Hamlet of Cambridge Bay Landfill Operations and Maintenance Manual

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TABLE OF CONTENTS

1.0 INTRODUCTION

The proper operation and maintenance of Hamlet of Cambridge Bay's municipal solid waste (MSW) disposal facility (or landfill site) are important components of its MSW management system (MSWMS). It is recognized that inappropriate operation and maintenance (O&M) of a MSW landfill site may cause the landfill site to become a source of potential public health hazards and adverse environmental impacts.

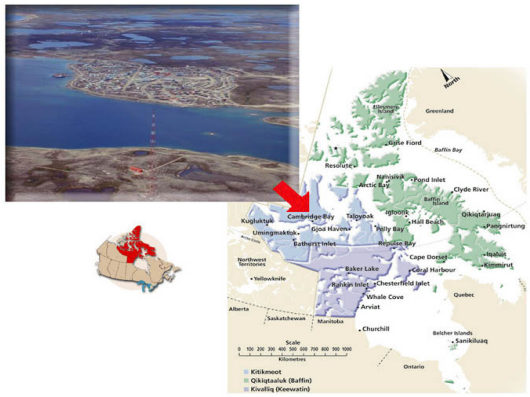
1.1 Objective of Hamlet of Cambridge Bay's MSWMS

The primary objective of the Hamlet of Cambridge Bay's MSWMS (O&M manual) is to assist the MSW landfill site staff in the proper operation and maintenance of the site, to apply an appropriate technology and procedures to dispose off its MSW in a manner to minimize the potential public health and environmental hazards from the site and make the site O&M acceptable to the Nunavut Water Board (NWB). The application of appropriate technology is dependent upon the geology, terrain and climate of the area, as well as the technical and financial capabilities of this Hamlet. In the case of Hamlet of Cambridge Bay the appropriate technology is a "modified landfill site with controlled burning".

The following general requirements to minimize the potential public health hazards and environmental impacts are addressed in this O&M Manual:

1. To minimize environmental nuisances that can interfere with community life and development;
2. To minimize the possibility of polluting surface and groundwater;
3. To control fire hazards during operational phase;
4. To control air pollution from smoke, dust and odor; and
5. To minimize occurrence of disease carrying bacteria, insects and animals.

1.2 Landfill Site Description



The Hamlet of Cambridge Bay, the gateway to the Kitikmeot region, is geographically situated on the Dease Strait between the Queen Maud Gulf and the Coronation Gulf in the North West Passage, at 69°07' N latitude and 105°03' W longitude. It is the largest community in the Kitikmeot Region and acts as the regional center and transportation hub. Environment Canada records that the average precipitation is 69.6 mm of rain and 82.1 cm of snow, and that the average temperature for January is -32.8°C and July is 8.4°C.

The Hamlet of Cambridge Bay's MSW landfill site is located approximately 0.9 km east of the community. There is a distance of 100 m between solid waste area and metal dump area. The site is located immediately west of the sewage lagoon. Currently, the Hamlet of Cambridge Bay does not employ any municipal waste diversion in the waste management practices. The current landfill site has been operating for thirty years and contains municipal solid waste (MSW) consisting of bagged household wastes, bulky wastes and a number of potentially hazardous wastes including paint, solvents and batteries, etc. The site is operated as a cut and fill or trench method until the mid-1990s. Since then, solid waste has been deposited throughout the landfill area and burned when the winds are away from the community. The burned wastes are covered with granular material (IEG, 2005).

Waste metals are directed from the municipal waste area to the metal dump site, which has been accumulating waste for approximately twenty (20) years. The metal dump site consists of unsegregated bulk wastes and metals including vehicles, heavy equipment, barrels, fuel talks, and other waste metal. There are approximately 23,800 m^3 of metal waste on site estimated by field observations in 2005 (Earth Tech, February 2007).

Currently, the hamlet has no control over who dumps, what kind of refuse is dumped, or where it is dumped. The site is currently not fenced and there is no permanent supervision of the site, and therefore, there is no record of the quantities and types of waste on the site.

