

# City of Iqaluit Landfill Operations and Maintenance Manual

Project number: 60571501 (500)

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City of Iqaluit Landfill	Operations and
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# 1. Introduction

## 1.1 Purpose

The purpose of the City of Iqaluit Landfill (the Landfill) Operations and Maintenance Manual (the Manual) is to provide the landfill management and operating staff with a guidance document to carry out operations in a practical and reasonable manner and for maintaining regulatory compliance. The Manual provides a basis for:

- Involving operating staff in decision making for daily activities
- Policy and procedure reference document for operating staff
- Employee training
- · Orientation of new employees

Given that there are no standards or guidelines for operations and maintenance of landfills in Nunavut, the Guidelines from Northwest Territories are used as reference of this manual. Therefore, this Manual is consistent with the requirements set out in the *Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories*, April 2003. This document will serve as the Guidelines for the purpose of the Manual.

## 1.2 Reference

Reference information that should be reviewed by operating staff includes the following:

- Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories, April 2003. (Available online at <a href="http://www.maca.gov.nt.ca/?page\_id=1765">http://www.maca.gov.nt.ca/?page\_id=1765</a>)
- Guideline for the General Management of Hazardous Waste in Nunavut (2010). (see Appendix C)
- End-of-Life Vehicle Hazardous Materials Recovery Program Manual Operation (2011) (see Appendix D)

## 1.3 Content

This Manual provides an overview of the Landfill design, operating plan and specific site features. In addition, this manual provides recommended procedures and "appropriate or best practices" for site operations and management. Updates to this manual are to be recorded in Table 1.

# 1.4 Due Diligence

Due diligence can be defined as: "the taking of all reasonable steps as part of the due care and attention to prevent the occurrence of an accident or mishap, as well as having a contingency plan to control an incident and limit any consequential damage".

Due diligence includes policy development, planning and goal setting, implementation of "best management" practices, checking and corrective action, and management review. Best management principles include:

- Good housekeeping
- Preventative maintenance
- Inspections and record keeping
- Security
- Employee hiring and training
- Incident reporting

- Operations procedures
- Emergency response planning
- Risk identification and assessment
- Review and corrective action

**Table 1: List of Manual Revisions** 

Section	Date of Revision	Replaces (Date)	Purpose of Revision
1	November 2018	January 2014	Up date
2			

# 1.5 Site Description

## 1.5.1 Location

Iqaluit is a rapidly growing Baffin Island community and is the Capital of Nunavut Territory. It is located at the south end of Baffin Island, on Frobisher Bay at 64 ° 31' N latitude and 68 ° 31' W longitude. Access is provided by commercial aircraft year-round, and sea-lift from the port of Montreal in the summer. Annual precipitation in the Iqaluit area is approximately 255 cm of snowfall and 19.2 cm of rainfall. Average annual temperatures range from a low in January of approximately -29.7 degrees Celsius (°C) to a high of approximately 11.4 °C in July.

Iqaluit has developed into the eastern Arctic's largest community. In order to minimize the impact of the community on this environment, it is imperative that the solid wastes produced by the community are carefully managed.

The location of the solid waste disposal facility relative to the community is shown in Figure 1.1.

The solid waste disposal site is located in West 40. This site was built in 1995 and was intended as an interim landfill site until the location of a long term operating site could be identified and implemented. In 2001 and 2006, the Landfill was expanded to extend its lifespan and a water surface water management system was installed. Waste disposal techniques at that landfill include compaction and covering with soil materials wood waste when available.

# 2. Organizational Structure

In the City of Iqaluit, the Department of Public Works and Engineering is responsible for municipal solid waste (MSW) management, which includes collection of residential and commercial waste, and the management of the Landfill.

## 2.1 Duties and Responsibilities

## 2.1.1 Director of Public Works and Engineering

The Director of Public Works and Engineering (Director) is responsible for solid waste management of the City. Duties of the Director for landfill management include:

#### 1. Administration

- Preparation of operating budgets
- · Maintenance of operating records and administrative reports
- Environmental monitoring and Reporting
- · Meeting and administrative reports
- Monthly and annual reports, as required by the Nunavut Water Board License and Chief Administrative Officer (CAO)
- Staffing
- Authorize policies pertaining to landfill operations
- · Report to Council, as required by the CAO

## 2. Planning and Development:

- · Work with Engineering Department to oversee capital development projects
- Review the overall operations to monitor that development is according to current engineering plans
- Review and implement plans for reclamation of completed portions of the site

#### 3. Regulatory Compliance:

- Sampling required under the City's Water License
- Review and submit required monitoring reports
- · Review landfill audits
- Work with Engineering Department to review and submit other landfill related documentation to Nunavut Water Board (NWB)

## 4. Public Communication:

- Respond to public and media inquiries
- · Address any complaints

#### 5. Policies

· Responsible to review and update all Landfill policies

#### Safety

Make safety training available to staff

## 2.1.2 Superintendent of Public Works

The Superintendent of the Department of Public Works is responsible for the management of the Landfill and reports to the Director of Public Works. Duties of the Superintendent include the following:

- 1. Planning and Development of the Landfill:
  - Coordinate the overall operations to ensure development is according to the current engineering plans
  - Plan for reclamation of completed portions of the site
  - Schedule and coordinate shipment of hazardous materials to accredited southern waste management facilities
  - Schedule and coordinate shipment of non-hazardous materials to southern recycling facilities as required
- 2. Regulatory Compliance:
  - Oversee the completion of the monitoring program and the preparation of required monitoring reports
  - Prepare and submit to the Director other related documentation required by the NWB
- 3. Safety
  - Ensure staff receive applicable safety training
  - Ensure staff are familiar with the site safety plan

## 2.1.3 Landfill Foreman

The Landfill Foreman reports to the Superintendent and is responsible for overseeing vehicular traffic and day-to-day operations of the Landfill. At the site entrance, the Landfill Foreman provides the first level of contact with the landfill customer and must provide all initial waste screening requirements. Duties of the Landfill Foreman include:

- 1. Gate Operations:
  - Control vehicles entering and exiting the landfill and record the amount of waste received for disposal and recycling
  - · Identify wastes entering the Landfill and screen for prohibited wastes
  - Direct site users to appropriate disposal or storage location
  - · Communicate with other Landfill Operators to assist in their waste screening responsibilities
  - · Report to Superintendent in cases of rejecting waste
  - Collect tipping fees as per the City's Solid Waste Bylaw
- 2. Vehicle Spotting and Waste Inspection:
  - Direct site users to appropriate disposal or storage areas
  - Direct vehicles to safe area for unloading
  - Visually inspect wastes and spot prohibited wastes
- 3. Site Maintenance:
  - Carry out winter and summer maintenance of roads and drainage ditches
  - Collect spilled and wind-blown debris and litter
- 4. Equipment Operations:
  - Pile wood
  - Spread and compact wastes on the working face
  - Maintain the tipping pad free of debris and hidden obstacles

- · Maintain equipment
- 5. Planning and Development of the Landfill:
  - Plan daily working face operations to comply with the overall Landfill fill plan
  - Work with Superintendent to plan disposal area construction
  - Work with Superintendent to conduct landfill audits/inspections
  - Coordinate the overall operations to ensure development is according to the current engineering plan
  - Manage storage compounds
- 6. Regulatory Compliance:
  - Maintain landfill operations within regulatory requirements
  - Complete landfill audits as required
  - Take corrective action for minor issues of non-compliance and notify the Superintendent
  - Recommend corrective action to the Superintendent for major items of non-compliance
- 7. Monitoring of surface water and waste disposal including:
  - Maintain drainage system and manage surface water as required under Water Licence No.3AM-IQA1626
  - Oversee the overall operations of surface water management to ensure no water is pounding on site and run-off outside the Landfill area; development is according to the current engineering plans
  - Perform and document regular visual inspections of the Landfill perimeter berms
  - Complete monitoring required under the Water License No.3AM-IQA1626
- 8. Planning and Development of the Landfill:
  - · Plan daily working face operations
  - Work with Superintendent and Landfill Operator to plan disposal area expansion and soil cover supply
  - Work with Superintendent and Landfill Operator to conduct landfill audits/inspections
- 9. Administrative Duties:
  - Schedule delivery of fuel, oil, and supplies
  - Maintain daily operating records
- 10. Safety:
  - Administer the Site Safety Plan
  - Conduct Safety Orientation for Visitors and Contractors

## 2.1.4 Landfill Operator

The Landfill Operator (Operator) is responsible for performing duties as assigned by the Landfill Foreman. These positions would typically address both ongoing and periodic general site operation and maintenance requirements. Duties of the Operator include:

- 1. Vehicle Spotting and Waste Inspection:
  - Direct site users to appropriate disposal or storage areas
  - Direct vehicles to safe area for unloading
  - Visually inspect wastes and spot prohibited wastes
- 2. Site Maintenance:
  - Carry out winter and summer maintenance of roads and drainage ditches
  - Collect spilled and wind-blown debris and litter

## 3. Equipment Operations:

- Pile wood
- Place and compact cover soil
- Maintain the tipping pad free of debris and hidden obstacles
- Maintain equipment

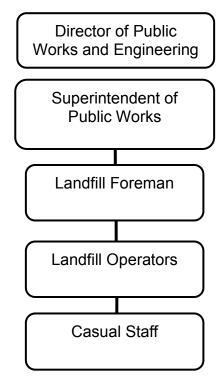
## 4. Safety

• Familiarise and adhere to the facility safety plan

# 2.2 Organization Structure

The organization structure for the City of Iqaluit Landfill is illustrated in Figure 2.1.

Figure 2-1: Organization Chart - City of Iqaluit Landfill



## 2.3 Contact List

The individuals responsible for the operation of the solid waste facility in Iqaluit are listed in the following table:

**Table 2: Contact List** 

Title	Phone Number
Landfill Foreman	(867) 222 - 2946
Superintendent of Public Works	(867) 979-5637
Director of Public Works and Engineering	(867) 979-5653

# 2.4 Personnel Training

Every landfill employee must be trained to perform his or her job in a safe and environmentally responsible manner, in accordance with applicable regulations. Employees will be kept current with changes in regulations and technology through ongoing applicable training courses as regulations and the technical aspects of landfill operation require. Specific training topics may include hazardous waste management, surface water control, spill prevention, first aid and safety.

Continued on-the-job training will be provided to all employees. The training will emphasize the safe and environmentally sound operation of the Landfill. A review of this Operations and Maintenance Manual will be a prerequisite for any employee before being declared eligible for work at the Landfill. All employees will be provided with safety training covering all equipment and systems, with which they will be expected to operate on a daily basis. The use of personal protective equipment (PPE), and the handling and precautions associated with hazardous wastes, will also be included in the safety training.

A training program for more specific tasks, such as those of mobile equipment operators will be documented with written records of meetings and types of instruction. This instruction will include identification of hazardous wastes and unacceptable wastes; emergency procedures in case of fire, spill or injury; confined space entry; respirator use; and other issues that may periodically arise. As required, individuals must be trained in Confined Space Entry, Transportation of Dangerous Goods (TDG) and/or Hazardous Waste Management, Workplace Hazardous Material Information System (WHMIS), and practice proper safety procedures in accordance with applicable legislation and the requirements of the Workers Safety and Compensation Commission (WSCC). Documentation will also be kept on file at the Site Owners office and reviewed annually for any necessary updates.

## 3. Governance

# 3.1 City of Iqaluit Solid Waste Bylaw

The Landfill operator and staff must adhere to the City's waste management By-law identified in Appendix G.

## 3.2 City of Iqaluit Water License

The City of Iqaluit Landfill must operate within the terms and conditions set out in the Licence No. 3AM-IQA1626/Type "A" issued by the NWB to the City of Iqaluit. This Licence is effective June 17, 2016 and expires June 16, 2026. Under this licence, the City is entitled "to use water and disposes of waste associated for municipal undertakings". Appendix H includes a copy of Water License No. 3AM-IQA1626.

## 3.3 Acts, Regulations and Guidelines

## 3.3.1 Acts and Regulations

In addition to the Water Licence, the Landfill must be operated within the *Nunavut Environmental Protection Act (1998)* (EPA) and its associated Regulations, *Environmental Right Act (1988)*. The EPA was amended in 1998 and came into force in April 1, 1999. It creates a framework for an integrated approach to protect the environment including air, land, water, and all organic and inorganic matter and living organisms.

The operations of the Landfill must also comply with *Nunavut Safety Act and Regulations* to protect Landfill operators, visitors, customers, or anyone at the Landfill site.

## 3.3.2 Guidelines

Relevant Government of Nunavut guidelines that may be used as additional reference information in the operation and maintenance of the City of Iqaluit Municipal Landfill are listed below. These documents can be viewed on the Nunavut Department of Environment (DOE) website

https://www.gov.nu.ca/environment/information/documents/195%2C184

- Waste Lead and Lead Paint (2014)
- Used Oil and Waste Fuel
- Biomedical and Pharmaceutical Waste
- Waste Batteries (2011)
- Waste Solvent (2011)
- Waste Paint (2010)
- Waste Asbestos (2011)
- Waste Antifreeze (2011)
- Ozone Depleting Substances (2011)
- General Management of Hazardous Wastes (2010)
- Dust Suppression
- Mercury-Containing Products & Waste Mercury (2010)
- Guideline for Burning and Incineration of Solid Waste (2012):
- Environmental Guideline for Used Oil and Waste Fuel
- Environmental Guideline for Used Oil and Waste Fuel

The document *End-of-Life Vehicle Hazardous Materials Recovery Program Manual* 2011) prepared for the DOE may be used as a reference for End of Life Vehicles operational procedures. It is available on the DOE's website at

https://www.gov.nu.ca/sites/default/files/final\_-\_elv\_program\_manual\_-\_jan\_10\_2011\_0.pdf.

The guideline for managing landfills in the NWT can also be used as a reference for managing waste disposal facilities in Nunavut. This guideline is "Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories (2003)". This guideline promotes effectiveness and efficiency of municipal solid waste landfills. It is available for download on the NWT MACA Solid Waste Management webpage:

https://www.enr.gov.nt.ca/sites/enr/files/guidelines/solidwaste\_guidelines.pdf

# 4. Site Facilities

All solid waste management facilities associated with the Landfill are located within the limits of the site development, with the exception of the offsite runoff retention pond and leachate treatment pond. These facilities include:

- A site office located near the entrance to the Landfill site
- Garage
- Scrap metal area
- Scrap tire collection area
- Hazardous waste depot
- · On-site runoff collection ponds
- White metal collection
- E-waste collection
- · End-of Life vehicle decontamination area
- Cardboard burn facility

## 4.1 Recycling Storage Facilities

The site includes storage areas for recycling of bulky materials including:

- Scrap metals
- Car bodies
- Appliances/refrigerators and freezers
- · Scrap tires
- E-waste

Public sorting of waste or scavenging is not permitted within the disposal area of the Landfill.

## 4.2 Hazardous Waste Area

This site includes storage areas for household hazardous waste (HHW) including:

- Paints and Solvents
- Batteries
- Cleaning Products
- Automotive Products (antifreeze, motor oil, car batteries, brake fluid, transmission fluid)
- · Small propane tanks and cylinders

# 4.3 Landfill Disposal Operating Area

The existing municipal waste operating area is operated using the area method and functions as a natural attenuation system without a liner. The site is underlain by bedrock, silty sand and permafrost.

# 4.4 Equipment

The list of landfill equipment includes:

- Cat 816F Land Compactor
- Cat 928G Loader
- Ford F250 With tidy tank for refueling
- Ford F250

# 4.5 Surface Water Management

Surface water is managed within the Landfill by a series of perimeter berms that collects contains on-site within the Landfill. On-site runoff is pumped to an off-site retention pond for storage. It is then treated prior to discharge to Koojesse Inlet.

# 5. Site Security and Control

# 5.1 Supervision

At least one employee will remain at the site during all hours that the facility gates are open for public access.

Upon arrival, all vehicles entering the Landfill site shall report to the Landfill Operator. Following load check and documenting the waste load, Landfill customers will be directed to the appropriate disposal or storage area for disposal of the waste.

## 5.2 Hours of Operations

The City of Iqaluit establishes the operating hours of the Landfill and posts these hours, at the entrance. The Hours of Operations Policy is subject to change and is included within the Policy Section of this manual.

In the event of an emergency or as deemed necessary, the Landfill Operator may provide access to the site at alternate times with prior arrangement and approval.

## 5.3 Gate Controls

Traffic enters and exits the Landfill via the existing access road approximately 4 kilometres (km) from the city center. The Landfill is surrounded by a chain link fence and has controlled access through one gate at the Landfill entrance. Access to the Landfill is gained through the main entrance gate located at the west side of the site. The gates will be closed and locked outside of the normal operating hours.

Public sorting of waste or scavenging is not permitted within the disposal area of the Landfill.

**Gate Control** - Landfill Foreman is responsible for ensuring the gates are locked and secure after hours. The Foreman will ensure that no persons remain in the Landfill before the gates are locked.

**Key Control -** Access keys are assigned to the Superintendent and Landfill Operator, and potentially to other authorized personnel, to limit circulation of keys.

Emergency access keys are kept at the office of the Department of Public Works and are under the control of the Superintendent and Director of Public Works.

# 5.4 End-of-the-Day Closure

At the scheduled closing time, the Landfill Operator will secure the site by closing and locking the main entrance gate. "End-of-the-day closure" includes:

- Checking for customers and visitors that may be remaining on the site
- The Landfill Operator will remain at the gate to allow exit of any customers or visitors remaining at the site
- Closing and locking the entrance gate once all customers and visitors have left the site
- Conducting backup for collected data
- Checking site building to ensure there is no one present and that all doors are locked
- Conducting a final check of the working face to ensure the area is secure and there is no evidence of fires
- Closing and locking the access road gate

## 6. Customer Service

# 6.1 Guiding Principles for Customer Service

Customers of the Landfill will form opinions on what they see and how they are treated. A positive experience builds trust and confidence in the site operations and will assist in gaining co-operation on future visits.

To meet this objective, the following are guiding principles to assist the Landfill employees:

- Be positive and enthusiastic
- Keep the site, facilities, and equipment in a clean and orderly fashion
- Be involved in decision making and support the decisions of co-workers
- Be open-minded to compromises and ideas
- Be flexible with customers with reasonable discretion
- Show respect for the customer
- Assist the customer within reasonable limits
- Communicate and educate the customer
- Provide effective and efficient service
- Create "win/win" solutions that satisfy the customer, with consideration for public safety, financial considerations, and Landfill operations
- Treat the customer as we would want to be treated at their place of business

# **6.2 Assisting Customers with Vehicle Problems**

In the event that a customer experiences problems with their vehicle, the Landfill Operator should provide assistance so that the vehicle and driver are:

- In a safe situation
- Out of the way of other customers
- Looked after so that appropriate help is provided

Assistance for vehicle problems may include:

- Assisting the vehicle driver to phone a tow truck
- Either assisting or arranging for someone to assist the driver to change a flat tire

Vehicle drivers must be informed of any risks or liabilities that may be involved in providing assistance, such as towing vehicles. Any actions taken are to be at the discretion of the Landfill Operator, with customer satisfaction and safe operation of the Landfill in mind.

# 6.3 Public Inquiries

The public, regulating agencies, or the media may ask questions to the Director, either directly or by phone. The Director should politely request any individual making an inquiry to identify themselves in order that the questions may be appropriately responded to.

The following are general guidelines for responding to inquiries:

- 1. If questions are of a general nature (i.e. hours of operations), the employee should provide these answers along with any relevant printed information that may help
- 2. Inquiries should be referred to the Superintendent if the questions are related to the following:
  - a. Technical issues

- b. Regulatory issues
- c. Financial issues
- 3. Inquiries received from regulatory agencies or the media should be referred to the Director
- 4. If a question is asked and the employee does not know the answer, the employee should say so and refer the person to the Superintendent
- 5. If an employee is unable to take the time to answer a question because of a heavy work load during peak periods, the employee should:
  - a. Explain the situation
  - b. Ask the person to leave their name and phone number so that someone may call back at a less busy time

# 7. Waste Acceptance Procedures

# 7.1 Accepted and Non-Accepted Wastes

## 7.1.1 Accepted Waste

Any waste disposal operation has limitations with respect to the waste streams which may be handled in an environmentally safe manner. Limits must be placed on the types of waste accepted at a disposal site in order to protect the environment, the employees, the users and neighbours, as well as the equipment from damage, while simultaneously providing adequate levels of service.

The Site Owner shall allow only those materials to be deposited at the Iqaluit Landfill for which the facility has been designed for with the exception of unique circumstances reviewed in consultation with regulatory agencies.

Acceptable wastes are listed below:

- Plastic, metal, and paper wastes; packaging; cardboard; newsprint; food; rubber; leather; glass; wood; from residential, commercial or industrial premises
- Animal and vegetable (organic) waste material
- Sweepings, clothing and textiles, consumer electronics, and discarded household utensils
- Furniture and major appliances
- Non-salvageable metals
- Tires
- Construction & Demolition wastes (provided the waste is not a hazardous or banned material)

#### Household Hazardous Waste Streams such as:

- Cleaning Products (oven cleaners, drain cleaners, bleach, spot remover)
- Paints and Solvents (oil-based paints, thinners, paint stripper)
- Automotive Products (antifreeze, motor oil car batteries, brake fluid, transmission fluid)
- Pesticides and herbicides
- Small propane tanks & cylinders (Barbeque tanks)
- Miscellaneous Hazardous Materials (household batteries, photographic chemicals, pharmaceuticals, aerosol sprays)
- Biomedical wastes/ash that have been incinerated, and cooled prior to disposal

## 7.1.2 Non-Accepted Waste

Wastes which present a danger at the Landfill Site, require special disposal techniques, or may interfere with the level of service to the public, are not acceptable for disposal. In some cases, wastes which are acceptable in small quantities may not be acceptable in large quantities from a single generator because they may cause the level of service to other users to deteriorate and cause handling problems at the site and increased environmental liability. To some extent, the acceptability of large quantity wastes must be at the Site Owners discretion, depending on the ability to accommodate disposal without deterioration in the level of service. In cases where unacceptable wastes are identified, site staff will attempt to identify allowable management alternatives to material haulers.

All wastes which pose potential safety or environmental problems cannot be listed in their entirety. The Site Owner and site personnel in general must be wary of accepting wastes which could cause future operational problems and must watch for the inclusion of unacceptable wastes in regular loads of refuse.

A list of materials which MAY NOT be accepted for placement in the Landfill is as follows:

- Contaminated soils
- Explosives or highly combustible materials of any nature
- Large volumes of waste oil and fuel (more than 5 Litres per load)
- Gas cylinders, unless the valve has been removed and the cylinder properly drained by a professional trained in handling gas cylinders
- Radioactive materials
- Mercury
- Industrial/Commercial Hazardous Waste
- Drums with unidentified contents
- Large volumes of fuel tank sludges from tank farms
- Hot ashes
- Any liquids, or liquid waste, of a quantity greater than five Litres in any one load
- Biomedical wastes that are not incinerated or autoclaved prior to disposal
- Waste pharmaceuticals
- Polychlorinated Biphenyls (PCBs) or PCB contaminated materials
- Any other materials not listed as acceptable or conditionally acceptable with the approval of the Site Owner

## 7.2 Segregation of Materials

Materials accepted at the Landfill for recycling that require segregation from general waste include:

- Appliances containing CFCs
- · Automobile batteries
- End of Life Vehicles
- Paint
- E-waste
- Propane tanks
- Scrap tires

# 7.3 Waste Acceptance Screening Procedure

Among the most important duties of the Landfill Operator are to ensure that wastes are properly and thoroughly screened, and if any unacceptable wastes are found, that they are safely managed. The community must be aware of the screening activities and their results.

#### Screening the Waste

Vehicles delivering waste to the Landfill are required to report to the Landfill Operator. The first point of onsite contact is at the gate, which allows for an initial screening process. It is not possible to screen the contents of packer trucks and transfer vans at the gate. Screening of these vehicles' contents must be done at the working face.

The second point of on-site contact is at the disposal area where vehicles are unloaded. The Landfill Operator will visually inspect loads. The Landfill Operator should look for any waste that does not fall within any of the acceptable waste types as listed in Section 7.

Hazardous or other waste that has received prior approval for shipment to the Landfill should be inspected to verify that it fits the description provided by the generator. The waste load should be inspected and clearly classified prior to being pushed or compacted.

#### **Know Your Generators and Haulers**

It is important to know the potential sources of prohibited wastes from the service area. Some examples are:

- The automotive repair industry generates solvents, paint wastes, lead acid batteries, grease and oil
- Medical and dental clinics generate bio-medical wastes
- Individuals may bring in batteries, paint, oils, spent fuel, etc.

#### Be cautious in accepting wastes from unknown, unlicensed, or otherwise questionable haulers.

The Landfill Operator will also identify suspicious wastes based upon visual and odor characteristics. Indicators of suspicious wastes may include:

- Hazardous signage or markings
- Liquids
- Powder or dusts
- Sludge
- · Bright or unusual colours
- Drums or commercial size containers
- Chemical odours
- Smoke

General information obtained from the waste hauler shall include:

- Time and date of visit to the Landfill
- Vehicle identification/license number
- Source and nature of the waste disposed of

## **Inspection Safety Considerations**

The Waste Inspector will wear the following safety clothing during inspection:

- Coveralls
- Safety boots
- Gloves
- Safety vest
- · Face mask as required
- Eye protection

Where a load is rejected and turned away from the Landfill, the Landfill Operator will attempt to secure the following information:

- Vehicle type and license number
- Identifying company names or addresses
- The source of the waste

- Name and description of the vehicle driver
- Details of the load inspection and reasons for rejection

## **Emergency Handling**

Should an emergency situation occur such as a spill, procedures outlined in Appendix I – Landfill Emergency Response Plan will be implemented. A copy of the Emergency Response Plan will be kept on site.

Procedures (beyond spill response) in such events involve:

- 1. Place notification call to the Environment Protection Division of the Department of Environment, NU as outlined in Section 13.12 and 15.6
- 2. Confirm and record the name and phone number of the contact person
- 3. Obtain and record the name and address of the company responsible for the emergency disposal or storage
- 4. Determine the nature of the material, handling procedures and necessary precautions to be taken.
- 5. Contact the Superintendent
- 6. Arrange for the Landfill Operator to remain after hours, if required
- 7. If material requires covering or handling with landfill equipment, contact the Landfill Operator.
- 8. If the responsible company does not have an account, information and collection of fees for the service will be done by the Public Works Department of the City of Iqaluit

# 8. Waste Handling

## 8.1 Overview

The nature of wastes accepted at a landfill requires that different types of materials be handled in different ways. Although there are special cases where the Landfill Operator must make a "best judgment" on how to handle a particular material, there are accepted procedures for most products in the waste stream. If the type of waste is unknown, then the operator should not accept the waste material until it can be verified.

## 8.2 Recyclable Materials

Procedures for managing recyclable materials delivered to the Landfill are outlined below.

## **Bulky Metals**

Metals are stored in the designated storage area. Alternative storage areas may be designated by the Landfill Operator for temporary storage and should be located where there is available room to unload vehicles and load recycling transport vehicles.

Metal piles should be sorted and organized to improve marketing potential. Metals may be sorted as cast iron, pared metals, tin, wire/cable, car bodies, and appliances.

Appliances that may contain CFCs (refrigerators, freezers, and air conditioning units) are to be set aside so that the CFC contents can be purged by a qualified individual as outlined in the Guideline for Ozone Depleting Substances.

## **Tires**

Tires will be loaded and stored on-site in a designated shipping container in the recycling area. Tires hauled by individuals will be accepted for storage in the recycling area. Once a shipping container is full it will be sealed and prepared for shipping to a tire recycler. The Superintendent will contact tire haulers/processors in the NU, if available, or in another provinces to arrange for recycling

#### E-Waste

All e-waste (i.e. T.V's, radios, cell phones, radios, computers and accessories, etc.) will be accepted and loaded and stored on-site in a designated shipping container in the recycling area. Once a shipping container is full it will be sealed and prepared for shipping to an e-waste recycler. The Superintendent will arrange with local haulers/processors to arrange for recycling.

## **Paint**

All waste paint will be loaded and stored in a designated shipping container in the recycling area. Once the container is full the container shall be sealed and arrangements made with the local processor to arrange for proper disposal and recycling. Any paint cans that are empty, and the paint is film dry, can be disposed of in the Landfill.

#### **Automotive Batteries**

All automotive batteries are to be accepted, loaded and stored in acceptable shipping containers. The batteries must be stored off the ground in weather proof containers or storage building. Superintendent shall make arrangements to have all stored batteries shipped to an approved recycler on an annual basis. Refer to Automotive Battery Policy

## **Propane Tanks**

Only propane tanks that are empty and valves open shall be accepted. Any accepted propane tanks shall then have the valves removed. Once the valves have been removed the tanks can then be stored in the scrap metal storage compound. Refer to Propane Bottle Policy for proper management.

## 8.3 Hazardous Waste

Hazardous waste materials which are household in origin are to be treated or stored in the hazardous waste disposal area. Hazardous wastes from commercial/industrial sectors will not be accepted at the Landfill. In accordance with the Nunavut Waste Guidelines, all hazardous waste generated by commercial and industrial activities are to be demobilized south by the waste generator.

The hazardous waste storage area has sea lift containers for storage of wastes. This area is surrounded by fence and has a separate gated entrance from the main road.

Due to the danger of handling hazardous wastes, the handling, packaging, storage, treatment of the wastes should only be completed by personnel trained in Transportation of Dangerous Goods (TDG) and/or Hazardous Waste Management and WHMIS.

#### 8.3.1.1 Hazardous Waste Definition

Hazardous wastes as those wastes which, due to their nature and quantity, are potentially hazardous to human health and/or the environment and which require special handling and disposal techniques to eliminate the hazard. A hazardous waste includes products, substances or organisms which, by their nature, satisfy the requirements of being a dangerous good as defined in the Federal Transportation of Dangerous Goods Act.

The Transportation of Dangerous Goods Act recognizes nine classes of dangerous goods which are considered hazardous.

Those products, substances, or organisms that would be considered hazardous generally include the following Classes of waste as defined in the Transportation of Dangerous Goods Act.

- Class 1 Explosives
- Class 2 Compressed gases
- Class 3 Flammable and combustible liquids
- Class 4 Flammable solids
- Class 5 Oxidizing substances
- Class 6 Poisonous, toxic and infectious substances
- Class 7 Nuclear substances
- Class 8 Corrosives
- Class 9 Miscellaneous products, substances or organisms that may pose a risk to life, health, property
  or the environment

Typical household hazardous waste which can be expected to be stored at the Landfill includes:

- Cleaning Products (oven cleaners, drain cleaners, bleach, spot remover)
- Paints and Solvents (oil-based paints, thinners, paint stripper)
- Automotive Products (antifreeze, motor oil, car batteries, brake fluid, transmission fluid)
- · Pesticides and herbicides
- Small propane tanks and cylinders (Barbeque tanks)
- Miscellaneous Hazardous Materials (household batteries, photographic chemicals, pharmaceuticals, aerosol sprays)

#### 8.3.1.2 Hazardous Waste Collection

Household hazardous waste can be dropped off at the Landfill during operating ours, this allows the Landfill Foreman to ensure that the hazardous waste entering the Landfill is residential and not commercial.

Any known hazardous wastes spotted in the general refuse area of the Landfill will be relocated to the hazardous waste area by trained personnel.

## 8.3.1.3 Hazardous Waste Storage

The accumulated household hazardous wastes shall be placed in the on-site storage containers by trained personnel. Once the wastes have accumulated a significant volume, they will be prepared and shipped to a southern disposal facility.

The site operator should be trained in WHMIS and Transportation of Dangerous Goods (TDG) and/or Hazardous Waste Management. The current Material Safety Data Sheets (MSDS) must be kept on site for all products stored at the site. Supplier or workplace labels must be placed on all containers which hold a hazardous waste.

Factors to be considered when storing hazardous waste include compatibility, segregation, ventilation, climate/environment, handling, security, labeling, record keeping, and emergency response. The following summarizes some of the factors that will considered when dealing with hazardous wastes.

#### Compatibility

The compatibility between different types of hazardous wastes stored in the same storage container must be considered before storage. The compatibility of wastes with materials and equipment which is stored nearby is also very important, particularly when dealing with flammable wastes. The compatibility of wastes with their storage containers must also be considered. The site operator will review the WHMIS for this information.

#### Segregation

The final destination of hazardous wastes will be considered before storage. If future recovery may be possible, storage of the material will allow for such recovery.

#### Ventilation

Hazardous wastes may present a serious health hazard in storage and will therefore be well ventilated. Volatile materials in particular will be considered. Since sealift containers do not accommodate proper ventilation, the site operator will ventilate the storage container before entering.

Ventilation will consist of opening the access doors one hour prior to entering. An observer will be present upon entering to ensure that the operator is not overcome by fumes. The observer must have access to communication in the event of an emergency.

#### Climate/Environment

Contact between hazardous wastes and rainwater and soil will be prevented, and wastes should not be exposed to direct sunlight. For outside storage of hazardous wastes, containers will be covered by a tarpaulin and placed on an impermeable base. This will also facilitate and reduce the cost of clean-up for any spills or leaks. The containment area will be curbed and diked to collect spills, leaks and precipitation.

#### Handling

Handling of hazardous wastes will be in accordance with WHMIS guidelines. The site operator will obtain WHMIS information for materials accepted at the site. The Transportation of Dangerous Goods Regulations will be followed when transporting the wastes off site.

## Security

Security precautions will be taken to avoid theft, accidental discharge, and any possible harm to the public. The gate to the hazardous waste storage area will be locked at all times except when the operator is working in the hazardous waste area. Sealift containers will be closed and locked when access is not required.

## **Record Keeping**

A record of the types and quantities of hazardous wastes must be maintained in a log book to ensure safe storage. Containers must be properly labeled during the entire time in storage. If this is not carefully completed then there could be problems identifying the waste when it is time to ship it south for disposal.

Record keeping will also include ongoing quantity totals and dates received. Since relatively small quantities of materials are expected to be delivered to the site, individual lists for each material will be worthwhile.

As a minimum record keeping should include the following:

- Type of waste received
- Quantity received
- Dates received
- Name of person/company who disposed the waste if available
- Method of storage/disposal
- On-going total quantity for each type of waste

#### **Emergency Response Plan**

An emergency response plan has been developed in case of a significant spill, fire, or other emergency (See Appendix I). The depot will also be equipped with an emergency spill kit and fire suppression equipment.

#### 8.3.1.4 Transport and Disposal

Hazardous waste collected and stored by the City will be shipped to a receiver or hazardous waste management facility located outside of Nunavut. As per the Department of Environment, Government of Nunavut *Environmental Guideline for the General Management of Hazardous Waste*:

- Hazardous waste will only be shipped to a receiver or facility that has been registered in the receiving
  province or territory to accept that waste
- Waste manifests will accompany each shipment of waste in accordance with the Transport Authorities' requirements and in compliance with the Interprovincial Movement of Hazardous Waste Regulations
- The Landfill Foreman will work with the carrier to ensure that any hazardous waste shipped is packaged, documented, labeled and placarded in compliance with the method of transport used

 The Landfill Foreman will receive all documentation stating that the Hazardous Waste has been received by a registered facility (manifest)

## 8.4 Sewage Sludge

Dewatered sewage sludge from the Waste Water Treatment Plant is accepted for direct disposal into the active working face. Prior to delivery of the sludge a small "disposal pit" shall be prepared at the active working face. A load of waste from one of the commercial City waste collection trucks shall be dumped close to the area prepared for the sludge. Once the sludge is dumped it shall be immediately covered with the reserved waste load. The Waste Water Treatment Plant must call ahead and make prior arrangements with the Landfill to allow the Landfill adequate time to make necessary preparations for the acceptance of the sludge. Arrangements for sludge acceptance should not be early in the morning and ideally would occur later in the day and prior to the last waste collection truck arriving at the Landfill.

## 8.5 End of Life Vehicles

The New Hampshire Department of Environmental Services identified a number of best practices with respect to dismantling end-of-life vehicles, including:

- Prior to removing parts and dismantling vehicle components, completely drain all vehicle fluids, including antifreeze, brake fluids, engine oils, transmission fluids, windshield washer fluid, power steering fluid, rear axle housing fluids, etc. Do this over an impervious surface.
- Do not mix the fluids. Recycle, reuse, or dispose of fluids in an appropriate manner.
- Dismantle and drain vehicles, parts, scrap, and cores in one centralized location that is under a roof and over an impervious surface (for example, concrete). Make sure there are no open drains or cracks in the surface.
- Use drip pans when unclipping hoses, unscrewing filters and removing parts.
- · Replace drain plugs when done draining.
- Fully drain parts and cores on a drain table or drip rack before moving them to a storage area.
- Keep spill control equipment nearby. Clean up spills immediately.
- Seal all fluid lines after draining to prevent leaks. Metal lines can be crimped or bent; rubber hoses can be plugged with clamps, balls, or golf tees.
- Remove and separate recyclable and potentially hazardous components, including the fuel tank, radiator, tires, battery, catalytic converter, air bag units, and mercury switches.
- Remove and capture air conditioning refrigerants (R-12 and R-134a). Qualified persons, using certified equipment, must perform this work.
- Remove engines through the hood. Do not tip vehicles on their sides, because this allows fluids to run
  out and spill on the ground.
- Establish a good routine for dismantling vehicles and stick with it.
- At "you-pull-it" facilities (where customers are allowed to remove parts), make sure the flu-ids are drained from vehicles before customers are allowed to remove parts. Instruct customers on proper procedures to prevent leaks during removal of parts, and provide spill control supplies for convenient customer use.
- Store engines, transmissions, and other oily, greasy parts off the ground, over an impervious surface, and under cover to prevent soil, groundwater, and storm water contamination. Have spill controls, including drip pans and absorbents handy.
- Keep an inventory of the vehicles and parts stored at the facility.

<sup>&</sup>lt;sup>1</sup> New Hampshire Department of Environmental Services. N.H. Green Yards BMP Guide Sheet #11. May 2003.

In Canada, the Automotive Recyclers of Canada recently prepared the *National Code of Practice for Automotive Recyclers Participating in the National Vehicle Recycling Program* for Environment Canada<sup>2</sup>. The document describes the environmental considerations of related to managing end-of-life vehicles and reviews the national code of practice for reuse and resale, administration, spills, dealing with hazardous materials, automotive recycler processing areas, and equipment and infrastructure. The document is available for download at <a href="https://www.certifiedautorecycler.ca/rescources.html">www.certifiedautorecycler.ca/rescources.html</a>.

As noted previously, the document *End-of-Life Vehicle Hazardous Materials Recovery Program Manual Operation* (2011) prepared for the DOE may be used as a reference for End of Life Vehicles operational procedures. It is available on the DOE's website at <a href="http://env.gov.nu.ca/sites/default/files/final-elv-program-manual-jan-10-2011">http://env.gov.nu.ca/sites/default/files/final-elv-program-jan-10-2011</a> 0.pdf.

## 8.6 Burn Box Operation

The Landfill utilizes an Airburners S-220 Refractory Walled Air Curtain Burner with a Kubota V2403-TE Diesel Engine to burn cardboard. Cardboard can be burned when conditions allow and the S-220 burner is to be operated according to the Operating Manual provided in Appendix K. The burn box is generally used to burn baled cardboard. **The burn box cannot be used when the wind speed exceeds 30 kilometers per hour (km/h).** The site operating procedures, read in conjunction with the Operating Manual, are as follows.

## 1. Engine Start

- Perform pre start checks Oil, coolant, fuel and air filter
- Check weather to ensure the winds are blowing under the 30 kilometres per hour limit
- Ensure that the power take-off clutch lever is disengaged.
- If needed, turn key switch counter clockwise to the PREHEAT position for a few seconds
- warm up the engine at idle 1000RPm for 5 to 10 mins

#### Cold lighting

- Load box with dry material if possible
- Spray 5-10 gallons of diesel fuel
- Using propane torch light the material from under the rear doors and from the access door in the forward panel on the manifold side of the unit
- Start fan when there is a good flame
- Engage fan clutch after turning RPMs to 1400 (engage clutch handle slowly until it locks in place)

## 3. Hot lighting

- Load box with dry material if possible
- Wait until there is good flame then start fan (if not too hot can assist by using torch)
- Engage fan clutch after turning RPMs to 1400 (engage clutch handle slowly until it locks in place)

#### Loading box

- Using either bucket or grapple place material in box
- Place material gently into box -avoid dumping material
- Alternate ends to avoid overloading
- Never overload box load to only 1/2 to 3/4
- Loading slowly will burn faster than loading large quantities

## 5. Shut down

- Stop loading 1 to 2 hours prior to end of shift
- DO NOT stop fan when flames are closer than 24" from manifold

<sup>&</sup>lt;sup>2</sup> Automotive Recyclers of Canada. National Code of Practice for Automotive Recyclers Participating in the National Vehicle Recycling Program. March 2010.

- If there is still significant material in box leave the fan engaged for the night at 1400 RPM
- If material is almost gone reduce RPMs to 1400 and disengage PTO
- Allow engine to cool off then shut down

## 6. Cleaning

- Open back doors and check temps
- If they are over 100C the rake must be used and pull material out
- If pulling out change over to bucket to clear pile by back doors
- If temps are cooler then can unload using the bucket and material piled to the side of box

# 8.7 General Guide

A general guide for the handling of various waste materials is provided in Table 3.0. This guide is only intended for reference; specific circumstances may dictate handling requirements and procedures.

**Table 3: General Guide to Waste Handling** 

GENERAL GUIDE TO WASTE HANDLING			
Type of Waste	Examples	Special Concerns	Handling Procedures
Asbestos	Insulation, coated pipes	Airborne particles post a health risk to landfill employees and customers	<ul> <li>DO NOT ACCEPT asbestos for disposal</li> <li>Refer to site policies and Guidelines for the General Management of Hazardous Waste in NWT for acceptance and handling of asbestos</li> </ul>
Bulk Liquids (except for select sump waste)	Oils, sump liquids, industrial liquids	Bulk liquids are prohibited from disposal	Do not accept liquid wastes for disposal
Bulky Metals	Appliances, culverts, sheets, equipment parts	<ul> <li>Consumes landfill space</li> <li>Recyclable materials</li> <li>Difficult to incorporate into working face</li> <li>Appliances may contain CFCs</li> </ul>	<ul> <li>Divert to metal storage area for recycling</li> <li>Apply Ozone Depleting Substances Management Policy</li> </ul>
CFC's	Refrigerators, Freezers	Contains CFC's	<ul> <li>Remove cfc's and store for shipping</li> <li>Move white goods to recycle area</li> </ul>
Clean Fill	Uncontaminated soil	Suitable for cover material on the landfill	Divert to soil stockpile at working face for use as cover material
Combustibles	Carbide, metal dust, hot lime	<ul> <li>Combustible with water and air</li> <li>Risk to site employees and customers</li> </ul>	<ul> <li>Apply hazardous waste acceptance procedure</li> <li>Separate from other waste and cover with soil</li> </ul>
Compressed Gas Canisters	Propane bottles/tanks, industrial canisters, CFC canisters	<ul><li>May be hazardous</li><li>May contain CFCs</li><li>May be dangerous to site employees and customers</li></ul>	<ul> <li>Do not accept for disposal if containers hold any contents</li> <li>Do not compact</li> <li>Store for recycling if appropriate</li> </ul>
Construction and Demolition Wastes (Inerts)	Concrete, rocks, wood, glass, metals, asphalt, plastics	<ul> <li>Bulky materials may be difficult to spread and compact</li> <li>Consumes landfill space</li> <li>May contain hazardous wastes such as asbestos</li> </ul>	<ul> <li>Dispose mixed inert loads in landfill operating area</li> <li>Where practical, divert asphalt to a storage area for reuse</li> </ul>

	GEN	ERAL GUIDE TO WASTE HANDLII	NG
Type of Waste	Examples	Special Concerns	Handling Procedures
Electronic Waste	Televisions, radio, computers	• N/A	<ul> <li>Store separately in shipping containers</li> <li>Ship south for recycling when practical</li> </ul>
Empty Containers	45 gallon drums, 20 litre pails, etc.	<ul> <li>May contain prohibited wastes (liquids, hazardous products)</li> <li>May burst upon compaction and pose danger to site employees or customers</li> <li>Some "empty" containers may be still classed as hazardous wastes unless properly cleaned</li> </ul>	<ul> <li>Apply contaminated solids acceptance procedures</li> <li>Do not accept containers unless contents are known to be non- hazardous solids</li> <li>Do not compact sealed containers</li> <li>Determine original contents of the containers</li> <li>Look at container labels for original contents or warnings</li> </ul>
End of Life Vehicles	Hazardous waste e.g. fluids such as gasoline and oil.	Proper handling of hazardous materials	Adhere to proper handling procedures outlined in this manual
Explosives	shells, dynamite	<ul> <li>Prohibited from landfills</li> <li>May indicate criminal activities</li> <li>High risk to site employees and customers</li> </ul>	<ul> <li>Do not accept</li> <li>If unloaded, isolate the area from site employees and customers</li> <li>Contact RCMP</li> </ul>
Fire Place or Barbecue Ash	Ash	<ul> <li>Easily airborne</li> <li>If hot ashes exist, may ignite fires when unloaded</li> </ul>	<ul> <li>Accept with caution</li> <li>Do not unload directly on the working face</li> <li>Unload away from working face or other burnable items and only unload onto soil</li> <li>Ensure there are no hot coals present before incorporating onto the working face</li> </ul>
Fluorescent Light Bulbs	Light bulbs	<ul><li>Contains mercury</li><li>Can break easily</li></ul>	<ul> <li>Store in a secure location (garage)</li> <li>Put fluorescent light bulbs through the Bulb Eater</li> <li>Store contained mercury for shipping</li> <li>Broken glass can be added to the municipal waste pile</li> </ul>
Household Hazardous Waste	Paints, solvents, oils, cleansers, pesticides, etc.	<ul> <li>Public is encouraged to separate HHW from municipal waste stream</li> <li>HHW is to be dropped off at the landfill by the Public</li> </ul>	<ul> <li>HHW has to be stored in a shipping container</li> <li>Ship south for proper disposal or recycling</li> </ul>

GENERAL GUIDE TO WASTE HANDLING				
Type of Waste	Examples	Special Concerns	Handling Procedures	
Industrial Solids	Powders, shavings, granules, sands, or dry chemicals	<ul> <li>Dust is easily airborne</li> <li>May pose health risks to site employees and customers</li> <li>May be abrasive or corrosive to equipment</li> <li>May have hazardous properties</li> </ul>	The facility does not accept industrial waste	
Land Clearing Debris	Soil, rocks, roots, , vegetation	<ul> <li>May be difficult to incorporate with refuse if it contains large solid materials</li> <li>Primarily clean soils (i.e. with limited vegetation ) may be suitable as cover material</li> </ul>	<ul> <li>Determine if suitable for cover material if material is suitable as cover material, direct it to soil stockpile at working face for use as cover material</li> <li>If material is unsuitable as cover material, dispose of it as inert waste</li> </ul>	
Lead Acid Batteries	Automobile, truck, and equipment batteries	<ul> <li>Wet cell batteries contain acids</li> <li>Contain lead</li> <li>May spark upon compaction and ignite fires</li> </ul>	<ul> <li>Store on wooden pallets in recycling compounds</li> <li>Place batteries into battery bags for shipment south to recyclers</li> <li>Provide secure storage using a sea Can</li> <li>Store as per Transportation of Dangerous Goods</li> </ul>	
Mattresses	Mattresses, box springs	<ul> <li>Difficult to handle in working face</li> <li>Box springs may bind up in equipment</li> </ul>	<ul> <li>Dismantle mattresses</li> <li>Place steel springs into scrap metal storage area and remaining material can be disposed of at the working face.</li> </ul>	
Municipal Solid Waste (MSW)	Household refuse, commercial refuse including paper, food wastes, yard wastes, metals, plastics, glass, and other refuse	<ul> <li>Bulky items may bridge over other wastes thereby reducing compaction</li> <li>Potential for odours and attraction of vectors</li> <li>Potential for blowing litter</li> </ul>	<ul> <li>Spread in thin layers on the working face and compact</li> <li>Apply cover material</li> </ul>	
Organic Waste	Household organic waste, gardening residue, soil	Potentially compostable material	Place in working face	

GENERAL GUIDE TO WASTE HANDLING						
Type of Waste						
Paint and Paint Cans		<ul> <li>Paint cans may not be empty</li> <li>Paint may not be dry</li> </ul>	<ul> <li>If paint cans are empty and dry, direct to working face for landfilling</li> <li>Paint cans that are not empty and/or that contain wet pain must be placed in the shipping container and shipped south for recycling</li> <li>May solidify paint by drying or adding cement powder before landfilling</li> </ul>			
Sewage Sludge	Municipal Sewage Sludge from the Wastewater Treatment Plant	Heavy metals	<ul> <li>Treatment plant should make prior arrangements for disposal at the end of the day</li> <li>Prior to arranged delivery time prepare a location in the working face for disposal, set aside a waste collection truck load of waste</li> <li>Sludge to be placed in the prepared disposal area and immediately covered with the waste that was set aside.</li> </ul>			
Used Oil (incl. filters, oil containers)	Engine and transmission oil	Liquid waste     Possibly flammable	direct customers to used oil drop facility			
Used Tires	Passenger car and small truck tires (15 inch or less), medium truck (up to 19 inch), OTR tires (large equipment tires)	Bulky and consume landfill space     Tires do not tend to stay buried but work their way to top of disposed waste material	<ul> <li>All tires accepted</li> <li>Tires are not to be disposed of at the working face</li> <li>Tires to be immediately loaded into a shipping container</li> <li>When shipping container filled arrange for shipment south to recycler</li> </ul>			
Wood Waste	scrap lumber	<ul> <li>Difficult to incorporate into general refuse</li> <li>Consumes landfill space</li> <li>Divert treated wood to construction and demolition material area</li> </ul>	Incorporate into the working face     Wood waste can be crushed with the compactor and mixed with soil material and used as cover material			

# 9. Operational Procedures

# 9.1 Operating Principles

The Landfill is to be operated by the following principles:

- Appropriate staff are on-site during operations hours
- Access to the Landfill is controlled
- Only approved or authorized waste is accepted for storage or disposal
- The Landfill is developed according to the engineering plans and fill plans
- Wastes are compacted to the greatest practical density
- Wastes are covered as necessary to control nuisances
- Surface water is managed and controlled within the requirements of the City's Water License
- Safe operating practices are followed and all Landfill personnel are encouraged to improve their skills and knowledge
- Records are maintained with respect to operations activities and site development
- · Landfill operations are managed by a Landfill Operator

# 9.2 Landfill Staging

Refer to the fill plans and Landfill Decommissioning Plan for detailed Landfill staging and fill sequencing.

# 9.3 Traffic Control

# 9.3.1 Signage

Signs should be posted throughout the Landfill to inform and provide directions to customers for the appropriate locations for unloading. See the following table for recommended signs and placement.

**Table 4: Recommended Signs and Placement** 

Location	Purpose	Туре
At Highway	Direction Board	Permanent
At Gate	Name of Site; Operating Hours; Emergency Numbers; Safety Notices; Prohibited Waste	Permanent
Waste Oil Storage	Accepted Products	Permanent
Tire Storage	Sign boards for passenger tires, truck tires, and off road tires	Portable
Metal Storage	Acceptable Metals	Permanent
Working Face	Direction Signs; Safety Signs	Portable
Access Roads	Direction Signs; Speed Signs	Permanent
Battery Storage	Sign Board	Permanent
E-Waste: monitors, TV, computers, etc.	Sign Board	Permanent
White Goods: refrigerators, stoves, dishwasher, etc.	Sign Board	Permanent

## 9.3.2 Traffic Control at the Entrance

The Landfill Foreman should provide directions to Landfill customers upon entrance to the Landfill. Directions should include:

- General directions to the proper location for unloading vehicles
- To follow direction signs to the appropriate location
- To follow the instructions of operating staff
- Any special instructions that apply to the particular load carried

All loads of waste delivered by self-haul customers are to be inspected and the waste screening form completed.

