

# Hamlet of Tuktoyaktuk

Water



## Operation and Maintenance Documentation

Sewage



## Municipal Solid Waste Facility

Solid Waste



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## 1.0 INTRODUCTION

The appropriate operation and maintenance of Hamlet of Tuktoyaktuk's Municipal Solid Waste (MSW) facility are important components of its municipal solid waste management system. It is universally recognized that inappropriate operation and maintenance (O & M) of a municipal solid waste site may cause the site to become a source of potential public health hazards and adverse environmental impacts.

### 1.1 OBJECTIVE OF TUKTOYAKTUK'S MSW FACILITY OPERATION AND MAINTENANCE

The primary objective of the Hamlet of Tuktoyaktuk's O & M manuals is to provide information for the facility staff to properly operate and maintain the facility, by applying appropriate technology and procedures to dispose off its MSW in a manner to minimize the potential public health and environmental hazards from the site. The objective is implemented within the conditions of the Hamlet's water licence. However, the application of appropriate technology depends 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 Tuktoyaktuk the appropriate technology is a "modified solid waste facility with controlled burning". The controlled burning refers to selected materials that are burned in a controlled manner.

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

1. To minimize environmental nuisances that can interfere with community life and development such as dust, litter, and noise;
2. To minimize the possibility of polluting surface and ground waters;
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 FACILITY DESCRIPTION AND HISTORY

#### 1.2.1 Facility Description

The Hamlet of Tuktoyaktuk's MSW site is a large fenced-in facility on the Tuktoyaktuk Peninsula, approximately 3 km south of the Hamlet, at an elevation of approximately 1 metre above the mean sea level (See Figure 1. Facility Locations). The site is approximately 5 kilometres west of the water supply lake, and approximately 2.5 kilometres north of the sewage lagoon.

The site covers a surface area of approximately 20 hectares, however, not all of the site area is currently in use (See Figure 2. Facility Operations). The current active areas on the site are on the southeast side (for MSW) and on the south side (for bulky waste). At

the centre of the site, the vast majority of the surface area is covered by a drainage retention pond. The on-site runoff is retained on the site by a 150 m long gravel/clay berm along the western edge.

### 1.2.2 Facility History

The Hamlet of Tuktoyaktuk's facility has been in operation since early 1970s, replacing the uncontrolled/open dump site that was located at the end of the community airstrip

In the period, from the site inception to 1984, the MSW disposal area was on the northern side of the current site (now a remediated area); the southern side had limited use as a disposal area. The southwestern side contained a large pile of bulky waste, originally comprising of old cars, and metal construction debris; this area was remediated with cover material in 2004. The site was located along the edge of a small bay and subject to tidal action, which frequently washed litter out into the adjacent inlet.

In 1986, a plan to improve the conditions of the site was developed, and this plan included an operation and management scheme to maintain these improvements. The plan consisted of filling in the site areas prone to tidal action with a layer of compacted debris to an elevation above the mean sea level, and then covering the debris with a fill. Future waste would then be placed in one area, and at the end of each year, would be compacted, covered, and graded.

In 1992, it was proposed to build an impermeable berm along the eastern side of the site, to prevent the tidal action. The berm was intended to be high enough to prevent flooding under typical storm tide conditions. The Hamlet built the berm using community resources.

### 1.2.3 Disposal at Facility

Wastes are deposited at the facility by the Hamlet collector in the active areas for MSW and bulky waste (see Figure 3. Solid Waste Schematic). Limited diversion of the solid waste occurs for appropriate materials to burn in the burn pit, and for storage in the hazardous waste diversion area. Cover material adjacent to the active areas is used to periodically cover the active areas.

Run-off from within the site is collected in the on-site drainage collection pond, and discharged seasonally over the control berm. Off site drainage is diverted away from the site by the natural topography.

## 1.3 INFORMATION SOURCES

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

1. Earth Tech Canada. Condition Assessment Report for Landfill. August, 2005.
2. Earth Tech Canada. Hamlet of Tuktoyaktuk, Water Licence Renewal, Background Report. April, 2005.
3. Government of the Northwest Territories. "Public Health Act – General Sanitation Regulations, R.R.N.W.T. 1990, c.P-16". 1990.
4. Municipal and Community Affairs (MACA), GNWT. "Guidelines for the Planning, Design, Operation and Maintenance of Modified Solid Waste Sites in the Northwest Territories", R. Kent, P. Marshall, and L. Hawke. 2003.
5. Municipal and Community Affairs (MACA), GNWT. "Guidelines for the Collection, Treatment and Disposal of Hazardous and Bulky Wastes in the Northwest Territories." P.L. Heeney & G.W. Heinke. 1991.
6. Municipal and Community Affairs (MACA), GNWT. "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. 1990.
7. Northwest Territories Water Board. Water Licence N7L3-0714 (Renewal) for the Incorporated Hamlet of Tuktoyaktuk Northwest Territories (Effective June 28, 2005 and expiring June 27, 2009).
8. Royal Military College. "Environmental Impact of Arctic Municipal Landfills as Contaminant Point Sources, Case Study of Tuktoyaktuk Solid Waste Site". M. A. Adams. 1997.
9. UMA Engineering Ltd. "Hamlet of Tuktoyaktuk, Landfill Operation and Maintenance Manual. September, 2000.