1.3 Reference Information

The preparation of this O&M Manual is based upon the following information sources:

1. "Water License NWB3CAM0207" for the Hamlet of Cambridge Bay, NU (effective September 1, 2002 and expiring on August 31, 2007), and "Amendment 1 to Water License" (effective February 16, 2005 and expiring on August 31, 2007).

2. "Guidelines for the Planning, Design, Operation and Maintenance of Modified Solid Waste Sites in the Northwest Territories", R. Kent, P. Marshall, and L. Hawke, Department of Municipal and Community Affairs, Government of Northwest Territories, 2003.

3. "Guidelines for the Collection, Treatment and Disposal of Hazardous and Bulky Wastes in the Northwest Territories", P.L. Heeney & G.W. Heinke, Department of Municipal and Community Affairs, Government of Northwest Territories, 2003.

4. "Guidelines for Contingency Planning", Nunavut Water Board, 1987.

5. "Draft Guidelines for Spill Contingency Planning", Nunavut Water Board, 2004.

6. "Establishing Guidelines for the Separation of Solid Waste Disposal Sites and Airports in the Northwest Territories. Final Report - Phase 1", R. M. Soberman, G. W. Heinke, and M. Lovicsek, Department of Municipal and Community Affairs, Government of Northwest Territories, 1990.

7. "Cambridge Bay Municipal Sewage Lagoon and Waste Facilities Assessment", IEG, Department of Community and Government Services, Government of Nunavut, October 2005.

8. Earth Tech, August, 2006, Cambridge Bay Waste Facility Improvements Sewage Analysis – Summary Report.

9. Earth Tech, April, 2007, Hamlet of Cambridge Bay Waste Facility Improvements – Draft Preliminary Engineering Report for Solid Waste Site Improvements.

10. IEG, October, 2005, Cambridge Bay Municipal Sewage Lagoon and Waste Facilities Assessment (GN Project No 04-4807).

11. Earth Tech, April, 2008, Hamlet of Cambridge Bay, NU, Waste Facility Improvements, Detailed Design Report for Redevelopment of Existing Waste Facilities.

2.0 LANDFILL SITE OPERATING REQUIREMENTS

2.1 General

The existing MSW waste disposal site is approximately 28,000 m^2, and is not capable of meeting the area requirements for the next twenty (20) years. However, the landfill site will be redeveloped and reengineered to provide sufficient capacity for the Hamlet's municipal solid waste for the next ten (10) years (Earth Tech, April 2008). In the future, separate waste disposal areas will be sectioned off and maintained as follows:

- Domestic waste disposal area for disposal of non-hazardous household, institutional, and commercial wastes,
- Plastic waste (including tires)
- Household hazardous waste (HHW)
- Honey bag waste and carcasses.

The metal dump site will remain used for metal dump after an isolation berm is constructed between the lagoon and the metal dump site to limit surface run-off.

2.2 Landfill Site Development

The future development of the MSW landfill site is to be carried out with careful consideration being given to measures that minimize the adverse impacts on the surrounding environment and the public health and safety. In improving the general layout of the site the natural topography of the site is to be utilized as much as possible.

2.2.1 Configuration

The site will be configured for domestic waste, household hazardous waste, sewage bags and carcasses and plastic waste and tires disposal. The metal dump area will remain. The active areas will be as small as possible to best manage the solid waste disposal facility.

The domestic waste cell area will include food waste, paper waste, glass, ceramics, and wood. It is anticipated that 42,000 m^3 of MSW will be generated in the next ten (10) years. As the active depth is estimated as two (2) metres, an area of 21,000 m^2 is required for disposal. The proposed cell area is 23,000 m^2.