All City waste collection trucks are to be log in using the Waste Truck Load Record form.

# 9.3.3 Traffic Control at the Working Face

During hours of operation, it may be necessary to direct traffic at the working face. When directing traffic, the Landfill Operator should:

- Always ensure his/her own personal safety when directing traffic
- Always face the movement of traffic
- Coordinate the flow of traffic to the working face including holding vehicles at a "staging" area until space is available for unloading
- Direct vehicles to an area where it is safe to unload
- Direct vehicles to areas where landfill equipment is not operating (at least 3 metres separation from operating equipment)
- Direct trailer units into an area where they have room to manoeuvre into position, without jack-knifing, for dumping
- Direct customers with hand signals, when appropriate, for safety reasons
- · Encourage customers to unload quickly and in a safe manner to allow access to other site users
- Direct vehicles that will take more time to unload to an area where they will not interfere with other vehicles and will not cause delays to other customers

# 9.4 Tipping Fees

Rates are outlined by the Solid Waste Bylaw (see Appendix G).

# 9.5 Disposal Area and Working Face

The municipal solid waste disposal area is the largest area at the Landfill. Residential, restaurant, institutional, commercial and construction wastes are placed here. The site is surrounded by drainage ditches which contains runoff on-site until the run-off is pumped to the off-site retention pond. This area is also surrounded by berms and fencing to minimize windblown debris.

Part of the disposal area is working face area and is defined as the active portion of the Landfill where wastes are disposed of by spreading and compacting with landfill equipment. The Landfill is designed and constructed using the area fill concept. The working face shall be kept to a minimum. A narrow daily disposal area will help reduce litter and cover material (mulch of wood, furniture, mattresses and plastic) use.

The width of the working face depends primarily on the traffic volume and should be wide enough to allow the day's maximum number of trucks to unload. Allow 4.5 to 5 metres (15 to 18 feet) per truck.

For efficient operations of compaction equipment, the working face should generally be constructed on a 25% (4H:1V) to 35% (3H:1V) slope. Typically, vehicles are to be unloaded at the bottom of the working face and waste is to be pushed up the slope.

Only one working face for municipal solid waste should be active at any one time, except where the Landfill Operator may designate additional working faces, as necessary, for the following reasons:

- Allow access during adverse weather (e.g. the active working face may become inaccessible)
- Manage higher-than-normal traffic volumes
- Provide adequate separation of commercial and public vehicles for safety purposes
- Ensure the safe handling of hazardous wastes

# 9.7 Waste Placement Procedures

The Landfill shall be developed in accordance with Landfill site development as provided by the fill plans which are updated on a regular basis.

The working face area shall be compacted regularly to maximize density (thereby minimizing the disposal area), minimize cover requirements, and reduce bird attraction and odour. The compacted waste area is then covered with cover material to minimize the problems of odour, birds, and flies. Material cover also provides surface drainage from the finished surface, thereby reducing infiltration and subsequent leachate production.

To monitor filling and monitoring airspace usage, the Landfill management should conduct topographic surveys to calculate the amount of airspace consumed, on an annual basis. The Landfill management may also conduct random audits throughout the year.

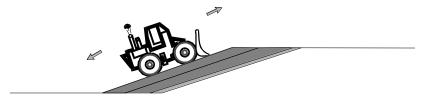
Compaction of solid waste is required to:

- Maximize waste density to optimize utilization of the Landfill airspace
- Minimize daily cover by providing an even surface on which cover is placed
- Reduce the potential for wind-blown litter

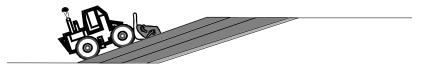
Figure 9-1 illustrates typical compaction procedures.

Figure 9-1: Compaction Procedures

SPREAD WASTE UPHILL IN THIN LAYERS (0.5 M)



COMPACT EACH LAYER WITH 3 - 5 PASSES



**BUILD SUCCESSIVE LAYERS** 

Once compaction is complete, cover material should be placed to cover the wastes on a regular basis. Cover the compacted waste with a minimum 150 mm of the cover material (mulch of wood, furniture,). Ideally cover waste once per month during the summer months. Due to frozen soil during winter months regular placement of cover soil is not practical, however the waste deposited during winter months should be covered as early in spring as practical. Each layer of solid waste and cover material will be sloped towards the collection ditches to allow drainage. A compaction and covering cycle is to be completed in the fall to prepare for the onset of winter.

Cover applications at the Landfill include:

- A cover once per month during the summer months
- Cover prior to winter freeze up and early in the spring
- A final cover when the Landfill is closed

# 9.8 Cover Material Management

Properly placed cover material at a landfill is important to a well-run landfill. Improperly placed cover material results in increased operational costs and in the needless loss of valuable airspace.

Factors that affect soil consumption include:

- · Compaction of the wastes
- Thickness of cover material
- Surface of the wastes
- Working face and operating area dimension

# 10. Nuisance Management

# 10.1 Litter Control

The *first level of litter control* involves actions to monitor that loads on vehicles hauling to the site are secured to prevent waste from falling or blowing onto roads leading to the site.

The **second level of control** is applied at the working face by directing vehicles to sheltered areas where possible, and by compacting and covering wastes.

The *third level of control* is retrieving litter that accumulates in site fencing, along roads leading to the site, on the site, or on adjacent lands.

The Landfill Foreman is responsible for patrolling and either cleaning or arranging for cleaning of:

- The access road and road leading to the site
- On-site permanent and temporary roads
- The Landfill property
- Adjacent lands around the perimeter of the Landfill

Should any loads be "illegally" unloaded along roads leading to the site or at entrance gates or fence lines along the property, the waste load should be inspected for any identifying wastes (i.e. addressed envelopes, utility bills, etc.) and the City of Iqaluit Municipal Enforcement Officer should be contacted. This waste must be cleaned up immediately to comply with operating and approval requirements.

# 10.2 **Dust**

Dust is generated by:

- Traffic dust on access roads
- Unloaded powdery or fine grained wastes
- Soil blowing from stockpiles or soil cover

Dust blowing from wastes may be controlled by:

- Unloading in a sheltered area away from the public disposal areas
- Requiring the waste generator/hauler to moisten or wrap the waste prior to delivery to the Landfill
- Covering the waste with other waste or cover material as soon as possible after unloading

Traffic dust may be minimized by:

- Reducing vehicle speed limits on gravel roads
- Applying water or dust suppressant to gravel road surfaces in hot dry weather

Soil stockpiles should be maintained to prevent blowing soil.

# 10.3 Noise

The Landfill is located in an isolated location away from any residential development and off-site noise is not anticipated to be of concern. Noise caused by operating equipment and vehicles may affect employee hearing, therefore, employees must comply with hearing protection PPE requirements as per the City H&S policy.

# 10.4 Odours

Odour issues can result in public complaints, negative public perception of the landfill operations, and nuisances to those who are most affected. Odours are more common in warm weather, during temperature inversions, and with breezes that carry odours from the site.

## Odours are caused by:

- Decomposition of organic wastes
- Disposal of waste products with strong odours (dead animals, sludges, etc.)
- · Chemical reactions in the landfill
- · Stagnant water

## Odours may be controlled through:

- Applying intermediate soil cover with the advance of the working face
- Immediately covering any wastes that, by their nature, emit strong odours (cover either with soil or other wastes)
- Working with waste generators to reduce odours at the source
- Immediately correcting any runoff seepage that may develop

## 10.5 Animals

A fence has been constructed around the perimeter of the site. This fence should be inspected on a regular basis to determine if there has been any breach of the fence. Any breach of the perimeter fence should be reported and arrangements made to repair as soon as possible.

## 10.6 Animal and Insect Controls

Following are "best management" approaches to minimizing the potential of an animal and insect infestation:

- Eliminate areas of ponded water other than designated retention ponds (insects and animals require water)
- Maintain a small working face
- Continue compaction of wastes
- Apply intermediate cover as the working face advances
- Apply soil or alternative cover where wastes once per week during the summer months, or more frequently as required

Should the Landfill Operator notice any signs that may indicate a rodent infestation or bear activity, he/she shall take action immediately. If a rodent extermination program is necessary, expert advice should be consulted. In the event of bear issues, the Department of Environment Wildlife Office should be contacted at (867) 975 - 7780.

# **10.7** Fires

Fires are included as a nuisance because of issues with safety, air quality, property damage, and general nuisances to site employees, customers, and neighbours. Fires are caused by:

- Hot loads unloaded at the working face
- Chemical reactions with a particular type of waste
- Intentional ignition
- Smoking (cigarette butts tossed onto the working face)
- · Flammable debris on hot parts of the landfill equipment
- Sparking from compacting wastes such as automobile batteries

Should a fire occur, procedures outlined in Section 16.2 – Fire Management, should be implemented.

# 11. Surface Water Management

In 2011, the City of Iqaluit retained an engineering consulting firm to complete a West 40 Landfill Drainage Management Review that discusses the collection of the run-off within the Landfill, different treatment options and discharge criteria that should be followed. Please see Appendix E for a copy of the report.

# 12. Landfill Leachate Management and Treatment

Leachate and surface water run-off from the Landfill is collected in a collection ditch/catchment pond that is constructed along the east and south perimeter of the Landfill in accordance with the surface water management plan developed in 2011. All run-off from the Landfill is to be diverted to this ditch/pond. On a regular basis the collected water is to be pumped from this collection ditch to the retention pond constructed on the west side of Akilliq Drive. The leachate is retained in this pond and on an as needed basis, once volume in the pond reaches capacity, The City contracts for the leachate to be treated.

In 2016 the City of Iqaluit submitted an amendment to the Nunavut Water Board an amendment to the licence to treat leachate generated at the Landfill. The details of this treatment process and related Spill Contingency Plan is provided in Appendix K.

# 13. Landfill Safety Plan

This section is to be read in conjunction with the City of Iqaluit safety requirements.

# 13.1 Introduction

Due to the nature of the facility, safety precautions should be taken by those personnel involved in the operation and maintenance of the Landfill. All personnel should be familiar and abide by the City of Iqaluit Occupation Health and Safety Program, which contains information such as training requirements, personal protective equipment requirements, WHMIS & Transportation of Dangerous Goods, Chemical Storage & Fire Protection, and First Aid. All personnel should be familiar and abide by the Nunavut Safety Act and Regulations.

Some of the safety precautions which Landfill personnel should follow include:

- · Water and puncture proof gloves, coveralls, and safety boots are to be worn at all times
- · Eye Protection and hard hats are recommended
- Work clothes should not be worn home
- Hands are to be washed frequently, as a minimum after work and before eating
- An appropriate fire extinguisher and a No. 1 First Aid Kit should be available at the site operators buildings
- Personnel should receive appropriate vaccinations and ensure they are kept up to date
- Proper lifting techniques should be exercised, lift with your legs and not your back
- Only personnel trained to handle hazardous materials should do so

Management is responsible to maintain an effective health and safety program, and provide the equipment, materials and training necessary to promote safe work practices and environments.

Supervisors are responsible to ensure that workers are supplied with the proper equipment and materials to conduct work safely, and to ensure that workers are trained in and follow established safe work procedures.

It is the duty of every worker to assume responsibility for their own safety by complying with legislative, company and industrial standards as well as the prompt reporting of all unsafe acts or conditions to supervisors to ensure immediate action and resolution.

# 13.2 Purpose

The City of Igaluit Municipal Landfill Safety Plan is intended to:

- Provide guidance and instructions for Landfill Operator on safety-related matters
- Aid Landfill Operator in identifying potentially dangerous situations and taking appropriate action

The safety of site operating staff and the public is of prime importance at all times. Site employees shall not endanger themselves or others on the site. Employees are obligated to report unsafe practices and are empowered to notify other employees or site users acting in an unsafe manner. All accidents, injuries, or near misses are reported to the Landfill and the following steps are taken:

- Investigate the incident immediately
- Determine the cause
- Complete the accident/incident report
- Take immediate measures to correct the cause and prevent it from reoccurring
- Have a safety meeting with employees as soon as possible after the incident

# 13.3 Safety of Site Users

By the very nature of its business, a landfill can be a very busy place with continual movement of various types of vehicles. It is the Landfill Operator's responsibility to maintain the safety of the site users by informing users of the landfill rules and monitoring that the rules are conformed to. To protect the safety of site users, the following basic rules shall apply:

- Children, pets, and individuals not unloading waste must remain in vehicles
- Only adults are allowed to unload vehicles in areas as directed by Landfill Operator
- Wastes shall be unloaded to the rear of vehicles and not strewn about
- Smoking at the unloading area is not allowed the site is non-smoking in all areas;
- No scavenging is allowed
- Users must leave unloading area immediately after unloading vehicles, unless advised to stay for inspection

To protect the safety of site users, the Landfill Operator shall:

- Control access to the site
- · Inform users of the rules upon reporting to the office
- · Post and maintain adequate directional signs
- Enforce the site speed limit
- Maintain an orderly site
- · Immediately inform users of unsafe practices

# 13.4 Working Safely Around Public Vehicles

Important considerations for working around the public include:

- The actions of the public are unpredictable.
- Never stand/go/run behind vehicles. Keep the tipping area clear and level so vehicles can have easy access.
- Potentially dangerous loads may include lumber, pipe, brush, or other materials; when unloaded without
  care these could harm persons or vehicles. If possible, spot these loads for unloading in a separate area
  away from other landfill users. If space does not allow this, do not allow these loads to unload until the
  area is safely clear of any other users.
- Avoid pushing waste around the unloading vehicles.
- Keep the working area free of glass, pipe, wire, wood, and other debris that could cause tripping hazards, and/or foot puncture hazards.

# 13.5 Safe Equipment Operations

- Machines shall be operated only by individuals who are properly trained and fully understand the machine.
- Perform a pre-check walk-around every time you get on the equipment near the working face;
- Check breaking system.
- Always use seat belt.
- Clean windows and adjust mirrors for best vision.

- No machine shall be operated unless all safety devices are operational and in good repair, i.e. brakes, backup alarms, fire extinguishers, lights, horn, etc.
- Check site for unsafe operating conditions such as large bulky items that will cause equipment instability.
- Ensure area around the machine is clear before moving.
- Use stepping points and handholds when mounting and dismounting equipment.
- Do not crush sealed containers with unknown contents.
- Always use caution around site users who may not be aware of dangers.
- When parking the equipment always:
  - Park on a level surface.
  - Lower blades, buckets.
  - Move transmission lever to park.
  - Apply the parking break.

# 13.6 Personal Protective Equipment

Appropriate personal protective equipment (PPE) for Landfill site work includes the following:

- Approved safety boots.
- Coveralls.
- Gloves.
- Safety goggles.
- Earplugs (when around loud equipment).
- Safety vest.
- Dust masks (when in dusty surroundings).

Special safety equipment may be required for dealing with fires and other incidents.

# 13.7 Safety Supervision

Site safety at the Landfill is coordinated through the Landfill Operator. All operations are to be conducted with safety as a priority at all times.

The safety of site operating staff and the public is of prime importance at all times. Site employees shall not endanger themselves or others on the site. Employees are obligated to report unsafe practices and are empowered to notify other employees or site users acting in an unsafe manner. All **accidents**, **injuries**, or **near misses** are reported to the Landfill Foreman, the Director of Public Works and the City's Safety Officer, and the following steps are taken:

- Investigate the incident immediately.
- Find out the cause.
- · Make a complete accident report.
- Take immediate measures to correct the cause and prevent it reoccurring.
- Have a safety meeting with employees as soon as possible after the incident.
   Submit report to WSCC.

# 13.8 Landfill Accidents

#### **Accidents**

Accident frequency for landfills tends to be higher than for most other construction industries. This is generally due to the nature of the waste and the fact that garbage is unpredictable and potentially dangerous.

All accidents at the Landfill will be investigated and an Accident Report Form for the incident will be completed. Complete the form providing as many facts as possible; provide only the facts. Do not place blame or fault, and include the following information as required on the form:

- Who was involved?
- Which vehicles were involved?
- Were there any personal injuries?
- What property was damaged?
- Which agencies or individuals responded to the accident?
- Date, time, weather conditions, witnesses, and other pertinent information.

# 13.9 Landfill Emergencies

Landfill Emergencies should be dealt with according to the Landfill Emergency Response Plan (see Appendix I) which sets out appropriate procedures to address foreseeable emergencies. The key elements of this plan are:

- 1. What is the nature and severity of the emergency?
- 2. What is to be done?
- 3. Who does it?

The emergency response plan addresses the following items:

- Fires
- · Accidents and Medical Emergencies
- Environmental and Operational Emergencies

During any landfill emergency, the press will likely become aware and cover the story. NOTE: Do not make any statement or comment to the press without approval of the Director of Public Works. The Director will be the only spokespersons for the City of Iqaluit Waste Management (Department of Public Works).

# 13.10 Personal Decontamination Procedures

In instances where workers accidentally come in contact with unknown substances, the following procedures are to be followed. As well the Landfill Foreman should fill out the Incident Report

#### **Skin Contact**

Wash with water for approximately 15 minutes. See a physician if any sign of irritation occurs.

# **Eye Contact**

Flush eye(s) with a gentle stream of water for 15 minutes. See physician immediately.

## Ingestion

• Contact emergency services immediately and provide them with as much information as possible about the product that was ingested. Do not induce vomiting unless instructed to do so.

#### Inhalation

 Remove person to fresh air. If discomfort persists, take victim to physician. Provide physician with as much information on the inhaled material as possible.

# 13.11 Contacts

This section provides a list of those individuals to be contacted under various conditions. NOTE: In all accidents that involve injuries and/or alcohol, call the RCMP.

If an accident occurs on-site, contact:

- Landfill Foreman
- Emergency and Protective Services of the City
- · Department of Public Works
- · Any employees which may be impacted
- Nearby employees who are trained to respond to this type of emergency

If there are injuries, contact:

- Igaluit Emergency Services
- The RCMP (fatality)
- Landfill Foreman
- Superintendent

# 13.12 Telephone Numbers

- Emergency Services Dispatch/Ambulance/Fire Department: (867) 979-4422
- Fire Fighters (general): (867) 979-5650
- RCMP: (867) 979-1111
- Public Works Administration: (867) 979-5630
- Spill Line 24 hours
  - Tel: (867) 920-8130Fax: (867) 873-6924
  - E-mail: spills@gov.nt.ca

# 14. Landfill Closure

# 14.1 Closure

When a new solid waste management facility is opened and this facility closes, it will be decommissioned according to the City of Iqaluit West 40 Landfill Decommissioning Plan (2014), see Appendix F. While the Landfill is still open, the final decommissioning plan should be considered as the Landfill is developed. As each area is completed, the perimeter slopes and surfaces are reclaimed. In this way the Landfill is closed and reclaimed progressively throughout the active landfill life.

# 15. Record Keeping and Reporting

Landfill management must establish and maintain an operating record and prepare required reports. Record keeping and reporting is an important part of landfill operations.

# 15.1 Daily Operator Log

The Landfill Foreman will maintain a record of daily operating activities. The log will be maintained in the Landfill site building/office and submitted to the Superintendent at the end of the month. Daily records include, but are not limited to:

- Weather conditions (i.e. precipitation, wind speed and direction, temperature)
- Operating staff on-site
- Equipment on-site
- Operations activities (waste placement, compaction, sorting, recycling, site clean-up, etc.)
- Monitoring (visual or measured)
- On-site issues encountered and response or corrective action taken

# 15.2 Load and Load Inspection Records

Load records are maintained at the site and kept on file at the Landfill Foreman's Office.

Local records generally include:

- Time and date of delivery
- Waste hauler or customer
- Volume of waste
- Type of waste
- Fees collected

# 15.3 Annual Report

The annual operations report will be prepared by the Superintendent and will include:

- · A record of the amounts and types of wastes received, disposed, stored, or recycled at the Landfill
- Major incidents, and corrective actions taken, if applicable
- Locations of waste disposal
- Record of public complaints and response actions
- Annual environmental compliance audits
- Current operations and design plans
- · As-built drawings and survey records
- Environmental monitoring results
- Spill Reports

The environmental annual report, which includes groundwater monitoring report, shall be submitted to the Engineering Department for inclusion in the Department's annual report to the NWB. The annual operations report must meet the requirements prescribed in the City of Iqaluit Water License.

# 15.4 Engineering Reports

Engineering reports will be developed where new construction activities occur and will include:

- As-built drawings and records;
- · Current design plans and reports; and
- Construction QA/QC procedures, results, and survey records.

All Engineering reports will be submitted to the NWB as per Water License requirements.

# 15.5 Corrective Action Report

In the event that a corrective action is undertaken, the corrective action shall be documented and maintained in the operating record. A corrective action report may include:

- A description of the problem;
- · A description of activities and results; and
- A description of the monitoring and effectiveness of the corrective action.

# 15.6 Spill Reporting

In the event of a substance release, the Landfill Foreman shall immediately notify the Superintendent and the City's Spill Contingency Plan should be implemented (see Appendix J). The spill must be reported to the 24 – Hour Spill Report Line. The Foreman must call and fill out the spill response forms as provided by Nunavut Environment at the following web page: <a href="https://www.gov.nu.ca/environment/documents/spill">https://www.gov.nu.ca/environment/documents/spill</a>. The NT-NU Spill Report is also provided in Appendix B.

# 15.7 Monitoring

The City of Iqaluit is required to provide monitoring at the West 40 Landfill as per The Type "A" Water Licence No. 3AM-IQA1626, Part I and Schedule I.

The landfill is to be monitored at three (3) locations:

- IQA-08: Discharge from the leachate discharge location in the landfill run-off detention pond/ditch
- IQA-08A: Station located up-gradient of the Landfill
- IQA-08B: Station located down gradient of the Landfill

A plan showing the monitoring locations is provided in Appendix L.

## 15.7.1.1 Monitoring Station IQA-08

Monitoring Station IQA-08 is located in the landfill run-off detention pond which is used to collect landfill on-site runoff. Any water collected in this pond is pumped on a regular basis, as required, to the storage and treatment ponds located across Akilliq Drive.

Testing of this water is to occur:

- Once prior to discharge to the storage and treatment ponds
- Once during discharge
- Once prior to discharge

The samples are to be collected mid-depth in the ponded water. Testing results are to be provided in the Annual Report. The following table provides the testing requirements.

**Table 5: Water Testing Parameters** 

Test Group	Analytical Parameters	Units
Biological (B)	Biochemical Oxygen Demand	Mg/L
	Total and Fecal Coliform	CFU/100mL
Effluent (E)	Total Suspended Solids (TSS)	Mg/L
	Temperature (field)	°C
	Conductivity (field and lab)	uS/cm
	pH (field and lab)	pH units
Nutrients (N)	Ammonia-N, Nitrate-N, Nitrite-N	mg N/L
	Total Phosphorus, Orthophosphate	Mg/L
ICP-Metals Scan (Total)	Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Fe,	Mg/L
	PB, Li, Mn, Mo, Ni, Se, Sn, Ag, Sr, Tl,	
	Ti, U, V, Zn, Hg	
Flow (F)	Volume	$M^3$
Landfill Specific (LS)	Polychlorinated Biphenyls (PCBs)	Mg/L
	Benzene, Toluene, Ethylbenzene and	
	Xylene (BTEX)	

As per Licence Part E (4) the water within the pond is to meet the following criteria

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Suspended Solids (TSS)	50.0 mg/L	100.0 mg/L
pH	Between 6 and 9	

## 15.7.1.2 Monitoring Stations IQA-08A and IQA-08B

Monitoring Station IQA-8A is located in the road ditch up stream of the landfill, and IQA-08B is in the road ditch downstream of the landfill. Water is to be sampled at these locations once per year, in the spring, when there is run-off flowing in the ditches.

Testing results are to be provided in the Annual Report. The following table provides the testing requirements.

## **Table 6: Water Testing Parameters**

Table 15.2 Water Testing Parameters

Test Group	Analytical Parameters	Units
Biological (B)	Biochemical Oxygen Demand	Mg/L
	Total and Fecal Coliform	CFU/100mL
Effluent (E)	Total Suspended Solids (TSS)	Mg/L
	Temperature (field)	°C
	Conductivity (field and lab)	uS/cm
	pH (field and lab)	pH units
Nutrients (N)	Ammonia-N, Nitrate-N, Nitrite-N	mg N/L
	Total Phosphorus, Orthophosphate	Mg/L
ICP-Metals Scan (Total)	Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Fe,	Mg/L
	PB, Li, Mn, Mo, Ni, Se, Sn, Ag, Sr, Tl,	
	Ti, U, V, Zn, Hg	
Flow (F)	Volume (low estimated)	$M^3$
Landfill Specific (LS)	Polychlorinated Biphenyls (PCBs)	Mg/L
	Benzene, Toluene, Ethylbenzene and Xylene (BTEX)	

# 15.8 Water License Reporting Requirements

The City's Water License has specific reporting requirements for the West 40 Landfill (see Appendix H for the Water Licence). This reporting includes:

- Water monitoring reports
- Emergency discharge reports
- Engineering design reports (for planned work) and as-built drawing (for completed work)
- Annual Operation and Maintenance Manual revisions
- Follow up on Water Inspector orders/directives
- Shipping of recyclables
- · Shipping of hazardous waste
- Abandonment and restoration

# 15.9 Health and Safety Program Records

Health and Safety Program Records must be maintained as per the City's Health and Safety Program, the Nunavut Health and Safely Act and Regulations, and WSCC requirements. These include but are not limited to the following types of records:

- · Daily vehicle/equipment inspections
- · Safety meetings
- Incident reports (accidents/near misses)
- Site safety inspections
- Equipment maintenance



# Appendix A

# **Polices**

Contaminated Rags Policy Automobile Batteries Policy

Key and Gate Lock Policy Administrative Record Policy

Visitor Record Policy

Tipping Fees Policy

**Prohibited Waste Policy** 

Wash Up Policy

Vehicle Accident Response Policy

Treated Wood Policy

Spill Contingency Policy

Ozone Depleting Substances Management Policy

Litter Control Policy

Last Man Out Policy

Key Policy

Hours of Operations Policy

**Empty Container Policy** 

Fire Policy

Safe Work Policy

Random Load Checking Program Policy

Propane Bottle Policy

City of Iqaluit Health and Safety Program

City of Iqaluit Accident Investigation Program



#### CITY OF IQALUIT

		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Contaminated Rags Policy	Page: 1	1 of 1

# **PURPOSE:**

To define acceptable procedures for acceptance and disposal of oily rags.

## POLICY:

- 1. Contaminated rags generally means cloth materials that have been used in industrial applications for cleaning or spill cleanup purposes.
- 2. This policy does not apply to small quantities of rags that are normally deposited in waste receptacles at a household or business, but applies to large quantities that are generated as a result of a spill clean-up or that have been stored at an industry or business separately from the normal waste stream.
- 3. The waste generator must provide a full and complete description of the contaminant and include a waste analysis.
- 4. If the contaminated rags contain a prohibited waste (i.e. hazardous waste), then they must not be accepted at the landfill.

1	The Director of	of Public Work	s will be res	nonsible for	reviewing and	d updating this p	olicy

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Automobile Batteries Policy	Page: 1	l of 1

## **PURPOSE**:

To establish the storage and management of automobile batteries for recycling.

# POLICY:

- 1. Automobile and lead batteries will be accepted at the landfill from residents for recycling purposes.
- 2. Batteries will be placed at the hazardous wastes temporary storage area.
- 3. Batteries will not be accepted at the landfill from commercial businesses.
- 4. All efforts will be made to encourage landfill customers to separate batteries from other waste.
- 5. Batteries accepted for recycling will be stored:
  - a. On wooden pallets placed over a lime pad;
  - b. In a sheltered area; and
  - c. Covered with a tarp or plastic or placed in a weather-proof structure.
- 6. Recycling of automobile batteries will be coordinated by the Superintendent in accordance with contractual agreements.

## RESPONSIBILITIES:

.1 The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Key and Gate Lock Policy	Page: 1	1 of 1

#### PURPOSE:

To maintain control of access to the site after hours in order to minimize liabilities to the landfill.

## POLICY:

- 1. Customers requesting access to the landfill outside of the established operating hours shall arrange for the time of access with the Landfill Foreman.
- 2. The Landfill Foreman shall be present at all times, when after hours access is provided, they will remain on-site until the customer has left the site.
- 3. Customers requesting after hours access shall pay an hourly rate of \$ \_\_\_\_\_ to the Landfill Foreman for the period of time the employee is required at the site, with a minimum charge of 1 hour per entry, and shall pay the landfill tipping fee as set out in the Tipping Fees Policy.
- 4. The customer shall notify the Landfill Foreman at least **4 hours** in advance of requiring access to the site outside the established operating hours.

- 1. The Landfill Foreman will be responsible for scheduling any after hour access times with the customer and shall maintain a record of the customer and time incurred.
- 2. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Visitor Record Policy	Page:	1 of 1

#### **PURPOSE**:

To maintain a record of site visitors for site safety.

## POLICY:

- 1. In this Policy "visitors" means those persons that are non-customers and may include:
  - a. City employees and councillors;
  - b. Consultants;
  - c. Environmental Protection Service Inspector;
  - d. NWB Officer;
  - e. Scheduled tour groups; or
  - f. Other non-customers.
- 2. All visitors will report to the Landfill Foreman at the landfill office and will sign a visitor registry that includes the person's name, time of entry, and purpose of the visit.
- 3. All visitors will report to the Landfill Foreman upon leaving the site and will initial and enter the time of departure on the visitor registry.
- 4. Prior to departure from the site, the Landfill Foreman will check the visitor registry to make sure all visitors have signed out.

- 1. The Landfill Foreman will maintain the visitor registry.
- 2. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Tipping Fees Policy	Page: 1	1 of 2

## PURPOSE:

To establish tipping fees charged to commercial customers for use of the landfill.

## POLICY:

City of Iqaluit shall establish the tipping fee.

## RESPONSIBILITIES:

1. The Director of Public Works will be responsible to review tipping fees and recommend alternate tipping fees to the CAO.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Prohibited Waste Policy	Page: 1	of 1

#### PURPOSE:

To define waste that is prohibited from disposal at the landfill.

#### POLICY:

Prohibited waste is all substances and materials listed below:

- Any waste defined as "oilfield waste";
- · Biomedical waste that is not rendered inert;
- Radioactive waste;
- Combustible waste;
- Explosives; and
- Bulk liquids.
- 1. The Foreman reserves the right to determine if a waste is acceptable at the landfill for storage or disposal. The prohibited waste may include soils or materials containing non-hazardous materials, such as those containing high concentrations of chlorides or other such constituents.

- 1. The Landfill Foreman shall be responsible to inspect loads for prohibited debris and to take necessary actions to prevent such waste from entering the landfill site.
- 2. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Wash Up Policy	Page: 1	1 of 1

## **PURPOSE:**

To establish appropriate hygiene for operations staff at the landfill.

#### POLICY:

Hands **MUST BE** thoroughly washed before handling or consuming **ANY FOOD OR BEVERAGE**. Food and beverage is to be consumed only in the Building, another area designated by the Landfill Foreman, or **OFF-SITE**.

Hands **MUST BE** thoroughly washed before **SMOKING**.

Hands must be thoroughly washed **BEFORE LEAVING** the landfill site for any reason, except in the case of an emergency when the site must be quickly evacuated.

Exterior clothing worn while working around any hazardous wastes, MUST BE removed prior to leaving the site.

#### RESPONSIBILITIES:

1. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Vehicle Accident Response Policy	Page:	1 of 1

## PURPOSE:

To establish appropriate response in the event of a vehicle accident at the landfill site.

## **POLICIES:**

All vehicle accidents should be reported and an investigation into the cause of the accident should be carried out. In the event of a vehicle accident, the following actions should be taken:

- 1. Alert the Landfill Foreman of the accident.
- 2. If the damage to the vehicle(s) is minor, the Landfill Foreman may instruct the individual(s) involved in the accident to report to the RCMP station.
- 3. If the damage is major, the Landfill Foreman is to call the RCMP.
- 4. Secure the site for safety and for follow-up investigation.
- 5. Traffic is to be directed around the scene of the accident.
- 6. If the vehicle accident results in any injuries, the injured person(s) should be provided with any assistance required as set out in the Medical Emergencies Response Policy.
- 7. Assist the RCMP with any investigation that is undertaken.
- 8. Complete the Incident Accident Form.

## **RESPONSIBILITIES:**

The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Treated Wood Policy	Page:	1 of 1

## **PURPOSE:**

To outline acceptance and handling of treated lumber.

#### POLICY:

- 1. Treated lumber generally includes
  - Used railway ties;
  - Used power and telephone poles; or
  - Used fence posts.
- 2. Acceptance of treated lumber is to be done in accordance with the contaminated solid acceptance procedures outlined in the operations procedures manual.
- 3. Only non-processed (or whole units that have not been cut, shredded, or chipped) will be accepted for disposal.
- 4. Commercial volumes of treated lumber will not be accepted for disposal, whereby a commercial volume is more than five rail ties or five fence posts, and no more than one power pole or telephone pole.
- 5. Treated wood is not to be deliberately burned.

#### RESPONSIBILITIES:

1. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Spill Contingency Policy	Page: 1	l of 1

#### **PURPOSE:**

To establish appropriate procedures to follow in the event of a spill that occurs on the landfill site including the active operations area, storage areas, compost facility, or in buildings or parking areas. This Spill Contingency Policy shall be reviewed annually and revised as necessary to reflect changes in regulations, operations, and technology. Any proposed revisions shall be submitted to the NWB for approval.

#### POLICY:

- 1. Immediately close off and isolate (with a barricade if appropriate) the area of the spill to the public and site employees who are not directly involved in the clean-up of the spill.
- Identify, if possible, the material involved in the spill. If the material cannot be clearly identified, take note of the nature of the material (i.e. liquid or solid, colour, odour, original container, approximate amount, presence of vapours or fumes, or any other distinguishing features).
- 3. Direct traffic away from the spill area.
- 4. The Landfill Foreman shall coordinate the clean-up of the spill.
- Control the source of the spill first then work on containing the spill using earth berms or other appropriate means.
- 6. For large spills, berm drainage ditches in the vicinity of the spill to prevent release of the material off-site.
- Recover the spilled material and contaminated soils and deposit into an appropriate container for proper disposal. DO NOT HANDLE CHEMICALS.
- 8. Conduct personal decontamination if a chemical is spilled upon a person:
  - Remove and dispose of contaminated outer coveralls or personal clothing;
  - Utilize emergency eye wash and shower station if required:
  - Re-dress in cloth coveralls or a change of clothes that is kept on hand; and
  - If contaminated clothing cannot be washed safely, discard it.
- 9. If uncomfortable or hazardous fumes, bioinfectious, or radioactive materials are involved, follow evacuation procedures immediately and call Department of Public Works at (867)979-5653. Explain to the emergency operator the situation, identify the material (if possible) and provide as much information about the substance as possible such as liquid, solid, colour, quantity, or odours, and the location of the material on the site.
- 10. If outside fuel or oil storage tanks leak, contact a vacuum truck operator to vacuum up the free liquid product and use a spill kit to clean up any residue. Oil or fuel soaked soil should be excavated and properly handled through the biodegradation facility or other proper disposal.
- 11. Contact the Environmental Protection Division of the Department Environment, NU at (867) 975-7700.

- 1. The Director of Public Works shall be responsible for the review and update of this policy.
- 2. The Landfill Foreman shall be responsible for carrying out spill containment in the active landfill operating area.
- 3. The Superintendent shall be responsible for advising Environmental Protection Division, as necessary.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
<b>Policy:</b> Ozone Depleting Substances Management Policy	Page:	l of 1

## PURPOSE:

To prevent the uncontrolled release of Ozone Depleting Substances from appliances and equipment stored at the landfill.

## POLICY:

- 1. In this policy, the term "units" applies to all household and commercial appliances and equipment that may contain Ozone Depleting Substances (i.e. CFC's) and may include refrigerators, freezers, and air conditioning equipment, and may also include automobile air conditioners.
- All units will be inspected prior to acceptance for storage or disposal at the landfill, and only those units that are tagged by a qualified technician indicating that the CFC's have been purged, may be accepted for storage and recycling.
- 3. Units that are NOT tagged by a qualified technician indicating that the ozone depleting substances are not purged, the site supervisor may:
  - Refer the customer to a qualified technician for purging of the ozone depleting substance and tagging of the unit; or
  - b) May accept the unit for storage and assess a tipping fee in accordance with the rate set out by the Superintendent for all untagged units accepted for storage at the landfill.
- 4. All untagged units accepted for storage at the landfill will be stored in an area separate from tagged units and will not be crushed, recycled, or disposed until they are inspected and purged by a qualified technician in accordance with the Ozone Depleting Substances Regulations and appropriately tagged.
- 5. Units that have been improperly deposited at the working face or at other locations at the landfill will be separated and inspected for appropriate tags and moved and stored in the appropriate area. In all cases where an untagged unit is identified, attempts will be made to identify the customer and if identified, the appropriate fee will be assessed.

- 1. The Landfill Foreman will be responsible for inspecting all units delivered to the site.
- The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Litter Control Policy	Page: 1	l of 1

## **PURPOSE:**

To define litter control methods and responsibilities.

#### POLICY:

In summary, the following litter control methods are to be followed:

- All delivered loads should be secured;
- Compact waste as soon as practical after being deposited;
- Position wind catchment fences according to the location and configuration of the working face and wind direction;
- Retrieve litter as soon as practical following high wind events:
- Collect litter twice a year, once in the spring and once in the fall, as required in the Water Licence;
- Immediately clean up and, if safe to do so, dispose of in the landfill waste dumped illegally at the entrance gates or along access roads; and
- Regularly check ditches along adjacent roads and site access roads and pick up and dispose of spilled or blown litter
  as required.

- 1. The Landfill Foreman is responsible for controlling and litter retrieval of litter escaping from the working face and cleanup of litter on the north side along roads.
- 2. The Landfill Foreman is responsible for litter control and cleanup of litter in the recycling compounds.
- 3. The Foreman is responsible for inspecting the landfill to monitor litter control and cleanup.
- 4. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Last Man Out Policy	Page:	1 of 1

#### **PURPOSE:**

To maintain site control and the safety of site employees, customers, and visitors.

## POLICY:

- At the end of the day closure of the landfill, a "last man out" procedure shall be followed. The Landfill Foreman shall:
  - a. Remain at the site until all other employees, customers, and site visitors have left;
  - b. Close and lock the entrance gates;
  - c. Complete a complete drive through of the recycling compounds, working face, composting area, inert disposal area, and equipment area;
  - d. Check all buildings to make sure no one remains inside and to make sure all doors and windows are closed and locked; and
  - e. Check the working face and inert disposal area to make sure the area is secure and that no fires or other issues are present.
- 2. The Landfill Foreman shall check the visitor registry to make sure all visitors have signed out.
- 3. Every effort will be made to make sure that no unauthorized vehicles or individuals remain at the site after it is closed for the day.

- 1. The Landfill Foreman will be responsible to carry out this policy.
- The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Key Policy	Page: 1	1 of 1

## PURPOSE:

To maintain control of key distribution for the City of Iqaluit Municipal Landfill

## POLICY:

- 1. Keys for access to the landfill will be distributed to:
  - The Landfill Foreman, and
  - The Superintendent.

- 1. The Superintendent will be responsible for controlling distribution and use of keys.
- 2. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Hours of Operations Policy	Page: 1	1 of 1

## **PURPOSE:**

To control public access to the landfill is limited to a specified period of time.

## POLICY:

- 1. The landfill gates will only be open for public access during the hours of operations as set out in this policy.
- 2. The hours of operations are:

Tuesday to Saturday

08:00 - 12:00 P.M. and 1:00 P.M. - 5:00 P.M.

The Landfill is closed on the following holidays:

- New Year's Day;
- Good Friday;
- Easter Monday
- Toonik Tyme Day
- Nunavut Day;
- Victoria Day;
- · Canada Day;
- Civic Holiday (First Monday in August);
- Labour Day;
- Thanksgiving;
- Remembrance Day;
- · Christmas Day; and
- Boxing Day.

- 1. The Landfill Foreman will be responsible for opening and closing landfill gate to the prescribed hours of operations.
- 2. The Director of Public Works will be responsible for the reviewing and updating this policy.
- 3. The hours of operations will only be set by the Superintendent.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Environmental Policy	Page:	1 of 1

#### **PURPOSE:**

To apply "best management" practices with regards to environmental protection.

#### POLICY:

- 1. The Director of Public Works will manage the landfill using due diligence towards development and operations of the landfill in accordance with regulatory requirements and best management principles.
- 2. Utilities and Environment employees and Contractors will endeavour to work according to the operating principles as set out in this policy.
- 3. "Due diligence" is defined as "the taking of all reasonable steps as part of the due care and attention to prevent the occurrence of an accident or mishap, as well as having a contingency plan to control an incident and limit any consequential damage". This includes: policy development, checking and corrective action, and management review.
- Best management practices include:
  - a. Good housekeeping;
  - b. Preventative maintenance;
  - c. Inspections and record keeping;
  - d. Security;
  - e. Employee hiring and training;
  - f. Reporting of incidents;
  - g. Operations procedures;
  - h. Emergency response planning;
  - i. Identification and assessment of risks; and
  - j. Review and corrective action.

- 1. The Superintendent will be responsible to conduct, or arrange for, routine inspections of the landfill, operating procedures, and records in regards to this policy
- 2. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Empty Container Policy	Page:	1 of 1

## **PURPOSE:**

To provide direction to the Landfill Foreman for acceptance and management of empty containers.

## POLICY:

- 1. Empty containers include:
  - a. 45 gal drums;
  - b. Grease and oil containers; and
  - c. Other industrial containers.
- 2. Empty containers will only be accepted if:
  - a. The top of the container has been removed; and
  - b. The container has not been sealed.
- Containers will not be accepted that:
  - a. Are closed and sealed; and
  - b. The container holds any liquids.
- 4. The waste generator or hauler must provide a description of the previous contents of the container and identify if the container has been properly rinsed in accordance with the Guidelines. The Landfill Foreman may refuse acceptance of any container if the previous contents are not known or if the container has not been properly cleaned.
- 5. Empty containers that are recyclable will be stored in appropriate storage areas.
- 6. Empty containers that are not recyclable may be disposed in the landfill.

## RESPONSIBILITIES:

1. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Fire Policy	Page:	1 of 1

## **PURPOSE:**

To set out emergency procedures for responding to a fire.

### POLICY:

- 1. Upon discovery of fire at the landfill, the Landfill Foreman shall call:
  - The Fire Department at (867) 979-4422 immediately to report the fire, its location, and the materials that are burning.
  - The Landfill Foreman shall call the Superintendent immediately.
  - Contact adjacent property owners, particularly if it appears the fire will go off-site.
- 2. Remove all operating and non-operating persons to a safe location. All non-operating persons shall be escorted to the gates, and the entrance gates are to be closed.
- Maintain access to the site for Emergency Vehicles throughout the duration of the emergency.
- 4. Clear the Fire area of all persons, vehicles, and equipment with due consideration to safety.
- 5. For small fires (i.e. little or no flame present and capable of being extinguished by a portable fire extinguisher), if safe to do so, isolate the burning material from other waste, then extinguish or otherwise contain the fire to one area.
- 6. If the fire is isolated from other wastes, the fire may be extinguished by either covering it with sand or other soils, or by dousing it with water and covering it with soils.
- 7. If safe to do so, move flammable materials and wastes away from the fire **OR** cover these materials with sand or other soils to minimize the potential for the fire to spread to these materials.
- 8. Do not bury any fire into the working face under any circumstances.
- 9. Upon arrival of emergency response vehicles (Fire Truck, Ambulance) the senior staff members, e.g. Landfill Foreman, on-site shall identify themselves to the Emergency Commander and offer full assistance as requested. Once the Fire Department arrives, the Fire Commander in is full control and landfill staff takes instructions from the Fire Commander.
- 10. The landfill operating staff are to remain at the site unless otherwise evacuated or released by the Fire Commander.
- 11. Following a fire, an incident report is to be completed and an investigation into the cause of the fire is to be conducted by the Solid Waste Manager.
- 12. Once the fire is extinguished and it is safe to do so, the waste and debris is to be cleaned up and the site operations returned to normal conditions.

## RESPONSIBILITIES:

The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Safe Work Policy	Page:	1 of 1

## **PURPOSE:**

To protect employees from flying debris, dust, heat, noise, traffic, and other potential hazards.

#### POLICY:

- 1. Employees are to be aware of safe work practices and must know how and when to use personal protective equipment.
- Employees working at the landfill shall wear appropriate personal protective equipment for specific duties undertaken and in accordance with specific circumstances such as windy conditions, high dust conditions, or other situations that may arise.
- 3. Personal Protective Equipment to be worn by employees in accordance with the above includes:
  - a. Steel toed safety boots (for all field duties);
  - b. Safety vest (in the field when out of vehicles or landfill equipment);
  - g. Hard hat (where appropriate to specific duties);
  - h. Eye protection (in high wind or dusty conditions);
  - i. Ear protection (when operating or working around equipment);
  - j. Long pants and shirts (for all field duties); and
  - k. Hat (in hot weather).
- 4. In the event of dirt or dust in eyes, the eye wash station at the scale house is to be used with assistance from the Landfill Foreman, if required. If there is any doubt about debris in the eyes (i.e. metals, glass, or other materials) immediately see a Doctor.
- 5. All near misses and accidents must be reported and documented on the Accident and Incident Report Form.

- 1. All employees must take responsibility for their own safety and the safety of other employees, customers, and visiting pubic.
- 2. The Landfill Foreman shall provide input into the Policy and is responsible for enforcing the Policy.
- 3. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Random Load Checking Program Policy	Page: 1	of 2

#### PURPOSE:

- 1. To randomly inspect loads of waste being disposed at the landfill;
- 2. To detect hazardous or other prohibited waste material and avoid their disposal in the landfill; and
- 3. To identify potentially recyclable material which could be diverted from the landfill in the future.

#### POLICY:

- 1. Randomly select a load for inspection and ask the driver to stop in a designated area.
- Record the following information on a Waste Inspection Form prior to allowing the driver to dump the load (see Waste Inspection Form):
  - Name of hauler;
  - Name of waste generator;
  - Type of waste;
  - · License plate number;
  - Truck number;
  - · Name of the driver; and
  - Signature of the driver.
- 3. Ask the driver to dump the load in the designated area. The driver is not required to stay on-site while the load is being inspected.
- 4. Spread out the waste, using a rake or front-end loader if required.
- 5. Record any potentially recyclable materials.
- 6. Inspect the load for hazardous or prohibited waste materials. If such materials are found, then do the following:
  - Isolate the waste and contact the Landfill Foreman if the waste material poses an immediate risk to human health or the environment;
  - Record the information on the Waste Inspection Form;
  - Take photographs of the material;
  - Attempt to confirm information on the generator of the waste;
  - Contact the hauler or generator of the waste material and require them to remove the material from the Landfill Facility;
  - If the waste materials are considered hazardous, contact the Environmental Protection Division Department of Environment at (867) 975-7700.
- 7. Complete and sign the Waste Inspection Form.
- 8. Send a letter to the generators of the recyclable materials advising that the material could be recycled in the future.



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Random Load Checking Program Policy	Page: 2	2 of 2

## **RESPONSIBILITIES:**

## **Record Keeping**

- A Waste Inspection Form will be completed for each load inspected and will be kept on file at the landfill and administrative offices.
- 2. If hazardous waste materials are identified, the Waste Inspection Form and a summary of the action taken will be forwarded to NWB, and the Environmental Protection Division Department of Environment.
- 3. Photographs of hazardous waste materials will be filed with the appropriate Waste Inspection Form.

## Safety Considerations

- 1. The Waste Inspector will wear the following safety clothing during inspections:
  - · Coveralls;
  - Safety boots;
  - Gloves;
  - Safety vest;
  - · Face mask as required; and
  - Eye protection.

## **Inspection Frequency**

- 1. One in every 300 loads, a minimum of two loads per month will be inspected.
- 2. The Director of Public Works will be responsible for reviewing and updating this policy.

Approved By:	Date Approved:
Approved By:	Date Approved:



		Policy No.
Facility: City of Iqaluit Municipal Landfill	Effectiv	ve Date:
Policy: Propane Bottle Policy	Page:	1 of 1

## **PURPOSE:**

To provide guidance for the acceptance and handling of propane bottles.

## POLICY:

- 1. Propane bottles will not be accepted at the landfill unless the container has been purged or emptied of its contents and the operating valve is in an open position, or if it has been removed from the bottle.
- 2. If the operating valve is closed, the propane bottle will not be accepted.
- 3. Empty propane bottles will be stored in the designated propane bottle storage area.
- 4. Propane bottles will not be offered, given, or sold to any person for use, unless that person is qualified to refurbish and certify the propane bottle.
- 5. All valves will be removed from propane bottles for recycling.
- 6. Empty propane bottles with removed valves will be recycled through scrap metal dealers if possible, but will otherwise be disposed in the landfill.

1.	The Director of	of Public Works	will be responsible	for reviewing and	updating this	policy.
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Approved By:	Date Approved:
Approved By:	Date Approved:

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Health and Safety Program		
Title		HSP
Approved By:	CAO	_
Date Approved:	3 Nov 2011	
Date JWHSC Approved:	15 Nov 2011	Annual Review
Revision Date:		

# 1. Purpose

1.1. The purpose of this program is to prevent injury/harm to all workers and citizens of the City of Iqaluit by implementing proactive inspections, hazard identification, accident investigations and a Joint Work Site Health & Safety Committee. It will also aid in reducing the accidental damage to equipment and materials used in the daily operation of our City. The goal of this program is to meet or exceed governmental legislation, recognized industry standards and work practices while working to serve the citizens of Iqaluit.

# 2. Scope

2.1. This program pertains to all workers of the City of Iqaluit, including visitors, contractors and sub-contractors.

## 3. Procedures

- 3.1. This program will be developed by management in conjunction with the Joint Work Site Health and Safety Committee, to meet the City of Iqaluit's Health and Safety Policy. There will be 13 main programs established to meet the Nunavut Safety Act and Regulations. These programs are:
  - 3.1.1. Health and Safety Program HSP
  - 3.1.2. Health and Safety Orientation HSO
  - 3.1.3. Health and Safety Education & Training HSET
  - 3.1.4. Joint Work Site Health and Safety Committee JWHSC
  - 3.1.5. Workplace Inspections WI
  - 3.1.6. Accident Investigations Al
  - 3.1.7. Emergency Response Plan ERP
  - 3.1.8. Personal Protective Equipment PPE
  - 3.1.9. Prevention Maintenance Program PMP
  - 3.1.10. Safe Work Practices SWP
  - 3.1.11. High Risk Tasks HRT
  - 3.1.12. Health and Safety Program Audit HSPA
  - 3.1.13. Return to Work Program RTW

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3.2. To support these programs Safe Work Practices SWP will be developed by management again with consultation by the Joint Work Site Health and Safety Committee to define task specific responsibilities by department.