## 2.0 FACILITY OPERATING REQUIREMENTS

### 2.1 FACILITY DEVELOPMENT

The development of the facility is carried out with consideration being given to measures that minimize the adverse impact on the surrounding environment and the public health and safety. The general layout of the solid waste facility uses the natural topography of the site as much as possible.

The facility is currently bounded by a security fence. The normal traffic access is through the main entrance gate (See Figure 4. Facility Components).

#### 2.1.1 Facility Configuration

The solid waste facility is configured for non-combustible waste disposal and limited combustible waste disposal. The open burning of segregated combustible construction waste will be used as a means of volume reduction. 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 territories is influenced by an appropriate technology and available community resources (both

financial and non-financial). The open burning of selected combustible construction waste appears to be an appropriate MSW volume reduction method.

To contain the burning of MSW, a separate large burn pit area has been set aside for this activity (Figure 2. Facility Operations).

The non-combustible bulky wastes will be directed to a bulky waste.

The household hazardous waste storage is permitted within the site by the Hamlet's appropriate means. **Commercial and industrial hazardous waste collection, storage and ultimate disposal will be the responsibility of the generator.**

#### 2.1.2 Setbacks

The setback criteria for the various features are based upon various guidelines (Reference Information, Section 1.3), and in the absence of any regulatory guidelines, generally accepted guidelines:

1. 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).
2. Recreation: the site maintains a generally accepted 300 m setback from recreational activities such as
  - i. 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 facility and an airport cannot be achieved on this site. The anticipated travel path of birds would be from the site to the community or to the ocean, not possibly affecting air travel path.
  - ii. Tank Farm: the burning pit for the facility is approximately 300 m from the perimeter fence of the tank farm.
3. Access Road: the site maintains 100 m setback between the site and Reindeer Point road, conforming to 90 m setback (Public Health Act – General Sanitation Regulations, R.R.N.W.T. 1990, c.P-16).

#### 2.1.3 Access Road

The access road for the facility utilizes a 6 m driving surface and turnaround areas. The access road is constructed with suitable granular material to provide an all-season driving surface for heavy equipments.

#### 2.1.4 Cover Material

Two types of covers may be used for the operation of the facility: primary cover and intermediate cover.

The primary cover will be a clean fill to reduce windblown materials, and to reduce attraction to the MSW by animals.

The intermediate cover will be a clean granular fill used to create a drivable surface as the working face of the landfill advances.

#### 2.1.5 Drainage Routing and Discharge

An on-site drainage collection routing system, consisting of a pond and berm, will allow potentially contaminated water to be routed for a controlled discharge off-site . The containment berms are incorporated into the site on the west side. These berms are designed to contain drainage within the facility. The seasonal discharge of the on-site landfill runoff is allowed under Part D, Item 12 of the Hamlet's water licence.

The seasonal discharge operates und the following parameters:

BOD <sub>5</sub>	120 mg/L
Suspended Solids	180 mg/L
Polychlorinated Byphenyls	25 ug/L

The seasonal discharge is sampled before and three times during the discharge period between September 15, and October 31, and tested. The discharge is tested for the following parameters: pH, total mercury, total chromium, total copper, total nickel, total iron, BOD<sub>5</sub>, polychlorinated byphenyls, suspended solids, total cadmium, total cobalt, total manganese, total lead, total zinc and faecal coliforms.

The off-site drainage is controlled with the existing topography adjacent to the site (See Figure 2. Facility Operations).

#### 2.1.6 Fence and Sign

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. The Hamlet's solid waste facility has a fence surrounding the site, with the exception of the west perimeter (along the ocean).

The portable barricades may be used in the vicinity of the landfill operating areas. The site has instructional and directional signs.

### 2.2 RECORD KEEPING

The facility operator will maintain records of the operation of the site (see Section 4.9 for details).



## 2.3 EQUIPMENT FOR OPERATION AND MAINTENANCE

Proper and adequate equipment is essential in the efficient operation of the facility. The Hamlet has equipment for spreading, compacting and covering of the landfill. The spreading, compacting and covering of a landfill may be accomplished with one machine.