The honey bag disposal area will be in the northwest corner of the site, and will account for an estimated 1% of the site volume. This area is considered bio-hazardous waste material, and as such will be isolated from the main disposal area. Coverage of the area is required during non-winter months to reduce odour and prevent animal scavaging.[11] Approximately 932 m^3 is required, and the design area for this cell is 900 m^2. This area will be bermed with a 3 m wide top and 2 m deep. The side slopes will be 1 vertical per 3 horizontal. The hazardous waste area will account for approximately 2% of total waste, and will predominantly be composed of oils and grease and household hazardous waste. The area will be lined to prevent infiltration. Future removal of this cell will be considered, and is being investigated by many other northern communities.

A berm will be constructed to isolate the metal dump from the sewage lagoon.

The open burning of segregated combustible waste will continue to be used as a mean of volume reduction when the prevailing winds are away from the community. It is acknowledged that the open burning of any MSW may pose adverse impacts on the surrounding environment and the public health and safety. However, MSW management in small northern communities is influenced by an appropriate technology and available community resources (both financial and non-financial). The Hamlet will investigate using a burning vessel/incinerator in lieu of open burning.

2.2.2 Setbacks

The setback criteria for the various features are based upon various guidelines noted in the References, and in the absence of any regulatory guidelines, generally accepted guidelines:

- *Human Habitation*: the site maintains a minimum 450 m setback from the areas of human habitation (Public Health Act – General Sanitation Regulations, R.R.N.W.T. 1990, c.P-16). The site is 1.0 km away from the community.
- *Recreation*: the site maintains a generally accepted 300 m setback from recreational activities.
- *Airport*: the recommended minimum 3 km setback (Establishing Guidelines for the Separation of Solid Waste Disposal Sites and Airports in the Northwest Territories. Final Report - Phase 1, 1990) between a MSW landfill site and an airport is achieved on this site.

2.2.3 Access Road

The access road for the landfill site utilizes a 6 m driving surface and a turnaround area at the end of the working area. Access to the waste cells is proposed. The access road is connected to the lagoon decant location. Any access road construction will be with granular material for an all-season driving surface.

2.2.4 Cover Material

Cover material will be stockpiled separate from the MSW landfill.

The Hamlet will investigate using a mulch composed of shredded wood and construction waste as a cover material for the landfill. This technology has proven effective in Iqaluit, Nunavut (Journal, 2006).

2.2.5 Drainage Routing

Engineered improvements to the waste disposal will include controlled runoff management. The site may be partially regarded. Perimeter ditches are proposed along the access road and berms to direct runoff to a runoff detention pond on a low area north of the site. The pond will provide detention before being discharged to the lagoon system by a pump.

2.2.6 Fence and Signs

The fencing of a MSW landfill site is practical for a number of purposes. A fence provides a barrier to windblown wastes and also controls access to the site by community residents and scavenging animals, thereby improving the site management. Site operator Derek Anderson anticipates that a fence will be provided by the Government of Nunavut in 2008. Multi-lingual instructional and directional signs should be in place leading to the site and identifying areas of the site and materials to be dumped.

2.3 Filing Plan and Recordkeeping

The sit operator will maintain records of the general description of the type of waste and its quantity being deposited at the site. Recordkeeping should include:

- Date compacted
- Final depth of compacted garbage (above ground)
- Number of trips per week, number of vehicles
- Number of hours per week hauling garbage
- Number of operators.

2.4 Equipment for Operation and Maintenance

The Community has limited equipment for spreading, compacting and covering the solid waste disposed off at landfill site. Equipment (truck, bulldozer) should be well maintained and properly serviced. Equipment need not be on site on a full-time basis.

3.0 ENVIRONMENTAL CONTROL

3.1 Nuisance Control

The adverse effects of any nuisance, such as dust, litter and noise will be controlled on the properties surrounding the landfill site.

Dust may be difficult to control because of the dry road material. Site operator experience will be used to determine frequency and amount of road watering.

Blowing litter will be controlled by the proper use of fencing and installing a lockable gate at the entrance to the metal dump.

The regular application and compaction of soil cover may discourage the feeding and proliferation of *birds and insects*.

Noise should not be a problem due to the buffer zone around the landfill site.