# 4. Roles & Responsibilities

## 4.1. CAO

- 4.1.1. Establish the City of Iqaluit Health and Safety Policy
- 4.1.2. Support all Programs established by departments

## 4.2. Directors

- 4.2.1. Ensure compliance with approved Prevention Programs
- 4.2.2. Monitor compliance through regular inspections of the workplace
- 4.2.3. Conduct requirements of Section 4.3 should there be no direct Manager/Supervisor in the Department
- 4.2.4. Discipline infractions of non-compliance

## 4.3. Managers/Supervisors

- 4.3.1. Know all Prevention Programs
- 4.3.2. Comply with all Prevention Program requirements
- 4.3.3. Train employees on the Prevention Programs
- 4.3.4. Develop SWP's to support the Program
- 4.3.5. Inspect the workplace monthly
- 4.3.6. Conduct a Job Hazard Analyses to control hazards
- 4.3.7. Discipline infractions of non-compliance
- 4.3.8. Recommend changes to the Programs

## 4.4. Workers

- 4.4.1. Participate in the Prevention Programs
- 4.4.2. Identify hazards to managers/supervisors
- 4.4.3. Work in accordance with legislative and city requirements
- 4.4.4. Recommend changes to the Programs

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Health and Safe		
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## 4.5. JWHSC

- 4.5.1. Review the Prevention Programs annually
- 4.5.2. Monitor effectiveness of Programs through inspections
- 4.5.3. Identify areas of improvement
- 4.5.4. Recommend changes to the Programs

## 4.6. Health & Safety Officer

- 4.6.1. Audit the Prevention Programs
- 4.6.2. Provide assistance developing SWP's
- 4.6.3. Provide assistance developing Job Hazard Analysis
- 4.6.4. Monitor legislative and industry standards to improve Programs

## 5. Communication

- 5.1. Directors shall communicate with Managers/Supervisor changes required to the Program.
- 5.2. Managers/Supervisors shall communicate changes of the Program to workers.
- 5.3. Workers shall communicate with Managers/Supervisors any required changes to the Program.

# 6. Training

- 6.1. All workers shall receive a City of Iqaluit Employee Orientation within the first 2 weeks of employment with the City of Iqaluit outlining Program areas.
- 6.2. All workers shall receive Departmental Orientation on work place specific Programs upon hire.
- 6.3. All workers shall receive training whenever new procedures/equipment has been introduced into the department.
- 6.4. All contractors and sub-contractors shall receive training on City of Iqaluit Programs as required.

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# 7. Evaluation

- 7.1. Annually
  - 7.1.1. Directors
  - 7.1.2. Managers/Supervisors
  - 7.1.3. JWHSC
- 7.2. Quarterly
  - 7.2.1. Health and Safety Officer

## 8. Forms

8.1. As required throughout the City of Iqaluit Program.

# 9. Reference Material

9.1. Nunavut Safety Regulation Section 7

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Accident Investigation Program		AIP
Title		AIF
Approved By:	CAO	
Date Approved:	23 January 2012	
Date JWHSC Approved:		Review
Revision Date:		3 Years

# 1. Purpose

- 1.1. To meet legislative requirements of the Territory of Nunavut to report deaths, incidents and injuries within specified periods to the Chief Safety Officer of the WSCC.
- 1.2. To ensure that all incidents, injuries, near misses are reported, investigated and corrective action is taken to prevent the situation from occurring again.

# 2. Scope

- 2.1. The following incidents/injuries shall be investigated immediately by Directors/Managers/Supervisors upon notification by a worker.
  - 2.1.1. Death
  - 2.1.2. Incident of a Serious Nature
    - 2.1.2.1. A major structural failure or collapse of a building, bridge, tower, crane, structure, scaffold, temporary construction support system or excavation:
    - 2.1.2.2. An uncontrolled spill or escape of a toxic or hazardous substance:
    - 2.1.2.3. An accidental contact with an energized electrical conductor;
    - 2.1.2.4. A premature or accidental detonation of explosives;
    - 2.1.2.5. A concussion, major blood loss, serious fracture, unconsciousness or amputation; and
    - 2.1.2.6. An incident involving heavy equipment.
  - 2.1.3. Incident Involving Non-Serious Injury
    - 2.1.3.1. A work related injury where Medical Treatment or First Aid is required.
  - 2.1.4. Incident with No Injury
    - An undesired event that under different circumstances could have resulted in an accident with injury, property damage, or loss of productivity.

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Accident Investigation Program  Title		AIP
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## 3. Procedures

- 3.1. The following course of events is not implied to be sequential however are very important to ensure the integrity of the accident scene investigation.
- 3.2. Death The goal of our Health and Safety Program is to avoid this circumstance at all cost. An accident causing death is a traumatic event for the worker witnessing it. First Aid and or Medical Treatment are always the first priority for the injured worker. Legal obligations after the injury may apply and therefore it is important to notify the supervisor of the accident.
- 3.3. Notify your supervisor. The supervisor shall then ensure all responsibilities listed in Parts 3.3.1 through 3.3.7 are completed.
  - 3.3.1. Immediately inform the WSCC Chief Safety Officer.
  - 3.3.2. An accident involving a motor vehicle shall be reported to the RCMP.
  - 3.3.3. Secure the scene of the incident.
    - 3.3.3.1. Avoid compromising the integrity of scene. This may be accomplished with barrier tape, posting workers around the scene to prevent entrance or other means necessary.
    - 3.3.3.2. Identify potential witnesses and separate them if possible.
    - 3.3.3.3. Contact Emergency Services (ambulance/paramedics).
  - 3.3.4. Contact the following City of Iqaluit employees:
    - 3.3.4.1. Chief Administration Officer(all media communication shall be disseminated through the CAO);
    - 3.3.4.2. Director of Human Resources (for notification of family):
    - 3.3.4.3. City Health and Safety Officer (shall communicate with WSCC/RCMP/Municipal Enforcement);
    - 3.3.4.4. Joint Worksite Health and Safety Committee member; and
    - 3.3.4.5. Department Director.
  - 3.3.5. Conduct an Accident Investigation with assistance from the City Health and Safety Officer and Joint Worksite Health and Safety Committee.



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- 3.3.6. Complete and submit within 3 days-WSCC Claim: Employer's Report of Fatal Injury Form.
- 3.3.7. Complete Accident Investigation Form AIPF-01

## 3.4. Incident Involving Serious Injury or Incident of a Serious Nature

- 3.4.1. Notify your supervisor.
- 3.4.2. The supervisor shall then ensure all responsibilities listed in Parts 3.4.3through 3.4.11 are completed.
- 3.4.3. Provide medical treatment to injured worker.
- 3.4.4. Provide or arrange transportation to a medical facility for an injured worker.
- 3.4.5. Within 24 hours submit written or oral report to the WSCC Chief Safety Officer.
- 3.4.6. Secure the scene of the incident.
  - 3.4.6.1. Avoid compromising the integrity of scene. This may be accomplished with barrier tape, posting workers around the scene to prevent entrance or other means necessary.
  - 3.4.6.2. Identify potential witnesses and separate them if possible.
  - 3.4.6.3. Contact Emergency Services if required.
- 3.4.7. Contact the following City of Iqaluit employees:
  - 3.4.7.1. Chief Administration Officer:
  - 3.4.7.2. Director of Human Resources;
  - 3.4.7.3. City Health and Safety Officer;
  - 3.4.7.4. Joint Worksite Health and Safety Committee; and
  - 3.4.7.5. Department Director.
- 3.4.8. Conduct an Accident Investigation with assistance from the City Health and Safety Officer.



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- 3.4.9. Complete and submit within 3 days WSCC Claim: Employer's Report of Injury Form.
- 3.4.10. Provide the Worker with a WSCC Claim: Workers Report of Injury Form.
- 3.4.11. Complete Accident Investigation Form AIPF-01.

## 3.5. Incident Involving Non-Serious Injury

- 3.5.1. Notify your supervisor.
- 3.5.2. The supervisor shall then ensure all responsibilities listed in Parts 3.5.3through 3.5.12 are completed.
- 3.5.3. Worker shall inform Supervisor immediately of the Injury or Incident.
- 3.5.4. Provide medical treatment to injured worker.
- 3.5.5. Provide or arrange transportation to a medical facility for an injured worker.
- 3.5.6. Secure the scene of the incident.
  - 3.5.6.1. Avoid compromising the integrity of scene. This may be accomplished with barrier tape, posting workers around the scene to prevent entrance or other means necessary.
  - 3.5.6.2. Identify potential witnesses and separate them if possible.
  - 3.5.6.3. Contact Emergency Services if required.
- 3.5.7. Contact the following City of Igaluit employees:
  - 3.5.7.1. City Health and Safety Officer;
  - 3.5.7.2. Joint Worksite Health and Safety Committee; and
  - 3.5.7.3. Department Director.
- 3.5.8. Conduct an Accident Investigation with assistance from the City Health and Safety Officer.



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- 3.5.9. Complete and submit within 3 days WSCC Claim: Employer's Report of Injury Form.
- 3.5.10. Provide the Worker with a WSCC Claim: Workers Report of Injury Form.
- 3.5.11. Complete First Aid Record book with a First Aid Representative Signature.
- 3.5.12. Complete Accident Investigation Form AIPF-01 when Medical Treatment is required for the injury.

## 3.6. Incident with No Injury

- 3.6.1. Notify your supervisor.
- 3.6.2. The supervisor shall then ensure all responsibilities listed in Parts 3.6.3 through 3.6.6 are completed.
- 3.6.3. Worker shall inform Supervisor immediately of the Incident.
- 3.6.4. Contact the following City of Iqaluit employees:
  - 3.6.4.1. City Health and Safety Officer;
  - 3.6.4.2. Joint Worksite Health and Safety Committee; and
  - 3.6.4.3. Department Director.
- 3.6.5. Conduct an Accident Investigation with assistance from the City Health and Safety Officer.
- 3.6.6. Complete Accident Investigation Form AIPF-01 when Incidents are assigned an Incident Rating of 1, 2 or 3.

# 4. Roles & Responsibilities

## 4.1.CAO

- 4.1.1. Establish the City of Iqaluit Accident Investigation Program.
- 4.1.2. Review annually the Accident Investigation Program.



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## 4.2. Directors

- 4.2.1. Ensure investigations are conducted according to the Program.
- 4.2.2. Ensure corrective measures are implemented to prevent the incident/injury occurring again.
- 4.2.3. Ensure the WSCC Incident Reporting Responsibilities is posted in the workplace for all workers.
- 4.2.4. Ensure Managers/Supervisors are trained in Accident Investigation.
- 4.2.5. Conduct requirements of Section 4.3 should there be no direct Manager/Supervisor in the Department.
- 4.2.6. Encourage worker participation in the Accident Investigation Program.

## 4.3. Managers/Supervisors

- 4.3.1. Investigate all incidents/injuries reported by the worker.
- 4.3.2. Provide corrective measures to prevent the incident/injury occurring again.
- 4.3.3. Instruct all workers the importance of reporting incidents/injuries.
- 4.3.4. Complete all required Forms.
- 4.3.5. Encourage worker participation in the Accident Investigation Program.

## 4.4. Workers

- 4.4.1. Know the City of Igaluit Accident Investigation Program.
- 4.4.2. Report all incidents and injuries to the Manager/Supervisor immediately.
- 4.4.3. Participate in investigations.

## 4.5. **JWHSC**

- 4.5.1. Know the Accident Investigation Program.
- 4.5.2. Receive training on Accident Investigation (Co-chairs).
- 4.5.3. Participate in Accident Investigations.
- 4.5.4. Review all Accident Reports.

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## 4.6. Contractors/Visitors

- 4.6.1. Know the City of Igaluit Accident Investigation Program.
- 4.6.2. Report all incidents and injuries to the Department Manager/Supervisor.
- 4.6.3. Participate in investigations.

## 4.7. Health and Safety Officer

- 4.7.1. Develop the Accident Investigation Program.
- 4.7.2. Provide training on Accident Investigation.
- 4.7.3. Assist with Accident Investigations.
- 4.7.4. Review all Accident Reports.
- 4.7.5. Report to CAO and JWHSC incidents/injuries monthly.

## 4.8. Training Development Officer

4.8.1. Coordinate training requirements for Directors.

## 5. Communication

- 5.1. The Accident Investigation Program shall be posted and available to all workers in the workplace.
- 5.2. All incidents/injuries shall be reported to the Health and Safety Officer.
- 5.3. Workers shall be informed of the Accident Investigation Program through the Orientation Program.
- 5.4. Workers shall report immediately any injury/incident to the Manager/Supervisor.

# 6. Training

- 6.1. Accident Investigation Program Training through the Orientation Program.
  - 6.1.1. Directors
  - 6.1.2. Managers/Supervisors
  - 6.1.3. Workers
  - 6.1.4. Contractors
- 6.2. Accident Investigation.
  - 6.2.1. Directors

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- 6.2.2. Managers/Supervisors
- 6.2.3. JWHSC Co-chairs
- 6.3. Refresher Training
  - 6.3.1. Every 3 years
  - 6.3.2. Change in the Accident Investigation Program.

## 7. Evaluation

- 7.1. Annually
  - 7.1.1. Health and Safety Officer
  - 7.1.2. Joint Worksite Health and Safety Committee

## 8. Forms

- 8.1. Accident Investigation Program Form AIPF-01
- 8.2. First Aid Log Book
- 8.3. WSCC Claim Employer's Report of Fatal Injury form
- 8.4. WSCC Claim Employer's Report of Injury form
- 8.5. WSCC Claim Worker's Report of Injury form

## 9. Reference Material

9.1. Nunavut Safety Regulation Sections 35 & 65.

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	Department				File #		Report L	)a	te
	Location				Date of Incident		Time		
	Inju	ry			Damage		N	ea	ar Miss
7	Name		Property			Inciden	ıt		
TION	Description of Injury		Damage	Туре	;	Cost			
\T	Occupation				Cost	Reporte	ed By		
INFORMA	Job Experience		Estimate	d		Persons	s Involved	l	
OR			Actual			Superv	isor		
		Inciden	t Type (cho	eck)			Contact	((	check)
	Struck Against	Caught On		Fa	ll on Same Level	Electricity			Caustics
	Struck By	Caught Betw	een	Fa	ll to Lower Level	Heat			Noise
	Caught In	Slip		Ov	verexertion	Cold			Hazardous Substance
						Radiation			

		Incident Ratin	ıg			
		Severity		Probability		
	1	<i>Catastrophic</i> – could cause death/major equipment loss	A	<i>Probable</i> -likely to occur soon (daily)		
	2	<i>Critical</i> – could cause severe injuries/equipment	В	Reasonable Probable-likely to occur eventually		
$\mathbf{Z}$		damage/environmental damage (time lost from work)		(monthly)		
RISK	3	<i>Marginal</i> - minor injury/moderate damage/small environment	C	<b>Remote</b> -occur at some point (quarterly)		
R		impact (no time lost other than day of injury)				
	4	Negligible- first aid treatment	D	Extremely Remote- unlikely to occur again		
				(annual)		
	This incident is rated as a (example-3D)					
	Any Incident Rating with a Severity Rating of 1, 2 or 3 must be investigated with the Health & Safety Officer.					

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Description of Incident/Statement of Observer (use back of form if required)			
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Name	Signature	Date	
		L.	
		1	
Description of Incident/St	tatement of Observer (use back of form if required)	1	
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	Sub	standard Act (check all that apply)		
	Operating Equipment without Authority	Using Defective Equipment	Improper Lifting	
	Failure to Warn	Improper Use of Equipment	Improper Position for Task	
	Failure to Secure	Failure to use PPE	Servicing Equipment in Operation	
	Operating at Improper Speed	Improper Loading	Horseplay	
	Inoperable/Not using Safety Devices	Improper Placement	Under Influence Alcohol/Drugs	
	Substan	ndard Condition (check all that apply)		
S	Operating Equipment without Authority	Inadequate Warning	Noise	
SISI	Improper Protective Equipment	Fire & Explosion Hazard	Radiation	
CAUSES	Defective Tools/Equip/Materials	Housekeeping	Temperature	
	Congestion	Hazardous Environment	Lighting	
			Ventilation	
	Ba	ic Causes (check all that apply)		
INCIDENT	Personal Fac	Job Factors		
	Experience	Stress	Supervision/ Leadership	
	Knowledge	Motivation	Engineering	
	Training	Skill	Purchasing	
			Maintenance	
			Tools/Equipment	
			Work Standards	
			Wear and Tear	
			Abuse and Misuse	

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	Expand on Incident Causes Identified on Page 3
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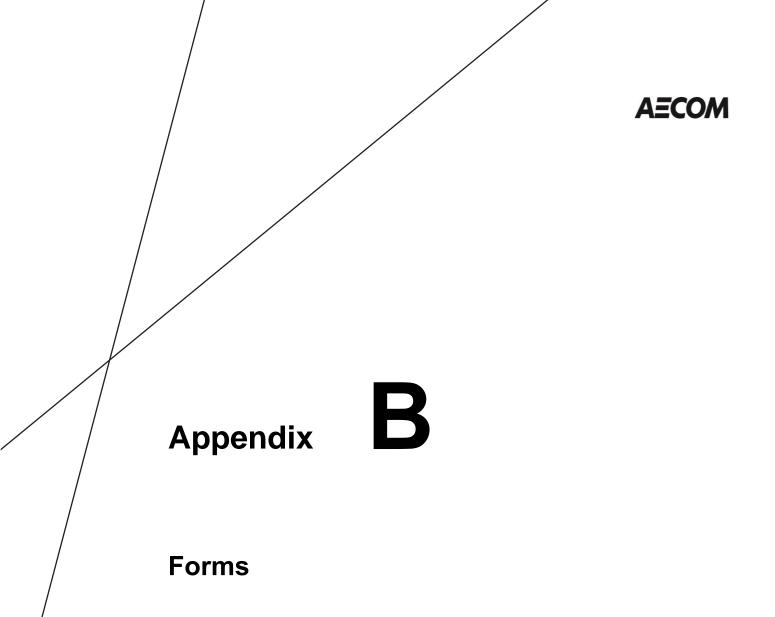
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	What must be done to prevent occurring again?	Deadline	Whom	Completed
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ACTIONS				
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	Investigators Signature	Date		•

	Health & Safety Officer		
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	Signature	Date	

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# Canada NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE

TEL: (867) 920-8130 FAX: (867) 873-6924 EMAIL: spills@gov.nt.ca

#### REPORT LINE USE ONLY

Α	REPORT DATE: MONTH DAY	-YEAR		R			ORIGINAL SPILL REPORT,		REPORT NUMBER	
_	OCCURRENCE DATE: MONTH	I – DAY – Y	YEAR	0	CCURRE	NCE TIME		OR UPDATE #	UPDATE #	
В	)				TC		TO THE ORIGINAL SPILL REPORT			
С	LAND USE PERMIT NUMBER	F APPLICABLE) WATER LICENCE NUMBER (IF APPLICABLE)								
D	GEOGRAPHIC PLACE NAME (	NCE AND DIRECTION	FROM NAMED LOC	CATION	REGION		_			
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_	RESPONSIBLE PARTY OR VE			RESPONSIBLE PA			FICE LOCATIO	WHITE THE THE	- 01	gonos
F										
G	ANY CONTRACTOR INVOLVED	D		CONTRACTOR AD	DRESS O	OR OFFICE LO	OCATION			
	PRODUCT SPILLED			QUANTITY IN LITE	ES, KILO	GRAMS OR C	CUBIC METRE	S U.N. NUMBER		
Н										
٠.	SECOND PRODUCT SPILLED	(IF APPLI	ICABLE)	QUANTITY IN LITE	RES, KILO	GRAMS OR C	CUBIC METRE	S U.N. NUMBER		
_	SPILL SOURCE			SPILL CAUSE				AREA OF CONTA	MINATION IN	SQUARE METRES
1										
J	FACTORS AFFECTING SPILL	OR RECO	WERY	DESCRIBE ANY AS	SSISTANC	CE REQUIRED	D	HAZARDS TO PE	RSONS, PROF	PERTY OR ENVIRONMENT
K										
L	REPORTED TO SPILL LINE BY	PO	SITION	E	MPLOYER	R		LOCATION CALLING F	ROM 1	ELEPHONE
	ANY ALTERNATE CONTACT	PO	SITION	E	MPLOYER	4		ALTERNATE CONTACT	T A	LTERNATE TELEPHONE
M			SENSON S		nwed bike p			LOCATION		
				REPORT LINE	USE ONL	Y				
N	RECEIVED AT SPILL LINE BY	PO	SITION	E	MPLOYER	3		LOCATION CALLED	F	REPORT LINE NUMBER
31/20	FIRE		ATION OPERATOR					YELLOWKNIFE, NT	0	867) 920-8130
LEAD	AGENCY DEC DCCG D	GNWT [	IGN DILA DINAC	NEB ITC	SIGNIF	CANCE III	MINOR MAJ	OR II UNKNOWN	FILE STATE	IS OPEN OCLOSED
AGE	NCY	CONTAC	T NAME		CONTA	CTTIME		REMARKS		
LEAD	LEAD AGENCY									
FIRS	T SUPPORT AGENCY									
SEC	OND SUPPORT AGENCY									
THIR	THIRD SUPPORT AGENCY									



Step 1: Fire Hazard Assessment Checklist					
Facility: _			Date:,		
Priority for (	Corrective Action # 1 high risk #2 moderate   #3 low risk #4 no risk #5 not applica				
D.	11 200 111 1		Safety Hazard and		
Item	Identified Hazard	Status (Priority)	Location		
Fire Safety		1			
1	Employee training				
2	Employee knowledge				
3	On-site communications				
4	Off-site communications				
5	Water supply				
6	Site security				
7	Fire safety plan				
8	Fire drills				
Storage of	Materials				
1	Compressed Gases				
2	Aerosols				
3	Dangerous goods				
5	6 m clearance of stored materials. From uncontrolled grass or weeds				
6	Fire Dept. access				
7	Fencing/Security				
8	Access to water				
9	Lumber storage				
10	Wood chips, hogged materials.				
11	Used Tire Storage				
12	Compressed gases				
13	Fire Dept. Access				
14	Fire breaks				



Facility:		Date			
Assessment Team			Persons Position		
		Follow-up			
Item	Priority	Recommended Action	Action tak Date/Tim		
Superintend	ent Signature:		Date:		



Step #3	Health and Safe	ety Hazard Assessme	ent Checklist		
Facility		Date/Time:			
Priority St	#2 haza #3 low r #4 O.K.	rdous with moderate r	ccident of high potential isk		
Item #	Identified Hazards	Status/Priority	Safety Hazard and Location		
1	Housekeeping				
2	Material Storage				
3	Waste disposal				
4	Lighting				
5	Ventilation				
6	Extreme Temperature				
7	Radiation exposure				
8	Gas (toxic or non-life supporting)				
9	Flammables (Fire/Explosion)				
10	Dangerous Pressure				
11	Chemicals				
12	Hazardous Materials (WHMIS)				
13	High Risk Positioning				
14	Electrical Hazards				
15	Overhead Hazards				
16	Underground Hazards				
17	Confined Space Entry				
18	Excavations				
19	Restricted Access/Egress				



Step #3	Health and Sa	afety Hazard Assessm	ent Checklist		
Facility		Date/Time:			
Priority St	#2 ha: #3 lov #4 O.l	zardous with moderate r	accident of high potential isk		
Item #	Identified Hazards	Status/Priority	Safety Hazard and Location		
20	Ladders				
21	Work at Heights				
23	Work over water				
24	Major lifts (hoisting)				
25	Vehicles				
26	Mobile equipment				
27	High traffic				
28	Power tools				
29	Permits				
30	Communications				
31	First Aid				
32	Personal Protection Equipment				
33	Other items				
Superinte	endent Signature:	1	Date:		

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# CITY OF CITY OF IQALUIT CITY OF IQALUIT MUNICIPAL LANDFILL ACCIDENT/NEAR MISS REPORT

Incident Date:	Time:
Location:	
Name and Position of Person Making Report	
Drivers License No.(s) if required	
Individual or Company	Phone No
Did the Incident Result in Personal Injury?	Yes No
Injury report attached (i.e. Worker's Safety and Compensation Com	Yes No nmission form or other applicable form)
Did the incident cause damage to Landfill or other property?	Yes No
Who investigated the Incident?	
Supervisor RCMP	Special Committee HS&S
Contact Person(s)	
Details of Equipment/Property Damage if A	Applicable
Damage was to: Vehicle Equipment	Property
Description:	
Unit No. Year Make	Model
Estimated Value of Vehicle/Equipment/Prope	

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Estimated Damage to Vehicle/Equipment/Property
Description of Incident (use attachment if necessary)
Incident Cause (use attachment if necessary)
Sketch of Incident Where Applicable (use attachment if necessary)
Recommendation to Prevent Re-occurrence (use attachment if necessary)
Comments (use attachment if necessary)
Name: Signature:
Report Date
Distribution List:

Ozone Depleting Substances

Electrical Equipment
Radio-Active Materials
Other (NOTE TYPE)



# CITY OF CITY OF IQALUIT CITY OF IQALUIT MUNICIPAL LANDFILL RANDOM LOAD VISUAL INSPECTION REPORT

Date:	Hauler a.m. /µ Houler Vehicle Description _ General Description of	Vehicle OperatorSource of the Waste	_
Composition	Estimated Per of Total Volu		
Food Waste			
Cardboard			
Paper Products			
Plastics			
Textiles/Rubber/Leath	ner		
Metals			
Ceramics/Bricks			
Dirt and rocks			
Ashes			
Yard wastes			
Wood wastes			
Glass			
Tires			
Drywall			
Oils or greases			
Glycol			
Paints/Solvents			
Pesticides			
Cleaning Products			

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# CITY OF IQALUIT CITY OF IQALUIT MUNICIPAL LANDFILL VISITOR LOG

Date	Name	Representing	Time In	Time Out	Signature	Reason for Visit



### CITY OF IQALUIT CITY OF IQALUIT MUNICIPAL LANDFILL MONTHLY SITE OPERATIONS INSPECTION

Date: \_\_\_\_\_ Inspector: \_\_\_\_\_

No	Item	Α	U	COMMENTS
1.0	PERMITS AND APPROVALS			
1.1	Municipal Development Permit			
1.2	Land Titles, Lease Agreements			
1.3	SAHTU Land and Water Board Approvals			
1.4	Other			
2.0	RECORDS			
2.1	Survey and Site Plans			
2.2	Waste Volumes			
2.3	Special Waste Records			
2.4	Daily Operating Logs			
2.5	Monitoring Reports			
0.0	DEPOCABLE TRAINING AND OFFICE	TION	II.	
3.0	PERSONNEL TRAINING AND CERTIFICA	IION	1	T
3.1 3.2	Landfill Foreman			
	First Aid			
3.3	Work Place Safety (OH&S)			
3.4	WHMIS			
3.5	Other			
4.0	DESIGN AND OPERATIONS AND MAINTENANCE PLAN			
4.1	Site Development Plan current			
4.2	Operations Procedures & Policies Current			
4.3	Construction/As-built records			
5.0	PERSONNEL, OPERATING EQUIPMENT	AND F	FACIL	LITIES
5.1	Landfill Foreman			
5.2	Support Personnel			
5.3	Staff Facilities			
5.4	Equipment Facilities			
5.5	Communication equipment			
5.6	Fuel Storage			



No	Item	Α	U	COMMENTS
0.0	ENTERANCE AND DOADWAYS			
6.0	ENTRANCE AND ROADWAYS			T
6.1	Site Appearance			
6.2	Entrance Road			
6.3	On-site Access Roads			
6.4	Road Surfacing			
7.0	SITE DEVELOPMENT			
7.1	Construction			
7.2	Cover Soils			
7.3	Borrow Areas			
7.4	Topsoil/Subsoil Salvaged/Stockpiled			
	, ,		l	
8.0	ACTIVE WORKING FACE		_	
8.1	Vehicle Staging/Safety			
8.2	Working Face			
8.3	Waste Compaction Density			
8.4	Cover Frequency			
8.5	Surface Water Controls			
8.6	Litter Controls			
8.7	Other			
9.0	INACTIVE SLOPES			
9.1	Intermediate Cover (300 mm)			
9.2	Vegetation Cover			
9.3	Drainage and Grading			
9.4	Erosion Controls			
10.0	COMPLETED AREAS			
10.1	1000 mm Compacted Shale Layer			
10.2	150 mm Topsoil Layer			
11.0	SURFACE WATER MANAGEMENT			
11.1	Working face controls			



No	Item	Α	U	COMMENTS
42.0	ENVIRONMENTAL MONITORING AND CO.	VITD (		
12.0	ENVIRONMENTAL MONITORING AND CO	NIKO	JLS I	
12.1	Groundwater Monitoring			
	Annual Report on file Wells protected and secure			
12.2	Litter Management			
12.3	Animal Management			
12.3	Dust Management			
12.4	Dust Management			
13.0	CONTROLLED BURNING AREA			
13.1	Materials accepted			
13.2	Site maintenance			
13.3	Burning controls			
13.4	Notification to Department of Environment and			
	Natural Resources Northwest Territories,			
	Neighbours, Fire Dept.			
14.0	RECYCLING FACILITIES			
14.1	Tires			
14.2	Metals			
14.3	Appliances			
14.4	Batteries			
14.5	Plastics			
15.0	SAFETY	_		
15.1	Employee Safety Practices/Issues			
15.2	Customer Safety Practices/Issues			
15.3	Equipment Backup Alarms			
15.4	Documentation			
16.0	EMERGENCY RESPONSE			
	T		1	
16.1	Medical Emergency Response			
16.2	Fire Response		-	
16.3	Environmental Response			



# CITY OF IQALUIT CITY OF IQALUIT MUNICIPAL LANDFILL DAILY OPERATIONS LOG

DATE:	Day Mor	nth	Year				
WEATHER:	Precipitation	mm Temp	·	_°C	Wind:		km from
DAILY WAS	TE RECORD:						
	Received (in-bound)		m3				
R	ecycled (out-bound)		m3				
	Compost Materials		m3				
CI	ean Wood Materials		m3				
STAFF:							
	Landfill Foreman	Start:				Leave:	
EQUIPMENT	:						
	Compactor	Hours:				Activity:	
		Hours:				Activity:	
SITE MAINT	ENANCE:		<u>Activities</u>				<u>Comments</u>
(i.e. litter, f	ences, roads, other)						
CONTROLL	ED BURN:	Time start:				Time end:	
SITE INSPE	CTIONS:		Observations			<u>Actio</u>	on Taken or Required
	Litter						
	Surface Water						
	Intermediate Cover						
	Final Cover						
	Compaction	-					
MONITORIN	G:						
	Groundwater	Ву	Record	l			
SITE MAINT	ENANCE:						
OTHER:			(Use ba	ack of	form to r	note other a	ctivities.)

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# CITY OF IQALUIT CITY OF IQALUIT MUNICIPAL LANDFILL WASTE SCREENING FORM

#### **GENERAL INFORMATION**

Signature of Landfill Personnel

Date and Time:		
Transporter Name:		
License Plate No.:		
Source of Waste:		
Transporters Waste Description:  WASTE INSPECTION OBSERVATIO	N (Completed by	I andfill Personnel)
Observation	Yes or No	If yes, explain
Hazardous Waste Labels or Placards		
PCB Transformers, Labels or Placards		
Unrinsed Pesticide Containers		
Bulk or Containerized Liquids		
Free Liquids Present (i.e. oil)		
Sludges, Pastes or Slurries		
Powders, Dust, Smoke or Vapours		
Petroleum Odours		
Lead-Acid Batteries		
Unusual Odours		
Cylinders		
Paint		
Freon Items (fridge, freezer)		
Metal		
Wood (for the burn pile)		
E-Waste		
Other Suspicious Items		
Waste Accepted		
If waste was rejected, explain why:		
What happened to rejected waste:		

Date



# CITY OF IQALUIT CITY OF IQALUIT MUNICIPAL LANDFILL HAZARDOUS MATERIAL LOAD CHECK FORM

Location				
Date				
Time				
Vehicle Description & I.	D			
Vehicle Operator				
Waste Source				
The following noteworth	ny items were found	during this inspection:		
Material Description	Container (i.e. Drum)	Quantity (i.e. kg/litre)	Remove to (Location)	Removed by (Name)
Comments and follow-u	ір:			
Landfill Foreman's cont	acted: Time	[	Date	
Name of person conduc	cting inspection			



Appendix C

**Environmental Guideline for the General Management of Hazardous Waste** 

# **Environmental Guideline for the General Management of Hazardous Waste**







#### **GUIDELINE: GENERAL MANAGEMENT OF HAZARDOUS WASTE**

Original: April 1999 Revised: January 2002

> April 2010 October 2010

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act*.

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks and hazards associated with hazardous waste and to assist in its proper management. This Guideline does not replace the need for the owner or person in charge, management or control of a hazardous waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of hazardous waste.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

Cover Photos: E. Paquin

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#### Introduction

'Waste' is a term used to describe materials that are no longer wanted or are unusable for their original intended purpose. Many different types of waste are generated each day in Nunavut by industry and small business, hospitals and health centers, schools and individuals during the normal course of carrying out daily activities. Some types of waste pose greater risks than others because of their chemical, physical and biological properties. These wastes are generally referred to as being a 'hazardous waste'. Examples of hazardous waste include discarded paint, used solvents, motor and lubricating oil, cleaning compounds, certain building construction and demolition waste and products with an expired shelf life. They will generally exhibit one or more of the following characteristics - ignitable (i.e. flammable), reactive, corrosive or toxic. Hazardous waste often requires that specific management measures be taken to ensure the health and safety of the environment, workers and the general public.

The purpose of the Environmental Guideline for the General Management of Hazardous Waste (the Guideline) is to ensure the safe, effective and efficient management of hazardous waste in Nunavut. It provides information to generators, carriers and receivers of hazardous waste on its hazards, how best to reduce or eliminate the effects it can have on the environment, worker and public safety and guidance on its storage, registration and transportation.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures that preserve, protect and enhance the quality of the environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of a hazardous waste is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in hazardous waste management.

#### 1.1 Definitions

Carrier A person who accepts hazardous waste for transportation or transports

hazardous waste, whether or not for hire or reward. A carrier is also

referred to as a transporter of hazardous waste.

Commercial Actions undertaken for hire or reward.

Commissioner's Land Lands that have been transferred by Order-in-Council to the Government of

Nunavut. This includes roadways and land subject to block land transfers.

Most Commissioner's Land is located within municipalities.

Consignee A person to whom hazardous waste is being or is intended to be

transported. A consignee is also referred to as a receiver of hazardous

waste.

#### Consignor

A person who has possession of hazardous waste immediately before it is transported. A consignor may also be a generator of hazardous waste.

#### Contaminant

Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,

- (a) endangers the health, safety or welfare of persons,
- (b) interferes or is likely to interfere with normal enjoyment of life or property,
- (c) endangers the health of animal life, or
- (d) causes or is likely to cause damage to plant life or to property.

#### Dangerous Good

Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the Schedule provided in the *Transportation of Dangerous Goods Act* (Canada).

#### **Empty Container**

A container that previously held a hazardous waste and has been emptied to the greatest extent practical or triple rinsed with an appropriate cleaning agent. This does not include containers that previously contained mercury or Class 2.3, 5.1 or 6.1 materials.

#### **Environment**

Means the components of the Earth and includes

- (a) air, land and water,
- (b) all layers of the atmosphere,
- (c) all organic and inorganic matter and living organisms, and
- (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.

#### Generator

The owner or person in charge, management or control of a hazardous waste at the time it is generated or a facility that generates a hazardous waste. A generator may also be a consignor of hazardous waste.

#### Hazardous Waste

A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal. A hazardous waste does not include a contaminant that is

- (a) household in origin;
- (b) exempted as a small quantity;
- returned directly to a manufacturer or supplier of the product, substance or organism for reprocessing, repackaging or resale for any reason;
- (d) an empty container; or
- (e) intended for disposal in a landfill or a sewage treatment facility and meets the applicable standards set out in the Environmental Guideline for Industrial Waste Discharges.

Hazardous Waste Management Facility A commercial facility used for the collection, storage, transfer, treatment, recycling or disposal of a hazardous waste. For clarity, a hazardous waste management facility does not include a municipal landfill or sewage lagoon.

Incompatible Hazardous Waste A hazardous waste that, when in contact with another substance or hazardous waste under normal circumstances, reacts to produce heat, gas, fire, explosion or a corrosive or toxic substance.

Landfilling

The intentional depositing or placement of waste in or on land for the purposes of disposal.

Long-term Storage

The storage of hazardous waste for a period of 180 days or more.

Manifest

The manifest as set out in Schedule IX to the Export and Import of Hazardous Waste and Hazardous Recyclables Regulations under the Canadian Environmental Protection Act (Canada).

Minister

The Minister of Environment of the Government of Nunavut.

**Qualified Person** 

A person who has an appropriate level of knowledge and experience in all relevant aspects of hazardous waste management.

Receiver

A person to whom hazardous waste is being or is intended to be transported. A receiver is also referred to as a consignee of hazardous waste.

Responsible Party

The owner or person in charge, management or control of the hazardous waste.

**Small Quantity** 

Hazardous waste that is generated in an amount that is less than five kilograms per month if a solid or less than five litres per month if a liquid, and where the total quantity accumulated at any one time does not exceed five kilograms or five litres. This does not include hazardous waste that is mercury or Class 2.3, 5.1 or 6.1 materials. These wastes must be generated in an amount that is less than one kilogram per month if a solid or less than one litre per month if a liquid, and where the total quantity accumulated at any one time does not exceed one kilogram or one litre.

**Transport Authority** 

The statute and regulations controlling the management of hazardous waste under that mode of transport. These include

- (a) Road and Rail Transportation of Dangerous Goods Act (Canada) and Regulations; Interprovincial Movement of Hazardous Waste Regulations (CEPA) and Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (CEPA).
- (b) Air International Air Transport Association (IATA) Dangerous Goods Regulations and International Civil Aviation Organization (ICAO) Technical Instructions; and

(c) Marine – International Maritime Dangerous Goods Code (IMDG).

Transfer The temporary storage of hazardous waste for a period of 179 days or less

for the purpose of changing from one vehicle or means of transportation to

another.

Transporter A person who accepts hazardous waste for transportation or transports

hazardous waste, whether or not for hire or reward. A transporter is also

referred to as a carrier of hazardous waste.

Waste Audit An inventory or study of the amount and type of waste that is produced at

a location.

#### 1.2 Roles and Responsibilities

#### 1.2.1 Environmental Protection Division

The Environmental Protection Division of the Department of Environment is the key environmental agency responsible for ensuring the proper management of hazardous waste and other contaminants on Commissioner's Land. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at <a href="http://env.gov.nu.ca/programareas/environmentprotection.">http://env.gov.nu.ca/programareas/environmentprotection.</a>

The Department of Environment will provide advice and guidance on the proper management of hazardous waste. However, it remains the responsibility of the owner or person in charge, management or control of the hazardous waste to ensure compliance with all applicable statutes, regulations, standards, guidelines and local by-laws.

#### 1.2.2 Generators of Hazardous Waste

The generator is the owner or person in charge, management or control of the hazardous waste at the time it is produced or of the facility that produces the hazardous waste. The generator is responsible for any and all hazardous waste produced and must ensure the hazardous waste is properly and safely managed from the time it is generated to its final disposal. This is referred to as managing the waste from cradle-to-grave.

Contractors may manage hazardous waste on behalf of the generator. However, the generator remains responsible for determining whether the waste is hazardous and ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the generator may also be held liable.

The basic responsibilities of a hazardous waste generator in Nunavut are:

- Registering with the Department of Environment as a generator of hazardous waste.
- Registering the facility with the Department of Environment as a hazardous waste management
  facility where the facility is used for commercial purposes and is intended for the storage of
  hazardous waste for a period of 180 days or more, where stored quantities exceed the criteria
  set out in Appendix 8 or where hazardous waste is recycled, treated or disposed of in quantities
  in any single month that exceed a 'small quantity'.
- Classifying and labeling hazardous waste in accordance with the Transport Authority.
- Managing the hazardous waste in accordance with the Guideline, *Environmental Protection Act, Fire Prevention Act, Safety Act, Public Health Act* and all other applicable statutes, regulations, standards, guidelines and local by-laws.
- Reusing, recycling, treating or disposing of the hazardous waste in a proper and safe manner.
- Where the hazardous waste is transported off-site, completing Part A of the waste manifest form and retaining a copy for two years, using a registered hazardous waste carrier to transport the waste and sending the waste to a registered receiver or hazardous waste management facility.
- Ensuring staff are trained and qualified to safely handle the hazardous waste.
- Filing a spill contingency plan with the Minister where stored quantities of hazardous waste exceed the criteria set out in Schedule A of the Spill Contingency Planning and Reporting Regulations.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a generator or a hazardous waste management facility are available from the Department of Environment. Refer to sections 3.2.1 and 3.2.2 and Appendices 4 and 7 for further information.

#### 1.2.3 Carriers of Hazardous Waste

Hazardous waste must be transported in accordance with the appropriate Transport Authority: Road and Rail - Transportation of Dangerous Goods Act (Canada) and Regulations, Interprovincial Movement of Hazardous Waste Regulations (CEPA) and Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (CEPA); Air – International Air Transport Association (IATA) Dangerous Goods Regulations and International Civil Aviation Organization (ICAO) Technical Instructions; and Marine – International Maritime Dangerous Goods Code (IMDG).

Carriers operating in Nunavut must be registered with the Department of Environment before transporting hazardous waste. Other basic responsibilities of hazardous waste carriers are:

- Placarding and labeling all transport vehicles and containers in accordance with the appropriate Transport Authority.
- Completing Part B of the waste manifest form and retaining a copy for two years.
- Accepting hazardous waste only from registered generators and safely transporting hazardous waste only to a registered receiver or hazardous waste management facility.
- Ensuring staff are trained and qualified to safely transport hazardous waste.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a hazardous waste carrier are available from the Department of Environment. Refer to section 3.2.1 and Appendix 5 for further information.

#### 1.2.4 Receivers of Hazardous Waste

Any person receiving or accepting hazardous waste in Nunavut for the purpose of storage, transfer, reuse, recycling, treatment or disposal must be registered with the Department of Environment as a hazardous waste receiver. The facility must also be registered as a hazardous waste management facility where it is used for commercial purposes and is used to store hazardous waste for a period of 180 days or more, store quantities that exceed the criteria set out in Appendix 8 or hazardous waste is recycled, treated or disposed of in quantities in any single month that exceed a 'small quantity'. Other basic responsibilities of hazardous waste receivers in Nunavut are:

- Handling and storing the hazardous waste in accordance with the Guideline, Environmental Protection Act, Fire Prevention Act, Safety Act, Public Health Act and all other applicable statutes, regulations, standards, guidelines and local by-laws.
- Reusing, recycling, treating or disposing of the hazardous waste in a proper and safe manner.
- Completing Part C of the waste manifest form and retaining a copy for two years.
- Accepting hazardous waste only from registered generators and carriers.
- Ensuring staff are trained and qualified to safely handle hazardous waste.
- Filing a spill contingency plan with the Minister where stored quantities of hazardous waste exceed the criteria set out in Schedule A of the Spill Contingency Planning and Reporting Regulations.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a receiver or hazardous waste management facility are available from the Department of Environment. Refer to sections 3.2.1 and 3.2.2 and Appendices 6 and 7 for further information.

#### 1.2.5 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of hazardous waste as there may be other environmental or public and worker health and safety issues to consider. Some of the other agencies include:

#### **Department of Economic Development and Transportation**

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and load safety matters.

#### **Workers' Safety and Compensation Commission**

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers. The Workplace Hazardous Materials Information System, or WHMIS, requires information be provided to workers on the safe use of any hazardous material used in the workplace. All hazardous waste generators, carriers and receivers should consult the Prevention Services Division for further information and guidance.

#### **Department of Community and Government Services**

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities. Emergency planning responsibilities under the *Emergency Measures Act* include developing territorial emergency response plans, coordinating emergency operations at the territorial and regional levels and supporting community emergency response operations.

The Office of the Fire Marshal is responsible for ensuring the safe storage, handling and use of flammable and combustible liquids and materials. The Office of the Fire Marshal derives its authority from the *Fire Prevention Act*, National Fire Code and National Building Code.

#### **Department of Health and Social Services**

Activities related to the generation, storage, transportation, treatment and disposal of hazardous waste may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act*.

#### **Environment Canada**

Environment Canada is responsible under the *Canadian Environmental Protection Act* for ensuring the safe management of designated hazardous waste at federal facilities and on federal lands. The management, disposal and export of polychlorinated biphenyl (PCB) waste is controlled under the *PCB Regulations*, the *Federal Mobile PCB Treatment and Destruction Regulations* and the *PCB Waste Export Regulations*. The interprovincial and international transport of waste is controlled under the *Interprovincial Movement of Hazardous Waste Regulations* and the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

#### **Indian and Northern Affairs Canada**

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters* and *Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact hazardous waste may have on the quality of these lands and waters.

#### **Natural Resources Canada**

The Explosives Act provides Natural Resources Canada with authority to manage explosives in Canada, including waste explosives. The Canadian Nuclear Safety Commission, which reports to Parliament through the Minister of Natural Resources, administers the safe handling and disposal of radioactive materials and licenses institutions and companies to possess and use radioactive materials under the Nuclear Safety and Control Act and Nuclear Liability Act.

#### **Local Municipal Governments**

The role of municipal governments is important in the proper local management of hazardous waste. Under the Nunavut Land Claim Agreement, municipalities are entitled to control their own municipal disposal sites. Hazardous waste may be deposited into municipal landfill sites and sewage treatment facilities only with the consent of the local government. Local environmental and safety standards are determined, in part, by how the property is designated under municipal government development plans (i.e. land use zoning). The local fire department may also be called upon if a fire or other public safety issue is identified.

#### **Co-management Boards and Agencies**

Co-management boards and agencies established under the Nunavut Land Claim Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving hazardous waste may be controlled through the setting of terms and conditions in plans, licenses and permits issued by the Nunavut Water Board and other co-management boards and agencies.

Appendix 3 provides further assistance in determining the primary regulatory agency contact for managing hazardous waste in Nunavut.

Appendix 11 provides mailing addresses, phone and fax numbers for each of the regulatory agencies.

#### **Management of Hazardous Waste**

#### 2.1 What is Hazardous Waste?

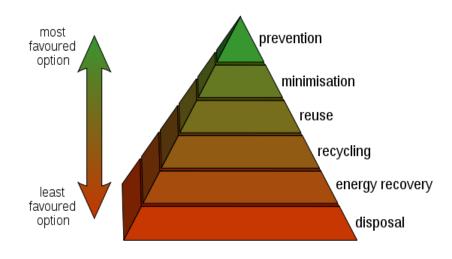
Hazardous waste is unwanted material or products that can cause illness or death to people, plants and animals. It may be a liquid, solid, sludge or gas and contain chemicals, heavy metals, radioactives, infectious organisms or other toxic substances. It may be a single product or a combination of many hazardous and non-hazardous materials (i.e. mixed waste). Its harmful effects may exist for a relatively short period of time (i.e. oil-based paint before hardening) or continue for hundreds of years. It can persist in soil, water and sediment (i.e. radioactive materials) or bioaccumulate in plants and animals (i.e. mercury, PCBs).

Hazardous waste is generated by everybody. Households commonly generate unwanted gasoline, brake and windshield wiper fluid, cleaning supplies, paints and paint thinners, lead acid batteries, used computer equipment and construction materials (i.e. asbestos), pesticides and others. Hospitals and nursing stations generate unwanted needles and waste human tissue, body fluids and biotic cultures. Business and industry generate many different types of hazardous waste including used motor and lubricating oil, cleaning solvent, drilling fluid and cuttings and mine tailings.

#### 2.2 Waste Management

Proper waste management simply makes good sense. Minimizing or eliminating the generation of hazardous and other waste helps to reduce the hazards and costs associated with its handling, storage, transport, recycling, treatment and disposal. It also reduces the impacts waste could have on the environment, human and worker health and safety and reduces the global emission of greenhouse gases by minimizing the use of raw materials. Another term commonly used to describe activities that reduce the amount of material entering a waste stream or being released to the environment is 'pollution prevention'.

Once a waste is created, the generator is responsible for its safe management from cradleto-grave. Waste generators can prevent pollution and reduce costs by implementing various waste reduction, reuse and recycling programs through changes to operational procedures, maintenance practices and raw material use. Treating and disposing of waste either locally or outside of Nunavut should be considered only if reuse and recycling options are not available or practical.



#### 2.2.1 Reduce and Minimize – the first option

Using raw materials efficiently and reducing the amount of waste generated is the first and most important step in effective waste management. Both environmentally and economically, consuming less is the most fundamental and effective step to reducing waste.

A waste audit should be undertaken to inventory and study the waste produced at a location or business. The audit should identify the type and amount of waste being generated, the costs of current management methods including handling, storage, treatment, transport and disposal, and examine opportunities and set targets for reducing or reusing waste. These opportunities include awareness and education, the substitution or reduction of purchased raw materials, production redesign, process changes and improved maintenance activities. Other opportunities include purchasing products that are durable or are manufactured from environmentally-friendly materials (i.e. biodegradable or post-consumer materials), avoiding products that are designed for single or short life usage and buying only the quantity that is needed. Effective communications is critical to the success of any waste reduction program.

#### 2.2.2 Reuse and Recycle

Even with effective waste reduction measures in place there will be waste generated. Reusing the waste product for a different but related purpose (reuse) or producing a new product from the original material (recycle) is an effective way to reduce the volume of waste. The waste audit should identify whether opportunities are available for reusing or recycling waste within the generating facility. Alternatively, other local or distant users may be found to reuse or recycle the waste that would otherwise require treatment or disposal.

The Department of Environment encourages the reuse and recycling of hazardous and other waste in the following ways:

- Local reuse and recycle programs are available in various communities for some types of
  hazardous waste including used oil and waste fuel. Generators should contact the Department
  of Environment or local municipal government for the names of registered waste receivers or
  other opportunities to reuse or recycle wastes locally.
- Waste exchanges and associations offer opportunities for waste generators to transfer unwanted, overstocked, obsolete, damaged, contaminated and post-dated material to another person or company that can use it. In some cases, the receiving company will purchase the waste from the generator. Appendix 10 provides a listing of several waste exchanges and associations in Canada.

#### 2.2.3 Treatment and Disposal in Nunavut

Treatment and disposal of a hazardous waste is the last step in effective waste management and should be undertaken only after all other practical reuse and recycle options have been examined.

Treatment covers a broad spectrum of activities. It includes any method, technique or process that will change the physical, chemical or biological character or composition of a hazardous waste so as to reduce its volume, neutralize or make the waste less hazardous and make it safer to transport or store

prior to its disposal. In some cases, more than one process may be required to treat the waste. Facilities in Nunavut at which hazardous waste is stored, treated, recycled or disposed of for commercial purposes must be registered as a hazardous waste management facility. The owner or operator of a facility should refer to section 3.2.2 and Appendix 7 for further information.

It is a contravention of the *Environmental Protection Act* for hazardous waste to be abandoned or disposed of on land or into water in Nunavut. Although a detailed discussion on specific hazardous waste disposal methods is beyond the scope of the Guideline, the following are general points for consideration:

- Hazardous waste must not be mixed or diluted with another substance, or divided into smaller quantities, simply to avoid meeting the definition of a hazardous waste.
- The generator is responsible for determining how hazardous waste can be safely disposed of and to comply with all applicable statutes, regulations, standards, guidelines and local by-laws. The Department of Environment will provide advice and guidance on the management of hazardous waste. Other sources of information and assistance include:
  - Manufacturer or distributor of the new product;
  - Manufacturer's Material Safety Data Sheets (MSDS); and
  - Waste exchanges and associations, other regulatory authorities, waste management consultants and other qualified persons with expertise in the management of hazardous waste.
- Hazardous waste that meets standards set out in the Environmental Guideline for Industrial Waste Discharges may be directed to municipal landfills and sewage treatment systems for disposal. The local municipal government must be consulted and consent to the use of their facility prior to the waste being disposed. Waste that does not meet the standards set out in the Environmental Guideline for Industrial Waste Discharges must be treated prior to disposal or transported to a facility that is registered to accept the waste.
- The open burning of hazardous waste is not an acceptable practice as toxic substances may be released into the atmosphere.
- Incompatible hazardous waste should not be mixed, combined or stored together in the same container as new hazards may be created. Combining or mixing one waste with another waste may also prevent its reuse or recycling and increase disposal costs.
- Containers that previously held a hazardous waste must be emptied to the greatest extent
  practical or triple rinsed with an appropriate cleaning agent prior to disposal. The rinsings must
  then also be managed according to their waste characteristics. Cleaned containers should be
  rendered unusable by puncturing or crushing prior to disposal to prevent their reuse. This is
  especially important for containers that could be reused for water or food storage.