## 3.0 ENVIRONMENTAL CONTROL

### 3.1 NUISANCE CONTROL

The adverse effects of any nuisance, such as dust, litter, and noise will be controlled/minimized on the properties surrounding the solid waste facility.

Dust will be controlled by the application of water to the on-site roads, on an as-required basis.

Blowing litter will be controlled by the proper use of portable barricades at the active disposal area and by perimeter fencing around the site. The mobile litter fences will be aligned according to the wind direction. The debris accumulated on the fences may be collected on a weekly basis to prevent migration onto adjacent properties. The collection of litter blown onto adjacent properties will also be undertaken.

The possibility of odors will be minimized by the immediate deposition of wastes, and the appropriate application of the primary cover (clean fill).

The regular application and compaction of soil cover may discourage the feeding and proliferation of disease vectors such as birds, insects and mosquitoes. Should the number of birds on-site become excessive and a nuisance; a percussion bird-scare device may be employed.

Noise should not be a problem due to the buffer zone around the solid waste facility.

### 3.2 SURFACE WATER MONITORING

The surface water monitoring is a very important component of the facility operating plan. The surface water monitoring program (sampling, analysis and reporting) should be undertaken, as presented in Sections 2.1.5 and 4.9. The objective of this program will be to detect any changes in surface water quality that may result from contaminated runoff originating from the facility.

The drainage control, routing and collection systems within the site are functional during the short summer season. During the winter months water movement is not a concern.

## 4.0 FACILITY OPERATING PROCEDURES

### 4.1 GENERAL

The operating procedures for the facility have been prepared with the intent to not restrict the efficient operation of the site but to provide a framework in which the site can operate.

### 4.2 SITE SECURITY

The facility is secured with a chain link fence. The fence will manage 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
- Site closure

#### 4.3.1 Uncontrolled Burning

In the event that uncontrolled burning takes place at the facility, the Hamlet will assess the potential danger of the burning and contact the appropriate authority (Fire Marshall) to control the fire as required.

The burning areas are located at a sufficient distance from fuel storage tanks, not to be considered a hazard under normal operating conditions.

#### 4.3.2 Accidental Injury

It is recognized that the facility is a potentially unsafe working environment. The operation of the site will incorporate safe working practices. If an accident will occur on the site, it should be reported to the Hamlet for a decision.

#### 4.3.3 Facility Closure

It may be necessary to close the facility for unscheduled periods. The reasons for closures can be:

- Uncontrolled fires
- Hazardous waste spill
- Accidents
- Severe weather

The decision to close the site will be made by the Hamlet or by another appropriate authority, and an appropriate notice will be given to the public.

#### 4.4 NUISANCE AVOIDANCE

##### 4.4.1 Litter Control

The control of litter is a priority in the operation of the facility, however, the litter will inevitably occur. The facility operation will be directed towards minimizing the amount of litter generated.

Two means of litter prevention will be adopted as a minimum:

1. All loads entering or moving on the site will be covered to inhibit litter; and
2. At the tipping face, a moveable barricade will be placed adjacent to active tipping cells to catch wind blown litter. The barricades will be positioned in accordance with the direction of litter travel. The barricades will be reasonably cleared of litter. Additionally, any litter bypassing these nets and screens and landing off-site will also be collected as required.

##### 4.4.2 Noise

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

##### 4.4.3 Dust

Controlling the dust at the Hamlet's facility 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 if not used in proper quantity. The site 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.

All loads entering or travelling on the site will be covered to prevent dust or litter, and vehicles will be confined to designated haul roads.

##### 4.4.4 Snow Accumulation

The snow drifting within the site may require some planning to avoid conflicts between snow disposal areas and active waste disposal areas. The following operating activities may improve winter operation:

1. Portable snow fencing may be used in addition to the normal peripheral fencing to prevent drifting snow from interfering with the operations.
2. Cover material should be stock piled for winter use.

#### 4.4.5 Pest Control

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

The occurrence of pests will be minimized by the adequate compaction, and sufficient 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 Odors

The operation of the facility will be directed to minimize the odor from wastes. Odors will be minimized by ensuring the immediate deposition of waste delivery, the adequate compaction of deposited waste and the provision of primary cover material.

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

#### 4.4.7 Bird Control

The operation of the facility will be directed to minimize the nuisance due to the presence of birds. The bird control will be facilitated by prompt 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 evacuated.

The Fire Department Officer in attendance will be furnished with all known information and given assistance if required. Prior contact will be made with the Fire Department to ensure they are aware of the nature of the landfill operations.