The possibility of *odours* will be minimized by immediate deposition of waste, and appropriate application of the cover during warmer months.

3.2 Surface and Subsurface Water Monitoring

Water monitoring is a very important component of proper landfill O&M. The surface and subsurface water monitoring program (sampling, analysis and reporting) should be undertaken, as deemed necessary by regulatory agencies. The objective of this program will be to detect any changes in surface and subsurface water quality that may result from contaminated storm water runoff originating from the landfill site. By engineering ditches and berms to direct runoff to a retention pond will decrease the environmental concerns of the site.

The sampling results will be compared with the licensed effluent water quality values (NWB3CAM0207, 2002), the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories (NWB, 1992), and CCME Guidelines for the Management of Municipal Wastewater Effluent (CCME, 2005). The Hamlet should develop a contingency plan, in accordance with NWB's Guidelines 1987 and 2004, to address the discharge of the runoff in the event it exceeds these guidelines.

4.0 OPERATING PROCEDURES

4.1 General

These operating procedures for the landfill site have been prepared with the intent not to restrict the efficient operation of the site, but to provide a framework in which the site can operate, effectively and economically.

4.2 Site Security

The landfill site will be secured with a chain link fence. The fence will restrict access to the site.

4.3 Emergency Procedures

The following are the events in which non-routine operational responses may be anticipated:

- Uncontrolled burning;
- Accidental injury; and
- Site closure.

4.3.1 Uncontrolled Burning

In the event that uncontrolled burning takes place at the site, the Community will assess the potential danger of the burning and contact the appropriate authority to control the fire, as required.

4.3.2 Accidental Injury

It is recognized that a MSW landfill site is a potentially unsafe working environment. The operation of the site will incorporate safe working practices and operators should be attentive to potential health and safety hazards. If an accident occurs on the site, it should be reported to the Community for a decision on the appropriate response.

Site operators should remain alert to potential health and safety hazards, such as tripping hazards. A first-aid kit should be available to all operators. Personal protective equipment, such as work gloves, should be worn when required.

4.3.3 Site Closure

It may be necessary to close the site for unscheduled periods. Reasons for closures may include:

- Uncontrolled fires,
- Hazardous waste spill,
- Accidents, and
- Severe weather.

The decision to close the facility will be made by the Community or by another appropriate authority, and appropriate notice to the public will be given.

4.4 Nuisance Avoidance

4.4.1 Litter Control

The control of litter is a priority in the operation of the landfill site. However, the litter will inevitably occur. The landfill site operation will be directed towards minimizing the amount of litter generated. To prevent litter the community may consider a portable barricade will be placed adjacent to active cells to catch wind blown litter. The barricades will be positioned in accordance with the direction of litter travel.

4.4.2 Noise

The site is located well away from the public; therefore noise is not considered to be a problem for the site operation.

4.4.3 Dust

Controlling dust at the landfill site may be difficult. The heavy traffic may create dust problems within the site because of dry road material. Watering the road surface may reduce dust, but it may also increase runoff within the site. Site operator experience must be used regarding the quantity of water applied to the access road to reduce dust. A road treatment such as calcium chloride may also be used to stabilize the road surface.

4.4.4 Snow Accumulation

The snow accumulation/drifting can be a problem for daily operation of a MSW landfill site in the Arctic. The snow may mix with the MSW and remain frozen once the waste is covered. Burning of wastes for the site improvement will greatly reduce likelihood of snow accumulation, and a small burning area will further reduce any snow accumulation because of the concentrated heat of combustion. Snow collection and disposal will be allocated to a 500 m^2 area of the site.

4.4.5 Pest Control

The operation of the site will be directed to ensure that the presence of vermin, insects and other pests on the site is limited.

The occurrence of pests will be minimized by adequate compaction, burning and, when applicable, covering of wastes at the end of each working day. The operation will minimize both the time that any material that is attractive to pests is exposed, and the volume of any void space in which pests can survive.