The Department of Environment will consider alternate hazardous waste management and disposal measures that provide an equivalent level of environmental protection to those identified in this Guideline.

#### 2.2.4 Treatment and Disposal Outside Nunavut

Hazardous waste can be sent to a receiver or hazardous waste management facility located outside of Nunavut only where the receiver or facility has been registered in the receiving province or territory to

accept that waste. The generator must comply with all applicable statutes, regulations, standards, guidelines and local by-laws of the receiving jurisdiction.

Within Canada, Environment Canada monitors and controls the interprovincial movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations*. Waste manifests must accompany each shipment of waste in accordance with the Transport Authorities' requirements. Generators and carriers should refer to section 3.3 of the Guideline for additional information on transport and waste manifest requirements.

The international movement of hazardous waste is controlled under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Known simply as the Basel Convention, it is an international treaty to control and reduce the transfer of hazardous waste from developed to less developed countries. Environment Canada monitors and controls the international movement of hazardous waste under the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.

A listing of Canadian waste management facilities may be obtained by contacting the waste exchanges and other organizations listed in Appendix 10.

#### **General Requirements**

Hazardous waste is classified using the system developed under the *Transportation of Dangerous Goods Act (Canada)*. Wastes are categorized into one of nine classes according to their chemical, physical or biological properties. Each waste, or group of similar wastes, is then identified using a specific 'UN' number assigned under the *Transportation of Dangerous Goods Regulations*. Refer to Appendix 2 for additional information on dangerous goods classifications.

#### 3.1 Storage

Storage refers to containment of a hazardous waste for transport, or while awaiting treatment and disposal. Except under extraordinary circumstances (i.e. radioactive materials), storage should always be considered as a temporary measure and is not acceptable for the long-term management of hazardous waste.

Recognition of the incompatibility of different wastes during storage is important in order to avoid the possibility of violent, explosive reactions and toxic fumes. Various systems have been developed to ensure compatible storage including the 'Hazardous Waste Compatibility Chart' adopted by the United States' Environmental Protection Agency<sup>1</sup>.

#### 3.1.1 Containers

Hazardous waste storage containers are designed to hold, store and transport small quantities of waste. Many different types of containers are available (i.e. barrels, bottles, bags and boxes) and are made from a variety of materials (i.e. aluminum, plastic, steel, and stainless steel). Selecting the proper container requires an understanding of the properties of the waste to be stored. If transport is to be undertaken, the generator should consult the Transport Authority to confirm the container meets all legislated requirements.

The following are additional general points for consideration:

- Hazardous waste should be stored in their original containers where possible or in containers specially manufactured for the purpose of storing hazardous waste. The containers must be sound, sealable and not damaged or leaking.
- Containers should be clearly labeled to identify their contents according to requirements of the Workplace Hazardous Materials Information System (WHMIS) and the relevant Transport Authority, if transport is planned.
- Small quantities of compatible hazardous waste should be bulked into 16 gauge or equivalent metal or plastic 205 litre (45 gallon) drums for the purpose of secondary containment.
- Containers should be closed and sealed at all times, except while waste is being added or removed.

<sup>&</sup>lt;sup>1</sup> EPA-600/2-80-076 April 1980. A Method for Determining the Compatibility of Chemical Mixtures.

#### 3.1.2 Facilities

A hazardous waste storage facility is a specially designed building or area that helps to ensure the safe and secure storage of hazardous waste. Detailed storage facility building designs are beyond the scope of the Guideline. The Department of Environment or other qualified person should be consulted prior to designing and constructing a storage facility.

The following are general points to consider when establishing a storage facility:

- The facility should meet all local and territorial siting and construction requirements and be
  readily accessible for fire fighting and other emergency responses. The local Fire Chief should
  be advised of the storage facility and its contents for emergency planning and response
  purposes.
- The facility should be secure. Access should be limited where practical to employees who have been trained in safety and emergency procedures. These procedures should be documented and a copy made available to those employees who have access to the facility.
- Inspections of the facility and stored wastes should be performed and recorded at least once every week.
- Containers should be placed so that each can readily and easily be inspected for signs of leakage, corrosion or deterioration. Leaking, corroded or deteriorated containers should immediately be removed and their contents transferred to a sound container.
- Records should be maintained indicating the type and quantity of waste being stored along with the date, type and quantity of hazardous waste brought into or removed from the facility.
- Drainage into and from the storage facility site should be controlled to prevent spills or leaks from leaving the site and to prevent run-off from entering the site.
- All waste should be stored on a firm working surface that is impervious to leaks.
- Incompatible waste must be stored in a manner that contact in the event of a spill or accidental release is not possible.
- Emergency response plans should be developed in cooperation with local emergency response
  personnel and emergency response equipment should be locally available in the event of a spill,
  fire or other emergency situation.

Where the facility is used for commercial purposes and is used to store hazardous waste for periods of 180 days or more or the quantity of waste stored on-site exceeds the criteria set out in Appendix 8, the facility must be registered with the Department of Environment as a hazardous waste management facility.

#### 3.2 Registration

#### 3.2.1 Hazardous Waste Generators, Carriers and Receivers

Generators, carriers and receivers of hazardous waste must be registered before undertaking activities involving these wastes. Completion of the approved form and submission of accurate information enables the Department of Environment to quickly complete the registration process. Registration enables the government to track the generation, transport and disposal of hazardous waste in Nunavut. It also provides assurance that the company has the necessary emergency response and spill

contingency plans in place should an accident or other incident occur involving a hazardous waste. Upon registration, the applicant will be assigned a unique identification number. This number is required in order to complete the waste manifest form.

Appendices 4, 5 and 6 provide samples of registration forms required for generators, carriers and receivers to apply for registration in Nunavut. Original forms and users' guides are available from Nunavut's Department of Environment or by downloading through the department's web site. Incomplete applications will result in delays in completing the registration process.

Generators and receivers of hazardous waste located in Nunavut must be registered with the Department of Environment. Carriers may be registered either in Nunavut or in the province or territory in which the company is based.

#### 3.2.2 Hazardous Waste Management Facilities

A hazardous waste management facility is a facility or specially-designated area that is used for the collection, storage, transfer, treatment, recycling or disposal of hazardous waste for commercial purposes. Where the facility is used solely for the collection, storage or transfer of hazardous waste, the facility must be registered where waste is stored for a period of 180 days or more or the quantities exceed those set out in Appendix 8 of the Guideline. Where the facility is to be used for the treatment, recycling or disposal of hazardous waste, the facility must be registered where the quantity treated, recycled or disposed of in any single month exceeds a 'small quantity'.

The collection, storage, transfer, treatment, recycling or disposal of hazardous waste on behalf of a third-party does not remove the obligation of the owner or operator of a hazardous waste management facility to register the facility.

Appendix 7 includes a sample of the registration form required for the owner or operator of a hazardous waste management facility to apply for registration of the facility. The owner or operator may obtain an original form and users' guide by contacting Nunavut's Department of Environment or by downloading through the department's web site. Incomplete applications will result in delays in completing the registration process.

Registration of a hazardous waste management facility does not remove the obligation to comply with all other applicable municipal, territorial and federal statutes, regulations, standards, guidelines and bylaws. Guidance on planning for and achieving territorial environmental requirements for new industrial projects may be found in the *Environmental Guideline for Industrial Projects on Commissioner's Lands*.

#### 3.3 Transportation

Carriers must ensure hazardous waste is packaged, documented, labeled and placarded in compliance with the method of transport used - road, rail, air or marine. A completed waste manifest must accompany each shipment of hazardous waste. Completion of the manifest together with proper marking and placarding of containers and vehicles enables police, ambulance, fire and other first responders to react effectively and safely in the event of a spill or other accident involving hazardous waste while in transit.

The transport of hazardous waste by road in Canada is controlled under the territorial and federal *Transportation of Dangerous Goods Acts* and the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. These Acts and Regulations require that personnel are trained, containers and transport vehicles are labeled and placarded and a completed waste manifest accompanies each shipment. The generator, carrier and receiver must each complete their portion of the manifest form and provide copies to the Department of Environment at various stages in the transport process. Refer to Appendix 9 for a copy of the manifest. Original manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further assistance in completing a waste manifest may be obtained by referring to the *User's Guide for the Hazardous Waste Manifest* produced by Environment Canada or by contacting the Motor Vehicles Division of the Department of Economic Development and Transportation.

The International Air Transport Association (IATA) requires that all shipments of hazardous wastes tendered to air carriers be accompanied by the IATA Shipper's Declaration of Dangerous Goods. The consignor is responsible for completion of the form in accordance with IATA requirements and to ensure all packaging, placarding and labeling is consistent with the product being transported.

The International Marine Dangerous Goods Code requires use of the International Marine Organization's Multimodal Dangerous Goods Form when transporting dangerous goods or hazardous waste by ship or barge.

Further information on transporting hazardous waste by air or marine can be obtained by contacting Transport Canada. Information and instructions on manifesting, placarding and labeling hazardous waste commonly generated in Nunavut can be obtained by referring to waste-specific guidelines produced by the Department of Environment. A complete listing of guidelines is available at <a href="http://env.gov.nu.ca/programareas/environmentprotection">http://env.gov.nu.ca/programareas/environmentprotection</a>.

#### Conclusion

This is a general introduction to the risks associated with hazardous waste and is intended to inform the reader about the proper handling, storage and transportation of hazardous waste in Nunavut. Detailed guidance on the management of specific waste types can be obtained by referring to other guidelines developed by the Department of Environment.

For additional information on the management of hazardous waste, or to obtain a complete listing of available guidelines, contact the Department of Environment at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, Box 1000, Station 1360
Iqaluit, Nunavut, XOA 0H0

Phone: (867) 975-7729 Fax: (867) 975-7739

Email: EnvironmentalProtection@gov.nu.ca

Website: http://env.gov.nu.ca/programareas/environmentprotection

#### References

Government of Alberta, Department of Environment. Alberta Users Guide for Waste Managers, (Catalogue # ENV-266-O/P).

Government of Alberta, Department of Environment. Hazardous Waste Storage Guidelines, (1988).

Government of the Northwest Territories, Department of Environment and Natural Resources. User's Guide for Hazardous Waste Movement Documents in the NWT, (2009).

Government of the Northwest Territories, Department of Municipal and Community Affairs. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories, (2003).

Government of Nunavut, Department of Environment. Environmental Guideline for General Management of Hazardous Waste, (2002).

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Projects on Commissioner's Lands, (2002).

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Waste Discharges, (2002).



#### APPENDIX 1 - ENVIRONMENTAL PROTECTION ACT

The following are excerpts from the Environmental Protection Act

- "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
  - (a) endangers the health, safety or welfare of persons,
  - (b) interferes or is likely to interfere with normal enjoyment of life or property,
  - (c) endangers the health of animal life, or
  - (d) causes or is likely to cause damage to plant life or to property;

"Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

"Environment" means the components of the Earth and includes

- (a) air, land and water,
- (b) all layers of the atmosphere,
- (c) all organic and inorganic matter and living organisms, and
- (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

"Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

- 2.2 The Minister may
  - (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
  - (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
  - (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
  - (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:
- 3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.
  - (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.
- 5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.
  - (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
  - (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
  - (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
  - (c) the contaminant was discharged from the exhaust system of a vehicle;
  - (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;

- (e) the discharge of the contaminant resulted from burning for land clearing or land grading;
- (f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
- (g) the contaminant was discharged for the purposes of combating a forest fire;
- (h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
- (i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).
- (4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.
- 5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
  - (a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
  - (b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
  - (c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.
- 6. (1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.
- 7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.
  - (2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

#### **APPENDIX 2 - DANGEROUS GOODS CLASSIFICATIONS**

#### Class 1 – Explosives<sup>1</sup>



#### Class 2 - Compressed Gases

Division 2.1 – Flammable Gases

Division 2.2 – Non-flammable and Non-toxic Gases

Division 2.3 - Poison Gases



**Class 3 - Flammable Liquids** 



#### Class 4 - Flammable Solids

Division 4.1 – Flammable Solids

Division 4.2 – Spontaneously Combustible

Division 4.3 – Water Reactive



#### **Class 5 - Oxidizing Substances and Organic Peroxides**

Division 5.1 – Oxidizing Substances

Division 5.2 – Organic Peroxides



#### **Class 6 - Toxic and Infectious Substances**

Division 6.1 – Toxic Substances
Division 6.2 – Infectious Substances



**Class 7 - Radioactive Materials<sup>2</sup>** 



Class 8 - Corrosives

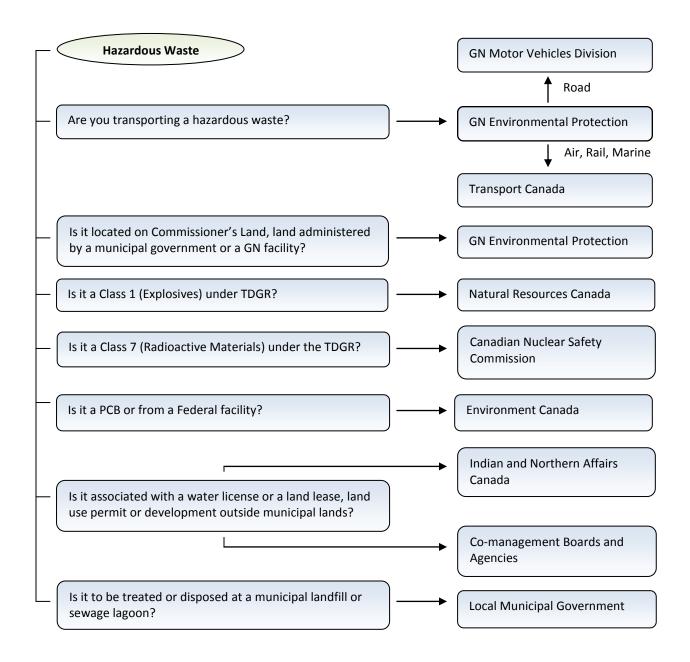


**Class 9 - Miscellaneous** 



- 1. Class 1 substances (Explosives) are regulated by Natural Resources Canada under the Explosives Act.
- 2. Class 7 substances (Radioactive Materials) are regulated by the Canadian Nuclear Safety Commission under the *Nuclear Safety and Control Act* and *Nuclear Liability Act*.

# **APPENDIX 3 - DETERMINING REGULATORY AGENCY CONTACTS**



# **APPENDIX 4 – REGISTRATION FORM – HAZARDOUS WASTE GENERATOR**

A copy of the generator registration form and users' guide is available by contacting the Department of Environment or by downloading at <a href="http://env.gov.nu.ca/programareas/environmentprotection">http://env.gov.nu.ca/programareas/environmentprotection</a>.

<ol> <li>The following information must I a generator number. Incomplete</li> <li>Completed registration forms are Government of Nunavut, Box 10 and may be forwarded to Enviro</li> </ol>	e applications will be e to be forwarded to 00, Station 1360, Iqal	returned to the the Manager of uit, Nunavut, XC	applicant. Pollution Control, Departme	nt of Environment,
3. Use additional pages to provide i 4. Applicants should refer to the ac form.	information as requir	ed.	assistance on completing the	generator registration
Section 1 - Identification				
Generator (Legal Name)				
Mailing Address			Postal Code	
Principle Contact Person			Title	
Phone			Email	
Alternate Contact Person			Title	
Phone			Email	
Section 2 - Description of Was		ovide a separa	te table if required)	
•		TDG Class	Quantity Generated each Month (L or Kg)	Frequency of Generation
Site Location(s) where Waste is Genera	ated		Quantity Generated	•
Site Location(s) where Waste is Genera	ated		Quantity Generated	•
Site Location(s) where Waste is Genera	ated		Quantity Generated	•
Site Location(s) where Waste is Genera	TDG Number		Quantity Generated	•
Shipping Name (Description)  Section 3 - Waste Managemen	TDG Number		Quantity Generated	•
Shipping Name (Description)  Section 3 - Waste Management	TDG Number		Quantity Generated	•
Shipping Name (Description)  Section 3 - Waste Management General Type of Business  Source of Waste	TDG Number  at Information	TDG Class	Quantity Generated each Month (L or Kg)	Generation
Shipping Name (Description)  Section 3 - Waste Management General Type of Business Source of Waste Hazardous Waste Carrier(s) Used	TDG Number  at Information	TDG Class	Quantity Generated each Month (L or Kg)	Generation
Shipping Name (Description)  Section 3 - Waste Management General Type of Business  Source of Waste Hazardous Waste Carrier(s) Used Hazardous Waste Receiver(s) Used	TDG Number  The Information	TDG Class	Quantity Generated each Month (L or Kg)	Generation
Shipping Name (Description)  Section 3 - Waste Management General Type of Business  Source of Waste Hazardous Waste Carrier(s) Used Hazardous Waste Receiver(s) Used	TDG Number  The Information	TDG Class	Quantity Generated each Month (L or Kg)	Generation
Shipping Name (Description)  Section 3 - Waste Managemer  General Type of Business  Gource of Waste  Hazardous Waste Carrier(s) Used  Oo you have an approved Emergency F	TDG Number  Int Information  Response and Spill Co	TDG Class	Quantity Generated each Month (L or Kg)  Yes (attain	Generation
Shipping Name (Description)  Section 3 - Waste Management General Type of Business Gource of Waste Hazardous Waste Carrier(s) Used Hazardous Waste Receiver(s) Used Do you have an approved Emergency For Section 4 - Certification  Certify that the information provided	TDG Number  Int Information  Response and Spill Co	TDG Class	Quantity Generated each Month (L or Kg)  Yes (attacked complete.	Generation  ch copy) No
Shipping Name (Description)  Section 3 - Waste Management General Type of Business Source of Waste Hazardous Waste Carrier(s) Used Hazardous Waste Receiver(s) Used Do you have an approved Emergency Re-	TDG Number  TDG Number  At Information  Response and Spill Co	TDG Class  ontingency Plan?	Quantity Generated each Month (L or Kg)  Yes (attacked complete.  Date (dd/mm/yy)	Generation  ch copy) No

# **APPENDIX 5 – REGISTRATION FORM – HAZARDOUS WASTE CARRIER**

A copy of the carrier registration form and users' guide is available by contacting the Department of Environment or by downloading at <a href="http://env.gov.nu.ca/programareas/environmentprotection">http://env.gov.nu.ca/programareas/environmentprotection</a>.

<ol> <li>The following information must be   Incomplete applications will be retu</li> <li>Completed registration forms are to Nunavut, Box 1000, Station 1360, Io EnvironmentalProtection@gov.nu.c</li> <li>Use additional pages to provide info</li> <li>Applicants should refer to the accor</li> </ol>	irned to the applicant.  b be forwarded to the I qaluit, Nunavut, XOA 0H  ca.  brmation as required.	Manager of Polluti	on Control, Department of Enviro stration forms are preferred and	onment, Government of may be forwarded to
Section 1 - Identification				
Carrier (Legal Name)				
Corporate Address				
Site (Dispatch) Address				
Principle Contact Person			Title	
Phone			Email	
Alternate Contact Person			Title	
Dhono			Email	
Section 2 - Description of Waste Shipping Name (Description)			Quantity Transported each Month (L or Kg)	
·	Transported (provi	ide a separate ta	Quantity Transported each	Frequency of Transport
Section 2 - Description of Waste	Transported (provi	ide a separate ta	Quantity Transported each	
Section 2 - Description of Waste	Transported (provi	ide a separate ta	Quantity Transported each	
Section 2 - Description of Waste	Transported (provi	ide a separate ta	Quantity Transported each	
Section 2 - Description of Waste Shipping Name (Description)	Transported (provi	ide a separate ta	Quantity Transported each	
Section 2 - Description of Waste  Shipping Name (Description)  Section 3 - Waste Management II  Mode of Transport (check all that apply)	Transported (provi	ide a separate to	Quantity Transported each	Frequency of Transport
Section 2 - Description of Waste  Shipping Name (Description)  Section 3 - Waste Management I  Mode of Transport (check all that apply)  Hazardous Waste Generator(s) Used	Transported (provi	ide a separate to	Quantity Transported each Month (L or Kg)	Frequency of Transport
Section 2 - Description of Waste  Shipping Name (Description)  Section 3 - Waste Management I  Mode of Transport (check all that apply)  Hazardous Waste Generator(s) Used  Hazardous Waste Receiver(s) Used	Transported (provi	TDG Class	Quantity Transported each Month (L or Kg)  Marine	Frequency of Transport
Section 2 - Description of Waste  Shipping Name (Description)  Section 3 - Waste Management I  Mode of Transport (check all that apply)  Hazardous Waste Generator(s) Used  Do you have an approved Emergency Responses	Transported (provi	TDG Class	Quantity Transported each Month (L or Kg)	Frequency of Transport
Section 2 - Description of Waste  Shipping Name (Description)  Section 3 - Waste Management I  Mode of Transport (check all that apply)  Hazardous Waste Generator(s) Used  Hazardous Waste Receiver(s) Used	Transported (provi	TDG Class	Quantity Transported each Month (L or Kg)  Marine	Frequency of Transport
Section 2 - Description of Waste  Shipping Name (Description)  Section 3 - Waste Management I  Mode of Transport (check all that apply)  Hazardous Waste Generator(s) Used  Do you have an approved Emergency Responses  Section 4 - Certification	Transported (provi	TDG Class Rail	Quantity Transported each Month (L or Kg)  Marine  Yes (at	Frequency of Transport
Section 2 - Description of Waste  Shipping Name (Description)  Section 3 - Waste Management II  Mode of Transport (check all that apply)  Hazardous Waste Generator(s) Used  Hazardous Waste Receiver(s) Used  Do you have an approved Emergency Resp.  Section 4 - Certification	Transported (provi	TDG Class  Rail gency Plan?	Quantity Transported each Month (L or Kg)  Marine  Yes (at	Frequency of Transport  Air  ttach copy) No
Section 2 - Description of Waste  Shipping Name (Description)  Section 3 - Waste Management II  Mode of Transport (check all that apply)  Hazardous Waste Generator(s) Used  Do you have an approved Emergency Responsive Materials of the Company of the Compa	Transported (provi	TDG Class  Rail gency Plan?	Quantity Transported each Month (L or Kg)  Marine  Yes (at	Frequency of Transport  Air  ttach copy) No

# **APPENDIX 6 – REGISTRATION FORM – HAZARDOUS WASTE RECEIVER**

A copy of the receiver registration form and users' guide is available by contacting the Department of Environment or by downloading at <a href="http://env.gov.nu.ca/programareas/environmentprotection">http://env.gov.nu.ca/programareas/environmentprotection</a>.

<ol> <li>The following information must I receiver number. Incomplete ap</li> <li>A receiver who operates a comm disposing of hazardous waste massection 3.2.2 of the Environment</li> <li>Completed registration forms and Government of Nunavut, Box 10 and may be forwarded to Environment</li> <li>Use additional pages to provide a Applicants should refer to the action.</li> </ol>	plications will be re nercial business for the ay be required to re al Guideline for the e to be forwarded to 00, Station 1360, Iq nmentalProtection( information as requi	turned to the app the purpose of co- gister the facility General Manage o the Manager of aluit, Nunavut, XO @gov.nu.ca. ired.	olicant. Illecting, storing, transferring, as a hazardous waste manage ment of Hazardous Waste for Pollution Control, Departmen DA OHO. Electronic registration	treating, recycling or ment facility. Refer to further information. t of Environment, n forms are preferred
Section 1 - Identification				
Receiver (Legal Name)				
Mailing Address				
Principle Contact Person				
			Email	
Alternate Contact Person			Title	
Phone			Email	
Section 2 - Description of Was Site Location(s) where Waste is Receiv Shipping Name (Description)	·	TDG Class	Quantity Received each Month (L or Kg)	Frequency of Acceptance
Site Location(s) where Waste is Receiv	ed		Quantity Received each	
Site Location(s) where Waste is Receiv	ed		Quantity Received each	
Site Location(s) where Waste is Receiv	TDG Number  sed facility.		Quantity Received each	
Site Location(s) where Waste is Received Shipping Name (Description)  Attach a brief description of the proposection 3 - Waste Management General Type of Business  General Type of Activity	TDG Number  sed facility.		Quantity Received each	
Site Location(s) where Waste is Receive Shipping Name (Description)  Attach a brief description of the proposection 3 - Waste Management General Type of Business  General Type of Activity  Hazardous Waste Generator(s) Used	TDG Number  Seed facility.  Int Information		Quantity Received each	
Shipping Name (Description)  Attach a brief description of the propo  Section 3 - Waste Management  General Type of Business  General Type of Activity  Hazardous Waste Generator(s) Used  Hazardous Waste Carriers(s) Used  Hazardous Waste Management Faciliti	TDG Number  sed facility.  It Information	TDG Class	Quantity Received each Month (L or Kg)	Acceptance
Shipping Name (Description)  Attach a brief description of the propo  Section 3 - Waste Management  General Type of Business  General Type of Activity  Hazardous Waste Generator(s) Used  Hazardous Waste Carriers(s) Used  Hazardous Waste Management Faciliti	TDG Number  sed facility.  It Information	TDG Class	Quantity Received each Month (L or Kg)	Acceptance
Shipping Name (Description)  Attach a brief description of the propo  Section 3 - Waste Management  General Type of Business  General Type of Activity  Hazardous Waste Generator(s) Used  Hazardous Waste Carriers(s) Used  Hazardous Waste Management Faciliti  Do you have an approved Emergency for Section 4 - Certification	sed facility.  It Information  Ses Used	TDG Class	Quantity Received each Month (L or Kg)	Acceptance
Shipping Name (Description)  Attach a brief description of the propo  Section 3 - Waste Management  General Type of Business  General Type of Activity  Hazardous Waste Generator(s) Used  Hazardous Waste Carriers(s) Used  Hazardous Waste Management Facility  Do you have an approved Emergency In Section 4 - Certification  If certify that the information provided	sed facility.  It Information  Ses Used Response and Spill (	TDG Class  Contingency Plan  rect, accurate an	Quantity Received each Month (L or Kg)  Yes (attack d complete.	Acceptance
Shipping Name (Description)  Attach a brief description of the propo  Section 3 - Waste Management  General Type of Business  General Type of Activity  Hazardous Waste Generator(s) Used  Hazardous Waste Carriers(s) Used  Hazardous Waste Management Facilitie  Do you have an approved Emergency I	sed facility.  It Information  Ses Used Response and Spill Conthis form is continuous control or continuous control or continuous control or contro	Contingency Plan	Quantity Received each Month (L or Kg)  Yes (attack d complete. Date (dd/mm/yy)	Acceptance

# APPENDIX 7 REGISTRATION FORM – HAZARDOUS WASTE MANAGEMENT FACILITY

A copy of the management facility registration form and users' guide is available by contacting the Department of Environment or by downloading at

http://env.gov.nu.ca/programareas/environmentprotection.

The following information must be provided facility number. Incomplete applications we completed registration forms are to be for 1000, Station 1360, Iqaluit, Nunavut, XOAI EnvironmentalProtection@gov.nu.ca.  Use additional pages to provide information.	vill be returned to the ap rwarded to the Manager 0H0. Electronic registrat on as required.	plicant. of Pollution Cor ion forms are pr	ntrol, Department of Environmen referred and may be forwarded to	t, Government of Nunavut, B
<ol> <li>Applicants should refer to the accompany</li> <li>Section 1 - Identification</li> </ol>	ing users' guide for furth	er assistance on	completing the management rac	lility registration form.
Applicant (Legal Name)				
Corporate Address				
Facility Address				
Principle Contact Person			Title	7
Phone			Email	
Alternate Contact Person			Title	
Phone			Email	
Section 2 - Description of Waste to be				
ite Location(s) where Waste is Managed  Shipping Name (Description)	TDG Number	TDG Class	Quantity Managed each	Frequency of Acceptance
		TDG Class	Quantity Managed each Month (L or Kg)	Frequency of Acceptance
		TDG Class		Frequency of Acceptance
Site Location(s) where Waste is Managed  Shipping Name (Description)		TDG Class		Frequency of Acceptance
Shipping Name (Description)  Attach a complete description of the proposed fa	TDG Number  cility, safety measures, e		Month (L or Kg)	
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform	TDG Number  acility, safety measures, e	equipment and n	Month (L or Kg)  nanagement processes to be used	d. Include engineered drawir
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform  General Type of Business (check all that apply)	TDG Number  cility, safety measures, e	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera	d. Include engineered drawir
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform  General Type of Business (check all that apply)  Type of Activity (check all that apply)	TDG Number  cility, safety measures, exaction  Receiver of Waste Collect and Store	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera  Transfer	
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform  General Type of Business (check all that apply)  Type of Activity (check all that apply)	TDG Number  cility, safety measures, exaction  Receiver of Waste  Collect and Store	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera  Transfer	d. Include engineered drawir
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform  General Type of Business (check all that apply)  Type of Activity (check all that apply)	TDG Number  cility, safety measures, exaction  Receiver of Waste  Collect and Store	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera  Transfer	d. Include engineered drawin
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform General Type of Business (check all that apply)  Type of Activity (check all that apply)  Treat  Hazardous Waste Generator(s) Used	ncility, safety measures, eation  Receiver of Waste Collect and Store Recycle	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera  Transfer	d. Include engineered drawin
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform  General Type of Business (check all that apply)  Type of Activity (check all that apply)  Treat  Hazardous Waste Generator(s) Used  Hazardous Waste Carriers(s) Used  Do you have an approved Emergency Response a	ncility, safety measures, eation  Receiver of Waste Collect and Store Recycle	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera  Transfer  Dispose	d. Include engineered drawin
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform General Type of Business (check all that apply) Type of Activity (check all that apply)  Freat	TDG Number  accility, safety measures, exaction  Receiver of Waste Collect and Store Recycle  and Spill Contingency Pla	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera  Transfer  Dispose	d. Include engineered drawin
Shipping Name (Description)  Attach a complete description of the proposed favore applicable.  Section 3 - Waste Management Inform General Type of Business (check all that apply) Type of Activity (check all that apply) Treat Hazardous Waste Generator(s) Used Hazardous Waste Carriers(s) Used Do you have an approved Emergency Response and Section 4 - Certification  Certify that the information provided on this for	TDG Number  accility, safety measures, experience of Waste Collect and Store Recycle  and Spill Contingency Plant of Spill Contin	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera Transfer Dispose  Yes (atta	d. Include engineered drawin
Shipping Name (Description)  Attach a complete description of the proposed fawhere applicable.  Section 3 - Waste Management Inform  General Type of Business (check all that apply)  Type of Activity (check all that apply)  Treat  Hazardous Waste Generator(s) Used  Hazardous Waste Carriers(s) Used  Do you have an approved Emergency Response a	TDG Number  accility, safety measures, exaction  Receiver of Waste Collect and Store Recycle And Spill Contingency Plant Spill	equipment and n	Month (L or Kg)  nanagement processes to be used  Manage Self-genera  Transfer  Dispose  Yes (atta	d. Include engineered drawin

# APPENDIX 8 - CRITERIA FOR REGISTERING A HAZARDOUS WASTE MANAGEMENT FACILITY

A facility must be registered with the Department of Environment as a hazardous waste management facility where it is used for commercial purposes to store hazardous waste for a period of 180 days or more or the quantity of hazardous waste<sup>1</sup> stored on-site at any one time exceeds the criteria established in the following table. Where the facility is to be used for the treatment, recycling or disposal of hazardous waste, the facility must be registered as a hazardous waste management facility where the quantity treated, recycled or disposed of each month exceeds a 'small quantity'<sup>2</sup>.

	Description	Quantity <sup>3</sup> (Kg or L)
Class 1	Explosives	50
Class 2	Division 2.1 – Flammable Gases Division 2.2 – Non-flammable and Non-toxic Gases Division 2.3 – Poison Gases	500 <sup>4</sup> 5000 <sup>4</sup> 200 <sup>4</sup>
Class 3	Flammable Liquids	4000
Class 4	Division 4.1 – Flammable Solids Division 4.2 – Spontaneously Combustible Division 4.3 – Water Reactive	5000 1000 500
Class 5	Division 5.1 – Oxidizing Substances Division 5.2 – Organic Peroxides	1000 50
Class 6	Division 6.1 – Toxic Substances Division 6.2 – Infectious Substances	1000 500 <sup>4</sup>
Class 7	Radioactive Materials	Any amount
Class 8	Corrosives	1000
Class 9	Miscellaneous PCB Materials Environmentally Hazardous Substance Solid – UN3077	1000 50 5000
All Classes	Total Aggregate Quantity	5000

<sup>1.</sup> Applies to hazardous waste only and not to dangerous goods.

<sup>2.</sup> Small quantity means hazardous waste that is generated in an amount that is less than five kilograms per month if a solid or less than five litres per month if a liquid, and where the total quantity accumulated at any one time does not exceed five kilograms or five litres. This does not include hazardous waste that is mercury or Class 2.3, 5.1 or 6.1 materials. These wastes must be generated in an amount that is less than one kilogram per month if a solid or less than one litre per month if a liquid, and where the total quantity accumulated at any one time does not exceed one kilogram or one litre.

<sup>3.</sup> Quantity applies to solids when expressed in kilograms (kg) and liquids when expressed in litres (L).

<sup>4.</sup> Total liquid capacity of the container.

# **APPENDIX 9 – HAZARDOUS WASTE MANIFEST**

MOVEMENT DOCUMENT / MANIFEST

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y/ Villa			Province	Positi	code/ Code po	Their	r-Rail car No. 2 morque - wagon			and the	7	96.		City /Ville	J	7	Province	Pos	hal code / Coo	do postal
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# **APPENDIX 10 - WASTE EXCHANGES AND ASSOCIATIONS**

The concept of exchanging waste began in Canada in the 1980s. It involves the transfer of unwanted, overstocked, obsolete, damaged, contaminated or post-dated material and waste to another company or person who would reuse it. Various waste exchanges and associations have been established in Canada to facilitate these transfers. Several, but not all, waste exchanges and associations are listed below.

Northern Territories Water and Waste Association 201, 4817- 49 Street Yellowknife, Northwest Territories X1A 3S7 (867) 873-4325 http://www.ntwwa.com

Alberta Waste Materials Exchange Building #350, 6815 Eighth Street NE Calgary, Alberta T2E 7H7 (403) 297-7505

Saskatchewan Waste Materials Exchange 515 Henderson Drive. Regina, Saskatchewan S4N 5X1 (306) 787-9800

Ontario Waste Exchange OCETA 63 Polson Street, 2nd floor Toronto, Ontario M5A 1A4 (416) 778-4199 http://www.owe.org

Canadian Chemical Exchange 900 Blondin Ste-Adele, Quebec JOR 1L0 (450) 229-6511 http://www.stobec.com Recycling Council of British Columbia Unit #10, 119 West Pender Street Vancouver, British Columbia V6B 1S5 (604) 683-6009 http://www.rcbc.bc.ca

Calgary Materials Exchange 809 Fourth Avenue NE Calgary, Alberta T2P 0K5 (403) 230-1443 http://www.cmex.ca

Manitoba Waste Exchange 1329 Niakwa Road Winnipeg, Manitoba R2J 3T4 (204) 257-3891

Canadian Waste Materials Exchange 2395 Spearman Drive Mississauga, Ontario L5K 1B3 (416) 822-4111

Quebec Waste Materials Exchange 14 Place du Commerce, Bureau 350 Le-des-Squeurs, Quebec H3E 1T5 (514) 762-9012

# **APPENDIX 11 – GOVERNMENT CONTACTS**

#### **Government of Nunavut**

Environmental Protection Division Department of Environment Inuksugait Plaza P.O. Box 1000, Station 1360

Iqaluit, Nunavut XOA 0H0

Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission P.O. Box 669

Baron Building/1091 Iqaluit, Nunavut XOA 0H0

Telephone: 1-877-404-4407 (toll free) Fax: 1-866-

979-8501

Office of Chief Medical Health Officer of Health Department of Health and Social Services P.O. Box 1000, Station 1000 Igaluit, Nunavut XOA 0H0

Telephone: (867) 975-5774 Fax: (867) 975-5755

**Motor Vehicles Division** 

Department of Economic Development and

Transportation P.O. Box 10

Gjoa Haven, Nunavut XOB 1JO

Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government

Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Igaluit, Nunavut XOA 0H0

Telephone: (867) 975-5400 Fax: (867) 975-5305

#### **Government of Canada**

Indian and Northern Affairs – Nunavut Region P.O. Box 2200

Igaluit, Nunavut XOA 0H0

Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut) 5019 52nd Street

Yellowknife, Northwest Territories X1A 1T5 Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air P.O. Box 8550 344 Edmonton Street Winnipeg, Manitoba R3C 1P6

Telephone: 1-888-463-0521 (toll free)

Fax: (204) 983-8992 Road, Rail and Marine only

Fax: (204) 983-1734 Air only



Appendix

**End-of-Life Vehicle Hazerdous Materials Recovery Program Manual** 



# End-of-Life Vehicle Hazardous Materials Recovery Program Manual

Manual for the Preparation and Disposal of End-of-Life Vehicles in Nunavut

Final Report

January 2011

Government of Nunavut

Project # 10-3574-2000

Dennis Heinrichs, P.Eng. - Project Manager

Prepared by:

**Dillon Consulting Limited** 

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Department of Environment

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# 1 INTRODUCTION

In 2004 the Government of Nunavut identified the disposition of End of Life Vehicles (ELVs) as a priority issue. The Departments of Environment (GN-DoE), Economic Development and Transportation and Community and Government Services were directed to initiate a pilot program to repatriateEnd-of-Life Vehicles (ELVs)to the south. A project was initiated at Iqaluit which resulted in the processing of approximately 3,600 tonnes of scrap metal.

Throughout the project, the GN-DoE had concerns with respect to the environmental impacts of the operation; specifically with respect to the hazardous materials present in the ELVs. Not having any previous experience with vehicle crushing operations put the Department at a disadvantage in terms of being able to direct the operators to conduct their activities in accordance with nationally and industry-accepted standards for vehicle crushing and bailing operations. It was decided that there is a need for an environmental manual to capture such operations in Nunavut.

The purpose of this manual is to provide Municipal Solid Waste (MSW) facility and other operators with a guide for the proper removal, storage and handling of potential hazardous materials from ELVs. This removal will allow these ELVs to be safely stored prior to ultimate removal of ELVs from Nunavut communities.

ELV recycling programs exist across Canada; however, due to their remote locations communities in Nunavut have limited access to these programs. By training local community staff to properly handle and prepare ELVs for shipping and recycling, more of these items can be removed from communities. Removal of these items has both environmental and aesthetic benefits, contributes to overall organization of the community and increases the available landfill capacity.

Information provided in this manual has been compiled from numerous sources including:

- The National Code of Practice for Automotive Recyclers Participating in the National Vehicle Scrappage Program.
- Department of Sustainable Development, Government of Nunavut.
- Summerhill Impact "Switch Out" Program.
- British Columbia Ministry of Environment's "Guidebook for the Vehicle Dismantling and Recycling Industry Environmental Planning Regulation".
- Interviews with automotive recyclers.

#### 2 BACKGROUND

As part of the Government of Nunavut's objective of INUUQATIGIITTIARNIQ: HEALTHY COMMUNITIES, the Department of Environment was directed to initiate a pilot program that looked into the task of dismantling ELVs and removing them from Nunavut communities (Department of Environment, Government of Nunavut, 2006). This program has begun in Iqaluit where a pilot project to crush and remove ELVs from the city has been in progress since 2008. ELVs were collected, crushed on-site and then prepared for shipment to southern recycling and disposal facilities. Shipment of crushed and prepared vehicles to southern facilities is planned for the summer of 2010.

Other communities have also benefited from similar pilot projects. During the summer of 2004 and 2005, a pilot project to removed scrap metal and vehicles from Rankin Inlet was implemented. The pilot project was able to remove 106 tons of scrap metal from the community. The completion of the pilot project led the community to begin formation of the Rankin Inlet Salvage Company, established to create income to sustain the scrap metal recycling program once the pilot project was complete (North Central Development, 2006).

There are a number of hazardous materials found in vehicles that should be removed from ELVs prior to crushing or further processing. Some of these materials include gasoline, engine oil, fluids (transmission, brake, power steering, etc.), batteries, mercury switches and refrigerants. If these items are not removed prior to crushing the ELVs, these materials may be disbursed into the surrounding environment. According to the Ontario Automotive Recyclers Association (OARA) (reference found in VT Solid Waste Districts and Alliances, 2002), the amount of fluids to be removed is estimated at around 5 US gallons per vehicle. The following table shows the break down of fluids per type as estimated by the OARA:

Fluid Type **US Gallons per Vehicle** Litres 2.70 Fuel 10.2 **Engine Oil** 0.96 3.6 Coolant 0.73 2.8 Transmission Oil 0.34 1.3 Steering Gear Oil 0.20 0.8

Table 1: Estimated Amount of Fluids per Vehicle (OARA)

The main purpose of this manual is to provide Municipal Solid Waste (MSW) facility and other operators with a guide for the proper removal, storage and handling of potential hazardous materials from ELVs. This removal will allow these ELVs to be safely stored prior to ultimate removal of ELVs from Nunavut communities. A section has also been incorporated to cover dismantling of waste appliances as some of the dismantling requirements for waste appliances are similar to those of ELVs.

#### 3 SCRAP VEHICLE AND METAL RECOVERY OPERATION

# 3.1 Required Equipment

The following is a recommended list of equipment that would be required to operate an ELV dismantling facility in Nunavut:

- Secured building with garage bay style door, concrete floor, adequate roof and no drains leading to a sewer, sewage tank or stormwater collection system (National Code of Practice, 2008 and British Columbia Ministry of Environment, 2008). Alternate for smaller locations is to undertake work outdoors in dry warm weather only upon an impermeable working surface. The constructed vehicle fluid recovery area should consist of, for example, a protective sand layer/poly liner/sand layer covered with a plywood working surface.
- Forklift or other heavy machinery to move ELVs from receiving area to dismantling area and then from dismantling area to vehicle hulk storage area.
- Gasoline evacuation pump with filter.
- Small wheel hoists to lift car high enough to drain fluids.
- Small hand pumps for removal of engine oil, transmission fluid, gear oil, coolants and brake fluid.
- Containers for storage of oils, antifreeze, windshield washer fluid, etc.
- Portable refrigerant removal device with separate storage tanks for each type of refrigerant.
- Drip pans to catch fluids.
- Spill kit to clean up spills.

# 3.2 Training Requirements

The main training requirements for employees working at an ELV recycling facility are:

- Proper collection, handling, storage and disposal of hazardous materials.
- Spill prevention and control procedures.
- Certification to remove and store refrigerants from vehicles.

All personnel who work at the facility must have proper training in handling and storing hazardous materials and must follow the procedures set out for the facility. Each facility will be operated according to methods specific to that facility and will be based on available equipment, personnel, shipping schedules and number of ELVs to be processed. The employer should ensure that each employee is trained in the hazardous waste handling and spill response procedures set out specifically for their operation. Please refer to Section 4 for specific handling procedures with regards to hazardous materials.

Removal of refrigerants (i.e. Freon), must be completed by a certified technician. According to the Department of Sustainable Development, Government of Nunavut (2002), a certified service technician is:

"A technician who is otherwise qualified to service ODS containing equipment and has successfully completed an environmental awareness course for ozone depleting substances certified by Environment Canada."

Further training of employees is required if the facility requests to take part in the National Vehicle Scrappage Program. In order to register with the program, employees of the facility must attend a training session provided by the program. This training session may be completed in person or online (National Code of Practice, 2008).

# 3.3 Administrative Requirements and Record Keeping

Administrative record keeping is essential in the operation of the ELV facility. Based on the National Code of Practice (2008) and British Columbia Ministry of Environment (2008), records must be kept on-site and include the following items:

- Transportation and manifest records from licensed hazardous waste transporters of all hazardous
  wastes transported. Records should be identified by a manifest number and invoice number and
  should be kept in a central filing location (kept on-site i.e Community Public Works office, a
  minimum of two years).
- Copy of the most up-to-date transporters' licence that allows them to transport all hazardous wastes with respect to ELVs.
- Records of staff members qualified to remove refrigerants (must be kept on-site a minimum of two years).
- Records created by qualified refrigerant removal technicians that tested and removed refrigerants from ELVs (kept on-site a minimum of two years).

The following plans and procedures (based on the National Code of Practice (2008) and British Columbia Ministry of Environment (2008)) should also be kept on-site and accessible to all employees:

- Detailed spill response plan and procedures.
- Standard operating procedures that have been developed specifically for the facility.
- Safety and environmental policies and procedures.
- Environmental Management Plans and audit reports.

# 3.4 Recycling and Processing Areas

According to the National Code of Practice (2008), recycling of ELVs will require space for six (6) different processing activities. These activities include:

- Accepting and storing ELVs.
- Removal of hazardous fluids and wet parts (if required).
- Storing ELV carcasses once wet parts and fluids have been removed.
- Storing hazardous fluids removed from ELVs.
- Storing wet parts removed from ELVs.
- Crushing ELV carcasses (if the site is equipped to complete this activity).

The following sections describe the site requirements for each activity.

# 3.4.1 Accepting and Storing ELVs and Waste Appliances

The ELV and appliance processing facility must have a space dedicated to storing and inspecting vehicles when they arrive on site. Based on the National Code of Practice (2008), there is no requirement for this area to be paved. However all spills must be cleaned up and any contaminated soils and cleaning materials must be disposed of as hazardous waste, unless materials are tested and shown not to be hazardous. Vehicles should be checked for leaks as they arrive to prevent soil and water contamination in the vehicle storage area. Runoff from the storage area caused by precipitation (rain, snow, etc.) must not be contaminated (National Code of Practice, 2008). Methods to collect and treat runoff may be required. This may include obtaining a water licence for the facility from the Nunavut Water Board.

# 3.4.2 Dismantling Vehicles and Appliances and Removing Hazardous Materials

Vehicles must be drained of all hazardous fluids prior to crushing the vehicle hulk. Wet parts are parts of the vehicle that contain hazardous fluids such as batteries, fuel tanks, transmissions, radiators and power steering units. Also parts that are leaking fluid, need to be treated as wet parts and their fluids removed.



Figure 1: Vehicle Ready for Dismantling

All hazardous fluids must be removed from ELVs and disposed appliances before safe storage or crushing. If these materials are not removed, hazardous materials may be released into the crushing zone thus contaminating the surrounding area or leaked into the environment during shipping. To ensure safe removal of all hazardous items, the vehicle's battery should be removed first, followed by refrigerants (if present) and thirdly fuel. The order of removal thereafter is not significant. Hazardous items that must be removed include:

- Battery
- Refrigerants
- Gasoline or Diesel
- Antifreeze
- Brake Fluid
- Engine Oil
- Transmission Fluid
- Power Steering Fluid

- Differential Fluid (if present)
- Windshield Washer Fluid
- Ballasts and Capacitors
- Mercury Switches (found in ABS brakes, convenience lighting)
- Lead (battery connectors, wheel weights)

Please refer to Section 4 for proper handling and storage techniques for the listed hazardous materials.

The space used for dismantling vehicles and appliances should have a non-permeable base, such as concrete or poly liner, to provide an easy cleaning surface and to prevent spilled fluids from contaminating the environment. The space should be covered to protect it from the weather and to prevent spilled materials from being washed into the environment. The concrete pad should be high enough to prevent flooding during rainstorm events. An alternate for smaller/temporary locations is to undertake work outdoors in dry warm weather only upon an impermeable working surface. The constructed temporary vehicle fluid recovery area should consist of, for example, a protective sand layer/poly liner/sand layer covered with a plywood working surface. Absorbent materials should be on hand at all times to clean up any spills. All spills must be cleaned up and any contaminated soils and cleaning materials must be disposed of as hazardous waste, unless materials are tested and shown not to be hazardous.



Figure 2: Absorbent Material place over Spilled Vehicle Fluids

# 3.4.3 Storage of Vehicle and Appliance Carcasses

Once all hazardous materials have been removed, there must be an area designated for the storage of vehicle and appliance hulks. Hulks may be salvaged for useable or recyclable parts. Once the hulks have no more "salvage" value, they may be crushed and shipped south for recycling.



Figure 3: Vehicle Hulks Ready to be Crushed

The vehicle and appliance hulk storage area must be kept clean and any spills or leaks must be cleaned up immediately. Contaminated soil and materials must be discarded as hazardous wastes, unless tested and determined to be non-hazardous. Care must be taken not to contaminate any water or runoff from the area (National Code of Practice, 2008).

# 3.4.4 Storage of Hazardous Fluids

Hazardous fluids must be stored in proper containers and separated appropriately. These containers should be kept in the vehicle dismantling area, stored on the concrete pad. This will provide easy access to the containers when draining fluids from vehicles. Storing in this area will also provide protection from the weather and a non-permeable surface to store the containers on. Fuels must be stored in a separate well-ventilated area of a building or outdoors protected from the weather (British Columbia Ministry of Environment, 2008). Contact the Fire Marshall for specific instructions on the storage of fuels. Please refer to Section 4 for proper handling and storage techniques for each hazardous material.



Figure 4: Example of Plastic Totes Used for Collection of Vehicle Fluids - Not Used for Gasoline

# 3.4.5 Crushing Area for ELV and Appliance Hulks

Crushing of vehicles and appliances is intended to reduce the volume for shipping. Crushing may consist of flattening an auto or logging. Logging an auto consists of compressing an auto into a rectangular cube. A crusher may be brought to site and operated by a third-party when quantity of hulks warrant. If so, the crushing area must be large enough to accommodate the crusher and also have a space designated for the storage of crushed vehicles. According to the National Code of Practice (2008) and the British Columbia Ministry of Environment (2008), the following items should be completed in conjunction with crushing operations:

- All hazardous materials must be removed from the vehicles prior to crushing.
- Any spills must be cleaned up immediately and all contaminated soil and cleaning materials must be disposed of as hazardous waste (unless tested and shown otherwise).
- Any water resulting from the crushing operations should be treated through oil absorbent filters.
- Once the crusher has been removed from site, the site should be cleaned and debris removed to landfill.



**Figure 5: Vehicle Crusher in Operation** 



Figure 6: Example of "Logged" Metal

# 3.5 Site Security

Site security is very important. ELV processing operations may become targets for vandalism and theft and may lead to injury or environmental contamination. Therefore, it is extremely important to keep all equipment locked and inaccessible to the public. Hazardous materials and vehicle dismantling equipment should be stored in a secured location. Any machinery such as the crushing equipment should be locked and tagged out at the end of each day to prevent injury as well as stored in a secured location.

# 4 COLLECTION, STOCKPILING AND DISPOSAL OF HAZARDOUS ITEMS

All hazardous fluids must be removed from ELVs before safe storage or crushing. If these materials are not removed, hazardous materials may be released during storage or crushing or leaked into the environment during shipping. To ensure safe removal of all hazardous items, the battery should be removed first, followed by refrigerants (if present) and thirdly fuel. The order of removal thereafter is not significant. Hazardous items that must be removed include:

- Battery
- Refrigerants
- Gasoline or Diesel
- Antifreeze
- Brake Fluid
- Engine Oil
- Transmission Fluid
- Power Steering Fluid
- Differential Fluid (if present)
- Windshield Washer Fluid
- Mercury Switches (found in ABS brakes, convenience lighting)

# 4.1 Waste Batteries

#### 4.1.1 Collection

A vehicle's battery should be removed in order to de-energize the ELV. This will allow the safe removal of all other materials. Waste batteries from ELVs contain corrosive fluids and heavy metals that may contaminate the environment if not stored and disposed properly (Department of Sustainable Development, Government of Nunavut, 2002). Therefore, all waste batteries from ELVs must be removed during the dismantling process.