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

#### 4.5.2 Subsurface Fires

The subsurface fires will be assessed for danger and may be treated as an emergency. 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 the isolation of the burning waste with cut-off trenches and flooding the area with water.

### 4.6 HAZARDOUS WASTE MANAGEMENT

#### 4.6.1 General

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 Hamlet of Tuktoyaktuk is responsible for the management of household hazardous waste. **The Hamlet is not responsible for commercial or industrial hazardous waste.**

#### 4.6.2 Hazardous Waste Collection

The Hamlet of Tuktoyaktuk's hazardous waste program will consist of a series of periodic collection, potentially two per year, during which citizens will bring their household hazardous waste to designated areas for collection and preparation for disposal. A designated drop off spot will be available year round at the facility. After several collection events, over a period of 2 to 4 years, 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 30 days prior to each collection event. The advertisements give the location of the event as well as the dates and the time of day for bringing the wastes to the site.

A household hazardous waste 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 citizens can drive their vehicles through an area and have the wastes unloaded for them.

#### 4.6.3 Hazardous Waste Storage

There are several factors to consider when storing hazardous wastes. These factors include compatibility, segregation, ventilation, climate/environment, handling, security, labelling, and record keeping.

#### 1. Compatibility

The compatibility between different types of hazardous wastes must always be considered before storage. The compatibility of wastes with their containers must be considered.

#### 2. 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.

#### 3. 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.

#### 4. Climate/Environment

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.

#### 5. Handling

The WHMIS (Workplace Hazardous Material Information Sheet) guidelines should be followed in all cases when handling household hazardous wastes.

#### 6. Security

The security precautions are necessary to avoid theft, accidental discharge or harm to the public from household hazardous wastes.

#### 7. Record Keeping

The records must be maintained to achieve safe hazardous waste storage. Care should be taken to ensure that containers remain properly labelled during the entire time in storage.

### 4.7 WASTE DISPOSAL

#### 4.7.1 Tipping Face

A well-defined tipping face will be provided. 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.

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.

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

The active areas of the facility should be as small as possible. This is important in providing a manageable and safe disposal site for the public and operating staff.

#### 4.7.2 Compaction of Waste

The compaction of wastes will be undertaken to fulfil the following objectives:

1. Maximize waste density, thereby ensuring the optimum use of the available air space.
2. Minimize primary cover requirements.
3. Reduce problems of infestation by vermin, flies, pests and birds.
4. Assist in the reduction of odor.

On a regular basis the wastes should be spread into a layer with a bulldozer equipped with a blade or bucket and then compacted by running the bulldozer over it several times. After compaction, each layer should be no more than about 2.5 m thick. The compacted waste should be covered with suitable cover material.

#### 4.7.3 Cover Material

The wastes will be deposited within a series of defined areas in order to ensure the concentration of disposal operations. The materials for cover will be stored separately from the waste.

The cover will be considered satisfactory if the following criteria are met:

1. Minimum thickness of 150 mm.
2. The waste is bound in place and does not cause odor or litter nuisance. In order to conserve airspace, maximum use will be made of on-site materials.

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

The covering layer should be at least 0.15 m thick for intermediate cover and at least 0.3 m thick for the final cover. Each layer of MSW and cover material should have a slight slope so water can drain.

#### 4.7.4 Burning

At the beginning of each day, the combustible wastes in the burn pit may be burned, if the winds are favorable. The fire control is an important part of the operation of the facility. In order to further reduce the risk of fire at the tank farm site from sparks created

by combustion at the site, an operating protocol will be identified and utilized during periods of higher risk for the tank farm. These periods would include:

1. Filling of the tank.
2. A site spill.
3. Venting of the tank during high wind.

A protocol will be established so that the Hamlet is advised of the tank filling, and burning on the site is temporarily suspended during this period.

A spill on the tank farm site would be contained by the containment berm, but this open fuel would be at a greater risk of combustion. A protocol will also be established so that burning on the solid waste disposal site is temporarily suspended until the spill is cleaned up.

Venting of the tank during a high wind may be potential problem, however this may be an infrequent occurrence depending upon the vapour pressure of the fuel.

Further burning control practices will include:

1. An attendant on the site while the fire is in its initial stages and periodic inspection.
2. A minimum buffer zone of 5 m around the combustion area.
3. Maintaining a reasonably small combustion area.
4. Restricted public access to the burning area.

#### 4.7.5 Waste Slope Stability

The minimum angle for waste slope will be 5 (horizontal) on 1 (vertical) 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). This slope may comprise a temporary condition during the opening of an area.