4.4.6 Odours

The operation of the site will be directed to minimize odour from wastes. Odours will be minimized by ensuring the immediate deposition of waste delivery, the adequate compaction of deposited waste and the provision of cover material.

The odours associated with burning will be managed by the use of favorable wind directions during burning activities.

4.4.7 Bird Control

The operation of the site will be directed to minimize the nuisance due to the presence of birds. The bird control will be facilitated by the prompt burning and placing of wastes on delivery, the adequate compaction of wastes and the provision of primary cover material.

The special bird control measures are not required at present. If birds on the site become a nuisance, they may be controlled by means of a bird scarer or other suitable means to be decided by the Hamlet. As part of the decision, daily operations will be reviewed to examine the reasons for the increase in activity.

4.5 Fire Safety

4.5.1 Surface Fires

If fire spreads rapidly beyond the control limit, the area involved will be cordoned off and the vicinity will be immediately evacuated. The Fire Department Officer in attendance will be furnished with all known information, and will be given assistance if required. Prior contact will be made with the Fire Department to ensure they are aware of the nature of landfill site operations.

The cause of any such fires will be investigated and necessary steps will be taken to prevent any recurrence. A record will be kept of any such incident, giving details of the action(s) taken.

4.5.2 Subsurface Fires

Subsurface fires will be assessed for danger and may be treated an emergency fire. The Fire Department will be notified immediately if the fire is considered to be an emergency.

If a subsurface fire is suspected, it will be investigated immediately by excavation. If a fire is confirmed, remedial action will depend on the depth and the extent. It may be possible to excavate the burning materials and extinguish them on the surface. Other measures to extinguish fires may require isolation of the burning waste with cut-off trenches and flooding the area with water.

4.6 Hazardous Waste Management

4.6.1 General

The HHW is the waste generated by households. Typical household hazardous wastes include pesticides, photography wastes, paint, solvents, nonspecific flammable liquids, corrosive cleaners, batteries, pool chemicals, used oil, oil filters and other toxic materials of unknown origin.

The management of hazardous waste has become a concern as Hamlets become aware that even small quantities of hazardous wastes can cause groundwater and/or air pollution when disposed of in landfills. The Hamlet of Cambridge Bay is responsible for the management of HHW.

4.6.2 Hazardous Waste Collection

The Hamlet of Cambridge Bay's hazardous waste program will begin with the generation of support from community leaders, business, service organizations and residents. The effective and positive communication will serve to educate community leaders of the potential long-term liabilities associated with improper disposal of even small quantities of hazardous waste, such as costly site remediation of contaminated soil and groundwater. The service organizations and citizen groups can be particularly helpful in garnering the support of waste generators, which is critical for the success of any HHW management program. A committee on hazardous waste will facilitate support of these efforts.

The HHW management program will consist of a series of collections, one in the spring and one in the fall, during which citizens will bring their HHW to designated areas for collection and preparation for disposal. A designated drop off spot will be available year round at the landfill site. The collection event will last one day. After several collection events the accumulated waste will require ultimate disposal. Hamlet staff will be trained for hazardous waste handling.

Advertising by the Hamlet of the collection event will begin a minimum of thirty (30) days prior to each collection event. Public service announcements on radio and in the newspaper are effective means of informing the public that a HHW collection event is coming. The advertisements give the location of the event as well as dates and time of day for bringing HHW to the site. Advertising is also an opportunity to provide the residents with information to help them determine what materials are hazardous prior to the event.

A HHW collection event will be held in an area which is easily accessible to the public. The collection event should be organized in such a manner that residents can drive their vehicles through an area and have the wastes unloaded for them. Residents should be encouraged to stay in their vehicles to avoid time delays, congestion and safety problems. When the wastes are unloaded the vehicles must have easy access back to the entrance road.

As vehicles enter the area, they will be greeted individually. Also, while the vehicles are waiting for unloading, the drivers can complete questionnaires on things such as estimated quantity of HHW, suggestions for improvement of the collection program and demographics or other information which may be useful for maintaining interest in the HHW management program.

