 BACKGROUND

2.1 General

Water use

The Hamlet of Paulatuk currently obtains its drinking water from New Water Lake, approximately 2km from the Hamlet at the base of the hills behind the community. New Water Lake is fed by a drainage basin approximately 140 hectares in size. The water supply facility and truck fill station is located near the lake, and the intake pipe leads out into the lake where water is withdrawn.

Chlorination is required for disinfection of the raw water, and treated drinking water is delivered by water truck to homes and facilities in Paulatuk.

Sewage Disposal

The community sewage lagoon is a natural lake (locally referred to as 'Dead Lake' or 'Lake "A') located approximately 2 km from the Hamlet. The lagoon is approximately 250 x 350m, and is not connected to the drainage basin that the water supply (New Water Lake) is located within. The Hamlet's solid waste facility is located at the same site. The community has used this particular lake for the treatment of its' municipal sewage since the early 1990's.

Sewage is collected from the community by vacuum truck five days a week and disposed at the sewage lagoon. The trucks discharge the sewage using the chute at the facility.

Solid Waste Disposal

Solid waste is collected from the community by a truck twice weekly, with increased pickup as required during peak times such as near Christmas holidays. The waste is transported to the solid waste disposal site; there is one public access road to the disposal site. Separate disposal areas are used for refuse, hazardous materials, and bulky metal waste. Refuse is disposed of in cells (trenches) and covered with overburden as required.

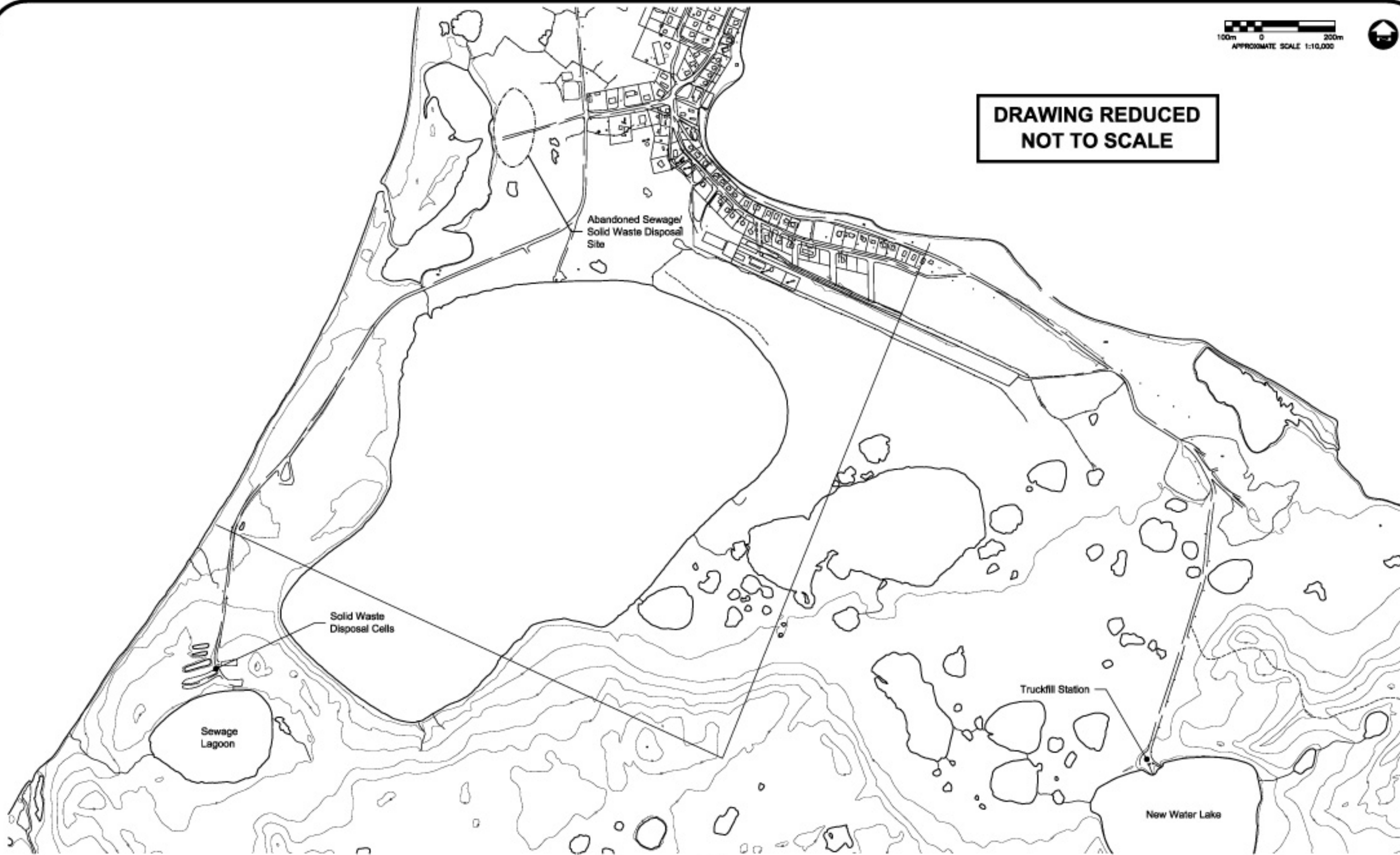
A preliminary study of options for a new sewage and solid waste disposal site for the Hamlet was done in 1986 by Reid Crowther & Partners Ltd. prior to the sites being relocated to where they are now. This study mentioned that the community residents preferred a location for the lagoon that was further from town; the old location was only 400m away, and upwind of the community. In addition, the old solid waste facility was a dump rather than a landfill or modified landfill, and was unaesthetic and odiferous near the community.