#### 4.7.6 Waste Recycling

Recycling or diversion within the facility is very limited, and may only include 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 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, however, fill material will be required to advance the driving service of the bulky waste area. 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.

#### 4.7.8 Disposal of Honey Bags

The disposal of honey bags should be undertaken at the facility. The public health risk associated with honey bags is ultimately similar to that of animal carcasses, which are also disposed of at a solid waste facility. The disposal will be addressed by site segregation and warning signs around a pit. The pit should be covered with an appropriate material (soil and/or lime), especially during warm weather to prevent the breeding of flies.

### 4.8 LANDFILL MANAGEMENT

#### 4.8.1 Surface Water Management

Surface water will be controlled within the site to minimize the possibility of discharging contaminated runoff. The natural topography around the landfill will minimize the runoff entering the landfill.

#### 4.8.2 Scavenging Management

Scavenging by local residents should be controlled at the facility. Uncontrolled scavenging is dangerous and unnecessary.

#### 4.8.3 Spring Cleanup Operations

Once a year, after the snow has melted, the Hamlet may organize a spring clean up to collect loose waste around the facility that has accumulated and was once buried by the previous winter snow.

### 4.9 FACILITY RECORDS

#### 4.9.1 Facility Monitoring

The environment surrounding the facility is subject to monitoring by the Hamlet, the NWT Water Board and the Inuvik Region Health Board. These monitoring records will be maintained in a current state at the site and the Hamlet office. The monitoring data will be shared to all these parties as it becomes available.

Samples of runoff from within the site may be taken during the seasonal discharge in the early fall.

#### 4.9.2 Facility Record Keeping

Daily observations and monthly records of the progress of the solid waste facility will be maintained (See Sample Form in Appendix A). This information will chart the performance and progress of the facility.

#### 4.9.3 Facility Audit

An audit of the facility operations will be undertaken by the Hamlet annually as part of the annual water licence report. The audit should include a review of the following:

Access routes/signs ; noise ; width of tipping face ; safety ; 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; runoff; birds; depth of tipping face; diversion; dust; and odour;

The Hamlet will remedy any part of the operations, which is not in accordance with the Operating Plan, or accepted good standards for landfill sit operations.

#### 4.10 SAFETY

A specific Safety Plan is incorporated into the operation to cover issues including:

1. Personal Safety Equipment.
2. Occupational Health and Safety Requirements.
3. Emergency Procedures.

The facility operator has the responsibility to ensure that all aspects of MSW disposal are conducted safely.

### 5.0 FACILITY MAINTENANCE

Recognizing the importance of facility maintenance, a Schedule of Maintenance relevant to each aspect of site operations is provided. The maintenance of the following aspects of the Hamlet's facility will be conducted on a routine basis:

1. site equipment (signs, barricades, building, storage containers); and
2. site infrastructure (roads, drainage, fencing, berms).

## 5.1 FACILITY EQUIPMENT

### 5.1.1 Signs and Barricades

Signs within and adjacent to the solid waste facility should be inspected by the site operator on a monthly basis. Signs should be inspected for wear and breakage of the mounting system 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

The facility operator should inspect the exterior of the storage containers on a biweekly basis to observe and record any signs of deterioration and advise the Supervisor of observations.

## 5.2 FACILITY INFRASTRUCTURE

### 5.2.1 Roads

The access road for the facility 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:

1. Potholes can be filled with stockpiled material.
2. Roads should be reshaped as required to provide proper drainage.
3. Snow should be removed as necessary and deposited in the south cell.
4. Wastes fallen from the collection vehicle during hauling should be collected from the roads and surrounding areas.
5. In dry weather roads should be sprayed with water to control dust.
6. A good granular base should be maintained on the road.

### 5.2.2 Fencing

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

### 5.2.3 Perimeter Berms

The perimeter berms of the facility 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 to repair the berms.

## 6.0 CLOSURE AND POST-CLOSURE

### 6.1 GENERAL

The Hamlet's facility will have a finite life; closure will be a part of the everyday operating of the site and it is to be considered as part of the routine working practices.

### 6.2 FACILITY CLOSURE

The facility will be constructed, operated and restored as a containment landfill, an integral part of which is the final cover. The final cover will be silt placed over the area of active cells.

The final cover is required to serve the following purposes:

1. To minimize infiltration of surface water and precipitation
2. To contain the waste from exposure
3. To provide a medium for planting and vegetation of the site

A multi-layer configuration is used for cover in which each layer has a distinct purpose. The first layer, closest to the waste, should consist of a granular material, which is used to grade the site to provide positive drainage off the surface (a minimum 3% slope).