A HHW management program draws much of its strength from informed and concerned residents. Providing the residents with facts and figures that support the need for minimization of HHW generation, waste recycling and proper disposal of wastes, go a long way towards maintaining support for the program. A good focus of educational efforts is on the youth in the community, as they can take their environmentally friendly ideas with them into adulthood. Also, many times children are the first to convince parents that new ideas in waste reduction are appropriate.

4.6.3 Hazardous Waste Storage

There are several factors to consider when storing hazardous wastes. These factors include compatibility, segregation, ventilation, climate, handling, security and labeling/recordkeeping.

- **Compatibility**

  The compatibility between different types of hazardous wastes must always be considered before storage in homes and on the site. The compatibility of wastes with their containers must be considered. For example, acids should not be stored in steel drums, and some hydrocarbons cannot be safely stored in plastic. The compatibility of wastes with nearby materials and equipment is also very important, particularly when dealing with flammable wastes.

- **Segregation**

  The final destination of hazardous wastes should always be considered before storage. If recovery may be possible in the future, wastes should be stored in a manner that will allow such recovery.

- **Ventilation**

  Hazardous wastes should be well ventilated. Highly volatile organics in particular can present a serious health hazard in storage. If possible, most wastes should be stored outside in sheds, which provide free air movement.

- **Climate**

  Not all hazardous wastes should be stored outside. For example, flammable wastes stored outside in drums during a hot summer can build up pressure and damage the container. Wastes with high water content can experience freeze/thaw cycles and eventually crack and leak.

  If stored outside, containers should be covered by a roof or tarpaulin, and preferably placed on an impermeable base. This prevents contact of rainwater and soil, keeps off the direct sunlight, and makes clean up of any spills or leaks easier and cheaper. The area should be curbed or diked to collect spills, leaks and precipitation.

- **Handling**

  The Health Canada's WHMIS (Workplace Hazardous Material Information System) guidelines should be followed in all cases when handling HHW. These guidelines are legally enforceable throughout Canada.

- **Security**

  Security precautions are necessary to avoid theft, accidental discharge or harm to the public from HHW.

- **Recordkeeping**

  The records must be maintained to achieve safe hazardous waste storage on the site. If quantities and types of wastes are not recorded, serious problems may arise in the future. Care should be taken to ensure that containers remain properly labelled during the entire time in storage on the site.

4.7 Waste Disposal

4.7.1 Tipping Face

A well-defined tipping face will be provided on the site. The width of the tipping face will be in keeping with the number of vehicles likely to be at the tipping face at any time. The wastes will be placed at the brow of the tipping face, unless there are valid reasons otherwise.

At the tipping face, vehicles using different means of unloading may be segregated to reduce the turnaround time of each vehicle at the discretion of the landfill site operator. Signs will be provided to ensure that any designated tipping areas for different vehicles and waste types, such as soil cover, are clearly defined. Signage will be provided at the tipping face to direct vehicles to safely approach. This will also minimize waste deposited on the ground surface.

The slope angle of the tipping face in each cell (waste area) will be no steeper than 1 (vertical) on 5 (horizontal). The uncompacted faces will not be allowed to develop.

The active areas of the landfill site should be as small as possible. This is important in providing a manageable and safe disposal site for the public and operating staff. The area for combustible wastes requires particular attention because of potential hazard of a large fire.

Minimizing the active areas of the landfill site will also reduce the exposure of the wastes to water within the site, and to reduce the potential contamination of water within the site.

4.7.2 Compaction of Wastes

Compaction of wastes will be undertaken to fulfill the following objectives:

- To maximize waste density, thereby ensuring the optimum use of the available air space,
- To prepare a drivable area for vehicles
- To minimize primary cover requirements,
- To reduce problems of infestation by vermin, flies, pests and birds, and
- To assist in the reduction of odour.