Figure 1 on the next page illustrates the locations of the sewage lagoon and the solid waste disposal facility in relation to the Hamlet of Paulatuk.

100m 0 200m
APPROXIMATE SCALE 1:10,000



**DRAWING REDUCED
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PROJECT	Hamlet of Paulatuk Current & Abandoned Water Supply Facilities and Waste Disposal Sites
TITLE	Site Plan

PROJECT NUMBER	043332
DATE	July 2004
FIGURE NUMBER	FIG 1

3.0 SEWAGE DISPOSAL SYSTEM

3.1 Manual Organization

This section of the manual was developed to present operational and maintenance procedures to designated operators of the wastewater treatment facility in Paulatuk. Each set of procedures is explained individually. The final section of the manual provides a summary of operational and maintenance procedures broken down into daily, weekly, monthly and annual tasks.

3.2 Equipment

The equipment used to operate the Paulatuk sewage treatment system consists of the following:

- Year 2000 Freightliner FL80 Vacuum Truck (see Appendix A, Figure 1 for photo)
- Year 1991 Ford F700 Vacuum Truck

3.3 Site Personnel

The Senior Administrative Officer (SAO) has the overall responsibility for the waste disposal site, and oversees the employees working at the site. The day-to-day operation and maintenance of the facility is the responsibility of the Hamlet Foreman. One or two people are employed by the Hamlet to operate the sewage collection vehicle.

3.4 Operational Procedures

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

3.4.1 Basic Operations

1. Wastewater in Paulatuk is collected from holding tanks at each residence or commercial building.
2. Suction trucks pump the wastewater out of the holding tanks and transport it to the sewage treatment area.
3. There are a very small number of homes still using honeybags; these are collected as required and deposited in a designated pit near the lagoon. They are covered over with dirt as often as required.
4. Each time it is collected, the wastewater is trucked out and discharged into the lagoon. The sewage truck backs up to a chute on the gravel pad at the lagoon, and the valve is opened. Wastewater is discharged through the chute into the lagoon. (See Appendix A, Figure 2 and Figure 3)
5. Discharge from the lagoon is at a natural rate, as there is a natural outflow from the lagoon through a wide vegetated corridor before it reaches Darnley Bay.

3.4.2 Sampling Procedures and Requirements

Monitoring the wastewater effluent is an important step in the efficient operation of the wastewater treatment system in Paulatuk and is required by the NWT Water Board. Six factors are particularly important to producing meaningful results:

1. Collecting the samples at the designated time
2. Using the correct clean sampling container for the parameter being tested
3. Collecting the samples from the correct location and completing any necessary field tests at that time
4. Labeling the samples correctly and filling out a record sheet
5. Using the correct procedure for field tested parameters
6. Shipping the samples quickly and in the correct containers to the analytical laboratory

A “Surveillance Network Program” (SNP) sampling protocol has been developed and SNP station locations are outlined in the Hamlet’s Water License as well as below.