The final cover will comprise the following as a minimum:

1. 300 mm thickness of compacted silt material
2. Positive gradients from all points on the solid waste facility
3. Vegetative cover, if possible.

The vegetation serves to stabilize the final cover from erosion and to assist in minimizing infiltration by evapotranspiration. The plants selected will be a shallow rooting variety that will not compromise the low permeability layer.

There will be some settlement of the waste, and the gradients of the final cover must account for this.

### 6.3 FACILITY POST-CLOSURE

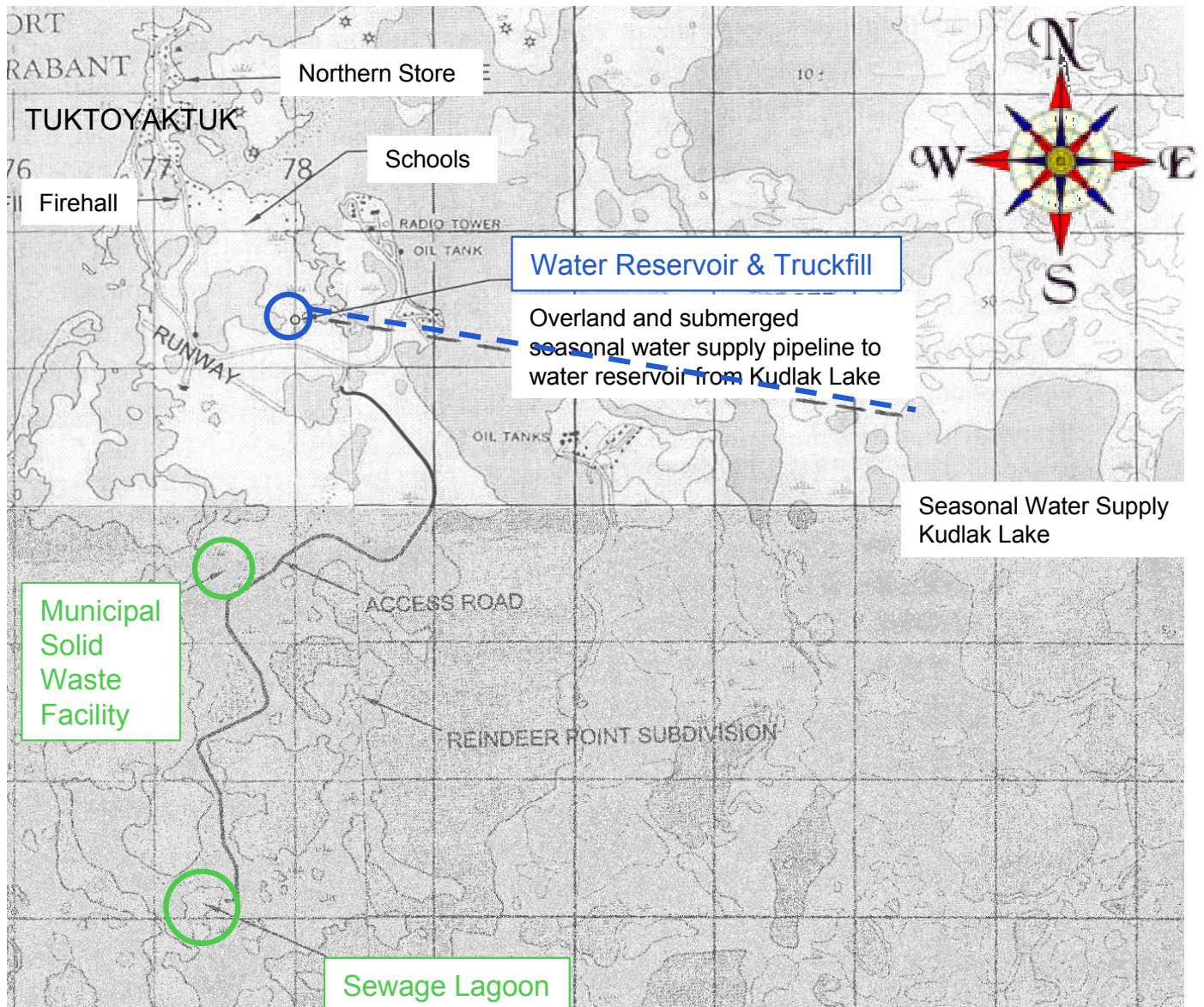
Following the closure of the facility the site must be maintained. This care will comprise the monitoring and maintenance of the final cover and the monitoring of the leachate, if any.

The facility surface is subject to erosion. More significantly the waste will settle differentially. This may cause ponding of surface water in moderate cases. It may result in a breach of the final cover in severe cases. The problems of waste settlement will be

addressed by the separation of bulky items such as car bodies and washers from the waste stream and by the consistent compaction of the waste.