Compaction will be preformed on a weekly or bi-weekly basis during summer. Compaction will be achieved having heavy equipment, such as a bulldozer, run over the waste several times. After compaction, each layer should be no more than about 2.5 m thick. Where applicable, the compacted waste should be covered with suitable cover material.

4.7.3 Cover Material

Daily, intermediate, and final covers are normally used in a solid waste disposal site. Cover is used to minimize surface runoff, odour and blowing litter. However, due to the limited availability of cover materials in the Hamlet, daily cover may not be possible.

Intermediate cover is used when portions of the site are exposed and anticipated to remain open for a period of time. Intermediate cover can be used to provide a drivable surface.

Final cover is used to minimize water infiltration once disposal activities have ceased. Final cover should consist of a multi-layer composition. The first layer closes to the waste should consist of a granular material used to grade the site and provide drainage off the surface (minimum 3% slope). The second layer will act as a barrier for water infiltration, and be composed of material such as clay or amended soil such as bentonite. Due to the scarcity of such material in Cambridge Bay, the second layer may have to consist of silty sand.

The stockpiles of cover material will be established adjacent to the landfill site. Separate stockpiles will be formed of clean cover materials and of suitable materials segregated from the incoming waste stream.

Covering layer should be at least 0.15 m thick for intermediate cover and at least 0.3 m thick for final cover.

4.7.4 Burning

Combustible wastes in the MSW disposal area may be burned, if winds are favorable.

Fire control is an important part of the operation of a landfill site. In order to further reduce the risk of fire at the site, an operating protocol will be identified and utilized. Burning control practices will include:

- Presence of an attendant during initial stages of fire, period inspection
- Minimum buffer zone of 5 m around burning area
- Maintaining a small combustion area
- Restricting public access.

4.7.5 Waste Slope Stability

The minimum angle for waste slope will be 5 (horizontal) on 1 (vertical) (11°) for active areas. This slope accommodates equipment access for spreading and compacting.

The maximum angle for waste slope will be 1.5 (horizontal) on 1 (vertical) (37°). This slope may comprise a temporary condition during the opening of a cell.

4.7.6 Recycling

Recycling within the site may involve salvaging of certain construction materials brought to the site for disposal. This material may be reused by the Hamlet or other groups authorized by the Hamlet. Additional limited recycling operations may also be feasible at some time in the future.

4.7.7 Bulky Waste Area

Bulky wastes are deposited in a separate area. These wastes do not need to be covered.

Stacking and collapsing of cars, barrels and appliances will be undertaken where possible. Hazardous materials associated with bulky waste such as fuel will be removed prior to placement.

4.8 Landfill Site Management

4.8.1 General

The philosophy of the management of a landfill site will be of prevention rather than cure. The essence of the approach is to anticipate where problems may occur in the future and to prevent their occurrence.

4.8.2 Surface Water Management

Surface water will be directed through ditches and berms to a discharge pond for detention, before being pumped to the sewage lagoon.

4.8.3 Scavenging Management

Scavenging by local residents at the landfill site will be discouraged. Uncontrolled scavenging can be dangerous to public health and safety.

4.9 Landfill Site Records

4.9.1 Site Monitoring

The purposes of monitoring a solid waste disposal site are twofold: to find out if a site is performing as designed and troubleshoot if indications of problems arise, and to judge if a site is confirming to regulatory requirements.

Performance inspections and evaluations of the site performance and development should be preformed routinely. Where possible, improvements should be undertaken.

Regulatory performance should satisfy concerns of regulatory agencies with monitoring and reporting as deemed necessary. Sampling of the runoff may be periodically required.

The environment surrounding the landfill site is subject to monitoring by the Hamlet, the NWB and Indian and Northern Affairs Canada.

4.9.2 Site Development

Monthly records of landfill site operations will be maintained. These will chart the progress of the landfill within the planned development of each landfill cell. An annual photographic survey of the landfill site will be undertaken to provide a continuous record of site usage and to assess the site utilization.