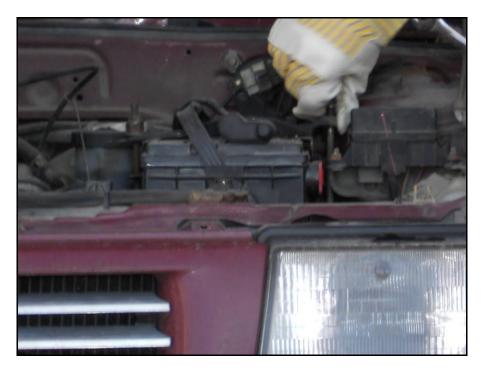


Figure 7: Removing Battery from Vehicle

# 4.1.2 Stockpiling

Waste batteries should be stored in a leak-proof drum (metal or plastic) with a secured lid to protect batteries from rain and snow. Batteries may be stacked, but a layer of cardboard or plywood must be placed between the layers of batteries. If batteries are stacked without cardboard or plywood between the layers, there is the potential for the batteries to short and cause an electrical fire. The batteries must be secured to the pallets by nylon straps and must not be stacked more than two batteries high. A polyethylene containment liner must be used and must be large enough to place under the batteries and then wrap around them to create a sealed containment unit (Department of Sustainable Development, Government of Nunavut, 2002).



Figure 8: Batteries Not Correctly Stored

# 4.1.3 Disposal

Waste batteries may be sent to recycling facilities in southern Canada. The ELV operator will have to contact a recycling/disposal facility and make arrangements for that facility to receive the waste batteries. Please contact the appropriate transport authority (marine, rail, road) for appropriate shipping and transportation instructions of waste batteries (Department of Sustainable Development, Government of Nunavut, 2002). Ensure that manifests and transportation records are kept on-site.

# 4.2 Refrigerants

#### 4.2.1 Collection

Refrigerants should be removed after the battery has been removed and prior to removal of any other fluids or items from ELVs. This is to prevent an accidental release of refrigerants into the atmosphere.

Removal of refrigerants must be performed only by a certified technician. Technicians must use an approved portable refrigerant recovery unit to remove refrigerants from ELVs. They must also record the amount of refrigerant removed per vehicle. Once refrigerants have been removed, the technician must clearly label each vehicle as such (British Columbia Ministry of Environment, 2008).

# 4.2.2 Stockpiling

Refrigerants must be stored in approved, refillable storage containers. They must not be vented to the atmosphere. Storage containers must be properly labelled and should be replaced or hydrostatically tested every five (5) years (British Columbia Ministry of Environment, 2008).





**Figure 9: Refrigerant Evacuation Unit** 

Records of all refrigerants removed from ELVs must be maintained on-site. Records should contain the amount of refrigerant removed from each vehicle, the date it was removed, name of the certified technician who performed the recovery, registration number of the certified technician, whether the technician performed the service as an employee or agent of the business and the name of the business responsible for removal of refrigerant (British Columbia Ministry of Environment, 2008).

# 4.2.3 Disposal

Waste refrigerant from vehicles can be disposed of through the Refrigerant Management Canada<sup>TM</sup> program on a fee basis. This program was set up to safely collect and destroy refrigerant compounds without releasing them into the atmosphere. For more information on the program or for contact information on coordinating disposal of waste refrigerants please contact an RMC Collection Service Provider. Contact information for providers can be found on the Refrigerant Management Canada<sup>TM</sup> website: http://www.refrigerantmanagement.ca/index.php.

# 4.3 Waste Fuel

# 4.3.1 Collection

Waste fuel pertains to fuels such as gasoline and diesel. These fuels should be collected and stored separately in dedicated containers or transferred to other vehicles on-site. Fuels that are still usable (i.e. gasoline that has not gone stale) may be used in on-site vehicles. Stale gasoline cannot be used in vehicles as it may cause damage and must be handled and disposed of as a hazardous waste (British Columbia Ministry of Environment, 2008). Stale gasoline can often be identified by a bad smell caused by degradation of the fuel.

Gasoline can be dangerous as it is flammable and may catch on fire or explode if it comes into contact with a spark or ignition source. Gas should be removed in a well ventilated area and stored outside of the dismantling area. Remove gas using a suction system specifically designed for the removal of gasoline. Do not use a plastic hand pump as this may cause a build up of static electrical charge and may lead to fire or explosion. Do not puncture holes in a tank to drain gasoline or diesel; this may result in leaks or spills (National Code of Practice, 2008 and British Columbia Ministry of Environment, 2008).



Figure 10: Example of Gasoline Collection System

### 4.3.2 Stockpiling

Usable fuel may be stored in storage containers approved for the specified type of fuel and reused in on-site vehicles. These containers must be kept outside of the dismantling area to prohibit fume build-up and decrease the risk of fire. Stale gasoline and waste fuel must also be stored in approved containers outside of the dismantling area and must be labelled as waste/unusable fuels. Secondary containment should be provided. If stored outdoors, these containers should be protected from rain and snow.

# 4.3.3 Disposal

Usable fuel should be reused where possible to decrease the amount of waste fuels to be transported offsite. This will decrease shipping and disposal costs. Waste fuels and stale gasoline must be collected and transported off site. The most effective method to transporting out of the community will be by annual barge. These fuels will need to be transported off site by a licensed Transportation of Dangerous Goods shipper. Arrangements will have to be made with the barge company to complete the appropriate manifests and have the approved packaging for transportation offsite. Records of manifests must be kept on-site for a minimum of two years.

#### 4.4 Waste Oils and Fluids

#### 4.4.1 Collection

Waste oils found in ELVs include: engine oil; transmission, power steering, and brake fluids; and differential oil. According to the National Code of Practice (2008), brake, transmission and power steering fluids may be mixed with waste oil. However, based on information from Yukon Environment (2005) and Missouri Department of Natural Resources (1997), brake fluid may sometimes be included, however, due to chlorinated compounds that may be found in some brake fluids, it is recommended that brake fluid not be mixed with waste oils. Please refer to Section 4.5 for further information.

It is recommended that brake fluid be collected with a dedicated pump and stored separately from other oils. Other oils i.e. engine, transmission, power steering and differential can be collected using a common pump and stored in a mixed oil container. Brake fluid should be tested when the container is full to determine chlorinated content and end disposal.

Waste oils can be collected by draining from the vehicle components or by using a hand pump. When draining, use a drip pan to collect the fluids. Once all the fluid has been drained from the component, replace the drain plug, empty the fluid into the designated and marked storage container. For differentials, replace all removed bolts to prevent leakage.



Figure 11: Using Drip Pans to Catch Draining Fluids

When using a hand pump to remove fluids, ensure that each fluid (aside from oils such as engine, transmission, power steering and differential) has a dedicated hand pump. Do not use the same hand pumps for brake fluid, antifreeze, windshield washer fluid, etc. Once all fluid has been drained, empty the container of each pump directly into the designated storage container.



Figure 12: Using Hand Pump

# 4.4.2 Stockpiling

Waste oil may be stored in steel drums or plastic containers. Both types of containers must have proper fitting lids. These containers may be kept in the dismantling area within a secondary containment unit. According to the British Columbia Ministry of Environment (2008), steel drums are recommended over plastic containers as plastic tends to degrade over time and could potentially cause a leak or spill.



Figure 13: Example of Plastic Container Used for Storage of Waste Oils



Figure 14: Example of Steel Drum Used for Storage of Waste Fluids

# 4.4.3 Disposal

Waste oil can be disposed of in different ways, however the most appropriate disposal methods for Nunavut include transportation to a recycling facility or used as fuel in a waste oil furnace. Transporting to a recycling facility will involve shipping waste oil out of the community on the annual barge. Hazardous waste/recyclable manifests will need to be completed.

Use of waste oil as a fuel in an approved furnace will eliminate the need to ship waste oil to a southern recycling facility. Waste must only be transported to an approved user/recycler of waste oil.

#### 4.5 Brake Fluid

#### 4.5.1 Collection

Brake fluid may be collected using a hand pump as described for the collection of waste oils. The fluid should then be disposed of into a container designated specifically for brake fluid.

Depending on the end disposal methods of the collected waste oil, brake fluid should not be mixed with waste oil as it may contain chlorinated compounds. Chlorinated compounds when burned in a waste oil burner may cause smoke, fumes or problems with the waste oil burner (Yukon Environment, 2005 and Missouri Department of Natural Resources, 1997). According to the Missouri Department of Natural Resources (1997), brake fluids may contain chlorinated compounds if:

- 1. An older brake fluid manufactured using chlorinated compounds was used; or,
- 2. It had become contaminated from brake cleaners that contain chlorinated compounds.

To be sure, the ELV facility operator may want to use a test kit to determine whether or not the used brake fluid contains chlorinated compounds. The facility operator will have to contact the waste oil recycler/disposal company to determine if they will accept waste oil mixed with brake fluid that may contain chlorinated compounds (Missouri Department of Natural Resources, 1997).

# 4.5.2 Stockpiling

Brake fluid may be stockpiled in approved clearly labelled containers until it can be shipped out by barge. Waste brake fluid should be kept separate from other waste oils unless the ELV facility operator has contacted the recycling/disposal company and has confirmed with them that adding brake fluid to the waste oil is acceptable.

# 4.5.3 Disposal

Waste brake fluid must be shipped out of the community by annual barge by a licensed Transportation of Dangerous Goods shipper. Brake fluid must be sent to a proper disposal/recycling facility and arrangements with the facility to accept brake fluid must be made prior to shipping.

#### 4.6 Antifreeze

# 4.6.1 Collection

Antifreeze may be collected by using a hand pump to remove it from the ELV. It must be stored in a clearly marked steel drum or plastic container and must not be mixed with other waste fluids such as oils, windshield washer fluid, brake fluid, etc. Water contaminated by antifreeze must not be put through an oil/water separator as a method of treatment. Oil/water separators do not remove antifreeze from water and if discharged through an oil/water separator the antifreeze may be released into the environment (British Columbia Ministry of Environment, 2008).

# 4.6.2 Stockpiling

Waste antifreeze must be stored in an appropriate container with a secure lid. Store containers within a secondary containment area that does not have a drain, thereby preventing the release of antifreeze into the environment. Antifreeze that is reusable can be used within other operating vehicles (British Columbia Ministry of Environment, 2008). Unusable antifreeze must be kept separate and stored until it can be shipped out of the community.

# 4.6.3 Disposal

Antifreeze must not be disposed into the environment as it is toxic and may contaminate the soil and water. It must be stockpiled until it can be shipped to a proper disposal facility. Transportation and manifest records of shipments of waste antifreeze must be kept on-site for a minimum of two years (British Columbia Ministry of Environment, 2008).

#### 4.7 Windshield Washer Fluid

# 4.7.1 Collection

Windshield washer fluid is a toxic substance that must be drained from all ELVs prior to crushing. Remove washer fluid from ELVs by using a dedicated hand pump and draining the fluid into a dedicated container. Do not mix with other fluids such as engine oil, antifreeze, brake fluid, transmission fluid, etc. Sell or give away reusable washer fluid for use in other operational vehicles.

#### 4.7.2 Stockpiling

Washer fluid must be stored in an appropriate container with a secure lid. Store containers within a secondary containment, area that does not have a drain in order to prevent the release of washer fluid into the environment. Most washer fluid is reusable and can be used within other operating vehicles (British Columbia Ministry of Environment, 2008). Unusable washer fluid must kept separate and stored until it can be shipped out of the community.

#### 4.7.3 Disposal

Waste washer fluid must not be disposed into the environment as it may be toxic. It must be stockpiled until it can be shipped to a proper disposal facility. Transportation and manifest records of shipments of waste fluid must be kept on-site for a minimum of two years.

#### 4.8 Mercury Switches

#### 4.8.1 Collection

The Mercury Switch Out Program is a program that was developed to help automotive recyclers and dismantlers remove and dispose of mercury switches safely from ELVs, when an ELV dismantling facility registers with the program. Clean Air Foundation staff will send to the facility training and educational materials, a collection container for the mercury switches and a pre-paid waybill to send the container back once it is full.

All mercury switches must be removed from ELVs prior to crushing the vehicle hulks. Mercury switches can be found in trunks, hoods, convenience lighting and anti-lock braking systems. Not all vehicles have the same number of mercury switches and not all switches are found in the same locations in each vehicle. The Mercury Switch Out Program website has a number of resources to help ELV facility operators locate mercury switches in various vehicle models and step by step instructions on how to remove these switches. For each convenience light location, the following general steps must be taken:

- Locate the lighting assembly under the vehicle trunk and/or hood.
- Remove any fasteners to separate the entire lighting assembly from the vehicle.
- Break open the lighting assembly to expose the mercury switch capsule (a sealed metal pellet). Small flathead screwdrivers and wire cutters are often the only tools that are required.
- Remove the mercury switch capsule (using a small screwdriver) and place it in the *Switch Out* collection container. Replace the lid on the container. The remaining plastic/metal from the lighting assembly can be disposed of with regular waste.

On vehicles with ABS breaking systems, the following general steps must be taken:

- Locate the ABS G-Force sensor module on the vehicle. Module locations include: the drive tunnel, below the rear seat on the floor pan, on the right front wheel apron, and on the left frame rail right below the driver.
- Remove the ABS G-Force sensor module and place the entire sensor module in the *Switch Out* collection container. Replace the lid on the container. **NOTE:** The ABS G-Force sensor module contains either two or three mercury switch capsules embedded in the casing. Do not attempt to remove the mercury switch capsules from the sensor module.

Please refer to the Mercury Switch Out Program website at http://www.switchout.ca/ for further information.



Figure 15: Example of Removing Light Assembly Containing a Mercury Switch



Figure 16: Mercury Pellet removed from Vehicle Convenience Light

#### 4.8.2 Stockpiling

Once the mercury switches have been removed from each unit, they should be stored in the plastic container provided by the Mercury Switch Out Program. Most of the mercury found in these switches is contained within a metal capsule and therefore the likelihood of a spill is relatively low. However, should a metal capsule break, refer to the Switch Out Clean-Up Instructions located on the Mercury Switch Out Program's website for proper techniques to clean up the spill.

#### 4.8.3 Disposal

Once the container has been filled, use the pre-paid waybill provided by the Mercury Switch Out Program to ship the switches back to the mercury management facility for safe disposal.

#### 4.9 Lead

#### 4.9.1 Collection

Most lead in ELVs comes from wheel weights and battery cable ends. These items must be removed from vehicles prior to crushing and stored in separate, covered strong containers. Lead can be recycled into other usable items (National Code of Practice, 2008 and British Columbia Ministry of Environment, 2008).

#### 4.9.2 Stockpiling

Store lead wheel weights and battery cable ends in separate, covered strong metal or wooden containers.

#### 4.9.3 Disposal

Lead can be recycled into other usable items. The ELV operator will have to contact a metals recycler and make arrangements for them to accept the recovered lead.

#### 4.10 Summary

The following table summarizes information presented in Sections 4.1 to 4.9 of this manual.

**Table 2: Summary of Hazardous Materials Management Procedures for ELVs** 

Type of Material	Collection	Stockpile	Disposal	Comments
Battery	Disconnect terminals and remove from automobile.	Store in leak-proof container. Stack no more than 2 layers.	Recycling in southern Canada.	Must be labelled, packaged and manifested as hazardous recyclables.
Refrigerants	To be removed by a certified technician using a mobile refrigerant removal unit.	Store in approved storage containers for refrigerants.	Recycling in southern Canada.	Must be labelled, packaged and manifested as hazardous recyclables.
Gasoline or Diesel	Suction system specifically designed for removal of gasoline; Suction system specifically designed for removal of diesel.	Store in approved storage container, outside or in a well ventilated area.	Reuse "good" fuel in operable vehicles. Dispose of stale fuel to a facility in southern Canada.	Must be labelled, packaged and manifested as hazardous recyclables/wastes.
Engine Oil Transmission Oil Power Steering Oil Differential Oil	Use hand pump or drain from vehicle components.	Store mixed together in steel drums or plastic containers.	Recycling in southern Canada or for use in a certified waste oil furnace.	Must be labelled, packaged and manifested as hazardous recyclables/wastes.
Brake Fluid	Use dedicated hand pump to remove from vehicle.	Store separately in steel drum or plastic container.	Disposal in southern Canada.	Must be labelled, packaged and manifested as hazardous recyclables/wastes.
Antifreeze	Use dedicated hand pump to remove from vehicle.	Store separately in steel drum or plastic container.	Reuse "good" antifreeze in operational vehicles. Dispose of waste antifreeze to a facility in southern Canada.	Must be labelled, packaged and manifested as hazardous recyclables/wastes.
Windshield Washer Fluid	Use dedicated hand pump to remove from vehicle.	Store separately in steel drum or plastic container.	Reuse "good" washer fluid in operational vehicles. Dispose of waste washer fluid to a facility in southern Canada.	Must be labelled, packaged and manifested as hazardous recyclables/wastes.
Mercury Switches	Use small flathead screwdrivers and wire cutters to remove assemblies from vehicles. Remove metal mercury pellet from assembly.	Store in designated mercury switch collection container provided by the Mercury Switch Out Program.	Use waybill provided by the Mercury Switch Out Program to ship to mercury management facility.	Must be labelled, packaged and manifested as hazardous wastes.
Lead Wheel Weights	Remove battery cable ends and wheel weights from vehicles.	Store in separate covered, strong metal or wooden containers.	Recycling in southern Canada.	Must be labelled, packaged and manifested as hazardous recyclables.

#### 5 APPLIANCES

Appliances contain hazardous materials that must be removed prior to stockpiling and crushing at a solid waste site. As removal and disposal techniques of refrigerants and mercury switches from appliances is similar to those used for ELVs, it may be beneficial to have these items removed from appliances during the processing of ELVs. This is especially true if a certified refrigerant removal technician must be brought into the community to remove the refrigerants from ELVs. The following sections describe the various types of hazardous materials, where to find them and how to remove them from appliances.

#### 5.1 Refrigerants

#### 5.1.1 Collection

Refrigerants are found in refrigerators, freezers, window air conditioners and dehumidifiers. Refrigerants must be removed in a similar manner to the process described for ELVs. Removal of refrigerants must be performed only by a certified technician. Technicians must use an approved portable refrigerant recovery unit and follow approved procedures for removal of refrigerants from appliances. Venting of refrigerant into the atmosphere is unacceptable (Environment Canada, 2010).

Appliance dismantlers should also be aware that oil found in the appliance compressors may be contaminated with refrigerants. A certified refrigerant removal technician should be able to safely remove and dispose of refrigerants in the oil and the contaminated compressor oil (Environment Canada, 2010).

#### 5.1.2 Stockpiling

Recovered refrigerant must be stored in an approved storage container for the transport of refrigerant materials. Different refrigerants should not be mixed and refrigerant containers that held one type of refrigerant should not be used to hold another type (Environment Canada, 2010). The refrigerant recovery technician must be knowledgeable of which containers are approved for the collection and transport of recovered refrigerant. Technicians must also keep a record of what type and how much refrigerant was removed. Storage containers must be labelled appropriately for transport.

#### 5.1.3 Disposal

Waste refrigerant from appliances can be disposed of through the Refrigerant Management Canada<sup>TM</sup> program on a fee basis. This program was set up to safely collect and destroy refrigerant compounds without releasing them into the atmosphere. For more information on the program or for contact information on coordinating disposal of waste refrigerants please contact an RMC Collection Service Provider. Contact information for providers can be found on the Refrigerant Management Canada<sup>TM</sup> website: http://www.refrigerantmanagement.ca/index.php.

#### 5.2 Mercury Switches

#### 5.2.1 Collection

Mercury switches may be found in a variety of appliances, generally those that have automatic shut-off features and/or convenience lighting. These appliances may include freezers, washing machines, gas ranges, gas hot water heaters, gas furnaces, sump pumps, etc. However, these mercury switches do not look the same as those found in vehicles and therefore caution must be taken when identifying and retrieving switches from appliances. The Vermont Department of Environmental Conservation in conjunction with the Vermont Mercury Education & Reduction Campaign and Chittenden Solid Waste District have developed a manual titled *Household Appliance Mercury Switch Removal Manual*. A copy of this manual has been included as an appendix to this guideline or alternatively can be found on the following website: <a href="http://www.mercvt.org/PDF/appman.pdf">http://www.mercvt.org/PDF/appman.pdf</a>.



Figure 17: Assorted Mercury Freezer Switches for Disposal

(Source: Vermont Department of Environmental Conservation, Vermont Mercury Education & Reduction Campaign, Chittenden Solid Waste District, 2002)



Figure 18: Chest Freezer Light with an Inline Mercury Switch (Glass Ampule)

(Source: Vermont Department of Environmental Conservation et al., 2002)

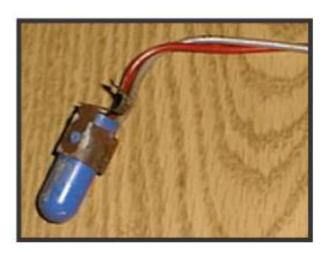


Figure 19: Washing Machine Mercury Switch

(Source: Vermont Department of Environmental Conservation et al., 2002)

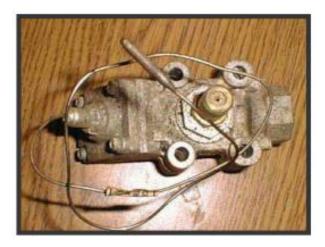


Figure 20: Gas Safety Valve Control, Gas Safety Valve Capillary Tube and Safety Valve Sensor Bulb from Gas Range

(Source: Vermont Department of Environmental Conservation et al., 2002)



Figure 21: Sump Pump Float Containing Mercury

(Source: Vermont Department of Environmental Conservation et al., 2002)

#### 5.2.2 Stockpiling

Once mercury containing units have been removed, they should be stored in a heavy plastic container with a proper fitting lid. Containers must be in good condition and must not leak. It is advisable not to use an aluminum or tin container as mercury may react with these metals and may leak through the container. Container contents must be marked on the outside of the container and containers must be stored in a dry location where they will not be disturbed (California Environmental Protection Agency, 2005).

#### 5.2.3 Disposal

Summerhill, the company which operates the Mercury Switch-Out Program for ELVs, in conjunction with the Canadian Appliance Manufacturers Association, is currently working on developing a similar program for the collection of mercury switches from appliances. Information regarding this program can be found by contacting the Summerhill Impact group or on the following website:

http://www.summerhillgroup.ca/eng/impact/programs/appliance-switches.php.

#### 5.3 Ballasts

#### 5.3.1 Collection

Ballasts are components generally found in fluorescent lighting fixtures and high intensity discharge (HID) lamps. In fluorescent lighting fixtures, the ballasts are usually found between two fluorescent tubes and protected by a heat shield. HID ballasts are generally found encased within a box attached to the outside of the light fixture or located within the light housing. Examples of HID lamps include streetlights and parking garage lights (Environment Canada, 1991).

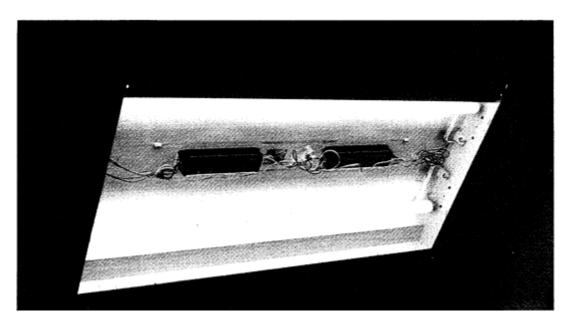


Figure 22: Fluorescent Lamp Unit with Exposed Lamp Ballasts

(Source: Environment Canada, 1991)

It should be noted that fluorescent lights found in appliances such as stoves may contain ballasts that may have PCB material within them. Unless ballasts are identified as "PCB free", these items should be removed and properly disposed of as hazardous waste.

Fluorescent ballasts contain a core/coil unit, a thermal protector and a capacitor. The capacitor may contain PCBs. It is the PCBs that are of concern as they may pose a risk to human and environmental health. These ballasts may also be filled with an asphalt/silica type compound. If the ballast contains this compound, the capacitor within the ballast will not be readily accessible. Therefore, it is important that the entire ballast unit is removed and disposed of through a proper hazardous waste disposal company. HID ballasts usually require higher levels of capacitance than fluorescent ballasts. Therefore, they often contain more capacitors and hence may contain more PCBs than fluorescent light ballasts (Environment Canada, 1991).

In the late 1970's to early 1980's, many companies began phasing out the use of PCBs in capacitors. However, there are still ballasts with capacitors in use today that may contain PCBs and therefore caution must be taken when removing and disposing of ballasts. In order to determine if a ballast contains PCBs, the manufacturer of the ballast should be contacted. The manufacturer should be able to determine whether the ballast contains PCBs based on the date codes and/or catalogue codes on the ballast casing (Environment Canada, 1991). Many manufacturers also began labelling non-PCB containing electrical equipment to aid in proper handling. Equipment labelled as "PCB-free" of "Non PCB" does not require removal. The recycler should mark each appliance as inspected and cleared as appropriate.

Caution must be taken when removing ballasts. The fixture must be de-energized prior to removal of the ballast and must not be re-energized during the removal. Capacitors may also hold a charge for several days after their last use and therefore there is a risk of electric shock to persons removing capacitors. As there is a possibility of PCBs leaking from the ballast, goggles and acid resistant gloves must be worn when removing and handling the ballast (Connecticut Department of Environmental Protection, 2005).

It should be noted that fluorescent lamp tubes contain mercury phosphor powder, lead and cadmium and must not be disposed of in the general waste stream. They must be disposed of through an approved hazardous waste recycler and/or disposal company. If the tubes are not broken, they may be packaged in their original packaging and sent to an approved facility with no further special transportation requirements. However, if the tubes are broken, special safety, handling, packaging and transportation requirements must be met. Safety procedures are of utmost importance to prevent worker exposure to mercury. In the case of disposing of a broken fluorescent tube, contact a Safety Officer at the Prevention Services Division, Workers Compensation Board in Iqaluit at (867) 979-8500 or 1-877-404-4407 (Environmental Protection Service, 2003).

#### 5.3.2 Stockpiling

The PCB Regulations (published in the Canada Gazette, 2008) under the Canadian Environmental Protection Act, 1999 states in paragraph 24:

"PCBs or products containing PCBs shall be stored at a site that is

- (a) a building, room, shipping container or other enclosed structure; or
- (b) an area that is enclosed by a woven mesh wire fence or any other fence or wall with similar security characteristics, and the fence or wall shall be at least 1.83 m high."

The PCB Regulations go on to state in paragraph 25:

"The owner or operator of a PCB storage site shall

- (a) store all PCBs or products containing PCBs that are in liquid form in
  - (i) sealed containers, other than drums, that are made of steel or other metals that provide sufficient durability and strength to prevent those PCBs or products from being affected by the weather or released, or
  - (ii) drums that are
    - (A) of a capacity not greater than 205 L,
    - (B) a closed-head double-bung drum made of steel having a gauge of 16 or heavier, and
    - (C) painted or treated to prevent rusting;
- (b) store all PCBs or products containing PCBs that are in solid form in
  - (i) containers, other than drums, that are made of steel or other materials that provide sufficient durability and strength to prevent those PCBs or products from being affected by the weather or released, or
  - (ii) drums that are
    - (A) of a capacity not greater than 205 L,
    - (B) made of steel having a gauge of 18 or heavier,
    - (C) equipped with a securely attached, removable steel lid and a gasket made of material that is resistant to the PCBs or the products containing PCBs that are stored in the drums, and
    - (D) painted or treated to prevent rusting;

#### (c) store equipment containing PCB liquids in

- (ii) containers, other than drums, that are made of steel or other materials that provide sufficient durability and strength to prevent the equipment from being affected by the weather and to prevent any PCB liquid that leaks from the equipment from being released, or
- (iii) drums described in subparagraph (b)(ii);"

Paragraph 25 goes on to list the storage space requirements for the above described containers. A copy of the PCB Regulations has been included as an appendix to this manual. Please refer to this document for further proper storage, handling and documentation information and requirements.

#### 5.3.3 Disposal

As previously stated, ballasts containing hazardous materials must be sent to an approved hazardous waste disposal facility. PCB Disposal (a division of Sanexen Environmental Services Inc.) is a company located in Ontario that will accept and dispose of PCB containing ballasts. They have also published a document to help identify ballasts that may contain PCBs. Further information regarding this company can be found on the website at: http://www.pcbdisposalinc.com/.

#### 5.4 Capacitors

#### 5.4.1 Collection

Capacitors found in household appliances are predominantly labelled as either 'oil-filled' or 'dry'. Oil-filled capacitors are often referred to as running capacitors. Running capacitors are generally used in applications where they are required to be in use during the entire operating time. As they are constantly in use, heat builds up within the capacitor. The oil contained within the capacitor helps to dissipate this heat. Oil-filled capacitors manufactured prior to the late 1970's and early 1980's may contain PCB compounds within the oil. In order to determine if the capacitor contains PCB material, contact the manufacturer and provide the date and/or catalogue code located on the capacitor casing. Some capacitors may be stamped with "NO PCBs" on the casing. In this case, the capacitor does not contain PCBs. Appliances that most likely contain oil-filled capacitors include air conditioners, copy machines, microwave ovens, mercury vapour lamps, dehumidifiers and submersible well pumps. Capacitors in microwaves can be found behind the front control panel and wired to the transformer (Connecticut Department of Environmental Protection, 2005).

Be aware that oil-filled space or portable heaters may not contain a PCB capacitor, however, PCBs may be found within the actual oil. Although most oil-filled space heaters do not contain PCBs, those that do may have very high concentrations of PCBs. It is recommended that any of these types of heaters be tested for the presence of PCBs prior to crushing or disposal (Connecticut Department of Environmental Protection, 2005).

Dry capacitors are generally known as starting capacitors as they are used to start a motor during the initial start up. Once the motor is running, they are no longer needed and so are not used during the entire motor operation. Because these capacitors are only used for short periods of time, they do not produce much heat and therefore do not require oil for heat dissipation. Starting capacitors are usually identified by a non-sealed black casing or outer shell. Starting capacitors are generally found in clothes dryers, fans, refrigerators, stoves, televisions, washing machines and various electronic equipment. These capacitors are not known to contain PCB materials and so are not required to be handled as hazardous waste material.

#### 5.4.2 Stockpiling

Capacitors containing PCBs should be stockpiled as outlined in Section 5.3.2 of this manual.

It is important to keep ballasts and capacitors containing PCBs away from fire hazards. Fire may cause these items to explode and release PCBs into the environment.

#### 5.4.3 Disposal

Capacitors containing PCBs should be disposed of as outlined in Section 5.3.3 of this manual.

#### 6 HEALTH AND SAFETY

#### 6.1 Worker and Public Safety

As ELV dismantling operations deal with a number of hazardous substances, employee and public safety are very important. Employers must ensure that their employees are trained in safe work practices for the facility. This may include but not be limited to special handling and storage requirements of hazardous materials, WHMIS, first aid, emergency procedures, etc. Employers must also provide employees with the necessary personal protective equipment (PPE) to complete their jobs in a safe manner. PPE and safety items that should be maintained on-site include:

- Approved safety boots (steel toe)
- Eye goggles
- Gloves
- Eye wash station
- First aid kit
- Fire extinguisher as approved by the Fire Marshall
- Work coveralls.

Workers should also remove items from vehicles in the following order to prevent injury and environmental damage:

- Remove the battery first to de-energize the vehicle.
- Remove refrigerants to prevent accidental release into the environment.
- Remove gasoline in a well ventilated area to prevent the build up of fumes and decrease the risk of fire or explosion.
- Remove other hazardous materials.

Public safety must also be taken into consideration when operating an ELV dismantling facility. All hazardous items must be kept in a secure location and away from public access. At the completion of each day, the site should be secured to prevent access.

#### 6.2 Environmental Health and Safety

With the collection and storage of hazardous materials on-site, there is the potential for environmental contamination to occur. The following best practices should be used in order to mitigate potential spills and contamination (National Code of Practice, 2008 and British Columbia Ministry of Environment, 2008):

- Store all hazardous materials in approved containers with securely fitting lids.
- All containers holding hazardous materials should be placed within a secondary containment area.
- Remove gasoline outside of the dismantling area in a well ventilated area.
- Remove refrigerants after the battery has been removed, but before removal of any other fluids or parts to prevent accidental discharge into the environment.
- Drip pans must be used at all times to catch fluids dripping from vehicles and to prevent spills.
- The dismantling area should have an adequate roof and concrete floor pad for easy clean up of spills and to prevent soil contamination. An alternate for smaller/temporary locations is to undertake work outdoors in dry warm weather only upon an impermeable working surface. The constructed temporary vehicle fluid recovery area should consist of, for example, a protective sand layer/poly liner/sand layer covered with a plywood working surface.
- Ensure water runoff does not flow through areas containing hazardous wastes.
- Spill kits should be available on-site.
- Ensure there is lime or bicarbonate of soda on hand to neutralize spilled battery acid.
- Dispose of all used spill cleanup material as hazardous wastes.

In order to follow the above best practices, the following equipment should be kept on hand (Minnesota Pollution Control Agency, 2002):

- Fire extinguishers should be available in all facility buildings. Please contact the Fire Marshal for specific type of fire extinguisher and code requirements.
- Safety equipment such as rubber or latex gloves and safety goggles.
- Absorbent materials such as rags, towels, sawdust, etc.
- Containers to hold spilled waste and used absorbent materials.
- Shovels and/or scoops.
- Industrial spill clean-up products tailored for the clean up of oils and solvents may want to be used. This will be dependent on the operation of the facility and will have to be determined whether purchase of these items is warranted.

#### 7 COST RECOVERY

Due to the location of many communities in Nunavut, transportation of vehicle hulks and associated hazardous materials to proper recycling and disposal facilities can be quite expensive. However, there are a few items that can be salvaged from ELVs, in advance of crushing, that may be sold to recyclers to help cover some of the related disposal costs. Recovery costs of these items will be dependent on the market value of the materials at the time of sale. These items may include:

- Catalytic converters (contains several precious metals)
- Aluminum wheels
- Fuel
- Windshield washer fluid
- Antifreeze
- Waste oil

Unfortunately, sales of these items will likely not cover the entire cost of the program. Funding will have to be supplemented to complete the entire cycle of dismantling and disposal.

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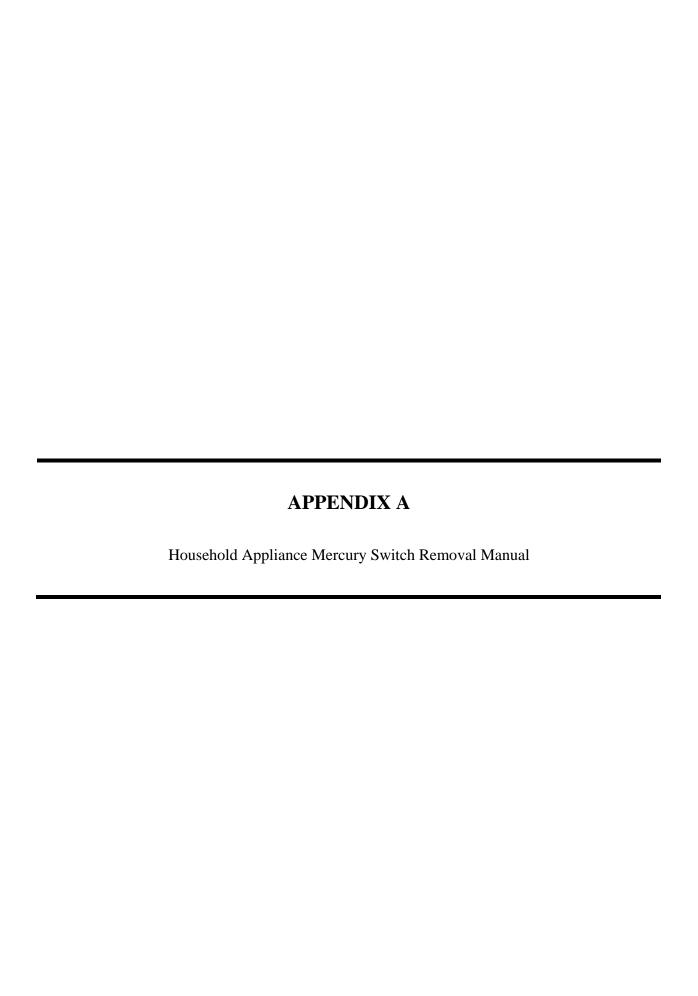
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# HOUSEHOLD APPLIANCE MERCURY SWITCH REMOVAL MANUAL

**SPRING 2002** 







#### PRODUCED BY:







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This document is available on the Internet at:



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#### **REFERENCES**

#### 1.0 INTRODUCTION

Mercury (Hg) is one of the most widespread, persistent and toxic contaminants in our environment. Its incorporation into many products and its emission from combustion processes has resulted in well documented instances of population poisonings, high level occupational exposures, and worldwide, chronic, low-level environmental exposures. About two-thirds of the mercury in the atmosphere comes from human sources such as coal burning power plants and incinerators, and one-third from natural sources such as volcanoes and forest fires. The amount of mercury flowing into our lakes is between two and four times what flowed into them 100 years ago<sup>8</sup>.

In the environment, mercury is found in various forms and complexes. Atmospheric mercury mixes with rain and snow and falls into lakes, rivers and watersheds. Once mercury enters a waterway, natural processes convert a small proportion of it to methyl mercury. Methyl mercury, one organic form of mercury, can accumulate up the food chain in lakes, ponds and reservoirs which results in high concentrations in predatory fish.

When certain mercury-tainted fish are consumed by humans, the levels of mercury can impair development of the nervous system in the fetus and in young children, affecting sensory, motor and cognitive functions, and resulting in such problems as difficulty in learning to read and inability to concentrate. Vermont's relatively pristine waters have not been spared from this regional and global problem. In addition to fish consumption advisories that recommend limiting consumption of certain fish in certain bodies of water, recent studies have shown that 12 percent of Vermont's lakes have sufficient mercury in their food chains to put common loons at considerable risk of toxic effects.

In order to prevent the continued release and build-up of mercury (in all forms) in the environment, many states including Vermont are currently working towards eliminating major sources of mercury releases. The Governors of the New England States and the Premiers of the Eastern Canadian Provinces have endorsed a regional goal of "the virtual elimination of the discharge of mercury into the environment" from man-made sources. Vermont has addressed mercury elimination through its Mercury Education and Reduction Campaign (MERC), which has included thermometer exchanges, school clean-outs, retailer and contractor mailings, dairy manometer exchanges, pharmacy pledges and various other outreach efforts to remove mercury from the solid waste stream.

One of Vermont's other efforts is the removal of mercury from discarded household appliances or "white goods". Many of these white goods, which are currently being collected for their scrap metal value, contain mercury switches and thermocouples. Mercury was used in household appliances due to it being a highly reliable means for electrical switching in varied temperature and moisture conditions<sup>4</sup>.

When "white goods" are processed for scrap metal, mercury may be released to the environment. In fact, when white goods are processed (shredded) for scrap metal, there are three distinct by-products. These are classified into ferrous, non-ferrous metallic and nonmetallic components<sup>1</sup>. It is the "fluff" or non-metallic components that many of the hazardous constituents in household appliances adhere to, including mercury<sup>2</sup>. These hazardous components are then available to be released either through smokestack emissions at smelters, incinerators or through landfill leachate from intact products or ash from their incineration<sup>1</sup>. The diagram on the following page details how mercury cycles through the environment.

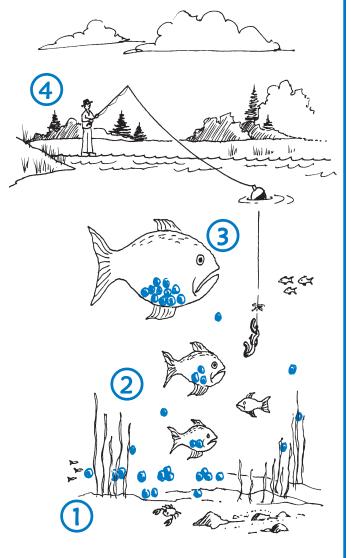
# How Does Mercury Get Into Fish?

Once in a lake or river, mercury is converted to methylmercury by bacteria and other processes. Fish absorb methylmercury from their food and from water as it passes over their gills. Mercury is tightly bound to proteins in all fish tissue, including muscle. There is no method of cooking or cleaning fish that will reduce the amount of mercury in a meal.

Methylmercury accumulates as you move up the food chain:

- 1. Methylmercury in the water and sediment is taken up by tiny animals and plants known as plankton.
- 2. Small fishes eat large quantities of plankton over time.
- Large predatory fish consume many smaller fish, accumulating methylmercury in their tissues. The older and larger the fish, the greater the potential for high mercury levels in their bodies.
- Fish are caught and eaten by humans and animals, causing methylmercury to accumulate in their tissues.

The State of Vermont Fish Contaminant Monitoring Program has been monitoring the



• = represents methylmercury

levels of mercury in fish tissue since 1987. Measureable concentrations have been observed in 95% of the samples collected from lakes and rivers across the state. The highest amounts of mercury are generally found in older fish of species which consume other fishes. The species which contain the greatest amounts of mercury are walleye from Lake Champlain, smallmouth bass, and chain pickerel. The lowest mercury levels are found in pumpkinseed sunfish, brown bullhead, and brook trout from streams. The Vermont Department of Health has issued a fish consumption advisory which recommends that fewer meals be consumed of species with greater than average mercury levels. The advisory is also more protective of women of child-bearing age and children under age 7. For more information on consumption advisories call the Department of Health toll-free at 1-800-439-8550.

The purpose of this manual is to address the removal of mercury switches and thermocouples prior to appliances being processed for their scrap metal. By educating individuals on how to remove mercury prior to metal reclamation, we all can help manage mercury wastes properly and keep mercury out of the environment.

#### 2.0 REGULATORY BACKGROUND

Mercury is an environmental concern because it is a heavy metal that can accumulate in living tissues and cause adverse health effects. When a mercury containing device is disposed of in a landfill or incinerator, the mercury in it can escape to contaminate air, soil, surface water and ground water. For a number of years, the Vermont Department of Health has issued health advisories warning people to limit consumption of freshwater fish caught in Vermont due to elevated levels of mercury in some fish species. When mercury is spilled in the home or workplace, the silvery liquid metal can evaporate and be breathed in by everyone in the building. Mercury affects the human brain, spinal cord, kidneys and liver. It affects the ability to feel, see, taste and move. Long term exposure can result in symptoms that get progressively worse and lead to personality changes, stupor and coma.

Mercury is intentionally added to many familiar products. Some of these include:

- > flourescent and high intensity discharge (HID) lights
- > certain types of thermometers and thermostats
- ➤ heat sensors for gas pilot lights
- > tilt switches in automobiles and appliances
- silent wall switches and electric relays
- vacuum gauges, barometers and manometers

For the last 20 years, mercury-containing waste from business, industry and institutions has been considered a hazardous waste because it often fails standard EPA toxicity test limits. More recently, a less restrictive waste handling option has been added to both state and federal hazardous waste regulations for certain mercury-containing wastes. These wastes are called "Universal Wastes" because they are equally likely to come from either regulated or unregulated sources. Only thermostats and hazardous waste (mercury-containing) lamps are currently listed as Universal Wastes. Wastes that are listed as "Universal Wastes" have reduced requirements for reporting, handling and storage (See Vermont Hazardous Waste Management Regulations, Subchapter 9, *Universal Waste Management Standards* for more information.). By having less restrictions on mercury-added product management, proper management can be easily facilitated.

The Vermont Agency of Natural resources is in the process of revising its "Universal Waste" rule to include all categories of mercury-added products. In the interim, to facilitate removal of as many of these products as possible from the solid waste stream and promote proper management of the collected mercury, these waste materials may be handled under existing provisions of the Vermont Hazardous Waste Management Regulations (See Subchapter 9, *Universal Waste Management Standards*) in the same manner as "Universal Waste Thermostats".

In 1998, the Vermont legislature passed a bill to decrease the amount of mercury in the State's solid waste. Under one provision of the bill, labeled mercury-added products are required to be separated

from the trash and are banned from landfill disposal. After March 1, 2000, all mercury-added products are required to be labeled under Vermont Law. Municipalities and Solid Waste Districts are required to provide collection programs for these materials. The Vermont law applies equally to households, farms, businesses and industries. The following mercury-added products are banned from landfill disposal and/or are required to be labeled in Vermont:

- > thermostats or thermometers
- > switches individually or part of other products
- > medical or scientific instruments
- > electric relays or other electric devices
- > lamps
- batteries, other than button cells

#### **HOW TO USE THIS MANUAL**

#### This manual covers:

- > the purpose of mercury in particular appliances
- > its location and use
- > how to safely and properly remove it
- > how to safely store mercury-added products
- > the proper methods of disposal or recycling
- ➤ mercury spill clean-up
- > lists of hazardous waste transporters, mercury recyclers and spill clean-up firms

Since we are constantly discovering additional products with mercury-added components, this manual remains a work in progress. Please let us know of any additional products that you feel should be added to this manual.

#### 3.0 HOUSEHOLD APPLIANCE MERCURY REMOVAL

**Safety Note:** Proper personal protective equipment should be used at all times (i.e, safety glasses, gloves, tyvek suit and in the event of a spill a respirator and mercury cartridges). In addition, spill equipment and storage material should be on-hand prior to any mercury-added device removal.

All appliances should be unplugged from an electrical outlet prior to any mercury switch removal. Appliances that have had these devices removed should be disabled to prevent future use (i.e, cut the electrical cord, or disable the gas feed line). All appliances that have had their mercury switches removed should be handled as scrap metal for recycling (not to be reused as a home appliance). All other hazardous components must be properly removed and disposed of (including but not limited to chlorofluorocarbons (CFCs) and polychlorinated biphenyls (PCBs) prior to scrap metal recycling.

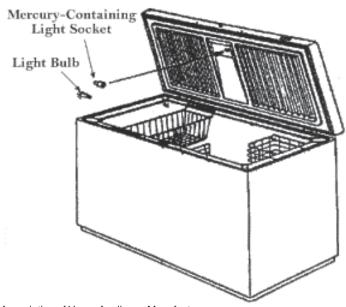
In case a switch breaks during the removal process, please follow the mercury spill clean-up instructions on page 20.

**Note:** Once these mercury-added products are removed, proper handling, storage and disposal are described on page 19 and in Appendix E.

#### 3.1 Chest Freezers

Some chest freezers are made with a mercury switch inside the freezer cover light socket (see Figure below). The mercury engages two contact points when the lid is opened thus completing the electrical circuit and turning on the light. All freezer manufacturers have stopped using mercury as a switching mechanism and begun using a mechanical switch by January 1, 2000. If there is no visible push button switch mechanism, the freezer is likely to have a lid mercury tilt switch<sup>3</sup>.

Chest Freezer with Mercury-Containing Light Socket.



Reprinted with permission from the Association of Home Appliance Manufacturers, Appliance Recycling Information Center, Bulletin #8, Mercury in Home Appliances.

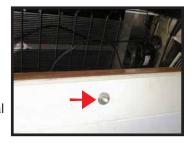
The following procedure should be used for removal of the mercury tilt switch.

#### CHEST FREEZER MERCURY SWITCH REMOVAL

## **ESTIMATED REMOVAL \$\iint\$** TIME: 1-5 MINUTES

#### STEP 1.

Open the freezer lid and look for a manual switch. similar to the one shown above. If it has a manual switch, the appliance can be handled as scrap metal (after removal of CFCs).



#### STEP 2.

Locate the light socket on the underside of the lid (on some freezers you may have to remove a plastic light cover).



If there is no manual switch, proceed to STEP 2.

#### STEP 3.

Remove the light bulb and properly discard.



STEP 4.

Remove the plastic housing (either by unscrewing it or breaking it off).



#### STEP 5.

Gently pull the light socket out of its mounting bracket (due to some lights having an in line mercury switch see Reference Photo 2 below).



STEP 6.

Cut or remove the attached wires.



STEP 7.

Remove and properly dispose of the entire light socket.



**REFERENCE PHOTO 1.** Assorted mercury freezer

switches for disposal.



**REFERENCE PHOTO 2.** 

Chest freezer light with an inline mercury switch (glass ampule).



#### 3.2 Washing Machines

Mercury switches were used in a small number of washing machines manufactured prior to 1972 because of their ability to reliably function in a high-moisture environment. Most washing machines with mercury switches will have passed through the recycling stream by 2010. Mercury switches were used for two different applications in washing machines, both of these uses were for consumer protection.

One application of the mercury switch was used to detect a lid opening and engage a brake to quickly stop the washer drum from moving. This feature is particularly important when the washer is in a spin cycle because it reduces the risk of a consumer being injured by reaching into a spinning basket. This switch is located between the washer tub and the cover for the tub area of the washer and is activated when the lid of the washer is lifted.

Another use for mercury switches in washing machines was in the dynamic stabilizing system to prevent a severe out-of-balance condition (only on certain models). This switch worked by breaking the circuit when the washing machine was severely out of balance. This switch is located on the back of certain washing machine models and is activated when the washing machine is severely out of balance.

These switches can be identified and removed using the following procedures.

#### WASHING MACHINE MERCURY SWITCH REMOVAL

# ESTIMATED REMOVAL TIME: 5-10 MINUTES

#### STEP 1.

Open the lid on the washer and look for a non-mercury mechanical switch. These switches come in various sizes, shapes and locations. You should also be able to hear an audible "click" when a mechanical switch engages and disengages (with the opening and closing of the lid). If there is no mechanical switch continue to STEP 2. Photos A and B are examples of non-mercury mechanical switches.

Non-mercury mechanical switch examples:







B) front tab switch.

Once you have determined that there is no mechanical switch, the following procedure can be used to remove the mercury switch.

#### STEP 2.

Pry off the top of the washing machine as shown in figure a. or remove any fasteners from the lid as shown in figure b.





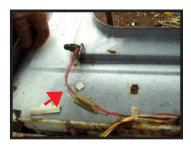
STEP 3.
On the underside of the lid, attached to the lid mounting rod, is an encapsulated mercury switch.



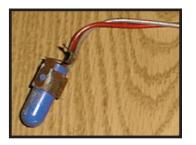
**STEP 4.**Remove the switch from the bracket.



**STEP 5.**Cut or remove any attached wires.



STEP 6.
Properly dispose of the entire washing machine mercury switch.



**ESTIMATED REMOVAL** G

TIME: 5-10 MINUTES

Another use for mercury switches in washing machines was in the dynamic stabilizing system to prevent a severe out-of-balance condition (only on certain models). Only through removal can you distinguish between a manual switch and a mercury switch. The mercury will be visible.

#### SEVERE OUT-OF-BALANCE SWITCH REMOVAL

STEP 1. Locate the dynamic stabilizing switch on the back of the washing machine.



STEP 2. Remove the fastening bolts.

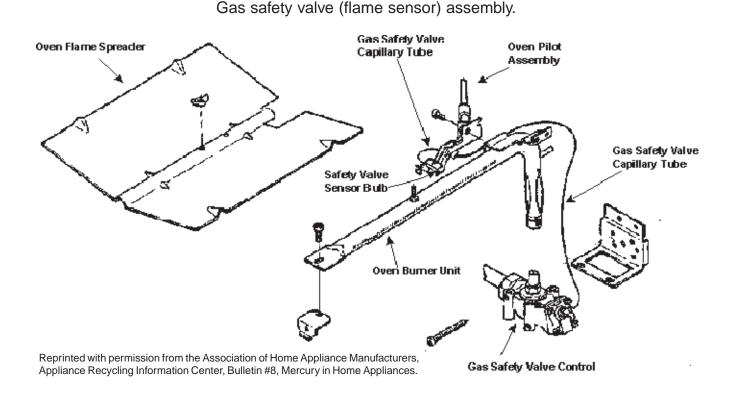


STEP 3.
Disconnect
the attached
wires and
properly
dispose of
the switch.



#### 3.3 Gas Ranges

Gas ranges are ignited using either an electronic ignition system or a pilot-light. Pilot-light ranges require a mechanical safety device to detect whether the pilot-light is on and shut off the supply of gas to the burner when the pilot-light is not burning. Otherwise, the potential exists for a dangerous quantity of gas to build up in the oven. The diagram on the following page depicts the mercury containing control device on the gas burner assembly.