<u>Station Number</u>	<u>Description</u>
1619-1	Raw water supply from New Water Lake
1619-2	Outlet of sewage lagoon before entering Darnley Bay

Record Keeping

Records should be kept to assist in planning for yearly operations and to assist in the evaluation of the effectiveness of the sewage treatment facility. The records should be stored in the Hamlet Office and be maintained by the Hamlet Foreman. As a minimum, the following information should be recorded:

- The approximate volume of sewage discharged to the system (this may be calculated as a percentage of the fresh water trucked to each residence or facility in the Hamlet; those records are kept by the Hamlet for water billing purposes)
- The dates any monitoring is conducted
- The results of the monitoring program
- Any maintenance activities carried out on the facility

3.4.3 Health and Safety

Due to the potential health hazards associated with sewage handling and treatment, the following safety precautions should be taken by sewage treatment personnel:

- Equipment is to be kept clean
- Hands are to be washed frequently, as a minimum after work and before eating
- Work clothes should not be worn home, and work gloves and boots should be worn at all times
- Personnel should receive appropriate vaccinations and ensure they are kept up to date

3.4.4 Bear Safety

Brown bears are known to frequent the area, and precautions should be taken. Bear safety information can be found in Appendix B, as well as on the GNWT's Resources, Wildlife and Economic Development website under Bear Safety:

<http://www.nwtwildlife.rwed.gov.nt.ca/Publications/safetyinbearcountry/safety.htm>

3.5 Maintenance Procedures

The following maintenance procedures should be carried out to ensure that wastewater treatment infrastructure operates efficiently.

3.5.1 Sewage Trucks and Holding Tanks

The transport of sewage to the treatment facility is critical to the whole process. As such, it is important that the sewage trucks be kept in good repair.

- Repairs to sewage trucks should be completed as a priority
- Sewage trucks should not sit full for long periods in the winter
- Holding tanks must be kept in good working order and prevented from freezing during the winter

3.5.2 Access Road and Truck Pad

The access road is constructed of gravel and is approximately 2km long. Basic road maintenance is to be conducted as follows:

- At least twice a year (spring and fall), the road and truck pad is to be graded to smooth and the surface is to be reshaped if required. The road should be graded more frequently if required. The sewage discharge point should also be inspected for erosion and maintained as required.
- As necessary during the winter, snow is to be removed to ensure unrestricted access to the sewage discharge point is maintained.
- Any spilled and frozen wastewater should be removed during snow removal and dumped to the lagoon.

3.5.3 *Drainage*

The truck pad at the sewage discharge point should be graded such that any wastewater spilled during the off-loading procedure will flow into the sewage system.

Operational and Maintenance Summary

Daily

- Collect wastewater from the holding tanks and transport it to the sewage truck discharge point
- Clean up any spills immediately
- Clear snow from road and truck pads as required
- Record O&M information as required

Weekly

- Remove non-sewage floating materials (i.e. plastic bags) from the lagoon
- Ensure significant erosion is not occurring at the truck discharge location
- Record O&M information as required

Monthly

- Grade and maintain the access road if required
- Conduct the monitoring program as required
- Record O&M information as required

Yearly

- Conduct the annual monitoring program
- Review the O&M records to evaluate the effectiveness of the sewage treatment system and plan for the upcoming year

4.0 SOLID WASTE FACILITY

4.1 Manual Organization

This section of the manual was developed to present operational and maintenance procedures to designated operators of the landfill facility in Paulatuk. Each set of procedures is explained individually. The final section provides a summary of operational and maintenance procedures broken down into daily, weekly, monthly and annual tasks.

4.2 Waste Disposal Site

The disposal site is organized into three separate disposal areas:

Refuse Disposal Area:

This is the main disposal area at the landfill; general wastes are placed here. The disposal area is located on the west side of the access road, near the sewage disposal lagoon. (See Appendix A, Figure 4)

Bulky Metal Waste Area:

Large non-combustible items such as automobiles, snowmobiles, etc. are placed in the bulky metal waste disposal area. It is located across the access road from the regular waste disposal area. (See Appendix A, Figure 5)

Hazardous Materials Area:

Hazardous materials such as paint, household hazardous wastes and old fuel drums are disposed of in the hazardous materials area. It is located near the bulky metal waste area. Waste oil generated by the Hamlet is stored in sealed drums until such time that it may be transported out of the community on the barge. Other generators of waste oil generally ship theirs out as well.