4.9.3 Landfill Audit

An audit of landfill site operations will be undertaken by the Hamlet annually. This will include a record of the following:

Access Routes/Signs	Noise	Width of Tipping Face	Safety
Gates and Fencing	On-Site Drainage	Primary Cover	Site Records
Waste Handling	Waste Types	Tidiness	Previous Audit Information
Bulky Items	Equipment Storage	Fires	Complaints
Litter Control	Waste Handling Equipment	Disposal Operation	Leachate
Birds	Depth of Tipping Face	Segregation	Dust
Odour			

The Hamlet will remedy any part of the site operations, which is not in accordance with the O&M Plan, or accepted as good standards for landfill site operations.

4.9.4 Activity Summary Report

Summary Report will be compiled periodically (bimonthly) by the landfill operator. The report will include the following information:

- Location of active landfilling area and the activities related to cell filling,
- Summary of the quantities of wastes and types of wastes,
- Summary of the weather,
- Summary of site maintenance and litter control activities,
- Summary of infractions and problems, and the measures undertaken to resolve, and
- Summary of Surveillance Network Point (SNP) sampling data.

4.10 Site Safety

A specific safety plan will be incorporated into the operation of the site to cover issues including:

- Personal safety equipment,
- Occupational Health and Safety requirements, and
- Emergency procedures.

The operator has the responsibility to make sure that all aspects of waste disposal are conducted safely.

5.0 SITE MAINTENANCE

The maintenance aspect is one of the most important components of a landfill site, which is frequently neglected in most of the northern communities. The maintenance of the Hamlet's landfill site will be conducted on a routine basis:

- Site equipments (signs, barricades, building, storage containers), and
- Site infrastructures (roads, drainage, fencing, berms).

5.1 Site Equipment

5.1.1 Signs and Barricades

Signs within and adjacent to the landfill site should be inspected by the site operator on a monthly basis. Signs should be inspected for wear and breakage of the mounting systems and wear of sign lettering. Any signs requiring repairs should be reported to the Hamlet so that repair may be undertaken.

Site barricades should be inspected on a monthly basis and the need for repairs should be reported to the Hamlet.

5.1.2 Storage Containers

If applicable, the landfill site operator should inspect the exterior of storage containers on a biweekly basis to observe and record any signs of deterioration and advise the Supervisor of observations.

5.2 Site Infrastructure

5.2.1 Access Road

Access to the site should be controlled in a suitable manner. Regular hours and closure by a locked gate may or may not be implemented. A container outside the gate could minimize dumping near the access road.

The access road for the landfill site should be maintained properly at all times. The frequent use of heavy equipment may cause the access road to deteriorate significantly. Adequate road maintenance should include the following points:

- Potholes can be filled with stockpiled material – road should be maintained relatively free of potholes,
- Road should be reshaped as required to provide and maintain proper drainage,
- Soil amending material to provide a better driving surface should be applied as needed,
- Snow should be removed as necessary and deposited in the appropriate snow disposal cell and road condition checked regularly in winter,
- Regular monitoring of road condition,
- Wastes fallen from the collection vehicle during hauling should be collected from the road and surrounding areas, and
- In dry weather road may be sprayed with water to control dust.

5.2.2 Drainage

The drainage from the landfill site should be checked monthly from June through October to ensure that blockages have not developed in ditches. Any blockage or ponding should be recorded and reported to the Hamlet by the site operator.

5.2.3 Fencing

The landfill site operator should examine the fencing for holes and check fence posts for frost heave. Wind blown material should be removed from fence to reduce wind loading and to improve appearance of the site.

5.2.4 Perimeter Berms

The perimeter berms of the landfill site should be inspected on a monthly basis from May through October. Any signs of erosion to the berms should be recorded and reported to the Hamlet; the Hamlet may then take appropriate remedial action based upon a contingency plan.

6.0 MPROVEMENTS OF LANDFILL SITE

The Hamlet of Cambridge Bay is currently planning on reengineering its solid waste site. [STAGE? TIME FRAME?]