The gas burner is located beneath the oven cavity in the broiler pan. (*Note: All appliances manufactured after March 1, 2000 should be labeled if they incorporate a mercury-containing device.*) Gas ranges contain many temperature sensing probes and switches. The following procedure shows you how to distinguish the non-mercury probes and switches from the mercury switches (many times within the same appliance). Many of your stainless steel safety valve capillary tubes and sensor bulbs are mercury-containing devices while copper safety valve capillary tubes and sensor bulbs are non-mercury containing devices. *As a general rule, magnetic metals are mercury-containing probes while non-magnetic metals are non-mercury containing probes.* This may be difficult to distinguish with baked on food. What may appear copper maybe stainless steel coated with baked on food. Removal of any baked on food maybe necessary prior to determining metal type.

Temperature capillary tubes and bulbs found within ovens or below upper burners are usually copper probes. A copper probe is good indication of a non-mercury containing device. These capillary tubes and bulbs are instead filled with an oil or sodium-potassium mixture. Photos A thru D on the following page show some examples of non-mercury probes.

#### NON-MERCURY TEMPERATURE PROBES

These photos are examples of non-mercury temperature probes in a gas range and oven. Photos A and B show the top view of a gas range after the burner surface has been removed. Note that these capillary tubes and bulbs start at the temperature control knob.

Photos C and D show the oven control temperature capillary tubes and bulbs (top of the oven cavity) which continue from the oven control knob into the oven cavity.









If you have determined that the gas oven capillary tubes and bulbs are mercury containing, the following procedure can be used to identify and remove the mercury gas safety valve control assembly.

## GAS RANGE MERCURY GAS SAFETY VALVE CONTROL ASSEMBLY REMOVAL PROCEDURE

#### STEP 1.

Remove the broiler pan drawer.



#### STEP 2.

Once the drawer is removed you can view the burner assembly inside.



**ESTIMATED REMOVAL** ©

TIME: 15-20 MINUTES

#### STEP 3.

When viewing the burner assembly, the small capillary tube (pointed out) is indicative of a mercury sensor switch.



#### STEP 3A.

Burner assemblies without a capillary tube but instead with an electronic pilot flame sensor (identifiable by the two wires) are **non-mercury**.



#### STEP 3B.

For gas ranges with a bracket covering the pilot, simply bend the bracket out of the way to view the wires indicating an electronic pilot sensor (non-mercury sensor).



Ranges without a capillary tube can be sent to scrap metal after making sure there is no fluorescent backlighting (see STEP 16) or PCBs.

For ranges with a capillary tube, proceed to STEP 4.

#### STEP 4.

If you have a capillary tube (like the one in the photo), you will now have to remove the burner assembly, valve and all attached gas fittings.



#### STEP 5.

Start by removing the key (sometimes a screw or a pressure fit) holding the burner assembly in.



#### STEP 6.

With the burner assembly loose, **proceed to STEP** 7.



#### STEP 7.

Disconnect the gas feed line by loosening the fitting or cutting the gas line.



#### STEP 8.

Disconnect the pilot gas feed line by loosening or cutting (there may sometimes be two feed lines).



#### STEP 9.

Remove the two screws holding the gas safety valve control in place.



#### **STEP 10.**

The entire burner assembly and valve are now ready to be removed. Note there is no screw or pin holding the oven burner unit, this is an example of a pressure fitting oven burner unit.



#### **STEP 11.**

Gas range with the oven burner unit and gas safety valve control removed.



#### **STEP 12.**

The removed oven burner unit and gas safety valve control.



#### **STEP 13.**

Remove the screw holding the gas safety valve control and gas safety valve capillary tube and bulb to the oven pilot assembly.



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**STEP 14.** 

Carefully pull the gas safety valve capillary tube and safety valve sensor bulb back through the bracket.



#### **STEP 15.**

The entire gas safety valve control, gas safety valve capillary tube and safety valve sensor bulb are now ready for proper disposal. **Proceed to STEP 16**.



EXAMPLES OF SOME MERCURY GAS SAFETY VALVE CONTROLS, CAPILLARIES AND BULBS

Photos A & B show complete mercury gas safety valve control, capillary and bulb. Photo C shows a gas auto pilot probe.







#### GAS RANGE FLUORESCENT BACKLIGHTING REMOVAL

#### **STEP 16.**

Prior to disposal, all stoves should be inspected to make sure that there is no fluorescent backlighting or PCBs. Some backlighting contains fluorescents and PCBs that come in various shapes and sizes (in addition to the one shown in the photos) and should be carefully removed and disposed of properly.







#### 3.4 Gas Hot Water Heaters

Although all the current literature states that mercury was not used in residential hot-water heaters, the following procedure has been included to help prevent any mercury-added thermocouples from entering the waste stream and eventually the environment. Use the following procedure to properly identify and remove any mercury-containing thermocouples (usually commercial hot-water heaters of 100 gallons or more).

#### GAS HOT WATER HEATER MERCURY THERMOCOUPLE REMOVAL

ESTIMATED REMOVAL TIME: 5-10 MINUTES

**STEP 1.**Locate the temperature control unit.



STEP 2.

Determine if there is an electronic flame sensor (determined by the presence of wires) or if there is a mercury thermocouple.



STEP 3. Use a magnet to determine if it is indeed a mercury probe (non-magnetic probes are non-mercury).



STEP 4.

If the probe is mercury, simply remove the bottom of the heater and loosen the nut attaching the probe. Then properly dispose of the mercury thermocouple.

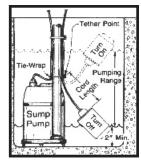


PHOTO A.
A non-mercury
temperature probe. Notice
that this probe is copper,
which is a good indication
of a non-mercury
containing device.



#### 3.5 Sump and Bilge Pumps

Another use for mercury was as a switch in sump and bilge pumps. This switch, which functioned very reliably in the high moisture environment, turned on and off based on the corresponding water level (see sump pump diagram at right). As the water level rises, so does the float ball and wire (a wire attached to the float is a good indication of a mercury sump pump) which would then tilt the mercury switch, completing the electrical circuit that turns on the pump. As the water level receded the electrical circuit would then be broken and the pump would turn off.



Basic sump pump operation (mercury switch). Reprinted with permission from Purdue University.

#### SUMP PUMP MERCURY REMOVAL



A mercury-free sump pump. Notice the metal guide and no attached wires.

The sump pump on the left is an example of a mechanical sump pump. This pump works on the same principle that as the float ball rises up with the water it would turn on the pump (mechanical switch) and when the water recedes it would sink down with the water and shut the pump off. As can be seen in the photo on the left, a metal guide is used instead of a wire. This is a good indication of a non-mercury sump pump.





Sump pump float containing mercury.

**ESTIMATED REMOVAL** 

TIME: 1-2 MINUTES

Once you have determined whether or not it is a mercury sump pump, the wire attaching the float can simply be cut and the whole float properly disposed of (see photo at right).

#### **BILGE PUMP MERCURY REMOVAL**



Bilge pump containing mercury.

Bilge pumps work on the same principle as a sump pump. By rotating on a stationary point (see drawing on right) with the fluctuations in water level either up or down, the bilge pump would turn on or off. Several of the newer models use this method with a rolling steel ball instead of mercury to complete the electrical circuit. This can be determined by simply shaking the bilge pump. A steel ball bearing will be easily discerned from liquid mercury.



Automatic switch bilge pump.

Once you have determined it is a mercury bilge pump, you can simply remove the entire pump and properly dispose of.

#### 4.0 MERCURY HANDLING, STORAGE AND DISPOSAL

Once mercury devices are removed, they should be properly handled, stored and disposed of. The handling, storage and disposal protocols covered below are a best management strategy for individuals or businesses (non-profit and for profit) that generate less than 11,000 pounds of universal waste at anytime (all universal wastes combined). Individuals or businesses who will be generating more than 11,000 pounds should refer to Subchapter 9, the Universal Waste Management Standards in the State of Vermont Hazardous Waste Management Regulations.

Included for your convenience are two fact sheets, **Appendix E - Waste Mercury Containing Switches and Devices** and **Appendix F - Flourescent Lamps**, which summarize handling, storage and disposal requirements for these products.

#### 4.1 Handling

A mercury-containing switch or product should always be handled in a way that will prevent breakage. Also when removing mercury or mercury-added components from a product do so only over or in a containment device that will collect and contain any mercury released in the event of a mercury-added product breaking. Be sure to keep spill clean-up kits (See Section 5, Mercury Spill Clean-up) and equipment readily available and always ensure that there is adequate ventilation. *Any spilled mercury or any contaminated clean-up materials must be handled as a hazardous waste. For large spill clean-ups (more than 1 or 2 tablespoons) a firm specializing in mercury clean-up should be acquired (see Appendix B).* Anyone handling mercury or mercury-added products should use proper personal protective equipment (latex gloves, tyvek suit, safety glasses and a respirator with mercury cartridges if cleaning up a mercury spill) and be thoroughly familiar with proper mercury handling and emergency procedures (See Appendix E - Waste Mercury Containing Switches and Devices Factsheet).

#### 4.2 Storage

All mercury-containing switches or products must be stored in containers that will prevent any breakage or leakage. These containers must be closed, structurally sound and compatible with the mercury-added products being stored. All containers of mercury-added products must be properly labeled with one of the following; "Universal Waste- Mercury-added Product(s)", or "Waste Mercury-added product(s)" or "Used Mercury-added products" and stored for no more than one year.

#### 4.3 Disposal

Properly contained and labeled mercury-added products can be disposed of in three possible disposal routes. These are:

- > Disposal through a local Solid Waste District, Alliance or Municipality. This is usually done through Household Hazardous Waste Collection events or facilities (see Appendix A for a list of Solid Waste Districts, Alliances and Municipalities).
- > Disposal through a hazardous waste transporter (see Appendix C).
- ➤ Disposal through a mercury recycler (see Appendix D).

#### 5.0 MERCURY SPILL CLEAN-UP

#### MERCURY SPILL KIT

At a minimum you should have the following supplies in the event of a mercury spill. Those removing and collecting mercury on a continued basis should consider adding a commercially available spill kit to these items.

- > index cards
- respirator with mercury vapor cartridges
- ➤ sulfur powder
- > flashlight
- > rubber squeegee
- > zinc or copper flakes
- > tape
- > Ziploc plastic bags
- > paper towels
- > plastic dust pan
- > wide mouth plastic container with cover
- > plastic trash bags
- > latex gloves

**Note:** Most spill/safety equipment suppliers have complete spill kits for purchase. Contact the Agency of Natural Resources for purchasing information.

#### EMERGENCY MERCURY SPILL CLEAN-UP PROCEDURE

This clean-up procedure is only intended for small mercury spills. If the spill involves more than one or two tablespoons of free mercury or the material has splattered over a sizeable area, is in cracks and crevices or other difficult to clean places, or is on a non-disposable porous item such as wall to wall carpeting or upholstery, we recommend you retain an environmental firm with the equipment and expertise to perform the cleanup (see Appendix B) and call the Vermont Spills Hotline at 1-800-641-5005.

- A) Wear latex gloves to prevent skin contact. Keep your hands away from your face-especially your eyes, nose and mouth. *Before beginning any spill clean-up make sure that the area is adequately ventilated or you have a respirator with mercury vapor cartridges*.
- B) Carefully pick up any broken pieces of glass (**NEVER SWEEP OR VACUUM MERCURY**). Place them on a paper towel or tissue. Wrap or fold the paper towel, and place into a leak-tight plastic bag or sealable plastic container.
- C) Sprinkle sulfur powder on the spill area to control mercury vapors. Then, working from the outside of the spill area toward the center, push small mercury beads together with a card, stiff paper, or squeegee to form larger droplets. Put droplets into a leak-tight plastic bag or plastic container.

- D) Use the sticky side of a two-inch (or wider) duct or masking tape to pick up any remaining glass or mercury beads. Pay special attention to cracks and crevices. Place tape and debris in a leak-tight plastic bag or sealable plastic container.
- E) Use a flashlight to look all around the spill area. The light will reflect off the shiny mercury beads and make it easier to see them.
- F) Sprinkle sulfur powder on the spill area after cleaning up beads of mercury; a color change from yellow to brown indicates that mercury is still present and more cleanup is needed.
- G) Sprinkle zinc flakes or copper flakes (available at hardware stores) to amalgamate any small amounts of mercury which remain.
- H) When finished, carefully remove latex gloves and place them in a leak-tight plastic bag or sealable plastic container. Do not touch the glove fingertips or parts that may have come in contact with mercury. Place all the closed containers in a double plastic bag and tie the opening. Properly dispose through a hazardous waste transporter, mercury recycler (see Appendix C) or call your Solid Waste District, Alliance or Municipality (see Appendix A).
- I) Thoroughly clean your hands and body. **Never wash contaminated clothing in a washing machine or remove contaminated clothing or apparel from a spill site. This will help prevent further site contamination**. These should also be properly disposed of.

#### **APPENDIX A**

#### **VERMONT SOLID WASTE DISTRICTS, ALLIANCES AND MUNICIPALITIES**

#### ADDISON COUNTY SOLID WASTE MANAGEMENT DISTRICT

P.O. Box 573, Route 7 South Middlebury, VT 05753 (802) 388-2333

Fax: 388-0037

email: acswmd@acswmd.org Website: www.acswmd.org

#### **Participating Towns:**

Addison, Bridport, Cornwall, Ferrisburg, Goshen, Leicester, Lincoln, Middlebury, Monkton, New Haven, Orwell, Panton, Ripton, Shoreham, Starksboro, Vergennes, Waltham, Weybridge, Whiting

#### BENNINGTON REGIONAL PLANNING COMMISSION

Box 342 Arlington, VT 05250 (802) 375-9964

Fax: 375-1561

#### Participating Towns:

Arlington\*, Dorset\*, Manchester\*, Pownal\*\*, Rupert, Sandgate\*, Shaftsbury\*\*, Stamford, Sunderland \* town works closely with BRPC

#### **Town Contacts:**

Pownal: Steffan Strohmaier, Pownal Town Office, P.O. Box 411, Pownal VT 05261 Tel# 823-7757. Shaftsbury: Dennis McCarthy, Asst. to Sel. Bd., P.O. Box 409, Shaftsbury VT 05262 Tel #442-4043.

#### CENTRAL VERMONT SOLID WASTE MANAGEMENT DISTRICT

137 Barre Street Montpelier, VT 05602 (802) 229-9383 or 1-800-730-9475

Fax: 229-1318

email: fieldprograms@cvswmd.com

#### Participating Towns:

Barre City, Barre Town, Berlin, Bradford, Cabot, Calais, Chelsea, East Montpelier, Hardwick, Marshfield, Middlesex, Montpelier, Northfield, Orange, Plainfield, Roxbury, Tunbridge, Walden, Washington, Williamstown, Woodbury

<sup>\*\*</sup> send mailings directly to town contact

#### CHITTENDEN SOLID WASTE DISTRICT

1021 Redmond Road Williston, VT 05495 (802) 872-8100

Fax: 878-5787

Recycling Hotline: 872-8111 E-mail: info@cswd.net

#### <u>Participating Towns:</u>

Bolton, Burlington, Charlotte, Colchester, Essex, Essex Junction, Hinesburg, Huntington, Jericho, Milton, Richmond, St. George, Shelburne, South Burlington, Westford, Williston, Winooski

#### GREATER UPPER VALLEY SOLID WASTE MANAGEMENT DISTRICT

96 Mill St. P.O. Box 58

North Hartland, VT 05052-0058

(802) 296-3688 Fax: 281-7088

E-mail: guvswd@valley.net

#### **Participating Towns:**

Bridgewater, Hartland, Norwich, Pomfret, Sharon, Strafford, Thetford, Vershire, West Fairlee, Woodstock

#### JOINT MUNICIPAL SURVEY COMMITTEE/SOLID WASTE ALTERNATIVE COMMITTEE

87 Halls Pond Road Salem, NY 12865 (518) 9702

email: pam@starlitridge.com

#### **Participating Towns:**

Benson, Chittenden, Fair Haven, Middletown Springs, Pawlet, Rutland Town, Shrewsbury, Sudbury, Tinmouth, West Haven

#### LAMOILLE REGIONAL SOLID WASTE MANAGEMENT DISTRICT

29 Sunset Drive Morrisville VT 05661-9788 (802) 888-7317

Fax: 888-6507

email: info@Irswmd.org

#### Participating Towns:

Belvidere, Cambridge, Craftsbury, Eden, Elmore, Hyde Park, Johnson, Morristown, Stowe, Waterville, Wolcott, Worcester

#### **LONDONDERRY GROUP**

Londonderry Recycling Coordinator P.O. Box 118 South Londonderry, VT 05148 (802) 824-6304

#### **Participating Towns:**

Langrove, Londonderry, Peru, Weston, Windham.

#### MAD RIVER SOLID WASTE ALLIANCE

P.O. Box 210 Waterbury Center, VT 05677 (802) 244-7373

Fax: (802) 244-7570

Email: malterport@aol.com

#### Participating Towns:

Duxbury, Fayston, Moretown, Waitsfield, Warren, Waterbury.

#### NORTHEAST KINGDOM WASTE MANAGEMENT DISTRICT

P.O. Box 1075 Lyndonville, VT 05851 (802) 626-3532 or 800-734-4602

Fax: 626-3519

email: progmgr@nekwmd.org

#### **Participating Towns:**

Averill, Averys Gore, Barnet, Bloomfield, Brighton, Brunswick, Concord, Danville, East Haven, Ferdinand, Granby, Groton, Guildhall, Holland, Lewis, Lunenburg, Lyndon, Maidstone, Morgan, Newark, Peacham, Ryegate, Sheffield, Stannard, Victory, Waterford, Warren Gore, Warners Grant, Westmore, Wheelock.

#### NORTHWEST VERMONT SOLID WASTE MANAGEMENT DISTRICT

10-12 Kingman Street P.O. Box 1547 St. Albans, VT 05478 (802) 524-5986

Fax: 524-5987

email: nwswdps@adelphia.net

#### Participating Towns:

Alburg, Bakersfield, Berkshire, Enosburg, Fairfield, Fletcher, Isle LaMotte, Montgomery, Richford, St. Albans City, Sheldon, South Hero.

#### **RUTLAND COUNTY SOLID WASTE DISTRICT**

2 Green Hill Lane Rutland, VT 05701-5915 (802) 775-7209

Fax: 773-5796

E-mail: rcswd@rcswd.com Recycling Hot Line: 773-4083

#### <u>Participating Towns:</u>

Brandon, Castleton, Clarendon, Danby, Hubbardton, Ira, Mendon, Mt. Tabor, Pittsford, Poultney, Proctor, Rutland City, Sherburne, Wallingford, Wells, West Rutland.

#### SOUTHERN WINDSOR/WINDHAM COUNTY SOLID WASTE MANAGEMENT DISTRICT

c/o NH/VT Solid Waste Project 130 Pleasant Street suite #3 Claremont, NH 03743 (603) 543-1201

Fax: (603) 542-5727

#### Participating Towns:

Andover, Baltimore, Cavendish, Chester, Grafton, Ludlow, Plymouth, Reading, Rockingham, Springfield, Weathersfield, Westminster, West Windsor, Windsor.

#### WHITE RIVER ALLIANCE

c/o Del Cloud Bethel Town Manager RR 1 Box 335 Bethel, VT 05032 (802) 234-9340 Fax: (802) 234-6840

#### Participating Towns:

Barnard, Bethel, Hancock, Pittsfield, Rochester, Royalton, Stockbridge.

#### WINDHAM SOLID WASTE MANAGEMENT DISTRICT

327 Old Ferry Road Brattleboro, VT 05301 (802) 257-0272

Fax: 257-5122

#### **Participating Towns:**

Brattleboro, Brookline, Dover, Dummerston, Guilford, Halifax, Jamaica, Marlboro, Newfane, Putney, Readsboro, Townshend, Vernon, Whitingham, Wilmington.

#### **OTHER CONTACTS**

Towns not listed in any of these Solid Waste Districts or Alliances should contact their town clerk, town offices or the Vermont Agency of Natural Resources for more information on proper disposal of Hazardous Waste.

#### **APPENDIX B**

#### MERCURY CLEAN-UP PROFESSIONALS

The following is a partial list of companies that offer remediation (clean-ups/elimination, etc.) concerning air quality related situations. This list is not a recommendation or endorsement by the Vermont Agency of Natural Resources.

Key: L=liquid mercury

M=microbial (mold, mildew, fungus, and/or bacterial)

O=odors (post fire, etc.)

C=chemical

F=fuel

#### Clean Harbors Env. Services, Inc.

Offices also near Concord, NH and Boston, MA (1-800-OILTANK)
32 Basik Road
Glenmount, NY 12077
(518) 434-0149
Key- (M,O,L,C,F)

#### **Environmental Products & Service**

2 Flynn Avenue Burlington, VT 05401 (802) 862-1212 or (1-800-THETANK) FAX-(802)860-7445 (24 hr, 7/day/upc full cleanup response) Key- (L,C,F,M)

#### **Seacoast Ocean Services/SOS**

36 Custom House Wharf Portland, Maine 04101 (800) 339-2111 or (207) 774-2111 FAX (207) 774-7240 Email: servoprovt@aow.com Key- (M,O,L,C,F)

#### Twin State Environmental Corp.

34 Roosevelt Highway Colchester, VT 05446 (802) 654-8663 FAX (802) 654-8667 Email: tsec@together.net Key- (L,C,F)

#### APPENDIX C

#### HAZARDOUS WASTE TRANSPORTERS

The following is a partial list of companies that offer hazardous waste transportation. This list is not a recommendation or endorsement by the Vermont Agency of Natural Resources.

#### APTUS Inc.

21750 Cedar Avenue P.O. Box 550 Lakeville, MN 55044

Contact: Bruce Burniece (612) 469-3475

#### **Clean Harbors Environmental Services**

35 Commerce Street #9
Williston, VT 05495

Contact: Cathy McNamara (802) 651-0558

#### **ENPRO Services Inc.**

12 Mulliken Way Newburyport, MA 01950

Contact: Larry Bouchard (978) 465-1595

#### **Environmental Hazards Management Inc.**

P.O. Box 785

Williston, VT 05495

Contact: Ken Morton (802) 862-4537

#### **Environmental Products & Services of VT**

2 Flynn Avenue Burlington, VT 05401

Contact: Donald Melander (802) 862-1212

#### **Heritage Environmental Services**

2 Avenue D

Williston, VT 05495

Contact: Kendra Demarest (802) 860-1200

#### **North Country Environmental Services**

11 Mill Street Barre, VT 05461

Contact: David Barchard (802) 479-5299

#### Safety Kleen Corp.

221 Sutton Street
North Andover, MA 01845
Contact: Brenda Leonardo

#### **Total Waste Management**

142 River Road Newington, NH 03801

Contact: Kevin Schmit (800) 345-4525

#### **Triumvirate Environmental Inc.**

P.O. Box 136

Boston, MA 02143-0003

Contact: Jeff Plotts (800) 966-9282

#### APPENDIX D

#### **MERCURY RECYCLERS**

The following is a partial list of mercury recyclers that accept all mercury-added products. This list is not a recommendation or endorsement by the Vermont Agency of Natural Resources.

#### **Adrow Chemical**

2 Lines Ave.

Wanaque, NJ 07465 Phone: (201) 839-2372

Contact: Bill Delaney or Frank Bindhammer

#### **Bethlehem Apparatus**

890 Front St., P.O. Box Y Hellertown, PA 18055 Phone: (610) 838-7034 Contact: John Boyle

#### Mercury Refining Co.

1218 Central Avenue Albany, NY 12205 Phone: (518) 459-0820

Phone: (518) 459-0820 Contact: Aaron Mars

#### Advance Env. Recycling Corp.

2591 Mitchell Ave. Allentown, PA 18103 Phone: (800) 554-2372

#### **Environmental Enterprises, Inc.**

10163 Cincinnati-Dayton Rd. Cincinnati, OH 45241

Phone: (800) 722-2818

#### Mercury Waste Solutions, Inc.

21211 Durand Avenue Union Grove, WI 53182 Phone: (800) 741-3343 Contact: Zach Unruh

#### APPENDIX E



**Vermont Department of Environmental Conservation** 103 South Main Street Waterbury, VT 05671 http://www.anr.state.vt.us/dec/dec.htm

November, 2000

### Fluorescent Lamps: **Handling and Disposal Guidelines**

#### Fluorescent and HID Lamps:

Fluorescent and HID lamps contain mercury, a highly toxic heavy metal. When lamps are broken or thrown in the trash, mercury is released to the environment. Even the small amount of mercury-laden phosphor powder contained in lamps can damage our lakes and streams and poison fish and wildlife. It is due to this toxicity of the mercury contained in lamps, that there are restrictions (limits) on their disposal.

In Vermont, the following types of lamps should not be placed in the trash:

#### Fluorescent Lamps

- full size fluorescents
- compact fluorescents

High Intensity Discharge (HID) Lamps

- mercury vapor lamps
- metal halide lamps
- sodium lamps

#### Why Use Fluorescent and HID Lamps?

Using energy-efficient lighting makes good sense because:

- Fluorescent and HID lamps last longer
- Use less electricity than incandescent lamps and therefore:
  - Cost less to run
  - Result in less air pollution emitted from coalburning power plants.

#### **Vermont Law Requires:**

- Proper labeling of mercury-added products.
- Towns and Solid Waste Districts to implement a program to collect mercury-added consumer products and to inform the public about them.
- Proper disposal.

#### **General Recycling Guide for Fluorescent Lamps:**

Here are a few precautions to take with Fluorescent and HID lamps after they have burned out:

- Do not break or crush lamps because mercury will be released.
- To avoid breaking the lamps, package them carefully when storing and transporting them. **DO NOT TAPE THEM TOGETHER!**
- Contact your local Town Manager or Solid Waste District (listed on the back of sheet) or the Agency of Natural Resources for information on the recycling program for Fluorescent and HID lamps in your area.
- If lamps are accidentally broken, follow the clean-up procedure below.

#### Lamp Breakage Clean-up Procedure

- Keep all people and pets away from breakage area so that mercury powder is not tracked into other areas.
- 2 Keep the area well ventilated.
- 3 Assemble the necessary supplies before cleaning up: Latex gloves, tweezers, tape, and a puncture resistant container.
- Using the latex gloves, carefully pick up any broken glass and place in a puncture resistant container. Tweezers may be needed to safely pick up broken glass. Tape can also be used to pick up any remaining small pieces of glass and powder residue still located on the spill surface. DO NOT VACUUM.
- **5** After clean-up is complete, place the contaminated clean-up equipment along with any other material that came in contact with the mercury powder into the puncture resistant container or a sealable plastic bag.
- Contact your local Town Manager, Solid Waste District or the Agency of Natural Resources for waste management options.

For additional information contact: **Environmental Assistance Division** tele: 802-241-3589 fax: 802-241-3273

e-mail: ead@dec.anr.state.vt.us web site: http://www.anr.state.vt.us/dec/ead/eadhome.htm

## Fluorescent Lamp Management Q&A for Businesses & Municipalities

#### Should I crush my lamps?

No, crushing mercury-containing lamps may pose health and environmental risks when mercury vapors are released. Lamps should be stored in ways that avoid breakage.

#### How should I store mercury-containing lamps?

- Place used lamps in packaging functionally equivalent to that used to ship new lamps.
- Seal full packages with tape (**Do not tape lamps together**).
- Label packages with any one of the following phrases:
  - "Waste Mercury-Containing Lamp(s)"
  - "Used Mercury-Containing Lamp(s)"
  - "Universal Waste Mercury-Containing Lamp(s)"
- Store packages of lamps no more than five (5) feet high.
- Store packages for no more than one year.
- Store packages of waste mercury-containing lamps in a storage area identified by a sign that is clearly visible and has a label that includes the words: "Waste Mercury-Containing Lamps".

#### What if a mercury-containing lamp breaks?

Once a lamp is broken, it is considered a hazardous waste and should not be thrown in the trash. First allow the area to ventilate for 15 minutes. Then transfer any damaged or broken mercury-containing lamps and residue to a closed compatible container labeled "Hazardous Waste" (with a description of the contents). Once properly contained and labeled, the broken lamps and residue should be stored on an impervious surface within a structure that sheds rain and snow.

#### How should we train workers who handle waste lamps?

All employees who handle or manage mercury-containing products shall be informed of proper handling and emergency procedures.

## Do I need any permits for transporting my own waste fluorescent and HID lamps?

No, only commercial haulers of waste lamps need to get a waste transporter's permit or certification.

#### What are the disposal options for mercury-containing lamps?

- Recycling through a Municipal or Solid Waste District Household Hazardous Waste collection program,
- 2 Direct shipment to a lamp recycler or,
- 3 Shipment through a hazardous waste transporter.

#### Where can I get additional information?

Additional information can be found by:

- Contacting your local Town Manager (if not in a Solid Waste District).
- Contacting your local Solid Waste District (see the list at right)
- Contacting the Agency of Natural Resources:
  - Waste Management Division (802) 241-3888
  - Environmental Assistance Division (802) 241-3589
- Accessing the following website http://www.anr.state.vt.us/dec/waste.htm
- Reviewing Subchapter 9 of the Vermont Hazardous Waste Regulations (accessible through the above website)

## **Vermont Solid Waste Districts**

ADDISON COUNTY SOLID WASTE DISTRICT (802) 388-2333

BENNINGTON REGIONAL PLANNING COMMISSION (802) 375-2576

CENTRAL VERMONT SOLID WASTE DISTRICT 1-800-730-9475 OR (802) 229-9383

> CHITTENDEN SOLID WASTE DISTRICT (802) 872-8111

GREATER UPPER VALLEY SOLID WASTE DISTRICT (802) 296-3688

LAMOILLE REGIONAL SOLID WASTE DISTRICT (802) 888-7317

MAD RIVER SOLID WASTE ALLIANCE (802) 244-7373

NORTHEAST KINGDOM WASTE MANAGEMENT DISTRICT 1-800-734-4602 OR (802) 626-3532

> NORTHWEST VERMONT SOLID WASTE DISTRICT (802) 524-5986

SOUTHERN WINDSOR/ WINDHAM COUNTY SOLID WASTE MGMT DISTRICT (603) 543-1201 OR (802) 885-5827

RUTLAND COUNTY SOLID WASTE DISTRICT (802) 775-7209 OR 802-773-4083

RUTLAND NON-DISTRICT TOWNS JMSC/SWAC (802) 235-2710

> WHITE RIVER ALLIANCE (802) 234-9340

WINDHAM SOLID WASTE DISTRICT (802) 257-0272

#### APPENDIX F



## **Environmental Fact Sheet**

Vermont Department of Environmental Conservation 103 South Main Street Waterbury, VT 05671 http://www.anr.state.vt.us/dec/dec.htm

VTDEC Publication #EA-1002

July, 2001

## Waste Mercury-Added Devices: Handling and Disposal Guidelines

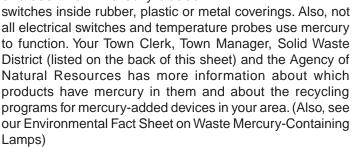
## Thermometers, Silent Switches and Temperature Probes

In addition to thermometers, mercury has been used for many years in electrical products. A moving drop of mercury is used to open or close electrical circuits in devices like thermostats, silent wall switches, sump pumps, and the tilt switches in automobiles, chest freezers, washing machines, and space heaters. Mercury is a naturally occurring heavy metal which at room temperature takes the form of a silvery

liquid. When a mercury-containing device is broken or thrown in the trash, mercury is released to the environment. Even a small amount of mercury can damage our lakes and streams and poison fish and wildlife. It is because of mercury's toxicity that restrictions (limits) have been placed on how and where mercury-added products are disposed.

#### Recognizing a Mercury-Added Device Is Not Always Easy

Although it is easy to see the silvery mercury in the bulb of a thermometer or the glass tilt switch of a home thermostat, most mercury containing devices enclose their mercury-added



#### **Vermont Law Requires...**

- Proper labeling of mercury-added products.
- Towns and Solid Waste Districts to offer programs to collect mercury-added consumer products and to inform the public about them.
- Proper disposal, NOT IN THE TRASH!

## op of mercury is s in devices like in individually sealed plastic bags placed inside larger sealable containers before storing or transporting them.

Contact your Town Clerk, local Solid Waste District (listed on the back of this sheet) or the Agency of Natural Resources for information about recycling programs for mercury-added devices in your area.

Do not break, crush or take apart a mercury-added switch

or device because mercury will be released.

- Contact local heating and air conditioning contractors or wholesalers about free thermostat take-back available through the Thermostat Recycling Corporation.
- If a mercury-added device is accidentally broken, use the following clean-up procedure.

## Mercury Spill Cleanup Procedure DO NOT SWEEP OR VACUUM MERCURY!

**General Recycling Guidelines** 

- Keep all people and pets away from the breakage area so that mercury is not tracked elsewhere.
- Weep the area well ventilated by opening windows and shutting off the heat or air conditioning.
- Collect the necessary supplies before cleaning up: latex gloves, stiff paper or cards, paper towels or tissues, wide masking or duct tape, a leak-tight plastic bag or sealable container, a small plastic scoop or eye dropper.
- Wearing the gloves, carefully pick up any broken glass or pieces of the device. Place on a paper towel or tissue. Wrap or fold the paper towel and place it in a leak-tight plastic bag or sealable container.
- Working from the edge of the spill towards the center, use a card or stiff paper to push small beads of mercury into larger droplets. Push the droplets into a plastic scoop or pick them up with an eye dropper. Place the mercury in a leak-tight plastic bag or sealable container.
- Use the sticky side of masking or duct tape to pick up remaining bits of glass or mercury beads. Put the tape, debris, gloves and cleanup equipment in a leak-tight plastic bag or sealable container.
- Contact your Town Clerk, Solid Waste District or the Agency of Natural Resources about how to dispose of mercury spill cleanup materials.



## Mercury-Added Device Management Q & A for Businesses and Municipalities

#### How should I handle mercury-added devices?

Mercury-added switches and devices are often removable components found inside much larger appliances. Once the switch or component has been removed from the larger product, the component should not be disassembled further. If need be, it should be stored in an individually sealed plastic bag placed inside a larger sealable container to avoid breakage. Direct exposure to mercury metal may pose health and environmental risks when mercury vapors are released.

#### Is every waste mercury-added product a hazardous waste?

When taken by itself, a mercury-added switch would exhibit the hazardous waste characteristic of toxicity for mercury. However, the hazardous waste regulations which apply to the proper handling and disposal of a mercury-added component do not automatically extend to the larger products containing them. For example, a mercury-added hood or trunk light switch does not turn the whole car into a hazardous waste.

## May waste mercury-added products or devices be handled as something other than a hazardous waste?

Yes. Both Vermont and federal hazardous waste regulations already contain provisions to simplify the handling and recycling of waste mercury-added thermostats and lamps. These are called "Universal Wastes". Under current Vermont Waste Management Division policy, the terms of these provisions have been extended to all fabricated mercury-added products, switches, and devices that are not presently listed as so-called "Universal Wastes".

#### What if a mercury-added device breaks?

At a minimum, the device, the released mercury and cleanup debris should be sealed in a plastic bag and transferred to a closed compatible container labeled "Hazardous Waste" (with a description of the contents) and managed as a hazardous waste.

#### What should we tell workers who handle waste mercury-added products?

All employees who handle or manage mercury-added products should be informed of the proper handling and emergency procedures for these products and for mercury.

#### What are the disposal options for mercury-added devices?

- Recycling through a Municipal or Solid Waste District's Household Hazardous Waste collection program.
- Thermostats only Recycling by heating, ventilation and air conditioning wholesalers participating in the free thermostat take-back sponsored by the Thermostat Recycling Corporation.
- O Direct shipment as "Universal Waste" to a mercury recycling facility.
- Shipment through a hazardous waste transporter to a proper destination facility.

#### Where can I get additional information?

- Contact your Town Clerk or Town Manager (if not in a Solid Waste District)
- Contact your Solid Waste District (see list to the right or the Agency web site below)
- Contact the Vermont Agency of Natural Resources:
  - Waste Management Division (802) 241-3888 (Hazardous/Universal Wastes)
  - Environmental Assistance Division (802) 241-3589 (Mercury-Added Products) or, on the web at: www.anr.state.vt.us/dec/waste.htm or www.mercvt.org
- Also, see our "Waste Mercury Containing Lamps" and "Universal Waste" Fact Sheets
- Review the Vermont Hazardous Waste Management Regulations in Subchapter 9: Universal Waste Management Standards. (also available on the Agency of Natural Resources website above)

## Vermont Solid Waste Districts

ADDISON COUNTY SOLID WASTE DISTRICT (802) 388-2333

BENNINGTON REGIONAL PLANNING COMMISSION (802) 375-2576

CENTRAL VERMONT SOLID WASTE DISTRICT 1-800-730-9475 OR (802) 229-9383

> CHITTENDEN SOLID WASTE DISTRICT (802) 872-8111

GREATER UPPER VALLEY SOLID WASTE DISTRICT (802) 296-3688

LAMOILLE REGIONAL SOLID WASTE DISTRICT (802) 888-7317

MAD RIVER SOLID WASTE ALLIANCE (802) 244-7373

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> NORTHWEST VERMONT SOLID WASTE DISTRICT (802) 524-5986

SOUTHERN WINDSOR/ WINDHAM COUNTY SOLID WASTE MGMT DISTRICT (603) 543-1201 OR (802) 885-5827

RUTLAND COUNTY SOLID WASTE DISTRICT (802) 775-7209 OR 802-773-4083

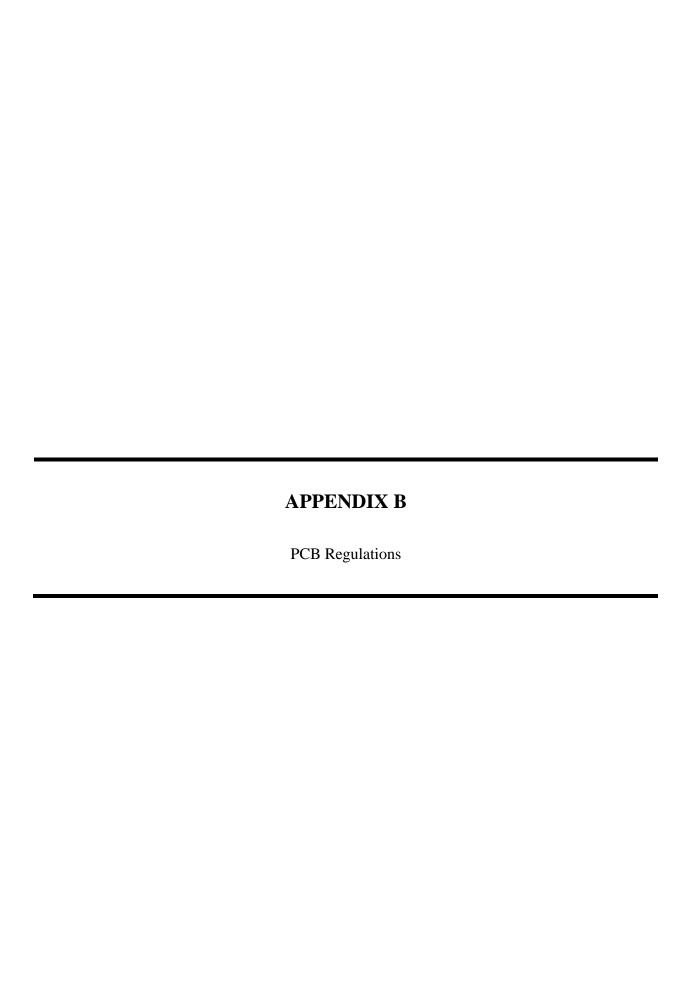
> RUTLAND NON-DISTRICT TOWNS JMSC/SWAC (802) 235-2710

> > WHITE RIVER ALLIANCE (802) 234-9340

WINDHAM SOLID WASTE DISTRICT (802) 257-0272

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- 1. <u>Discussion Paper: Management of Hard to Handle Wastes in Vermont</u>. Vermont Agency of Natural Resources. May 1998.
- Managing Problem Materials Generated by Discarded Appliances and Vehicles. Report to Northeast Waste Management Officials' Association. Prepared by DPRA Incorporated. September 1994.
- 3. <u>Fact Sheet: Mercury Applications in Major Appliances and Heating/Cooling Systems</u>. Minnesota Office of Environmental Compliance. April 13, 1998.
- 4. <u>Info Bulletin #8: Mercury in Home Appliances</u>. Appliance Recycling Information Center. August 1998.
- 5. <u>Fact Sheet: Did You Know that the Vermont Legislature has Banned Some Wastes from Landfills?</u> Vermont Agency of Natural Resources. October 1992.
- 6. *Fact Sheet: What if I Spill Mercury.* Purdue Research Foundation. 1996.
- 7. <u>Toxics in Vehicles: Mercury</u>. Ecology Center Great Lakes United University of Tennessee Center for Clean Products and Clean Technologies. January 2001.
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- 9. What Devices Contain Mercury? Purdue Research Foundation. 1996.
- 10. <u>Hazardous Waste Management Regulations</u>. State of Vermont Agency of Natural Resources. March 28, 2000.
- 11. <u>Factsheet: Fluorescent Lamps: Handling and Disposal Guidelines</u>. State of Vermont Agency of Natural Resources. November 2000.
- 12. <u>Factsheet: Waste Mercury-Containing Switches and Devices: Handling and Disposal Guidelines.</u>
  Agency of Natural Resources. June 2001.
- 13. <u>Mercury Factsheet: What is Mercury? Why be concerned?</u> Indiana Office of Pollution Prevention and Technical Assistance. May 2000.



Vol. 142, No. 19 Wol. 142, n° 19

## Canada Gazette Part II



# Gazette du Canada Partie II

OTTAWA, WEDNESDAY, SEPTEMBER 17, 2008

OTTAWA, LE MERCREDI 17 SEPTEMBRE 2008

Statutory Instruments 2008

SOR/2008-247 to 290 and SI/2008-93 to 107

Pages 1882 to 2241

Textes réglementaires 2008

DORS/2008-247 à 290 et TR/2008-93 à 107

Pages 1882 à 2241

#### NOTICE TO READERS

The Canada Gazette Part II is published under authority of the Statutory Instruments Act on January 9, 2008, and at least every second Wednesday thereafter

Part II of the *Canada Gazette* contains all "regulations" as defined in the *Statutory Instruments Act* and certain other classes of statutory instruments and documents required to be published therein. However, certain regulations and classes of regulations are exempted from publication by section 15 of the *Statutory Instruments Regulations* made pursuant to section 20 of the *Statutory Instruments Act*.

The Canada Gazette Part II is available in most libraries for consultation.

For residents of Canada, the cost of an annual subscription to the *Canada Gazette* Part II is \$67.50, and single issues, \$3.50. For residents of other countries, the cost of a subscription is US\$67.50 and single issues, US\$3.50. Orders should be addressed to Government of Canada Publications, Public Works and Government Services Canada, Ottawa, Canada K1A 0S5.

The *Canada Gazette* is also available free of charge on the Internet at http://canadagazette.gc.ca. It is accessible in Portable Document Format (PDF) and in HyperText Mark-up Language (HTML) as the alternate format. The PDF format of Part I, Part II and Part III is official since April 1, 2003, and is published simultaneously with the printed copy.

Copies of Statutory Instruments that have been registered with the Clerk of the Privy Council are available, in both official languages, for inspection and sale at Room 418, Blackburn Building, 85 Sparks Street, Ottawa, Canada.

#### AVIS AU LECTEUR

La Partie II de la *Gazette du Canada* est publiée en vertu de la *Loi sur les textes réglementaires* le 9 janvier 2008, et au moins tous les deux mercredis par la suite.

La Partie II de la *Gazette du Canada* est le recueil des « règlements » définis comme tels dans la loi précitée et de certaines autres catégories de textes réglementaires et de documents qu'il est prescrit d'y publier. Cependant, certains règlements et catégories de règlements sont soustraits à la publication par l'article 15 du *Règlement sur les textes réglementaires*, établi en vertu de l'article 20 de la *Loi sur les textes réglementaires*.

On peut consulter la Partie II de la  $Gazette\ du\ Canada$  dans la plupart des bibliothèques.

Pour les résidents du Canada, le prix de l'abonnement annuel à la Partie II de la *Gazette du Canada* est de 67,50 \$ et le prix d'un exemplaire, de 3,50 \$. Pour les résidents d'autres pays, le prix de l'abonnement est de 67,50 \$US et le prix d'un exemplaire, de 3,50 \$US. Veuillez adresser les commandes à : Publications du gouvernement du Canada, Travaux publics et Services gouvernementaux Canada, Ottawa, Canada K1A 0S5.

La Gazette du Canada est aussi disponible gratuitement sur Internet au http://gazetteducanada.gc.ca. La publication y est accessible en format de document portable (PDF) et en langage hypertexte (HTML) comme média substitut. Le format PDF en direct de la Partie II, de la Partie III et de la Partie III est officiel depuis le 1<sup>er</sup> avril 2003 et est publié en même temps que la copie imprimée.

Des exemplaires des textes réglementaires enregistrés par le greffier du Conseil privé sont à la disposition du public, dans les deux langues officielles, pour examen et vente à la Pièce 418, Édifice Blackburn, 85, rue Sparks, Ottawa, Canada.

Registration SOR/2008-273 September 5, 2008

CANADIAN ENVIRONMENTAL PROTECTION ACT, 1999

#### **PCB Regulations**

P.C. 2008-1659 September 5, 2008

Whereas, pursuant to subsection 332(1)<sup>a</sup> of the Canadian Environmental Protection Act, 1999<sup>b</sup>, the Minister of the Environment published in the Canada Gazette, Part I, November 4, 2006, a copy of the proposed PCB Regulations, substantially in the annexed form, and persons were given an opportunity to file comments with respect to the proposed Regulations or to file a notice of objection requesting that a board of review be established and stating the reasons for the objection;

Whereas, pursuant to subsection 93(3) of that Act, the National Advisory Committee has been given an opportunity to provide its advice under section 6° of that Act;

And whereas, in the opinion of the Governor in Council, pursuant to subsection 93(4) of that Act, the proposed Regulations do not regulate an aspect of a substance that is regulated by or under any other Act of Parliament in a manner that provides, in the opinion of the Governor in Council, sufficient protection to the environment and human health:

Therefore, Her Excellency the Governor General in Council, on the recommendation of the Minister of the Environment and the Minister of Health, pursuant to subsection 93(1) and section 97 of the Canadian Environmental Protection Act, 1999<sup>b</sup>, hereby makes the annexed PCB Regulations.

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#### Enregistrement

DORS/2008-273 Le 5 septembre 2008

LOI CANADIENNE SUR LA PROTECTION DE L'ENVIRONNEMENT (1999)

#### Règlement sur les BPC

C.P. 2008-1659 Le 5 septembre 2008

Attendu que, conformément au paragraphe 332(1)<sup>a</sup> de la Loi canadienne sur la protection de l'environnement (1999)<sup>b</sup>, le ministre de l'Environnement a fait publier dans la Gazette du Canada Partie I, le 4 novembre 2006, le projet de règlement intitulé Règlement sur les BPC, conforme en substance au texte ci-après, et que les intéressés ont ainsi eu la possibilité de présenter leurs observations à cet égard ou un avis d'opposition motivé demandant la constitution d'une commission de révision;

Attendu que, conformément au paragraphe 93(3) de cette loi, le comité consultatif national s'est vu accorder la possibilité de formuler ses conseils dans le cadre de l'article 6° de celle-ci;

Attendu que la gouverneure en conseil est d'avis que, aux termes du paragraphe 93(4) de cette loi, le projet de règlement ne vise pas un point déjà réglementé sous le régime d'une autre loi fédérale de manière à offrir une protection suffisante pour l'environnement et la santé humaine,

À ces causes, sur recommandation du ministre de l'Environnement et du ministre de la Santé et en vertu du paragraphe 93(1) et de l'article 97 de la Loi canadienne sur la protection de l'environnement (1999)<sup>b</sup>, Son Excellence la Gouverneure générale en conseil prend le Règlement sur les BPC, ci-après.

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Definiti	ons <b>1.</b> (1) The following definitions apply in these Regulations.		(1) Les définitions qui suivent s'appliquent au Définitions nt règlement.		
"Act" « Loi »	"Act" means the Canadian Environmental Protection Act, 1999.	la	C » Tout biphényle chloré visé à l'article 1 de «BPC» liste des substances toxiques de l'annexe 1 de "PCB"		
"authori facility" « install agréée » "Nation Code"	transfer site, that is authorized by the authorities of the jurisdiction in which it is located to process PCBs or products containing PCBs or to conduct laboratory analysis or research with PCBs or products containing PCBs.	la Loi.  « Code national de prévention des incendies » Le Code national de prévention des incendies — Canada 2005, CNRC 47667F, avec ses modifications successives, publié par la Commission canadienne des codes du bâtiment et de prévention des incendies du Conseil national de recherches du Canada.			
« Code national préventi incendie	de Canadian Commission on Building and Fire Codes, National Research Council of Canada, as		« installation agréée » Installation — notamment un centre de transfert — qui est autorisée par les autorités du territoire où elle est située à transformer « installation agréée » "authorized facility"		

"PCB"  $\ll BPC \gg$  "PCB" means any chlorobiphenyl described in item 1 of the List of Toxic Substances in Schedule 1 to the Act.

"process" « transformer » "process" includes to mix with a product.

"product" « produit » "product" includes equipment.

Concentration several matrices

(2) For the purposes of these Regulations, if a solid or a liquid containing PCBs is composed of several matrices, the concentration of PCBs is based on the mass of the matrix in which the PCBs are located.

Concentration and quantity

- (3) For the purposes of these Regulations, the concentration and quantity of PCBs shall be determined
  - (a) by a laboratory
    - (i) accredited by the Standards Council of Canada (SCC), the Canadian Association for Environmental Analytical Laboratories Inc. (CAEAL), or any other accreditation body that is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement, and the laboratory shall be accredited in accordance with the International Organization for Standardization standard ISO/IEC 17025:2005 entitled General Requirements for the Competence of Testing and Calibration Laboratories, as amended from time to time, and
    - (ii) for which the scope of accreditation shall include the analytical method used to determine the concentration of PCBs in the matrix in which the PCBs are located; or
  - (b) by a laboratory
    - (i) accredited in accordance with the Environmental Quality Act, R.S.Q., c. Q-2, as amended from time to time, and
    - (ii) for which the scope of accreditation shall include the analytical method used to determine the concentration of PCBs in the matrix in which the PCBs are located.

Sampling method

(4) For the purposes of these Regulations, other than section 13, the concentration of PCBs in a matrix is determined using a provincially, nationally or internationally recognized sampling method for PCBs in the matrix in which the PCBs are located.

Sampling method bulk solid products

(5) For the purposes of section 13, the concentration of PCBs is determined using a sampling method for bulk solid products, which is set out in either federal or provincial legislation, as amended from time to time, or approved by the United States Environmental Protection Agency for compliance with the Resource Conservation and Recovery Act or with the regulations made under that Act, as amended from time to time.

des BPC ou des produits qui en contiennent, ou à les utiliser pour des analyses de laboratoire ou des recherches.

«Loi» La Loi canadienne sur la protection de "Loi» "Act" l'environnement (1999).

« produit » S'entend notamment d'une pièce d'équipement.

« transformer » S'entend notamment du fait de mélanger avec tout produit.

« transformer » "process"

(2) Pour l'application du présent règlement, lors- Concentration qu'un solide ou un liquide qui contient des BPC est — plusie matrices composé de plusieurs matrices, la concentration de BPC est basée sur la masse de la matrice dans laquelle les BPC se trouvent.