A small breach in the final cover may give rise to large quantities of leachate being generated. It is important that any defects that are formed are remedied immediately as they are noticed.

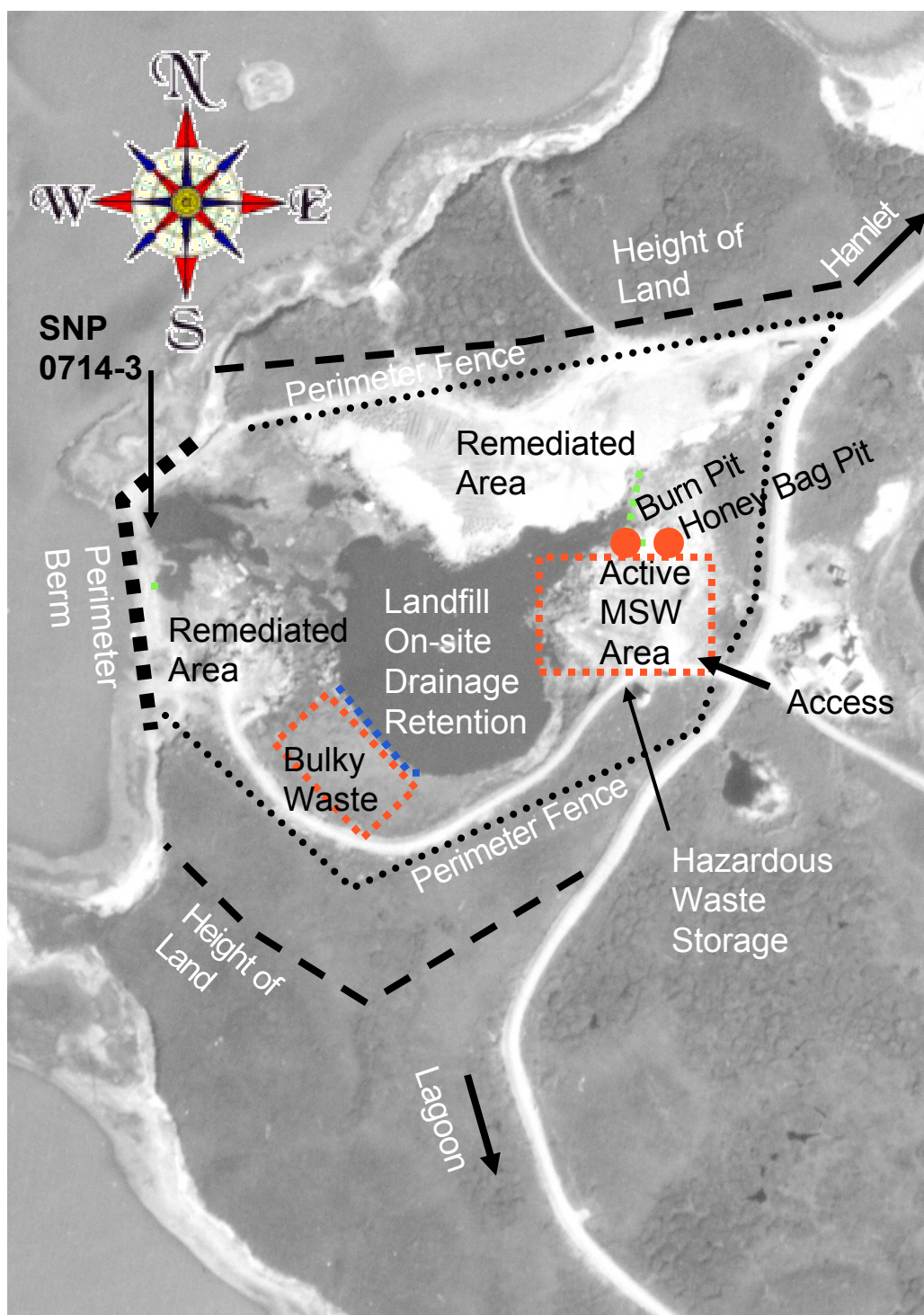
Annual surveys will be carried out on known points to establish settlement patterns. This will assist in predicting future maintenance requirements.