4.3 Equipment List

The following equipment is required to operate the Paulatuk solid waste disposal site:

- 1996 Ford F350 Truck for collection of waste (See Appendix A, Figure 6)
- 1997 CAT D6H Tractor
- 1991 Case W14 Loader
- 1985 Kubota Backdigger
- 2001 Komatsu Loader

4.4 Site Personnel

The Senior Administrative Officer is responsible for the overall operation of the landfill facility. The daily operation and maintenance of the landfill is the responsibility of the Hamlet Foreman. One or two people are employed by the Hamlet to operate the garbage collection vehicle.

4.5 Operation Procedures

These procedures must be carried out on a regular basis to ensure the landfill operates safely and efficiently.

4.5.1 Basic Operations

1. All wastes are to be dumped in the appropriate area
2. Dumping should be restricted to a manageable portion of each area at a time
3. Waste should be covered over with overburden as required
4. Each layer of solid waste and cover material should be sloped to allow drainage

4.5.2 Hazardous Waste Area Operation

The hazardous materials storage area is a small area located near the bulky metal waste disposal area. Specific information on handling hazardous waste materials, including final disposal requirements, can be found in the following GNWT Department of Resources, Wildlife and Economic Development Guidelines, present in Appendix C:

- Guideline for Waste Asbestos
- Guideline for Waste Lead and Lead Paint
- Guideline for Industrial Waste Discharges
- Guideline for the General Management of Hazardous Waste
- Guideline for Ozone Depleting Substances
- Guideline for Waste Solvents
- Guideline for Waste Antifreeze
- Guideline for Waste Paint
- Guideline for Waste Batteries

Further information on other relevant legislation (such as the *Environmental Protection Act*, the *Used Oil and Waste Fuel Management Regulations*, and the *Spill Contingency Planning and Reporting Regulations*) may also be found on RWED's website at this location:

<http://www.gov.nt.ca/RWED/eps/leg.htm>

4.5.3 Bulky Waste Area Operation

The bulky waste disposal area is the open area located across the access road from the regular household solid waste cells. To ensure effective operation:

- Place bulky wastes in an organized manner, starting from the back and working towards the front
- Stack bulky wastes whenever possible to conserve space
- Ensure that waste is stacked in such a way that it is safe to walk through the site

4.5.4 Special Considerations

Winter Operation Covering of partially-full or full areas of the cell being used should be completed in the late summer to prepare for the onset of winter.

Wind A fence should be constructed around the solid waste disposal area to help control the movement of wind driven material off the landfill site, as well as to reduce access to the area by wildlife. Waste should be collected off the fence on a regular basis and deposited in the landfill.

Spring Clean-up A spring clean-up should be conducted after the snow has melted to collect waste that has accumulated around the Hamlet over the winter.

Health and Safety Due to the nature of the facility, safety precautions should be taken by those personnel involved in the operation and maintenance of the landfill:

- Water and puncture proof gloves and safety boots are to be worn at all times, and work clothes should not be worn home
- Hands are to be washed frequently, as a minimum after work and before eating
- Personnel should receive appropriate vaccinations and ensure they are kept up to date
- Only personnel trained to handle hazardous materials should do so
- Reflective safety vests should be worn when working around heavy equipment

Bear Safety Brown bears are known to frequent the area, and precautions should be taken. Bear safety information can be found in Appendix B, as well as on the GNWT's Resources, Wildlife and Economic Development website under Bear Safety:

<http://www.nwtwildlife.rwed.gov.nt.ca/Publications/safetyinbearcountry/safety.htm>

4.5.5 *Site Records*

Records should be kept to assist in planning for yearly operations and future expansion. The information should be reviewed yearly to evaluate the effectiveness of the operation and to forecast future operational requirements. The records should be kept in the Hamlet Office and maintained by the Senior Administrative Officer. As a minimum, the following information should be recorded:

Refuse

- The number of loads per day
- The dates of cover placement in waste cells

Bulky Metal Wastes

- Itemize the site contents
- The number of trips to the site and the dates
- The date when the site is full

Hazardous Materials

- The number of trips to the site and dates
- The type of hazardous material placed there and method of storage
- The party using the site
- The date when the site is full

4.6 Maintenance Procedures

Proper maintenance of a landfill facility is crucial to ensuring the efficient operation of all the components. Activities can be divided into the following categories:

4.6.1 Storage Maintenance

As the first step in the waste collection process, residential and commercial storage containers should be adequately maintained. The following points should be considered:

- Garbage containers should be covered to prevent wind blown debris from littering the community and to prevent animals from getting into the garbage
- Bulky wastes should not be left in residential areas for long periods due to aesthetic and safety concerns

4.6.2 *Collection Maintenance*

The waste collection vehicle should be maintained in good operating condition to ensure the collection service is not interrupted for extended periods. Other maintenance considerations include the following:

- The collection vehicle should be equipped with a shovel to clean up accidental spills during collection
- The collection vehicle should be cleaned periodically

4.6.3 *Access Road Maintenance*

The access road is gravel and approximately 2km long. Basic road maintenance is to be conducted as follows:

- At least twice a year (spring and fall), the road and truck pad is to be graded to smooth and the surface is to be reshaped. This should occur more often if required.
- As necessary during the winter, snow is to be removed to ensure unrestricted access to the site for the garbage collection vehicles

4.7 **Operational and Maintenance Summary**

Daily

- Collect waste from the Hamlet and transport it to the landfill
- Ensure all wastes stay in designated areas
- Clean up any spills immediately
- Clear snow from roads and disposal areas as required
- Record O&M information as required

Weekly

- Pick-up wind blown materials which have migrated past the disposal area
- Record O&M information as required

Monthly

- Grade and maintain access roads, if required
- Cover waste with overburden as required
- Record O&M information as required

Yearly

- Review O&M records to assist in planning for the upcoming year

5.0 EMERGENCY RESPONSE

Due to the nature of these types of facilities, uncontrolled fires and spills of unknown or hazardous materials should be treated with extreme caution. Hamlet personnel responsible for the solid waste and sewage disposal facilities should be trained in Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods Act and Regulations (TDGA and TDGR) and First Aid. Appropriate vaccinations of employees should be kept current.

5.1 Fire

A contingency plan should be developed by the Hamlet of Paulatuk's Volunteer Fire Department for responding to a fire at the solid waste disposal site. Special precautions should be implemented, as burning of waste can produce poisonous vapors. The following procedures should be used in case of uncontrolled fire:

- Evacuate area around landfill immediately
- Keep all personnel up-wind of the site
- Notify the Hamlet Volunteer Fire Department at 580-2222.

5.2 Spills

A spill is defined as the discharge of a contaminant in contravention of the Environmental Protection Act.

Spills of unknown or hazardous substances at the landfill should be treated with extreme caution. Spilled materials should only be handled by properly trained and equipped personnel. The following actions should be undertaken by personnel in the event of a hazardous materials spill at the landfill:

- **Be alert and consider your personal safety first**
- Assess the hazard to persons near the spill and where possible take action to control danger to human life. If possible, identify the material or products spilled
- If the spill creates a fire, explosion or other hazard to human life, remove all potential ignition sources, if possible, evacuate the area and contact the RCMP (580-1111) and the Hamlet's Volunteer Fire Department (580-2222)
- If safe and practical, try to take appropriate action to stop the release of material
- Contact the Hamlet Foreman and the SAO, and report the spill
- Mark the spill scene to warn the public and prevent access

Once contacted, the Hamlet Foreman shall:

- Proceed to the spill location,
- Make the necessary arrangements for first aid and removal of injured personnel. Take the necessary action, where possible, to secure the site to protect human safety
- If not already done and it is safe to do so, take the appropriate action to stop the flow or release of material. If at all possible, take the necessary action to contain or prevent the spread of the spilled material
- **Contact the 24-hour Spill Line at (867) 920-8130**
- Contact the Hamlet Senior Administrative Officer
- Contact the Fire Department if required

Throughout the spill response, personnel should place their personal safety as the highest priority.

The *Spill Contingency Planning and Reporting Regulations* should be referred to for more information. These Regulations are found in Appendix C, and may also be found at

<http://www.gov.nt.ca/RWED/eps/pdfs/spillreg90.pdf>

REFERENCES

“A Preliminary Assessment of Alternatives for Water Supply, Sewage Disposal and Solid Waste Disposal at Paulatuk, NWT” Prepared by Reid Crowther & Partners Ltd. 1986.

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“Operations and Maintenance Manual for Solid Waste and Sewage Disposal – Community of Paulatuk” Prepared by Lee Maher Engineering Associates Ltd. March 1994.

“Paulatuk Community Conservation Plan” Prepared by the Community of Paulatuk, the Wildlife Management Advisory Council (NWT) and the Joint Secretariat. June 2000.