(3) Pour l'application du présent règlement, la Concentration concentration et la quantité de BPC sont déterminées:

- a) soit par tout laboratoire:
  - (i) qui est accrédité à la norme de l'Organisation internationale de normalisation intitulée Exigences générales concernant la compétence des laboratoires d'étalonnages et d'essais (ISO/IEC 17025:2005), avec ses modifications successives, par le Conseil canadien des normes (CCN), l'Association canadienne des laboratoires d'analyse environnementale (ACLAE) ou tout autre organisme d'accréditation signataire de l'International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement,
  - (ii) dont la portée d'accréditation couvre la méthode d'analyse utilisée pour déterminer la concentration des BPC dans la matrice dans laquelle les BPC se trouvent;
- b) soit par tout laboratoire:
  - (i) qui est accrédité conformément à la Loi sur la qualité de l'environnement, L.R.Q., ch. Q-2, avec ses modifications successives,
  - (ii) dont la portés d'accréditation couvre la méthode d'analyse utilisée pour déterminer la concentration des BPC dans la matrice dans laquelle se trouvent les BPC.
- (4) Pour l'application du présent règlement, sauf Méthode l'article 13, la concentration de BPC se trouvant d'échantillondans une matrice est déterminée au moyen de toute méthode d'échantillonnage pour les BPC dans cette matrice qui est reconnue à l'échelle provinciale, nationale ou internationale.

(5) Pour l'application de l'article 13, la concen- Méthode tration de BPC est déterminée au moyen de toute d'échantillonméthode d'échantillonnage pour les produits solides en vrac qui est prévue par une loi ou un règlement fédéral ou provincial, avec ses modifications successives, ou qui est approuvée par la United States Environmental Protection Agency pour l'application de la loi des États-Unis intitulée Resource Conservation and Recovery Act ou de ses règlements avec leurs modifications successives.

nage produits solides en vrac

Application

2. (1) These Regulations apply to PCBs and to any products containing PCBs.

Nonapplication

- (2) These Regulations do not apply to the following:
  - (a) the export and import of PCBs that are hazardous waste or hazardous recyclable material within the meaning of the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations or the export of PCBs that are waste within the meaning of the PCB Waste Export Regulations, 1996;
  - (b) the sale, importation or advertising of liquids containing PCBs for use in microscopy, including immersion oils, but not including refractive index oils, which is prohibited under section 4 of the Hazardous Products Act; and
  - (c) the offer for sale, sale and use of land contaminated with PCBs or with products containing PCBs.

Sale of property

- 3. Nothing in these Regulations shall be construed as preventing the sale of
  - (a) personal property or movables that contain PCBs, or real property or immovables that have PCBs or products containing PCBs, and that form part of the sale of the whole or part of a business, including a manufacturing or a processing business;
  - (b) real property or immovables that have products containing PCBs if the products continue to be used after the sale for the same purpose at the same place and are an integral part of the property or immovable; or
  - (c) real property or immovables on which a PCB storage site is located.

Compliance

**4.** In addition to the persons who must comply with the requirements set out in these Regulations, a person who owns PCBs or products containing PCBs shall ensure that the requirements of these Regulations with respect to those PCBs or products are met.

#### PART 2

#### PROHIBITIONS AND PERMITTED ACTIVITIES

#### **PROHIBITIONS**

Release into the environment

- **5.** (1) No person shall release PCBs into the environment, other than from the equipment referred to in subsection (2), in a concentration of
  - (a) 2 mg/kg or more for a liquid containing
  - (b) 50 mg/kg or more for a solid containing PCBs.

Release from equipment

(2) No person shall release more than one gram of PCBs into the environment from equipment

- 2. (1) Le présent règlement s'applique aux BPC Application et à tout produit qui en contient.
- (2) Il ne s'applique toutefois pas aux activités Exclusion suivantes:
  - a) l'exportation et l'importation de BPC qui sont des déchets dangereux ou des matières recyclables dangereuses au sens du Règlement sur l'exportation et l'importation de déchets dangereux et de matières recyclables dangereuses et l'exportation de déchets contenant des BPC au sens du Règlement sur l'exportation de déchets contenant des BPC (1996);
  - b) la vente, l'importation ou la publicité des liquides pour usage en microscopie qui contiennent des BPC, y compris les huiles à immersion mais à l'exclusion des huiles à indice de réfraction, interdites par l'article 4 de la Loi sur les produits dangereux;
  - c) la mise en vente, la vente et l'utilisation de terrains contaminés par des BPC ou des produits qui en contiennent.
- 3. Le présent règlement n'a pas pour effet d'em- Vente de biens pêcher la vente des biens suivants :

- a) tout bien meuble ou personnel qui contient des BPC ou tout bien immeuble ou réel où se trouvent des BPC ou des produits qui en contiennent, lesquels biens sont compris dans la vente de tout ou partie d'une entreprise, y compris une entreprise de fabrication ou de transformation;
- b) tout bien immeuble ou réel dont font partie intégrante les produits qui contiennent des BPC qui s'y trouvent, si les produits continuent d'être utilisés aux mêmes fins et au même endroit après la vente:
- c) tout bien immeuble ou réel où se trouve un dépôt de BPC.
- 4. En plus des personnes auxquelles il incombe Conformité des obligations en vertu du présent règlement, le propriétaire de BPC ou de produits qui en contiennent veille à ce que les exigences du présent règlement concernant ces BPC ou produits soient remplies.

#### PARTIE 2

#### INTERDICTIONS ET ACTIVITÉS PERMISES

#### INTERDICTIONS

5. (1) Il est interdit de rejeter dans l'environne- Rejet dans ment, autrement qu'à partir d'une pièce d'équipement visée au paragraphe (2), des BPC de l'une ou l'autre des concentrations suivantes :

a) dans le cas d'un liquide qui contient des BPC, une concentration égale ou supérieure à 2 mg/kg;

- b) dans le cas d'un solide qui contient des BPC, une concentration égale ou supérieure à 50 mg/kg.
- (2) Il est interdit de rejeter plus d'un gramme de Rejet à partir BPC dans l'environnement à partir d'une pièce d'une pièce d'équipement

l'environnement

referred to in section 16 that is in use or from equipment in use for which an extension has been granted under section 17.

Prohibited activities

- 6. Except as provided in these Regulations, no person shall
  - (a) manufacture, export or import PCBs or a product containing PCBs in a concentration of 2 mg/kg or more;
  - (b) offer for sale or sell PCBs or a product containing PCBs in a concentration of 50 mg/kg or
  - (c) process or use PCBs or a product containing PCBs.

#### PERMITTED ACTIVITIES

Laboratory analysis

- 7. A person may manufacture, export, import, offer for sale, sell, process and use PCBs or products containing PCBs for the purpose of laboratory analysis if the analysis is conducted
  - (a) in an authorized facility that is authorized for that purpose; or
  - (b) in a facility that conforms to internationally recognized guidelines on best laboratory practices, if the authorities of the jurisdiction in which the facility is located do not have a mechanism in place to authorize the facility to conduct the analysis.

Research

- **8.** (1) A person may offer for sale or sell PCBs or products containing PCBs to be processed or used for the purpose of research to determine the effects of those PCBs or products on human health or on the environment, if the facility in which they are processed or used is
  - (a) an authorized facility that is authorized for that purpose; or
  - (b) a facility that conforms to internationally recognized guidelines on best laboratory practices, if the authorities of the jurisdiction in which the facility is located do not have a mechanism in place to authorize the facility to conduct the research.

Processing and use

(2) A person may process and use the PCBs or products containing PCBs for the purpose of the research referred to in subsection (1) at a facility that meets the requirement set out in paragraph (1)(a) or (b).

Electrical capacitor

- 9. A person may offer for sale, sell and use an electrical capacitor containing PCBs if the electrical capacitor
  - (a) is an integral part of a consumer product;
  - (b) is fusion sealed; and
  - (c) would be rendered inoperable and irreparable if the PCBs were removed from it.

Aircraft, ships, trains and other vehicles

**10.** A person may export, import, offer for sale, sell and use for transportation purposes aircraft, ships, trains and other vehicles that contain PCBs d'équipement visée à l'article 16 qui est en usage ou d'une pièce d'équipement dont l'usage fait l'objet d'une prolongation en vertu de l'article 17 et qui est en usage.

6. Sauf dans la mesure prévue par le présent rè- Activités glement, il est interdit:

- a) de fabriquer, d'exporter ou d'importer des BPC ou tout produit qui en contient en une concentration égale ou supérieure à 2 mg/kg;
- b) de mettre en vente ou de vendre des BPC ou tout produit qui en contient en une concentration égale ou supérieure à 50 mg/kg;
- c) de transformer ou d'utiliser des BPC ou tout produit qui en contient.

#### ACTIVITÉS PERMISES

7. Il est permis de fabriquer, d'exporter, d'impor- Analyses de ter, de mettre en vente, de vendre, de transformer et d'utiliser des BPC et des produits qui en contiennent pour des analyses de laboratoire, si celles-ci sont effectuées:

laboratoire

- a) dans toute installation agréée à cette fin;
- b) dans le cas où les autorités du territoire où elle est située ne disposent d'aucun mécanisme l'autorisant à les effectuer, dans toute installation qui est conforme à des lignes directrices, reconnues à l'échelle internationale, sur les pratiques exemplaires en laboratoire.
- 8. (1) Il est permis de mettre en vente ou de ven-Recherches dre des BPC ou des produits qui en contiennent pour qu'ils soient utilisés ou transformés à des fins de recherche visant à déterminer les effets des BPC ou des produits sur la santé humaine ou l'environnement, si l'installation où ils sont utilisés ou transformés se conforme à l'une ou l'autre des exigences suivantes:

a) elle est agréée à cette fin;

- b) dans le cas où les autorités du territoire où elle est située ne disposent d'aucun mécanisme l'autorisant à effectuer des recherches, elle est conforme à des lignes directrices, reconnues à l'échelle internationale, sur les pratiques exemplaires en laboratoire.
- (2) Il est permis de transformer et d'utiliser des Transformation BPC et des produits qui en contiennent pour effec- et utilisation tuer les recherches visées au paragraphe (1) dans une installation qui se conforme à l'une ou l'autre des exigences prévues à ce paragraphe.

- 9. Il est permis de mettre en vente, de vendre et Condensateurs d'utiliser tout condensateur électrique qui contient électriques des BPC, si les conditions suivantes sont réunies :
  - a) il fait partie intégrante d'un produit de consommation;
  - b) ses joints sont thermoscellés;
  - c) il ne fonctionnerait plus et serait irréparable si les BPC en étaient extraits.
- 10. Il est permis d'exporter, d'importer, de met- Aéronefs, tre en vente, de vendre et d'utiliser pour le transport, tout aéronef, navire, train ou autre véhicule véhicules

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only in their communication, navigation or electronic control equipment or cables.

Colouring pigment

11. (1) A person may manufacture, export, import, offer for sale, sell, process and use a colouring pigment containing PCBs produced incidentally if the concentration of the PCBs is less than 50 mg/kg.

Annual average concentration

(2) Despite subsection (1), the annual average concentration of PCBs produced incidentally in colouring pigment that a person may manufacture, export, import, offer for sale, sell, process and use shall not exceed 25 mg/kg.

Destruction

12. A person may process PCBs or products containing PCBs for the purpose of destroying PCBs or recovering PCBs for the purpose of destroying them in an authorized facility that is authorized for that purpose.

Solid products

**13.** (1) A person may manufacture solid products containing PCBs in a concentration of less than 50 mg/kg using bulk solid products containing PCBs in a concentration of less than 50 mg/kg, and may use those solid products.

Application

(2) Subsection (1) only applies to the manufacture of the types of products that are manufactured before the day on which these Regulations come into force.

Exception

(3) No person shall offer for sale or sell the products manufactured in accordance with subsection (1) unless the products are used in the course of a commercial or industrial activity.

Cables, pipelines, electrical capacitors and other equipment

- **14.** (1) A person may use the following products containing PCBs:
  - (a) cables, if they remain in place on the day on which these Regulations come into force;
  - (b) pipelines that transport natural gas, petroleum or petroleum products and any associated equipment that is in contact with the natural gas, petroleum or petroleum products if the pipelines and the equipment remain in place on the day on which these Regulations come into force;
  - (c) fusion sealed capacitors if they are used in relation to communication equipment or electronic control equipment; and
  - (d) the following equipment containing PCBs in a concentration of less than 50 mg/kg if the equipment is used for the purpose for which it was manufactured:
    - (i) electrical capacitors, other than light ballasts, and electrical transformers and their auxiliary electrical equipment, other than pole-top electrical transformers and their pole-top auxiliary electrical equipment,
    - (ii) electromagnets that are not used in the handling of food, feed or any additive to food or feed, and

dont seuls l'équipement de communication, de navigation ou de commande électronique ou les câbles contiennent des BPC.

11. (1) Il est permis de fabriquer, d'exporter, Pigments pour d'importer, de mettre en vente, de vendre, de transformer et d'utiliser des pigments pour la coloration qui contiennent des BPC produit par inadvertance en une concentration inférieure à 50 mg/kg.

la coloration

(2) Toutefois, la concentration moyenne annuelle Moyenne de BPC produit par inadvertance dans les pigments annuelle maximale pour la coloration fabriqués, exportés, importés, mis en vente, vendus, transformés et utilisés par toute personne ne peut dépasser 25 mg/kg.

12. Il est permis, dans une installation agréée à Destruction cette fin, de transformer des BPC et des produits qui en contiennent pour les détruire ou pour les récupérer afin de les détruire.

13. (1) Il est permis de fabriquer des produits so- Produits solides lides qui contiennent des BPC en une concentration inférieure à 50 mg/kg à partir de produits solides en vrac qui eux-mêmes contiennent des BPC en une concentration inférieure à 50 mg/kg et d'utiliser ces produits solides.

(2) Le paragraphe (1) ne s'applique qu'aux types Application de produits qui sont fabriqués avant l'entrée en vigueur du présent règlement.

(3) Il est interdit de mettre en vente ou de vendre Exception des produits fabriqués conformément au paragraphe (1) pour tout usage en dehors d'une activité commerciale ou industrielle.

- 14. (1) Il est permis d'utiliser les produits ci- Câbles, après qui contiennent des BPC :
  - a) tout câble, s'il demeure à l'endroit où il se électriques et trouvait à l'entrée en vigueur du présent pièces règlement;
  - b) tout pipeline qui transporte du gaz naturel, du pétrole ou des produits pétroliers, ainsi que tout équipement connexe qui est en contact avec le gaz naturel, le pétrole ou les produits pétroliers, si le pipeline et l'équipement demeurent à l'endroit où ils se trouvaient à l'entrée en vigueur du présent règlement;
- c) tout condensateur électrique dont les joints sont thermoscellés et qui est utilisé à des fins de communication ou de commande électronique;
- d) les pièces d'équipement ci-après qui contiennent des BPC en une concentration inférieure à 50 mg/kg et qui sont utilisées aux fins auxquelles elles étaient destinées lors de leur fabrication :
  - (i) les condensateurs électriques, autres que les ballasts de lampes, et les transformateurs électriques et tout équipement électrique connexe, à l'exception des transformateurs sur poteaux et de tout équipement électrique connexe sur poteaux,

pipelines, condensateurs d'équipements (iii) heat transfer equipment, hydraulic equipment, vapour diffusion pumps and bridge bearings.

Electrical capacitors

(2) A person may import fusion sealed capacitors containing PCBs for use in relation to communication tactical equipment or electronic control tactical equipment.

Liquids for servicing concentration less than 2 mg/kg

Liquids for servicing concentration of 500 mg/kg or more

**15.** (1) A person may use liquids containing PCBs in a concentration of less than 2 mg/kg for the purpose of servicing equipment containing PCBs.

(2) A person may use liquids containing PCBs in a concentration of 500 mg/kg or more for the purpose of servicing equipment containing PCBs in a concentration of 500 mg/kg or more until December 31, 2009.

#### END-OF-USE DATES AND EXTENSION

Equipment referred to in subparagraphs 14(1)(d)(i) to (iii)

- **16.** (1) A person may use the equipment referred to in subparagraphs 14(1)(d)(i) to (iii) until the following dates if the equipment is in use on the day on which these Regulations come into force:
  - (a) in the case of equipment containing PCBs in a concentration of 500 mg/kg or more, December 31, 2009; and
  - (b) in the case of equipment containing PCBs in a concentration of at least 50 mg/kg but less than 500 mg/kg,
    - (i) December 31, 2009, if the equipment is located at a drinking water treatment plant or food or feed processing plant, in a child care facility, preschool, primary school, secondary school, hospital or senior citizens' care facility or on the property on which the plant or facility is located and within 100 m of it, and
    - (ii) December 31, 2025, if the equipment is located at any other place.

Light ballasts and pole-top electrical transformers

- (2) A person may use the following equipment containing PCBs in a concentration of 50 mg/kg or more until December 31, 2025, if the equipment is in use on the day on which these Regulations come into force:
  - (a) light ballasts; and
  - (b) pole-top electrical transformers and their pole-top auxiliary electrical equipment.

Liquid concentration of 2 mg/kg or more

(3) A person may use a liquid containing 2 mg/kg or more of PCBs that is in equipment until the day on which the liquid is removed from the equipment.

- (ii) les électroaimants ne servant pas à la manutention des aliments destinés aux humains ou aux animaux, ou de tout additif à ces aliments.
- (iii) l'équipement caloporteur, l'équipement hydraulique, les pompes à diffusion de vapeur et les appareils d'appui de pont.
- (2) Il est permis d'importer tout condensateur Condensateurs électrique qui contient des BPC et dont les joints sont thermoscellés pour qu'il soit utilisé à des fins de communication tactique ou de commande électronique tactique.

électriques

15. (1) Il est permis d'utiliser tout liquide qui Liquides pour contient des BPC en une concentration inférieure à 2 mg/kg pour l'entretien de toute pièce d'équipement qui contient des BPC.

entretien concentration inférieure à 2 mg/kg

(2) Il est également permis, jusqu'au 31 décem- Liquide pour bre 2009, d'utiliser tout liquide qui contient des entretien BPC en une concentration égale ou supérieure à de 500 mg/kg 500 mg/kg pour l'entretien de toute pièce d'équipe- ou plus ment qui elle-même contient des BPC en une concentration égale ou supérieure à 500 mg/kg.

concentration

#### UTILISATION — DATES LIMITES ET PROLONGATION

16. (1) Il est permis d'utiliser les pièces d'équi- Pièces pement visées aux sous-alinéas 14(1)d)(i) à (iii) qui sont en usage à l'entrée en vigueur du présent règlement jusqu'aux dates suivantes :

d'équipement visées aux sous-alinéas 14(1)d)(i) à (iii)

- a) si elles contiennent des BPC en une concentration égale ou supérieure à 500 mg/kg, jusqu'au 31 décembre 2009;
- b) si elles contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg mais inférieure à 500 mg/kg:
  - (i) jusqu'au 31 décembre 2009, si elles se trouvent dans une usine de traitement d'eau potable ou de transformation des aliments destinés aux humains ou aux animaux, dans une garderie, dans une école — de niveau préscolaire, primaire ou secondaire —, dans un hôpital ou dans une résidence pour personnes âgées ou sur le terrain d'un tel établissement, à 100 m ou moins de celui-ci,
- (ii) jusqu'au 31 décembre 2025, si elles se trouvent à tout autre endroit.
- (2) Il est permis, jusqu'au 31 décembre 2025, Ballasts de d'utiliser les pièces d'équipement ci-après qui sont en usage à l'entrée en vigueur du présent règlement et qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg :

lampes et transformateurs sur poteaux

- a) les ballasts de lampes;
- b) les transformateurs sur poteaux ainsi que tout équipement électrique connexe sur poteaux.
- (3) Il est permis d'utiliser tout liquide qui con- Liquides tient des BPC en une concentration égale ou supérieure à 2 mg/kg dans une pièce d'équipement jusqu'à ce qu'il en soit extrait.

concentration de 2 mg/kg ou Extension of end-of-use date

17. (1) Despite subsection 15(2), paragraph 16(1)(a) and subparagraph 16(1)(b)(i), a person may use the equipment and the liquids used for servicing that equipment, referred to in those provisions, until the date set out in an extension granted by the Minister under subsection (2) for that equipment and those liquids.

Application

- (2) The Minister shall, on receiving a written application containing the information set out in subsection (3), grant an extension up to the date applied for but no later than December 31, 2014, if either of the following conditions are met:
  - (a) the equipment is being replaced with equipment that is engineered to order, and
    - (i) it is not technically feasible to replace the equipment on or before December 31, 2009,
    - (ii) the applicant is taking all necessary measures to minimize or eliminate any harmful effect of the PCBs in the equipment on the environment and on human health,
    - (iii) a plan has been prepared, along with timelines, to end the use of the equipment by the date applied for,
    - (iv) a plan has been prepared for inspecting the equipment on a monthly basis for the period of the extension for damage that could lead to the release of PCBs, and
    - (v) the equipment bears the label required under section 29; or
  - (b) the equipment is located at a facility that is scheduled for permanent closure on or before December 31, 2014, and
    - (i) the applicant is taking all necessary measures to minimize or eliminate any harmful effect of the PCBs in the equipment on the environment and on human health,
    - (ii) a plan has been prepared, along with timelines, to end the use of the equipment by the date applied for,
    - (iii) a plan has been prepared for inspecting the equipment on a monthly basis, for the period of the extension, for damage that could lead to the release of PCBs, and
    - (iv) the equipment bears the label required under section 29.

Information

- (3) The application shall contain the following:
- (a) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the applicant and of any person authorized to act on the applicant's behalf;
- (b) a technical description of the equipment which is the subject of the application, including
  - (i) the type and function of the equipment,
  - (ii) the quantity of liquid containing PCBs that is in the equipment and the quantity of liquid needed for servicing that equipment, expressed in litres,

17. (1) Malgré le paragraphe 15(2), l'alinéa 16(1)a) Prolongation de et le sous-alinéa  $1\hat{6}(1)\hat{b})(\hat{i})$ , il est permis d'utiliser la date de fin les pièces d'équipement et les liquides utilisés pour leur entretien visés à ces dispositions jusqu'à l'expiration de toute prolongation accordée par le ministre en vertu du paragraphe (2) pour ces pièces d'équipement et ces liquides.

(2) Sur réception d'une demande écrite compor- Demande tant les renseignements prévus au paragraphe (3), le ministre accorde une prolongation jusqu'à la date prévue dans la demande mais au plus tard jusqu'au 31 décembre 2014, si l'une ou l'autre des conditions suivantes est remplie:

a) la pièce d'équipement doit être remplacée par une pièce d'équipement conçue et fabriquée sur

- (i) il est techniquement impossible de le faire le 31 décembre 2009 ou avant cette date,
- (ii) le demandeur prend les mesures nécessaires pour éliminer ou atténuer tout effet nocif des BPC contenus dans la pièce sur l'environnement et la santé humaine,
- (iii) un plan, incluant un échéancier, a été dressé afin que l'utilisation de la pièce cesse au plus tard à la date prévue dans la demande,
- (iv) un plan a été dressé pour l'inspection de la pièce une fois par mois durant la prolongation afin que soit décelé tout dommage pouvant mener au rejet de BPC,
- (v) la pièce porte l'étiquette exigée par l'article 29;
- b) la pièce d'équipement se trouve dans une installation dont la fermeture permanente est prévue au plus tard pour le 31 décembre 2014 et :
  - (i) le demandeur prend les mesures nécessaires pour éliminer ou atténuer tout effet nocif des BPC contenus dans la pièce sur l'environnement et la santé humaine,
  - (ii) un plan, incluant un échéancier, a été dressé afin que l'utilisation de la pièce cesse au plus tard à la date prévue dans la demande,
  - (iii) un plan a été dressé pour l'inspection de la pièce une fois par mois durant la prolongation afin que soit décelé tout dommage pouvant mener au rejet de BPC;
  - (iv) la pièce porte l'étiquette exigée par l'article 29.
- (3) La demande comporte :

Renseignements

- a) les nom, adresses municipale et postale et numéro de téléphone du demandeur et de toute personne autorisée à agir en son nom et, le cas échéant, leurs numéro de télécopieur et adresse électronique:
- b) les caractéristiques techniques de la pièce d'équipement qui fait l'objet de la demande, notamment:
  - (i) son type et sa fonction,
  - (ii) la quantité de liquide qui contient des BPC qui s'y trouve et la quantité de liquide nécessaire pour son entretien, exprimées en litres,

d'utilisation

- (iii) the concentration of PCBs in the liquid, expressed in milligrams of PCBs per kilogram of liquid,
- (iv) the quantity of PCBs in the liquid that is in the equipment, expressed in kilograms, and
- (v) the name-plate description, if any, and the manufacturer's serial number, if any;
- (c) the unique identification number that is on the label required under section 29;
- (d) the name, if any, and civic address of the facility where the equipment is located, or, if there is no civic address, the location using the owner's site identification system, and the function and technical description of the facility;
- (e) information demonstrating that
  - (i) it is not technically feasible to replace the equipment on or before December 31, 2009, or
  - (ii) the facility where the equipment is located is scheduled for permanent closure on or before December 31, 2014;
- (f) information demonstrating that the applicant is taking all necessary measures to minimize or eliminate any harmful effect of the PCBs that are contained in the equipment on the environment and on human health;
- (g) the plan, along with timelines, for ending the use of the equipment; and
- (h) the plan for inspecting the equipment.
- Notice of change to information
- (4) The applicant shall notify the Minister in writing of any change to the information provided under subsection (3) within 30 days after the day on which the change occurs.

False or misleading information

(5) The Minister shall refuse to grant an extension if the Minister has reasonable grounds to believe that the applicant has provided false or misleading information in support of its application.

Revocation

- (6) The Minister shall revoke the extension if
- (a) the requirements set out in subsection (2) are no longer met during the period of the extension;
- (b) the Minister has reasonable grounds to believe that the applicant has provided false or misleading information to the Minister in support of its application.

Reasons for revocation

- (7) The Minister shall not revoke the extension unless the Minister provides the applicant with
  - (a) written reasons for the revocation; and
  - (b) an opportunity to be heard, by written representation, in respect of the revocation.

- (iii) la concentration de BPC dans le liquide, exprimée en milligrammes de BPC par kilogramme de liquide,
- (iv) la quantité de BPC dans le liquide qui s'y trouve, exprimée en kilogrammes,
- (v) s'il y a lieu, l'information figurant sur la plaque d'identification et le numéro de série de son fabricant:
- c) le numéro d'identification unique figurant sur l'étiquette en application de l'article 29;
- d) le nom, s'il y a lieu, et l'adresse municipale de l'installation où se trouve la pièce d'équipement ou, à défaut, l'endroit où elle se trouve d'après le système d'identification de site du propriétaire, et la fonction et les caractéristiques techniques de l'installation;
- e) les renseignements qui établissent :
  - (i) soit qu'il est techniquement impossible de remplacer la pièce d'équipement le 31 décembre 2009 ou avant cette date,
  - (ii) soit que la fermeture permanente de l'installation dans laquelle se trouve la pièce d'équipement est prévue au plus tard pour le 31 décembre 2014;
- f) les renseignements qui établissent que les mesures nécessaires ont été prises par le demandeur pour éliminer ou atténuer tout effet nocif des BPC contenus dans la pièce d'équipement sur l'environnement et la santé humaine;
- g) le plan et l'échéancier qui seront mis en œuvre afin que cesse l'utilisation de la pièce d'équipement;
- h) le plan d'inspection de la pièce d'équipement.
- (4) Le demandeur est tenu d'aviser le ministre Avis de par écrit de tout changement des renseignements changement fournis en application du paragraphe (3) dans les renseignements trente jours suivant la date du changement.

(5) Le ministre refuse d'accorder une prolongation s'il a des motifs raisonnables de croire que le demandeur a fourni des renseignements faux ou trompeurs au soutien de sa demande.

Renseignements faux ou trompeurs

Révocation

- (6) Il révoque la prolongation :
- a) si, durant la prolongation, les conditions prévues au paragraphe (2), selon le cas, ne sont plus remplies;
- b) s'il a des motifs raisonnables de croire que le demandeur lui a fourni des renseignements faux ou trompeurs au soutien de sa demande.
- (7) Il ne peut toutefois révoquer la prolongation Motifs de que si, à la fois :

révocation

- a) il a avisé le titulaire par écrit des motifs de la révocation;
- b) il lui a donné la possibilité de présenter des observations écrites au sujet de celle-ci.

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#### PART 3

#### **STORAGE**

Application concentration of 50 mg/kg or

- 18. (1) Subject to subsection (3), this Part applies to a solid or liquid product containing PCBs in a concentration of 50 mg/kg or more
  - (a) that is in an amount equal to or greater than 100 L if the product is a liquid, or in an amount equal to or greater than 100 kg if the product is a solid; or
  - (b) that is in a lesser amount if the product contains 1 kg or more of PCBs.

Determination of amount

(2) For the purposes of subsection (1), the amount of PCBs or products containing PCBs is the aggregate of all amounts of PCBs and products that are located at a particular site.

Nonapplication

- (3) This Part does not apply in respect of the following products containing PCBs:
  - (a) solid or liquid products that are processed daily or used;
  - (b) pipelines that transport natural gas, petroleum or petroleum products, and any associated equipment that is in contact with the natural gas, petroleum or petroleum products, if they remain in place on the day on which these Regulations come into force; and
  - (c) cables, if they remain in place on the day on which these Regulations come into force.

Requirement to store

- **19.** (1) A person who owns, controls or possesses PCBs or products containing PCBs that are not processed daily or used shall, within 30 days after the day on which those PCBs or products are no longer processed or used or within 30 days after the day on which these Regulations come into force, whichever is later, either
  - (a) send them for destruction to an authorized facility that is authorized for that purpose; or
  - (b) store them at a PCB storage site for the period during which they are not processed daily or

Remote from or no access to roadway

(2) Despite subsection (1), if the PCBs or products containing PCBs are remote from a roadway system or if there is no access to a roadway system, the person who owns, controls or possesses the PCBs or products may store them at a PCB storage site as soon as feasible but no later than one year after the day on which they are not processed daily or used or one year after the day on which these Regulations come into force, whichever is later. That person shall use best management practices for them from the time that they cease to be processed daily or used until the time that they are stored at a PCB storage site.

Prohibition against storage

**20.** (1) Effective one year after the day on which these Regulations come into force, no person shall store PCBs or products containing PCBs at the

#### PARTIE 3

#### **STOCKAGE**

18. (1) Sous réserve du paragraphe (3), la pré- Application – sente partie s'applique aux produits liquides ou solides qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg et :

Concentration égale ou supérieure à 50 mg/kg

- a) dont la quantité est égale ou supérieure à 100 L, dans le cas d'un produit liquide, ou à 100 kg, dans le cas d'un produit solide;
- b) dont la quantité est moindre, si ces produits renferment 1 kg ou plus de BPC.
- (2) Pour l'application du paragraphe (1), la quantité Détermination de BPC ou de produits qui en contiennent correspond à la somme de toutes les quantités de BPC et de produits qui se trouvent dans un même emplacement.

des quantités

(3) La présente partie ne s'applique pas aux pro- Exclusion duits ci-après qui contiennent des BPC :

- a) les produits liquides ou solides qui sont transformés quotidiennement ou utilisés;
- b) tout pipeline qui transporte du gaz naturel, du pétrole ou des produits pétroliers, ainsi que tout équipement connexe qui est en contact avec le gaz naturel, le pétrole ou les produits pétroliers, si le pipeline et l'équipement demeurent à l'endroit où ils se trouvaient à l'entrée en vigueur du présent règlement;
- c) les câbles, s'ils demeurent à l'endroit où ils se trouvaient à l'entrée en vigueur du présent règlement.
- 19. (1) Le propriétaire de BPC ou de produits qui Obligation de en contiennent ou la personne qui en a la possession ou le contrôle est tenu, dans les trente jours suivant la date où ceux-ci cessent d'être transformés quotidiennement ou utilisés ou celle de l'entrée en vigueur du présent règlement, selon la plus tardive de ces dates:

- a) soit de les expédier pour qu'ils soient détruits dans une installation agréée à cette fin;
- b) soit de les stocker dans un dépôt de BPC pendant qu'ils ne sont pas transformés quotidiennement ou utilisés.
- (2) Si les BPC ou les produits qui en contiennent Endroit éloigné sont éloignés de tout système routier ou se trouvent ou inaccessible à un endroit où il n'y a pas d'accès à un tel système, le propriétaire ou la personne peut les stocker dans un dépôt de BPC le plus tôt possible, sans toutefois dépasser un an à compter de la date où ils cessent d'être transformés quotidiennement ou utilisés ou celle de l'entrée en vigueur du présent règlement, selon la plus tardive de ces dates. Ils sont tenus d'appliquer des pratiques exemplaires de gestion pour les BPC et les produits dès qu'ils cessent d'être transformés quotidiennement ou utilisés, et ce, jusqu'à leur stockage dans un dépôt de BPC.
- 20. (1) À compter d'un an après la date d'entrée Interdiction de en vigueur du présent règlement, il est interdit de stocker des BPC ou des produits qui en contiennent

following plants or facilities or on the land on which those plants or facilities are located and within 100 m of them:

- (a) a drinking water treatment plant or a food or feed processing plant; or
- (b) a child care facility, preschool, primary school, secondary school, hospital, or senior citizens' care facility.

Light ballasts

(2) Subsection (1) does not apply to light ballasts.

Maximum storage periods

- 21. (1) Despite any other provision in these Regulations and subject to section 22, no person shall store PCBs or products containing PCBs, other than those referred to in section 23, beyond the following time limits:
  - (a) one year, beginning on the day on which their use is no longer permitted under these Regulations or the day on which they are no longer processed daily or used, whichever is sooner, if the PCBs or products are stored at a facility that is not referred to in paragraph (1)(b) or (c);
  - (b) one year, if the PCBs or products are stored at an authorized facility that is a transfer site; and
  - (c) two years, if the PCBs or products are stored at an authorized facility that is authorized to destroy them.

Transfer sites

(2) If the PCBs or products containing PCBs are sent from one transfer site to another, the period referred to in paragraph (1)(b) begins when they are received at the first transfer site.

Destruction

(3) The owner or operator of the facility referred to in paragraph (1)(a) or (b) shall send the PCBs or products containing PCBs for destruction to an authorized facility that is authorized for that purpose within the time limit set out in those paragraphs.

Exceptions to maximum storage periods

- 22. (1) Section 21 does not apply to the storage
- (a) liquids referred to in subsection 15(2) or for which an extension has been granted under subsection 17; or
- (b) solids and liquids containing PCBs in a concentration of 50 mg/kg or more resulting from environmental restoration work and stored on site for the duration of the work, if the requirements set out in subsections (2) and (3) are complied with.

Information to be provided

- (2) The owner of the land where the solids and liquids referred to in paragraph (1)(b) are located shall submit to the Minister at least 30 days before the storage of the solids or liquids or within 30 days after the day on which these Regulations come into force, whichever is later, the following information:
  - (a) the civic address of the restoration work site or if there is no civic address, the location using the Global Positioning System;
  - (b) the date of commencement of the restoration work;
  - (c) the anticipated date of completion of the restoration work; and

dans l'un des établissements ci-après ou sur le terrain d'un tel établissement, à 100 m ou moins de celui-ci:

- a) une usine de traitement d'eau potable ou de transformation des aliments destinés aux humains ou aux animaux:
- b) une garderie, une école de niveau préscolaire, primaire ou secondaire —, un hôpital ou une résidence pour personnes âgées.
- (2) Le paragraphe (1) ne s'applique pas aux bal- Ballasts de lasts de lampes.

lampes

21. (1) Malgré toute autre disposition du présent Périodes règlement mais sous réserve de l'article 22, il est maximales de interdit de stocker des BPC et des produits qui en contiennent, autres que ceux visés à l'article 23, audelà de la période applicable suivante :

stockage

- a) un an à compter du jour où le présent règlement ne permet plus l'utilisation des BPC et des produits ou de celui, s'il est antérieur, où ils ont cessé d'être transformés quotidiennement ou utilisés, s'ils sont stockés à une installation qui n'est pas visée aux alinéas (1)b) ou c);
- b) un an, s'ils sont stockés dans une installation agréée qui est un centre de transfert;
- c) deux ans, s'ils sont stockés dans une installation agréée qui est autorisée à les détruire.
- (2) Si les BPC et les produits qui en contiennent Centres de sont expédiés d'un centre de transfert à un autre, transfert la période prévue à l'alinéa (1)b) commence à courir le jour de leur réception au premier centre de transfert.

- (3) Le propriétaire ou l'exploitant de l'installa- Destruction tion visée aux alinéas (1)a) ou b) est tenu d'expédier, dans le délai prévu à ces alinéas, les BPC ou les produits qui en contiennent pour qu'ils soient détruits dans une installation agréée à cette fin.
  - 22. (1) L'article 21 ne s'applique pas au stockage : Périodes a) des liquides visés au paragraphe 15(2) ou pour maximales de stockage lesquels une prolongation a été accordée en vertu exceptions de l'article 17;

- b) des solides et des liquides qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg et qui sont issus de travaux de restauration de l'environnement et stockés sur place pendant la durée des travaux, si les exigences prévues aux paragraphes (2) et (3) sont respectées.
- (2) Le propriétaire du terrain où se trouvent les Renseignements solides ou les liquides visés à l'alinéa (1)b) fournit à fournir au ministre, au plus tard trente jours avant la date de leur stockage ou après celle de l'entrée en vigueur du présent règlement, selon la plus tardive de ces dates, les renseignements suivants :
  - a) l'adresse municipale de l'endroit où sont effectués les travaux de restauration ou, à défaut, sa localisation d'après le système mondial de localisation:
  - b) la date de début des travaux de restauration;
  - c) la date prévue pour la fin des travaux de restauration;

(d) the anticipated date of the end of storage of the solids or liquids.

Changes to information

(3) The person referred to in subsection (2) shall notify the Minister in writing of the changes to be made at least 30 days before making any changes to the information provided under that subsection.

PCBs or products containing PCBs stored at the coming into force

23. The person who owns PCBs or products containing PCBs, other than liquids for which an extension has been granted under section 17, that are stored on the day on which these Regulations come into force shall send them no later than December 31, 2009 for destruction to an authorized facility that is authorized for that purpose.

PCB storage site

- **24.** PCBs or products containing PCBs shall be stored at a site that is
  - (a) a building, room, shipping container or other enclosed structure; or
  - (b) an area that is enclosed by a woven mesh wire fence or any other fence or wall with similar security characteristics, and the fence or wall shall be at least 1.83 m high.

Storage requirements

- 25. The owner or operator of a PCB storage site shall
  - (a) store all PCBs or products containing PCBs that are in liquid form in
    - (i) sealed containers, other than drums, that are made of steel or other metals that provide sufficient durability and strength to prevent those PCBs or products from being affected by the weather or released, or
    - (ii) drums that are
      - (A) of a capacity not greater than 205 L,
      - (B) a closed-head double-bung drum made of steel having a gauge of 16 or heavier, and
      - (C) painted or treated to prevent rusting;
  - (b) store all PCBs or products containing PCBs that are in solid form in
    - (i) containers, other than drums, that are made of steel or other materials that provide sufficient durability and strength to prevent those PCBs or products from being affected by the weather or released, or
    - (ii) drums that are
      - (A) of a capacity not greater than 205 L,
      - (B) made of steel having a gauge of 18 or
      - (C) equipped with a securely attached, removable steel lid and a gasket made of material that is resistant to the PCBs or the products containing PCBs that are stored in the drums, and
      - (D) painted or treated to prevent rusting;
  - (c) store equipment containing PCB liquids in
    - (i) containers, other than drums, that are made of steel or other materials that provide sufficient durability and strength to prevent the equipment from being affected by the weather and

- d) la date prévue pour la cessation du stockage des solides ou des liquides.
- (3) Il avise également le ministre par écrit, au Modification moins trente jours à l'avance, de toute modification apportée aux renseignements fournis.

renseignements

23. Le propriétaire de BPC ou de produits qui en BPC et contiennent, autres que des liquides pour lesquels produits qui une prolongation a été accordée en vertu de l'article 17, qui sont stockés à l'entrée en vigueur du l'entrée en présent règlement est tenu de les expédier, au plus vigueur tard le 31 décembre 2009, pour qu'ils soient détruits dans une installation agréée à cette fin.

en contiennent stockés à

24. Les BPC et les produits qui en contiennent Dépôt de BPC doivent être stockés dans un dépôt qui est :

- a) soit un bâtiment, une pièce, un conteneur ou tout autre ouvrage fermé;
- b) soit un endroit entouré d'une clôture grillagée ou d'un autre genre de clôture ou d'un mur présentant des caractéristiques similaires sur le plan de la sécurité, la clôture ou le mur ayant au moins 1,83 m de haut.
- 25. Le propriétaire ou l'exploitant d'un dépôt de Exigences

relatives au stockage

- a) stocke les BPC et les produits en contenant qui sont des liquides dans :
  - (i) soit des contenants étanches, autres que des fûts, faits d'acier ou d'autres métaux offrant une durabilité et une solidité suffisantes pour que ces BPC et ces produits ne soient pas affectés par les conditions climatiques ni rejetés,
  - (ii) soit des fûts qui, à la fois :
    - (A) ont une capacité d'au plus 205 L,
    - (B) sont faits d'acier d'épaisseur minimale 16. ont un dessus non amovible et sont munis de deux bondes,
    - (C) sont enduits d'une peinture ou d'un revêtement antirouille;
- b) stocke les BPC et les produits en contenant qui sont des solides dans :
  - (i) soit des contenants, autres que des fûts, faits d'acier ou d'autres matériaux offrant une durabilité et une solidité suffisantes pour que ces BPC et ces produits ne soient pas affectés par les conditions climatiques ni rejetés,
  - (ii) soit des fûts qui, à la fois :
    - (A) ont une capacité d'au plus 205 L,
    - (B) sont faits d'acier d'épaisseur minimale 18,
    - (C) sont dotés d'un couvercle d'acier amovible solidement fixé et d'un joint fait d'un matériau résistant aux BPC et aux produits en contenant qui y sont stockés,
    - (D) sont enduits d'une peinture ou d'un revêtement antirouille:
- c) stocke les pièces d'équipement qui renferment des liquides contenant des BPC dans :
  - (i) soit des contenants, autres que des fûts, faits d'acier ou d'autres matériaux offrant une

- to prevent any PCB liquid that leaks from the equipment from being released, or
- (ii) drums described in subparagraph (b)(ii);
- (d) store all equipment that is not in a container, other than drained equipment, if that equipment contains PCB liquid, and all containers of PCB liquid, on a floor or surface that is made of steel, concrete or any other similar durable material and that is constructed with curbing or sides that are capable of containing
  - (i) if one piece of equipment or one container is being stored, 125% of the volume of the PCB liquid in the equipment or container, and
  - (ii) if more than one piece of equipment or more than one container is being stored, the greater of twice the volume of the PCB liquid in the largest piece of equipment or the largest container and 25% of the volume of all the PCB liquid stored on the floor or surface;
- (e) if the material of the floor or surface or the curbing or sides referred to in paragraph (d) are capable of absorbing any PCB liquid or other product containing PCBs, seal the floor, surface, curbing or sides with an impervious, durable, PCB-resistant coating;
- (f) ensure that all floor drains, sumps or other openings in the floor or surface referred to in paragraph (d) are
  - (i) closed and sealed to prevent the release of liquids, or
  - (ii) connected to a drainage system suitable for liquid dangerous goods that terminates at a location where any spilled liquids will be contained and recovered and where the spilled liquids will not create a fire hazard or a risk to public health or safety;
- (g) place on skids or pallets all equipment containing PCBs and containers of PCBs or products containing PCBs that are not permanently secured to the floor or a surface;
- (h) stack containers of PCBs and products containing PCBs, other than drums, only if the containers are designed for stacking, and stack containers of PCB liquid not more than two containers high;
- (i) if drums containing PCBs or products containing PCBs are stacked, separate the drums from each other with pallets and, in the case of drums of PCB liquid, stack the drums not more than two drums high;
- (j) store equipment containing PCBs, and containers of PCBs or products containing PCBs, in a manner that makes them accessible for inspection;
- (k) store PCBs or products containing PCBs in a manner that prevents them from catching fire or being released;
- (*l*) store PCBs or products containing PCBs together, and separate them from other stored materials;

- durabilité et une solidité suffisantes pour que les pièces d'équipement ne soient pas affectées par les conditions climatiques et que les liquides, s'ils fuient des pièces, ne soient pas rejetés,
- (ii) soit des fûts visés au sous-alinéa b)(ii);
- d) stocke les pièces d'équipement autres que celles contenant des BPC qui ont été vidangées qui ne sont pas dans un contenant et qui renferment des liquides contenant des BPC, ainsi que tout contenant qui renferme de tels liquides, sur un plancher ou une surface fait d'acier, de béton ou d'un autre matériau durable semblable et entouré d'un rebord ou de côtés capables de retenir:
  - (i) si une seule pièce d'équipement ou un seul contenant est stocké, 125 % du volume des liquides contenant des BPC que renferme cette pièce d'équipement ou le contenant,
  - (ii) si plus d'une pièce d'équipement ou plus d'un contenant est stocké, le plus élevé des volumes suivants : le double du volume des liquides contenant des BPC que renferme la plus grosse pièce d'équipement ou le plus grand contenant ou 25 % du volume de l'ensemble des liquides contenant des BPC qui sont stockés sur le plancher ou la surface;
- e) scelle, au moyen d'un revêtement étanche, durable et résistant aux BPC, le plancher, la surface, le rebord ou les côtés visés à l'alinéa d), lorsqu'ils peuvent absorber des liquides ou d'autres produits qui contiennent des BPC;
- f) veille à ce que les drains de sol, puisards et autres ouvertures dans le plancher ou la surface visés à l'alinéa d) soient, selon le cas :
  - (i) obturés et scellés pour empêcher le rejet de liquides,
  - (ii) reliés à un réseau de drainage convenant aux marchandises dangereuses liquides, qui se jette dans un lieu où les liquides déversés seront confinés et récupérés et où ils ne constitueront pas un risque d'incendie ni un risque pour la santé et la sécurité publiques;
- g) place sur des patins ou des palettes les pièces d'équipement contenant des BPC et les contenants renfermant des BPC ou des produits en contenant qui ne sont pas fixés de façon permanente à un plancher ou à une surface;
- h) empile les contenants de BPC et de produits qui en contiennent, autres que les fûts, seulement s'ils sont conçus à cette fin et, dans le cas des contenants renfermant des liquides qui contiennent des BPC, ne les empile pas à plus de deux contenants de haut;
- i) s'ils sont empilés, sépare les fûts de BPC et de produits qui en contiennent les uns des autres avec des palettes et, dans le cas des fûts renfermant des liquides qui contiennent des BPC, ne les empile pas à plus de deux fûts de haut;

- (m) if reasonably practicable, equip any indoor PCB storage site having a mechanical exhaust system with heat or smoke sensory controls that stop the fan and close the intake and exhaust dampers in the event of a fire;
- (n) if equipment or containers of PCB liquid are stored outdoors, cover all PCB equipment that is not in a container, other than drained equipment, if that equipment contains PCB liquid, and all containers of PCB liquid, with a weatherproof roof or barrier that protects the equipment and containers and prevents rain or snow from entering the curbing and the sides of the floor and the surface under them; and
- (o) ensure that all drained PCB equipment and all containers of any PCB solid or PCB equipment are structurally sound and weatherproof if stored outdoors.

Access to PCB storage site

26. The owner or operator of a PCB storage site shall keep all points of access to the PCB storage site locked or guarded.

Inspection and maintenance of a PCB storage site

- **27.** The owner or operator of a PCB storage site
  - (a) inspect all floors, curbing, sides, drains, drainage systems, weatherproof roofs and barriers, fences and walls of the PCB storage site, any fire alarm system, fire extinguishers and fire suppression system and all equipment containing PCBs, containers used for the storage of PCBs or products containing PCBs and materials for clean-up at the PCB storage site
    - (i) each month,
    - (ii) at intervals of more than one month, if the Minister, on the written request of the owner or operator, determines that it is not reasonably practicable to inspect the site each month, due to its remote location, or
    - (iii) at intervals of less than one month, if more frequent inspections are necessary for the safe operation of the site; and
  - (b) keep in good condition and, if damaged, immediately repair or replace the floors, curbing, sides, drains, drainage systems, weatherproof roofs or barriers, fences, walls, fire alarm system, fire extinguishers, fire suppression system, equipment containing PCBs and containers and immediately clean up any contaminated area.

- j) stocke les pièces d'équipement qui contiennent des BPC et les contenants renfermant des BPC ou des produits qui en contiennent de manière à ce qu'ils soient accessibles à des fins d'inspection;
- k) stocke les BPC et les produits qui en contiennent de façon à empêcher leur inflammation ou
- l) stocke les BPC et les produits qui en contiennent ensemble, à l'écart des autres matériaux
- m) dans la mesure du possible, munit tout dépôt de BPC intérieur ayant un dispositif mécanique de ventilation de commandes sensibles à la chaleur ou à la fumée qui, en cas d'incendie, arrêtent le ventilateur et ferment les registres d'admission et d'évacuation d'air;
- n) s'ils sont stockés dehors, couvre les pièces d'équipement — autres que celles contenant des BPC qui ont été vidangées — qui ne sont pas dans un contenant et qui renferment des liquides contenant des BPC, ainsi que tout contenant qui renferme de tels liquides, d'une toiture ou d'un écran à l'épreuve des intempéries qui les protège et empêche la pluie et la neige de pénétrer à l'intérieur du rebord et des côtés du plancher et de la surface sur lesquels ils sont posés;
- o) s'ils sont stockés dehors, veille à ce que les pièces d'équipement contenant des BPC qui ont été vidangées et tout contenant qui renferme des solides ou des pièces d'équipement contenant des BPC aient une structure en bon état et soient à l'épreuve des intempéries.
- 26. Le propriétaire ou l'exploitant d'un dépôt de Accès au dépôt BPC tient chaque point d'accès au dépôt verrouillé ou veille à ce qu'il soit gardé.

27. Le propriétaire ou l'exploitant d'un dépôt de Inspection et BPC:

- a) en inspecte les planchers, les rebords, les côtés, les drains, les réseaux de drainage, les toitures et écrans à l'épreuve des intempéries, les clôtures, les murs, le système d'alarme-incendie, les extincteurs et le réseau d'extinction automatique, ainsi que les pièces d'équipement qui contiennent des BPC, les contenants servant au stockage des BPC ou des produits qui en contiennent et les agents de nettoyage qui s'y trouvent :
  - (i) tous les mois,
  - (ii) à des intervalles de plus d'un mois, si le ministre, à la demande écrite du propriétaire ou de l'exploitant, a déterminé qu'il est en pratique impossible d'inspecter le dépôt tous les mois en raison de son isolement,
  - (iii) à des intervalles de moins d'un mois, si l'exploitation du dépôt en toute sécurité exige des inspections plus fréquentes;
- b) les garde en bon état et, en cas de dommage, les répare ou les remplace immédiatement et nettoie sur-le-champ les aires contaminées.

entretien des dépôts de BPC Fire protection and emergency procedures

- **28.** (1) The owner or operator of a PCB storage site shall
  - (a) develop and implement at the PCB storage site a fire protection and emergency procedures plan and shall
    - (i) update and test the plan once per year,
    - (ii) keep a written copy of the latest plan at the PCB storage site and another at their principal place of business, and
    - (iii) make the latest plan readily available to persons who implement the plan and to the local fire department or to the local officer appointed by the provincial Fire Marshall if there is no local fire department or to any other local authority responsible for fire protection;
  - (b) ensure that all employees who are authorized to enter the PCB storage site are familiar with the contents of the latest plan;
  - (c) equip the indoor PCB storage site with a fully operative fire alarm system that is maintained, inspected and tested in accordance with articles 6.3.1.1 and 6.3.1.2 of the National Fire Code and with
    - (i) portable fire extinguishers that are selected and installed in accordance with article 2.1.5.1 of the National Fire Code and maintained, inspected and tested in accordance with article 6.2.1.1 of that Code, or
    - (ii) an automatic fire suppression system that meets the requirements of article 3.2.7.9 of the National Fire Code, if required;
  - (d) keep a copy of the records referred to in sections 43 and 44 at the PCB storage site and make a copy readily available to the local fire department and, if there is no local fire department, to the local officer appointed by the provincial Fire Marshall or to any other local authority responsible for fire protection;
  - (e) ensure that all employees who are authorized to enter the PCB storage site are made aware of the hazards of PCBs and are familiar with the use of protective equipment and clothing and the clean-up procedures referred to in the *Guidelines for the Management of Wastes Containing Polychlorinated Biphenyls (PCBs)*, CCME-TS/WM-TRE008, September 1989, as amended from time to time, issued by the Canadian Council of Ministers of the Environment; and
  - (f) store absorbent materials for clean-up near the PCB storage site.