## Hamlet of Tuktoyaktuk Solid Waste Operation and Maintenance

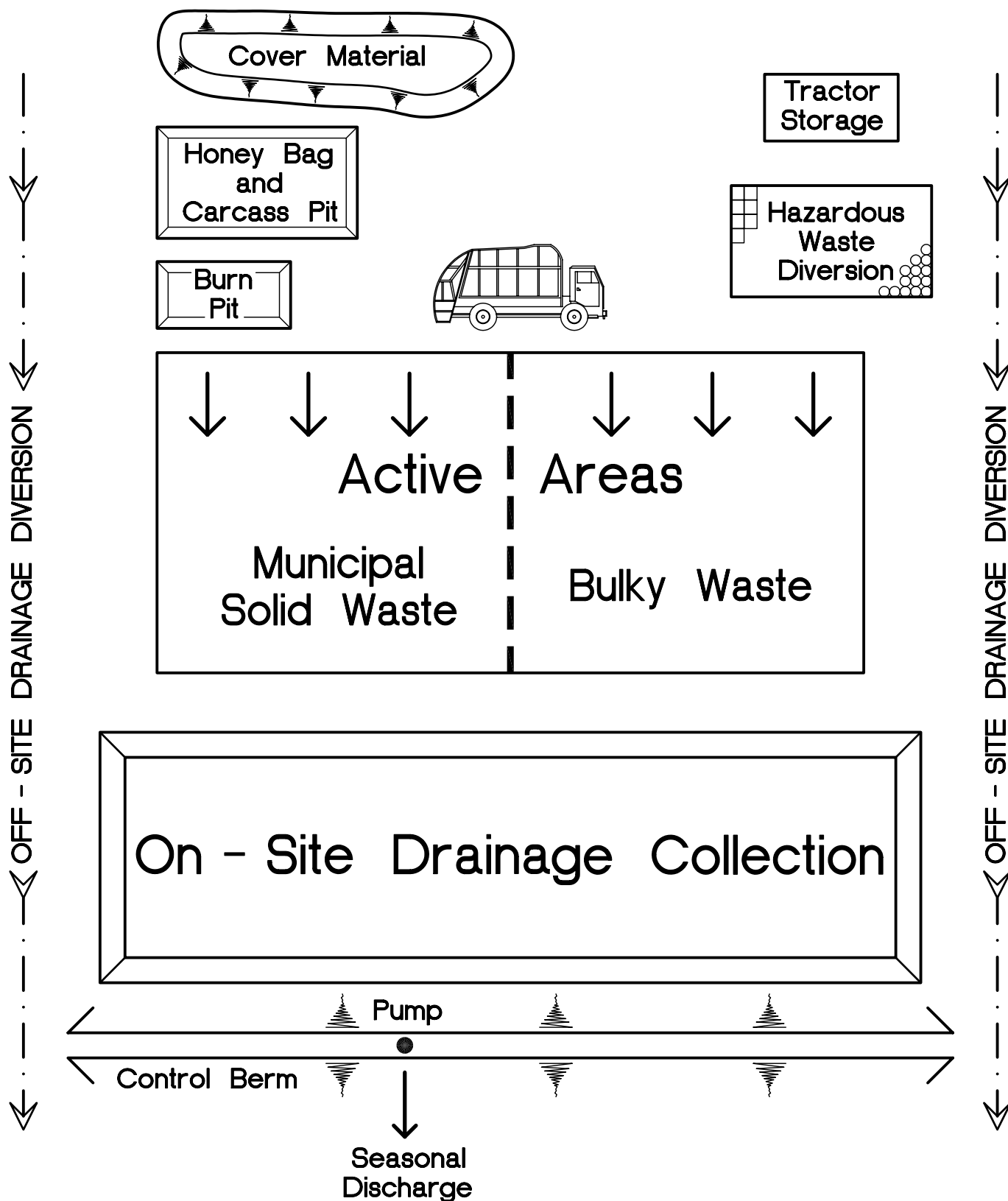
**Figure 1. Facility Locations**





Hamlet of Tuktoyaktuk  
Solid Waste Operation and Maintenance

**Figure 3. Facility Operations**



Date: SEPTEMBER 30, 2005

# Hamlet of Tuktoyaktuk, N.W.T. Solid Waste Operation and Maintenance Manual SOLID WASTE SCHEMATIC





Entrance to Municipal Solid Waste (MSW) Area



Active Municipal Solid Waste (MSW) Area



Perimeter berm along west edge



A **tyco** International Ltd. Company

2005-09-28

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Solid Waste Operation and Maintenance

**Figure 4. Facility Components**

# Appendix A

## Record Keeping Documentation

# Tuktoyaktuk Landfill Record Keeping

**Daily Operation Observations for Month of \_\_\_\_\_, 20\_\_.**

Day	Landfill Normal	Landfill Not Normal	Observations
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			

**Site Development for Month of \_\_\_\_\_, 20\_\_\_\_.**

## OBSERVATIONS

[illegible]

**Not to Scale.**