(2) Despite paragraph (1)(c), if the indoor PCB storage site is a shipping container, the owner or operator of the site does not have to equip that site with a fire alarm system.

**28.** (1) Le propriétaire ou l'exploitant d'un dépôt Protection de BPC :

- a) élabore et met en œuvre un plan d'intervention mesures d'urgence et de lutte contre les incendies et : d'urgenc
  - (i) le met à jour et le vérifie annuellement,
  - (ii) en conserve une copie écrite à jour au dépôt et à son établissement principal,
  - (iii) en met une copie à jour à la disposition de toute personne qui participe à sa mise en œuvre et au service d'incendie local ou, à défaut, au fonctionnaire local nommé par le commissaire provincial aux incendies ou à toute autre autorité locale chargée de la protection contre les incendies.
- b) veille à ce que tous les employés autorisés à entrer dans le dépôt connaissent bien le contenu du plan à jour;
- c) s'agissant d'un dépôt intérieur, le munit d'un système d'alarme-incendie en état de fonctionnement qui est entretenu, inspecté et mis à l'essai conformément aux exigences des articles 6.3.1.1 et 6.3.1.2 du Code national de prévention des incendies, ainsi que :
  - (i) soit d'extincteurs portatifs qui sont choisis et installés conformément à l'article 2.1.5.1 de ce code et qui sont entretenus, inspectés et mis à l'essai conformément aux exigences de l'article 6.2.1.1 de ce code,
  - (ii) soit d'un réseau d'extinction automatique conforme aux exigences de l'article 3.2.7.9 du même code, si celles-ci s'appliquent;
- d) conserve au dépôt une copie des documents et registres visés aux articles 43 et 44 respectivement et en met une à la disposition du service d'incendie local ou, à défaut, au fonctionnaire local nommé par le commissaire provincial aux incendies ou à toute autre autorité locale chargée de la protection contre les incendies;
- e) veille à ce que tous les employés autorisés à entrer dans le dépôt soient informés des dangers que présentent les BPC et connaissent bien l'utilisation du matériel et des vêtements de protection et les méthodes de nettoyage mentionnées dans le Guide pour la gestion des déchets contenant des biphényles polychlorés (BPC) CCME-TS/WM-TRE008, septembre 1989, avec ses modifications successives, publié par le Conseil canadien des ministres de l'environnement;
- f) garde les matériaux absorbants servant au nettoyage près du dépôt.
- (2) Malgré l'alinéa (1)c), le propriétaire ou l'exploitant d'un dépôt de BPC intérieur qui est un conteneur n'est pas tenu de le munir d'un système d'alarme-incendie.

contre les incendies et mesures d'urgence

Shipping containers

#### PART 4

#### LABELLING, REPORTS AND RECORDS

#### LABELLING

Equipment and liquids used for their servicing

29. (1) The owner of equipment referred to in section 16, other than equipment for which an extension has been applied for under section 17, or of a liquid used in its servicing referred to in subsection 15(2) shall affix a label in a readily visible location on the equipment or on the container of the liquid, no later than 30 days after the day on which it ceases to be used.

Equipment for which extension applied for

(2) The owner of equipment for which an extension has been applied under section 17 shall affix a label in a readily visible location on the equipment.

Exceptions

- (3) Subsection (1) does not apply to
- (a) equipment or containers of liquids that bear a label on the day on which these Regulations come into force that indicates the presence of PCBs: and
- (b) equipment that is too small, including light ballasts, to bear the label referred to in subsection (4), until the day on which they cease to be used and are placed in a container that bears the label.

Description

- (4) The label must
- (a) state "ATTENTION contains 50 mg/kg or more of PCBs / contient 50 mg/kg ou plus de BPC" in black lettering on a white background, in a font size of no less than 36 points;
- (b) measure at least 150 mm by 150 mm or at least 76 mm by 76 mm in the case of capacitors;
- (c) in the case of equipment for which an extension is applied for under section 17, state a unique identification number.

Cables and pipelines

- **30.** (1) The owner of a cable, a pipeline or equipment associated with a pipeline, referred to in paragraphs 14(1)(a) and (b), containing PCBs in a concentration of 50 mg/kg or more that is in a room, a tunnel or a facility shall either
  - (a) affix the label in the form set out in subsection 29(4) in a readily visible location on a part of the cable, pipeline or associated equipment that is accessible; or
  - (b) place a notice in a readily visible location at the entrance of the room, tunnel or facility that states the information set out in paragraph 29(4)(a) and measures at least 150 mm by 150 mm.

If dismantled

(2) If a part of the cable, pipeline or associated equipment is dismantled, the owner of the cable, pipeline or associated equipment shall affix on each dismantled part the label in the form set out in

#### PARTIE 4

#### ÉTIQUETAGE, RAPPORTS ET DOSSIERS

#### ÉTIQUETAGE

29. (1) Le propriétaire d'une pièce d'équipement Pièces visée à l'article 16, autre qu'une pièce d'équipement qui fait l'objet d'une demande de prolongation en vertu de l'article 17, ou de tout liquide utilisé pour l'entretien visé au paragraphe 15(2) est tenu d'apposer une étiquette, à un endroit bien en vue sur la pièce d'équipement ou le contenant du liquide, au plus tard trente jours après que la pièce ou le contenant cesse d'être utilisé.

d'équipement et liquides pour leur entretien

(2) Le propriétaire d'une pièce d'équipement qui Équipement fait l'objet d'une demande de prolongation en vertu faisant l'objet de l'article 17 est tenu d'y apposer une étiquette à de prolongation un endroit bien en vue.

d'une demande

(3) Le paragraphe (1) ne s'applique pas :

Exceptions

- a) aux pièces d'équipement et aux contenants de liquide qui portent, à l'entrée en vigueur du présent règlement, une étiquette qui indique la présence de BPC;
- b) aux pièces d'équipement qui sont trop petites, y compris les ballasts de lampes, pour que l'étiquette visée au paragraphe (4) y soit apposée, jusqu'à ce qu'elles cessent d'être utilisées et qu'elles soient placées dans un contenant sur lequel l'étiquette est apposée.
- (4) L'étiquette doit :

Description

- a) porter la mention « ATTENTION contains 50 mg/kg or more of PCBs / contient 50 mg/kg ou plus de BPC », inscrite en caractères d'au moins 36 points, en noir sur fond blanc;
- b) être d'une dimension minimale de 150 mm sur 150 mm ou, dans le cas d'un condensateur, 76 mm sur 76 mm;
- c) dans le cas d'une pièce d'équipement qui fait l'objet d'une demande de prolongation en vertu de l'article 17, porter un numéro d'identification
- **30.** (1) Le propriétaire de câbles, de pipelines ou Câbles et d'équipement connexe visés aux alinéas 14(1)(a) et pipelines (b) qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg et se trouvent dans une pièce, un tunnel ou une installation est tenu :

- a) soit d'apposer une étiquette conforme au paragraphe 29(4) à un endroit bien en vue sur toute partie accessible du câble, pipeline ou équipement connexe;
- b) soit de placer à l'entrée de la pièce, du tunnel ou de l'installation à un endroit bien en vue une affiche d'une dimension minimale de 150 mm sur 150 mm portant la mention prévue à l'alinéa 29(4)a).
- (2) En cas de désassemblage d'une partie du câ- Désassemblage ble, du pipeline ou de l'équipement connexe, le propriétaire de ceux-ci est tenu, dans les trente jours suivant le désassemblage, d'apposer une étiquette

subsection 29(4), no later than 30 days after the day on which it is dismantled.

A facility other than transfer site or destruction facility

- **31.** (1) The owner or operator of a PCB storage site, other than the PCB storage site of an authorized facility that is a transfer site or that is authorized to destroy PCBs, shall affix a label in a readily visible location on any product containing PCBs in a concentration of 50 mg/kg or more and that are stored at the PCB storage site, which
  - (a) is in the form referred to in subsection 29(4); and
  - (b) states "Date of Commencement of Storage" and the date on which the storage begins.

Transfer site or destruction facility

(2) The owner or operator of the PCB storage site of an authorized facility that is a transfer site or that is authorized to destroy PCBs shall affix a label in the form set out in subsection 29(4) in a readily visible location on any container that is a fixed tank and that is used at the facility for the storage of PCBs or products containing PCBs in a concentration of 50 mg/kg or more.

Notice

(3) The owner or operator of a PCB storage site shall place a notice in a readily visible location at the entrance of the site that states the information set out in paragraph 29(4)(a) and that measures at least 150 mm by 150 mm.

Exception

(4) Subsections (1) and (2) do not apply if the product or the container bear a label on the day on which these Regulations come into force that indicates the presence of PCBs and that states "Date of Commencement of Storage" and the date on which the storage begins.

Retention of labels

**32.** The person who is required to affix a label on a product or container in accordance with sections 29 to 31 shall ensure that it bears that label for the duration that the person possesses the product or container.

#### REPORTS

End of use of equipment and liquids — 2009

- **33.** (1) The owner of the equipment referred to in paragraph 16(1)(a) and subparagraph 16(1)(b)(i), other than the equipment for which an extension is granted by the Minister in accordance with section 17, or the liquids referred to in subsection 15(2) shall prepare a report that is current to December 31 of each calendar year in which the person owns the equipment or the liquids and that contains the following information:
  - (a) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the owner and any person authorized to act on the owner's behalf;
  - (b) the civic addresses of the facilities where the equipment and liquids are located or, if there is no civic address, their location using the owner's site identification system;

conforme au paragraphe 29(4) sur chaque partie désassemblée du câble, du pipeline ou de l'équipement connexe.

31. (1) Le propriétaire ou l'exploitant d'un dépôt Installation de BPC d'une installation autre qu'une installation autre qu'un agréée qui est un centre de transfert ou qui est autorisée à détruire des BPC est tenu d'apposer une de destruction étiquette à un endroit bien en vue sur tout produit en contenant qui y sont stockés et qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg; l'étiquette

transfert ou

- a) est conforme au paragraphe 29(4);
- b) porte la mention « Date de début de stockage » et la date de début de stockage.
- (2) Le propriétaire ou l'exploitant d'un dépôt de Centre de BPC d'une installation agréée qui est un centre de transfert ou transfert ou qui est autorisée à détruire des BPC est tenu d'apposer une étiquette conforme au paragraphe 29(4) à un endroit bien en vue sur tout contenant qui est un réservoir fixe utilisé pour stocker des BPC à l'installation ou des produits qui en contiennent en une concentration égale ou supérieure à 50 mg/kg.

de destruction

(3) Le propriétaire ou l'exploitant d'un dépôt de Affiche BPC place à l'entrée du dépôt à un endroit bien en vue une affiche d'une dimension minimale de 150 mm sur 150 mm portant la mention prévue à l'alinéa 29(4)a).

(4) Les paragraphes (1) et (2) ne s'appliquent pas Exception si le produit ou le contenant porte, à l'entrée en vigueur du présent règlement, une étiquette qui indique la présence de BPC, qui porte la mention « Date de début de stockage » et indique la date de début de stockage.

32. La personne qui a l'obligation d'apposer une Conservation étiquette sur un produit ou un contenant en application des articles 29 à 31 veille à ce que le produit ou le contenant la porte en tout temps pendant qu'il est en sa possession.

des étiquettes

#### **RAPPORTS**

33. (1) Le propriétaire des pièces d'équipement Date de fin visées à l'alinéa 16(1)a) ou au sous-alinéa 16(1)b)(i), autres que celles pour lesquelles une prolongation a d'équipement été accordée par le ministre en vertu de l'article 17, ou des liquides visés au paragraphe 15(2) est tenu de préparer un rapport, au 31 décembre de chaque année civile durant laquelle il en est propriétaire, comportant les renseignements suivants :

et des liquides 2009

d'utilisation

des pièces

- a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom:
- b) l'adresse municipale des installations où se trouvent les pièces d'équipement et les liquides ou, à défaut, l'endroit où ils se trouvent d'après le système d'identification de site du propriétaire;

- (c) the quantity of the liquids containing PCBs in the equipment and of the liquids, expressed in
  - (i) that are in use on December 31,
  - (ii) that are stored on December 31 at the person's PCB storage site,
  - (iii) that are sent, in that calendar year, to an authorized facility that is a transfer site,
  - (iv) that are sent, in that calendar year, to an authorized facility that is authorized to destroy them, or
  - (v) that are destroyed in that calendar year; and
- (d) a certification that the information is accurate and complete and that is dated and signed by the owner or by a person authorized to act on the owner's behalf.

Equipment and liquids for which extension granted

- (2) The owner of the equipment referred to in paragraph 16(1)(a) and subparagraph 16(1)(b)(i) or the liquids referred to in subsection 15(2) for which an extension is granted by the Minister in accordance with section 17 shall prepare a report that is current to December 31 of each calendar year in which the person owns the equipment or the liquids and that contains the following information for each piece of equipment or container of liquid:
  - (a) the information required under paragraphs (1)(a) and (d);
  - (b) the unique identification number that is on the label referred to in paragraph 29(4)(c);
  - (c) the civic address, function and technical description of the facility where the equipment or container of liquid is located or, if there is no civic address, its location using the owner's site identification system;
  - (d) the progress on the plan's implementation and the timelines for ending the use of the equipment;
  - (e) the measures taken to minimize or eliminate any harmful effect of the PCBs in the equipment on the environment and on human health; and
  - (f) the findings of the inspections of the equipment.

End of use of equipment - 2025

- (3) The owner of the equipment referred to in subparagraph 16(1)(b)(ii) and subsection 16(2) shall prepare a report that is current to December 31 of each calendar year in which the person owns the equipment and that contains the following information:
  - (a) the information required under paragraphs (1)(a), (b) and (d); and
  - (b) the quantity, expressed in litres, of liquids containing PCBs in the equipment, and the concentration, expressed in mg/kg, of the PCBs
    - (i) that are stored on December 31 at the person's PCB storage site,

- c) la quantité, exprimée en litres, de liquides qui contiennent des BPC dans les pièces d'équipement et de liquides :
  - (i) en usage le 31 décembre,
  - (ii) stockés à son dépôt le 31 décembre,
  - (iii) expédiés, au cours de l'année civile, à une installation agréée qui est un centre de
  - (iv) expédiés, au cours de l'année civile, à une installation agréée qui est autorisée à les détruire,
  - (v) détruits au cours de l'année civile;
- d) une attestation, datée et signée par lui ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.
- (2) Le propriétaire des pièces d'équipement vi- Pièces sées à l'alinéa 16(1)a) ou au sous-alinéa 16(1)b)(i) ou des liquides visés au paragraphe 15(2) pour lesquels une prolongation a été accordée par le ministre en vertu de l'article 17 est tenu de préparer un été accordée rapport, au 31 décembre de chaque année civile durant laquelle il en est propriétaire, comportant les renseignements suivants pour chaque pièce d'équipement et contenant de liquides :

d'équipement et liquides pour lesquels une prolongation a

- a) les renseignements prévus aux alinéas (1)a) et *d*);
- b) le numéro d'identification unique figurant sur l'étiquette conformément à l'alinéa 29(4)c);
- c) l'adresse municipale, la fonction et les caractéristiques techniques de l'installation où se trouvent la pièce d'équipement ou le contenant des liquides ou, à défaut, l'endroit où il se trouvent d'après le système d'identification de site du propriétaire;
- d) le progrès accompli dans la mise en œuvre du plan et de l'échéancier dressé en vue de la cessation de l'utilisation de la pièce d'équipement;
- e) les mesures prises pour éliminer ou atténuer tout effet nocif des BPC contenus dans la pièce d'équipement sur l'environnement et la santé humaine;
- f) les résultats des inspections de la pièce d'équipement.
- (3) Le propriétaire des pièces d'équipement Date de fin visées au sous-alinéa 16(1)b)(ii) ou au paragraphe 16(2) est tenu de préparer un rapport, au d'équipement 31 décembre de chaque année civile durant laquelle il en est propriétaire, comportant les renseignements suivants:

d'utilisation des pièces

- a) les renseignements prévus aux alinéas (1)a), b) et *d*):
- b) la quantité de liquides qui contiennent des BPC dans les pièces d'équipement, exprimée en litres, et la concentration de ces BPC dans les liquides, exprimée en mg/kg:
  - (i) stockés à son dépôt de BPC le 31 décembre,

- (ii) that are sent, in that calendar year, to an authorized facility that is a transfer site,
- (iii) that are sent, in that calendar year, to an authorized facility that is authorized to destroy them, or
- (iv) that are destroyed in that calendar year.

Research

- **34.** The person who offers for sale, sells, processes or uses PCBs or products containing PCBs for the purpose of research in accordance with section 8 shall prepare a report that is current to December 31 in each calendar year in which the person offers for sale, sells, processes or uses those PCBs or products and that contains the following information:
  - (a) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the person and of any person authorized to act on that person's behalf;
  - (b) an indication of whether the person offers for sale, sells, processes or uses the PCBs or products;
  - (c) the quantity of the PCBs or of the products containing PCBs that are offered for sale, sold, processed or used in that calendar year; and
  - (d) a certification that the information is accurate and complete and that is dated and signed by the person or by a person authorized to act on their behalf.

Colouring pigment

- **35.** The person who manufactures, exports or imports colouring pigment in accordance with section 11 shall prepare a report that is current to December 31 in each calendar year in which the person manufactures, imports or exports the colouring pigment and that contains the following information:
  - (a) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the person and of any person authorized to act on that person's behalf;
  - (b) an indication of whether the person manufactures, exports or imports colouring pigment;
  - (c) the quantity of colouring pigment, expressed in kilograms, the maximum concentration of PCBs in the colouring pigment, expressed in mg/kg, and the average annual concentration of PCBs in the colouring pigment, expressed in mg/kg, that is manufactured, imported or exported in that calendar year;
  - (d) in the case of importing, the name, telephone number and civic and mailing addresses of the person from whom the colouring pigment is imported and, in the case of exporting, the name, telephone number and civic and mailing addresses of the person to whom the colouring pigment is exported; and
  - (e) a certification that the information is accurate and complete and that is dated and signed by the person or by a person authorized to act on their behalf.

- (ii) expédiés, au cours de l'année civile, à une installation agréée qui est un centre de transfert,
- (iii) expédiés, au cours de l'année civile, à une installation agréée qui est autorisée à les détruire.
- (iv) détruits au cours de l'année civile.
- 34. La personne qui met en vente, vend, trans- Recherches forme ou utilise des BPC ou des produits qui en contiennent en vue d'effectuer des recherches conformément à l'article 8 est tenue de préparer un rapport, au 31 décembre de chaque année civile durant laquelle elle les a mis en vente, vendus, utilisés ou transformés, comportant les renseignements suivants:
  - a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom:
  - b) une mention indiquant si elle les a mis en vente, vendus, transformés ou utilisés;
  - c) la quantité de BPC ou de produits qui ont été mis en vente, vendus, transformés ou utilisés durant l'année civile;
  - d) une attestation, datée et signée par elle ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et
- 35. La personne qui fabrique, exporte ou im- Pigments pour porte, conformément à l'article 11, des pigments pour la coloration est tenue de préparer un rapport, au 31 décembre de chaque année civile durant laquelle elle les fabrique, exporte ou importe, comportant les renseignements suivants :
  - a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom:
  - b) une mention indiquant si elle les a fabriqués, exportés ou importés;
  - c) la quantité, exprimée en kilogrammes, de pigments qui ont été fabriqués, exportés ou importés durant l'année civile ainsi que la concentration moyenne annuelle et la concentration maximale en BPC de ces pigments, exprimée en mg/kg;
  - d) les nom, adresses municipale et postal et numéro de téléphone de la personne de qui proviennent les pigments, dans le cas où ils sont importés, ou à qui ils sont expédiés, dans le cas où ils sont exportés;
  - e) une attestation, datée et signée par elle ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.

la coloration

Solid products containing **PCBs** 

- **36.** The person who manufactures solid products containing PCBs in accordance with section 13 shall prepare a report that is current to December 31 in each calendar year in which the person manufactures the products and that contains the following information:
  - (a) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the person and of any person authorized to act on that person's behalf;
  - (b) the quantity of solid products manufactured in that calendar year, expressed in kilograms, and the maximum concentration and average concentration of PCBs in the solid products, expressed in mg/kg, for that calendar year;
  - (c) the name, telephone number and civic and mailing addresses of the person to whom the manufacturer sells the products; and
  - (d) a certification that the information is accurate and complete and that is dated and signed by the person or by a person authorized to act on their behalf.

Stored PCBs or products PCR concentration of 50 mg/kg or more

- 37. The person who owns and stores PCBs or products containing PCBs in a concentration of 50 mg/kg or more, other than the equipment and liquids referred to in section 33, shall prepare a report that is current to December 31 in each calendar year in which the person stores the PCBs or products at their PCB storage site and that contains the following information:
  - (a) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the owner and of any person authorized to act on the owner's behalf;
  - (b) the civic addresses of the PCB storage sites where the PCBs or products are located, or if there is no civic address, their location using the owner's site identification system;
  - (c) the quantity of liquids containing PCBs in the products, expressed in litres, and the quantity of solids containing PCBs in the products, expressed in kilograms, and the concentration of PCBs in the liquids and the solids, expressed in
    - (i) that are stored on December 31 at the person's PCB storage site,
    - (ii) that are sent, in that calendar year, to an authorized facility that is a transfer site,
    - (iii) that are sent, in that calendar year, to an authorized facility that is authorized to destroy them, or
    - (iv) that are destroyed in that calendar year;
  - (d) a certification that the information is accurate and complete and that is dated and signed by the owner of the PCBs or products containing PCBs or by a person authorized to act on the owner's behalf

36. La personne qui fabrique, conformément à Produits solides l'article 13, des produits solides qui contiennent des qui contiennent BPC est tenue de préparer un rapport, au 31 décembre de chaque année civile durant laquelle elle les fabrique, comportant les renseignements suivants:

- a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son
- b) la quantité, exprimée en kilogrammes, de produits qui ont été fabriqués durant l'année civile ainsi que la concentration moyenne et la concentration maximale en BPC de ces produits, exprimée en mg/kg, pour cette année civile;
- c) les nom, adresse municipale et postale et numéro de téléphone de la personne à qui elle a vendu les produits;
- d) une attestation, datée et signée par elle ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et
- 37. Le propriétaire de BPC ou de produits qui en BPC ou contiennent en une concentration égale ou supé- produits rieure à 50 mg/kg, autres que les pièces d'équipement ou les liquides visés à l'article 33, qui les de BPC de stocke à son dépôt de BPC est tenu de préparer un 50 mg/kg ou rapport, au 31 décembre de chaque année civile plus durant laquelle il les stocke ainsi, comportant les renseignements suivants:

- a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom;
- b) l'adresse municipale des dépôts où sont stockés les BPC et les produits ou, à défaut, l'endroit où ils se trouvent d'après le système d'identification de site du propriétaire;
- c) la quantité de liquides qui contiennent des BPC dans les produits, exprimée en litres, la quantité de solides qui contiennent des BPC dans les produits, exprimée en kilogrammes, et la concentration de BPC dans les liquides ou les solides, exprimée en mg/kg:
  - (i) stockés à son dépôt de BPC le 31 décembre,
  - (ii) expédiés, au cours de l'année civile, à une installation agréée qui est un centre de
  - (iii) expédiés, au cours de l'année civile, à une installation agréée qui est autorisée à les détruire.
  - (iv) détruits au cours de l'année civile,
- d) une attestation, datée et signée par lui ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.

Stored PCBs or products transfer site or destruction facility

- **38.** The owner of an authorized facility that is a transfer site or that is authorized to destroy PCBs or products containing PCBs and who stores them at their PCB storage site, other than the owner referred to in section 37, shall prepare a report that is current to December 31 in each calendar year and that contains the following information:
  - (a) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the owner and of any person authorized to act on the owner's behalf;
  - (b) the civic addresses of the sites where the PCBs or products containing PCBs are stored, or if there is no civic address, the location of the sites using the owner's site identification system;
  - (c) the quantity of liquids containing PCBs in the products, expressed in litres, or the quantity of solids containing PCBs in the products, expressed in kilograms, and the concentration of the PCBs in the liquids and the solids, expressed in mg/kg
    - (i) that are stored on December 31 at the owner's PCB storage site,
    - (ii) that are sent, in that calendar year, to an authorized facility that is a transfer site,
    - (iii) that are sent, in that calendar year, to an authorized facility that is authorized to destroy them, or
    - (iv) that are destroyed in that calendar year; and
  - (d) a certification that the information is accurate and complete and that is dated and signed by the owner of the authorized facility or by a person authorized to act on the owner's behalf.

Date of submission of report

**39.** (1) The person who is required to prepare a report in accordance with subsection 33(1) or (2) and with any of sections 34 to 38 shall submit it to the Minister on or before March 31 of the year following the calendar year for which the report is

Report made under subsection 33(3)

- (2) The person who is required to prepare a report in accordance with subsection 33(3) shall submit it to the Minister
  - (a) on or before March 31, 2010 for reports that are current to December 31 of the year that these Regulations come into force up to the year 2009;
  - (b) on or before March 31, 2014 for reports that are current to December 31 of each of the years 2010 to 2013;
  - (c) on or before March 31, 2018 for reports that are current to December 31 of each of the years 2014 to 2017;
  - (d) on or before March 31, 2022 for reports that are current to December 31 of each of the years 2018 to 2021;
  - (e) on or before March 31, 2026 for reports that are current to December 31 of each of the years 2022 to 2025;

- 38. Le propriétaire d'une installation agréée qui BPC ou est un centre de transfert ou qui est autorisée à dé- produits truire des BPC et des produits qui en contiennent, Centre de autre que le propriétaire visé à l'article 37, et qui transfert ou les stocke à son dépôt de BPC est tenu de préparer de destruction un rapport, au 31 décembre de chaque année civile durant laquelle il les transforme ou les détruit, comportant les renseignements suivants :
  - a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son
  - b) l'adresse municipale des dépôts où sont stockés les BPC et les produits ou, à défaut, l'endroit où ils se trouvent d'après le système d'identification de site du propriétaire;
  - c) la quantité de liquides qui contiennent des BPC dans les produits, exprimée en litres, la quantité de solides qui contiennent des BPC dans les produits, exprimée en kilogrammes, et la concentration de BPC dans les liquides ou les solides, exprimée en mg/kg:
    - (i) stockés à son dépôt de BPC le 31 décembre,
    - (ii) expédiés, au cours de l'année civile, à une installation agréée qui est un centre de transfert.
    - (iii) expédiés, au cours de l'année civile, à une installation agréée qui est autorisée à les détruire,
    - (iv) détruits au cours de l'année civile,
  - d) une attestation, datée et signée par lui ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et
- 39. (1) La personne qui est tenue de préparer tout Date de rapport visé aux paragraphes 33(1) ou (2) ou à l'un présentation des articles 34 à 38 le présente au ministre au plus tard le 31 mars de l'année civile qui suit celle pour laquelle il est établi.

au paragra-

phe 33(3)

- (2) Celle qui est tenue de préparer le rapport visé Rapport visé au paragraphe 33(3) le présente au ministre :
  - a) au plus tard le 31 mars 2010, s'il porte sur toute année civile suivant l'entrée en vigueur du présent règlement jusqu'à l'année 2009;
  - b) au plus tard le 31 mars 2014, s'il porte sur l'une ou l'autre des années 2010 à 2013;
  - c) au plus tard le 31 mars 2018, s'il porte l'une ou l'autre des années 2014 à 2017;
  - d) au plus tard le 31 mars 2022, s'il porte sur l'une ou l'autre des années 2018 à 2021;
  - e) au plus tard le 31 mars 2026, s'il porte sur l'une ou l'autre des années 2022 à 2025;
  - f) au plus tard le 31 mars 2027, s'il porte sur l'année 2026:
  - g) au plus tard le 31 mars 2030, s'il porte sur l'une ou l'autre des années 2027 à 2029.

(f) on or before March 31, 2027 for reports that are current to December 31 of the year 2026; and (g) on or before March 31, 2030 for reports that are current to December 31 of each of the years 2027 to 2029.

Release into the environment

**40.** (1) For the purposes of paragraph 95(1)(a) of the Act, where there occurs or is a likelihood of a release into the environment of PCBs in contravention of section 5, the person who is designated to be provided with a written report is the Manager of Inspection Program, Environmental Enforcement Division, Enforcement Branch of the Department of the Environment in the region where the release occurs or is likely to occur.

Contents

- (2) The report shall include the following information:
  - (a) the name, civic and mailing addresses and telephone number of the person who owns or has the charge, management or control of the PCBs that are released into the environment;
  - (b) the date, time and location of the release;
  - (c) a description of the source of the release; and
  - (d) the quantity of liquids containing PCBs released, expressed in litres, the quantity of solids containing PCBs released, expressed in kilograms, and the concentration of PCBs in the liquids and the solids that are released, expressed in mg/kg.

Retention

**41.** Any person who is required to submit a report under these Regulations shall keep a copy of the report at their principal place of business in Canada for at least five years after the day on which the report is submitted.

Method of submission

- 42. Each report referred to in sections 33 to 38 shall be submitted electronically in the format provided by the Department of the Environment, but the report shall be submitted in writing if
  - (a) no such format is provided; or
  - (b) it is, owing to circumstances beyond the control of the person required to submit the report, impracticable to submit the report electronically in the format provided.

#### RECORDS

Records for permitted activities

- **43.** The following persons shall maintain records that demonstrate that they manufacture, process, use, sell, offer for sale, store, import or export PCBs or products containing PCBs in accordance with the Act and these Regulations:
  - (a) the owner of PCBs or products containing PCBs:
  - (b) the person who is engaged in any of these activities; and
  - (c) the owner or operator of a PCB storage site.

Inspection record

- **44.** (1) The owner or operator of a PCB storage site shall maintain a record of all inspections conducted at the PCB storage site under paragraph 27(a)
  - (a) listing all items that are inspected;
  - (b) describing any deficiency found;

**40.** (1) Pour l'application de l'alinéa 95(1)(a) de Rejets dans la Loi, en cas de rejet dans l'environnement effectif ou probable — de BPC en violation de l'article 5, la personne désignée pour recevoir le rapport écrit est le Gestionnaire du programme d'inspection, Direction de l'application de la loi en environnement, Direction générale de l'application de la loi du ministère de l'Environnement, dans la région où a lieu le rejet — effectif ou probable.

(2) Le rapport comporte les renseignements Contenu suivants:

- a) les nom, adresses municipale et postale et numéro de téléphone de la personne qui a toute autorité sur les BPC qui ont été rejetés dans l'environnement ou qui en est propriétaire;
- b) les date, heure et lieu du rejet;
- c) une description de la source du rejet;
- d) la quantité de liquides qui contiennent des BPC rejetés, exprimée en litres, la quantité de solides qui contiennent des BPC rejetés, exprimée kilogrammes, et la concentration de BPC dans les liquides ou les solides rejetés, exprimée en mg/kg.
- 41. Toute personne qui est tenue de présenter un Conservation rapport en application du présent règlement en conserve une copie à son établissement principal au Canada pendant au moins cinq ans après la date de sa présentation.

- 42. Les rapports visés aux articles 33 à 38 sont Méthode de présentés sous forme électronique selon le modèle présentation établi par le ministère de l'Environnement. Ils sont toutefois présentés par écrit dans les cas suivants :
  - a) aucun modèle n'a été établi par le ministère;
  - b) il est pratiquement impossible, pour des raisons indépendantes de la volonté de la personne tenue de les présenter, de le faire sous forme électronique selon le modèle établi.

#### DOCUMENTS ET REGISTRES

43. Les personnes ci-après conservent les docu- Documents ments établissant que des BPC ou des produits qui en contiennent ont été fabriqués, transformés, utilisés, mis en vente, vendus, stockés, importés ou exportés conformément à la Loi et au présent règlement:

permises

- a) le propriétaire des BPC ou des produits;
- b) la personne qui exerce l'activité;
- c) le propriétaire ou l'exploitant du dépôt de BPC.
- 44. (1) Le propriétaire ou l'exploitant d'un dépôt Registres de BPC tient un registre de toutes les inspections d'inspections effectuées au dépôt de BPC en application de l'alinéa 27a), lequel fait état :
  - a) de tous les points inspectés;

- (c) setting out the measures taken to remedy the deficiency; and
- (d) specifying the dates of the inspections and the names of the inspectors.

Owner of equipment extension

(2) The owner of equipment for which an extension of the end-of-use date is applied under section 17 shall maintain a record of all inspections conducted on the equipment that contains the information set out in paragraphs (1)(a) to (d).

Retention of records

- **45.** The person who is required to maintain a record under sections 43 and 44 shall retain it at their principal place of business in Canada or at the place where they conduct the activity for at least five
  - (a) after the destruction of the PCBs or the products containing PCBs that are the subject of the record, in the case of the owner of PCBs or products containing PCBs or the owner or operator of the PCB storage site where the PCBs or products containing PCBs are stored; or
  - (b) after the completion of an activity referred to in section 43, in the case of the person who is engaged in that activity.

#### PART 5

#### REPEALS AND COMING INTO FORCE

#### REPEALS

Repeal

46. The Chlorobiphenyls Regulations<sup>1</sup> repealed.

Repeal

47. The Storage of PCB Material Regulations<sup>2</sup> are repealed.

#### COMING INTO FORCE

Coming into force

48. These Regulations come into force on the day on which they are registered.

- b) de toutes les lacunes relevées;
- c) des mesures à prendre pour y remédier;
- d) de la date de l'inspection et du nom de l'inspecteur.
- (2) Le propriétaire d'une pièce d'équipement Propriétaire dont l'utilisation fait l'objet d'une prolongation en vertu de l'article 17 tient un registre de toutes les inspections de la pièce d'équipement qui ont été prolongation effectuées, lequel fait état des renseignements prévus aux alinéas (1)a) à d).

d'une pièce d'équipe-

**45.** Toute personne qui est tenue de conserver Conservation des documents ou de tenir un registre en application des articles 43 et 44 respectivement les conserve à son établissement principal au Canada ou à l'établissement où l'activité est exercée pendant au moins cinq ans après:

des dossiers

- a) dans le cas du propriétaire de BPC ou de produits qui en contiennent ou du propriétaire ou de l'exploitant d'un dépôt de BPC où sont stockés des BPC ou des produits qui en contiennent, la date de destruction des BPC ou des produits qui en contiennent visés par le document ou le registre;
- b) dans le cas de la personne qui exerce une activité visée à l'article 43, la date de la fin de l'activité.

#### PARTIE 5

#### ABROGATIONS ET ENTRÉE EN VIGUEUR

#### ABROGATION

- 46. Le Règlement sur les biphényles chlorés<sup>1</sup> est Abrogation abrogé.
- 47. Le Règlement sur le stockage des matériels Abrogation contenant des BPC<sup>2</sup> est abrogé.

#### Entrée en vigueur

48. Le présent règlement entre en vigueur à la Entrée en date de son enregistrement.

SOR/91-152

<sup>&</sup>lt;sup>2</sup> SOR/92-507; SOR/2000-102, s. 15

DORS/91-152

<sup>&</sup>lt;sup>2</sup> DORS/92-507; DORS/2000-102, a. 15



Appendix

**Iqaluit West 40 Landfill Drainage Management Review** 



City of Iqaluit

# West 40 Landfill **Drainage Management Review**

Prepared by:

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**Project Number:** 

60221928

Date:

September 16, 2011

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780 488 6800 tel 780 488 2121 fax

September 16, 2011

Paul Clow Project Officer City of Iqaluit Box 460 Iqaluit, NU XOA 0H0

Dear Mr Clow:

Project No: 601221928

Regarding: West 40 Landfill Drainage Management Review

Enclosed for your reference is a report which reviews the current landfill drainage management at the West 40 Landfill in Iqaluit, NU. The report reviews historical sample test results from landfill runoff retention and detention ponds on site and compares the results to appropriate regulatory guidelines. Options which have been examined by the City of Iqaluit for the future treatment of landfill runoff are presented and commented on. Recommendations are provided for the collection, treatment, and appropriate effluent quality criteria.

Should you have any questions or concerns please do not hesitate to call the undersigned at (780) 453 0910.

Sincerely, **AECOM Canada Ltd.** 

Ken Johnson, P.Eng Senior Planner and Engineer Ken.Johnson@aecom.com

XX:xx Encl. cc:

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# **AECOM Signatures**

**Report Prepared By:** 

Kristi Beckman, EIT

Project Engineer

**Report Reviewed By:** 

Project Manager

# **Executive Summary**

The City of Iqaluit's Water Licence states that the City is required to collect, monitor and control the discharge of runoff from the West 40 Landfill site and adjacent Sludge Management Facility. The City currently employs a surface water management system to divert off-site surface runoff from entering the site, and to collect on-site surface runoff for a controlled discharge into the environment. The landfill site relies on the local permafrost regime to provide a low permeability barrier to control the subsurface runoff.

In 2006 the City upgraded the landfill's drainage management system by constructing two berm structures, three onsite detention ponds and an off-site retention pond. The berm structures create a continuous ditch system for surface runoff collection and controlled movement on site. On-site runoff water drains into detention ponds around the site and then into a larger on-site retention pond where the water is stored until it is decanted as a controlled discharge into a marine environment. In 2010 the City of Iqaluit purchased a tube filtration system and has been filtering the retention pond water through this device prior to discharge.

The historical sampling results from the landfill runoff between 2004 and 2011 show that the water is consistently over the maximum allowable concentration limits for iron, manganese and zinc as listed in the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories. There are no specific guidelines in place for landfill surface runoff water in Nunavut. In the absence of specific guidelines, the most appropriate benchmark for comparing sample results are the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories, as well as limits established from other Nunavut Water Licences.

The City of Iqaluit has examined treatment options which could be applied to the landfill runoff, including wetland treatment, mechanical treatment (membrane bioreactor technology) and physical-chemical treatment with filtration. The City has completed a conceptual design for a constructed wetland that would treat the runoff by utilizing the natural processes of wetland vegetation, soils and soil microbial populations to degrade and store contaminants. The City has also completed a review of Membrane Bioreactor Technology which combines filtration and a suspended growth bioreactor to treat the runoff. Most recently the City advanced a turnkey proposal on physical-chemical treatment applying a Geotube® filtration system to remove precipitated solids.

The City initiated a filtration process in 2010 to determine the practicality and the potential treatment of the runoff by filtration alone. The 2010 sampling results of the filtered runoff suggest some contaminant removal, however the 2011 sampling results are inconclusive. The next phase of the trial process for the City will be applying chemical treatment in advance of the physical filtration process.

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# 1. Introduction

The City of Iqaluit Water Licence No. 3AM-IQA0611 Type "A" (valid until July 15, 2012) requires that the City of Iqaluit collect, monitor and control discharge of the runoff from the West 40 Landfill site and adjacent Sludge Management Facility. Currently the City of Iqaluit sends approximately 30,000 cubic meters of compacted waste to the landfill annually (estimate provided by Landfill Foreman September 2011). In 2007 AECOM calculated that the volume of winter runoff water generated from the landfill would be approximately 7,700 m³ and that the summer runoff would be 6,600 m³. The West 40 Landfill currently employs a surface water management system to divert off-site surface runoff from entering the site, and to collect on-site surface runoff for a controlled discharge into the environment. The landfill site relies on the local permafrost regime to provide a low permeability barrier to control the subsurface runoff.

# 2. Current Site Conditions

## 2.1 Current Drainage Management Plan

In 2006 the City of Iqaluit upgraded the West 40 landfill to improve drainage management. The current landfill drainage management system on site is based on a system of berms, ditches, detention ponds and a retention pond. A figure showing the landfill operating conditions can be located in Appendix A.

A berm structure on site diverts off-site runoff around the site and divert on-site runoff into a ditch collection system. The perimeter berm structures provide the infrastructure for a continuous ditch system for surface runoff management. On-site runoff control ditches drain to several control ponds (refer to Appendix A for locations). In 2006 three new drainage control ponds were constructed on site, increasing the total number of control ponds to 4 with an approximate total volume of 3000 m<sup>3</sup>. The control ponds provide a point where runoff may be sampled and transferred to the retention pond.

The runoff retention pond was constructed in 2006 and has approximately 5000 m³ of storage volume. The retention pond provides storage before the runoff is decanted into the receiving water system. Upon notification of the regulatory authorities the water is currently either decanted from the retention pond directly or decanted after filtration. In 2010 the City of Iqaluit purchased a tube filtration system and has been filtering the retention pond water through this device before the water enters the receiving environment.

Appendix B contains a photo presentation of the current landfill drainage management system on site.

Associated with the capital improvements have been operational improvements the drainage management. The landfill operating staff has taken steps to minimize the generation of on-site runoff by initiating removal of clean snow from the landfill site. The removal of snow ultimately reduces the amount of on-site runoff.

The City of Iqaluit is continuing to make capital improvements to the drainage management system associated with the West 40 landfill. Construction has been awarded for the expansion of the perimeter berm on the east side of the site to provide a larger berm structure, and an impermeable membrane on the interior face of the berm.

## 2.2 Summary of Historical Landfill Water Sampling Data

Twelve water samples taken from the retention pond, detention ponds and landfill runoff between 2004 and 2011 were provided by the City of Iqaluit and reviewed by AECOM. Currently there are no specific guidelines for the discharge of landfill surface runoff in Nunavut so the sample results were compared to limits for discharge from a

0.5 mg/L

INAC Results July 30, 2009

sewage lagoon from the City of Iqaluit Water Licence (2006) and the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories (GDTMWNWT).

All twelve samples throughout the time period tested exceeded the limits for iron, manganese and zinc. Table 1 presents the maximum and minimum sample results for these three parameters compared to the guideline limit. The June 2006 sample results from the retention pond exceeded the limits for iron, manganese and zinc as well as for BOD<sub>5</sub>, TSS, aluminum, copper and lead. All other samples analyzed were below the limits for BOD<sub>5</sub>, TSS, aluminum, copper and lead.

	GDTMWNWT Limit	Maximum Sample Result	Minimum Sample Result
Iron	0.3 mg/L	122 mg/L	2.3 mg/L
		INAC Results July 30, 2009	Detention Pond May 9, 2006
Maganese	0.05 mg/L	1.61 mg/L	0.61 mg/L
		Retention Pond #2 May 23 2011	Retention Pond Sample #1 May 3 2010

15.0 mg/L

Control Pond 2007

Table 1. Comparison of GDTMWNWT Limit and Maximum and Minimum Sample Results

Full summary sample results are located in Appendix C.

0.5 mg/L

Zinc

# 3. Review and Recommendation of Discharge Criteria

## 3.1 Origin of Effluent Quality Criteria for Landfill Runoff

The current water license in place for the City of Iqaluit was issued on May 15, 2006 (License No. 3AM-IQA0611 Type "A") and will expire in July 15, 2012. Within this license there is a condition (Part E, Item 17) which states that the City must submit a report "that will include a discussion of available treatment options, proposed discharge criteria, ... and a monitoring program". In response to this condition of the current license, the City retained Earth Tech as an Engineering Consultant in 2008 to meet the reporting requirements.

In June 2008 Earth Tech completed the report entitled City of Iqaluit – Water License Monitoring Program. The report identified parameters that should be tested for and also recommended the frequency of sampling of both the detention ponds and the retention pond associated with the landfill runoff management system. Table 2 lists the parameters from the report. The report was reviewed and supported by Environment Canada and Indian and Northern Affairs Canada. The report did not recommend any specific limits (maximum allowable concentrations) on the parameters to be monitored.

Table 2. Landfill Runoff Monitoring Parameters and Frequency as Recommended in 2008 Water Licence Monitoring Program Report

Parameter	Earth Tech's Recommendation on Sampling Frequency
<b>Detention Ponds</b>	
pH	Annually
Turbidity	Annually
Total suspended solids	Annually
BOD <sub>5</sub>	Annually
COD	Annually
тос	Annually
Retention Pond	
pH	Annually
Turbidity	Annually
Total suspended solids	Annually
BOD₅	Annually
COD	Annually
тос	Annually
Ammonia nitrogen	Annually
TKN	Annually
Total phosphorous	Annually
Full Metal Scan + Hg	Annually
Total Coliform	Annually
Fecal Coliform	Annually
BTEX	Annually
PCBs	Annually

The full 2008 City of Igaluit Water License Monitoring Program report is presented in Appendix D.

## 3.2 Sampling Criteria from Other Jurisdictions

The West 40 Landfill discharges into a marine environment, for this reason it is not appropriate to consult or compare sampling guidelines and criteria developed for surface water discharge situations with data from the West 40 Landfill runoff.

The Canadian Council of Ministers of the Environment (CCME) have guidelines for the discharge of water into marine environments for the protection of aquatic life. The criteria outlined in CCME's Water Quality Guidelines for The Protection of Aquatic Life lists guidelines for select metal parameters and petroleum hydrocarbon parameters. The CCME guidelines were developed in a national context for receiving environments across Canada.

The CCME Water Quality Guidelines for the Protection of Aquatic Life are located in Appendix E.

## 3.3 Applicable Sampling Parameters and Maximum Allowable Concentrations

It is most applicable to compare landfill runoff water sample results from the West 40 Landfill with the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories (GDTMWNWT) (Season: Summer, 150-600Lcd, marine/bay receiving environment). The GDTMWNWT criteria are the current effluent quality guidelines referenced in the City of Igaluit's Water Licence.

Another applicable reference is a water licence issued by the Nunavut Water Board to Defense Construction Canada for a DEW Line remediation project (licence number 1BR-DYE0914). This water licence lists guidelines that apply to discharge events associated with demolition rinse water, water from dewatering contaminated soil areas, contact water and potential seepage from a non-hazardous waste disposal facility and other monitoring stations at the site (Cape Dyer, Dye-M).

The City of Iqaluit's Water Licence issued in 2006 lists guidelines for water and waste disposal. The guidelines listed in this licence are for discharge of a municipal wastewater treatment lagoon and can be used as a reference when establishing appropriate guidelines for the discharge of landfill runoff.

Table 3 compares the parameters and maximum allowable concentrations from the three appropriate references discussed above.

Table 3. Appropriate Parameters and Maximum Allowable Concentrations for Comparison with West 40

Landfill Runoff Sampling Results

Parameter	Maximum Allowable Concentration	Source						
рН	6 to 9	2009 Cape Dyer WL & 1992 GDTWNWT						
Oil and Grease	5	2009 Cape Dyer WL						
Arsenic (total)	0.1	2009 Cape Dyer WL						
Cadmium (dissolved)	10	2009 Cape Dyer WL						
Chromium (dissolved)	0.1	2009 Cape Dyer WL & 1992 GDTWNWT						
Cobalt (dissolved)	0.5	1992 GDTWNWT						
Copper (dissolved)	0.2	2009 Cape Dyer WL & 1992 GDTWNWT						
Lead (dissolved)	0.05	2009 Cape Dyer WL & 1992 GDTWNWT						
Mercury (total)	0.0006	2009 Cape Dyer WL & 1992 GDTWNWT						
Nickel (dissolved)	0.3	1992 GDTWNWT						
PCB (total)	1	2009 Cape Dyer WL						
Zinc (total)	0.5	2009 Cape Dyer WL & 1992 GDTWNWT						
Benzene	0.37	2009 Cape Dyer WL						
Toluene	0.002	2009 Cape Dyer WL						
Ethylbenzene	0.09	2009 Cape Dyer WL						
BOD (5 Day)	120	1992 GDTWNWT & 2006 City of Iqaluit WL						
TSS	180	2006 City of Iqaluit WL						
Aluminum (total)	2	1992 GDTWNWT						
Barium (total)	1	1992 GDTWNWT						
Boron (dissolved)	5	1992 GDTWNWT						
Cyanide (total)	0.1	1992 GDTWNWT						
Fluoride (dissolved)	5	1992 GDTWNWT						
Iron (dissolved)	0.3	1992 GDTWNWT						
Maganese (dissolved)	0.05	1992 GDTWNWT						

Methylene Blue Active Substances (MBAS)	5	1992 GDTWNWT				
Molybdenum (total)	0.2	1992 GDTWNWT				
Selenium (total)	0.05	1992 GDTWNWT				
Silver (total)	0.1	1992 GDTWNWT				
Suplhate (dissolved)	500	1992 GDTWNWT				
Sulphide (dissolved)	0.5	1992 GDTWNWT				
Tin (total)	5	1992 GDTWNWT				

Note: 2009 Cape Dyer WL refers to the 2009 Cape Dyer DEW Line Remediation Water Licence 2006 City of Igaluit WL refers to the City of Igaluit 2006 Water Licence

# 4. Landfill Water Treatment Options

The City of Iqaluit has examined treatment options which may be applied to the landfill runoff water in the future. Currently none of the option listed below have been pursed further than the conceptual design and planning stage.

## 4.1 Constructed Wetland Treatment (Earth Tech Conceptual Design Report 2007)

#### 4.1.1 Overview of Constructed Wetland Technology

In 2007 Earth Tech (now AECOM) was retained by the City of Iqaluit to develop a conceptual plan for a wetland treatment system for the West 40 Landfill. The full report is attached as Appendix F. It was determined that a constructed wetland system was most appropriate wetland configuration because of the runoff volumes and cold climate conditions. Constructed wetlands are engineered systems that are designed and constructed to utilize the natural functions of wetland vegetation, soils and soil microbial populations to treat contaminants in wastewater streams. As wastewater flows slowly through a wetland, pollutants are removed through physical, chemical and biological processes. The physical processes include entrapment, sedimentation and adsorption. The biological processes include nitrification and denitrification, the uptake of nutrients and metals by plants and by organisms that occupy the bedding media. Constructed wetlands are advantageous to natural wetland systems because they can be specifically engineered for particular wastewater characteristics, they have lower lifecycle costs, and they may be operated with less labor and power. It is important to note that wetland technology is still in a developing phase, and it is not possible to predict the ultimate performance of a wetland system.

#### 4.1.2 Proposed Details of a Constructed Wetland Structure for the West 40 Landfill

The conceptual design report recommended that a subsurface horizontal flow wetland system be designed to treat the surface runoff from the landfill site. Subsurface flow wetlands involve passing the wastewater substrate through gravel or organic soil based systems. The large surface area of the media and plant roots provides space for microbial activity to degrade contamination. Media based wetland systems have high efficiencies at removing biodegradable organic matter and nitrate-nitrogen. Subsurface flow systems are below ground and work ideally in colder climates. Subsurface wetlands are preferred because they reduce odor and bug problems and reduce the potential for human contact with contaminated wastewater.

The proposed wetland treatment system would be located adjacent to the existing landfill site. The available and optimal location is the area east of the runoff retention pond which is sloped west to east. This land is currently under the control of another jurisdiction, therefore the City would have to negotiate for the use of this land for the wetland system. The wetland would be in operation from June to October. The proposed wetland would have a subsurface flow with permeable soil matrix growing medium. Landfill runoff would be introduced via a perforated head pipe to a gravel flow dispersion trench.

The wetland system would be developed in two phases. Phase 1 would have 7,700 m³ treatment capacity to meet the 2007 current discharge quality requirements. Phase 2 would have a 6,600 m³ treatment capacity for the future process improvements. The cost estimated to implement a constructed wetland at the site in 2007 for Phase 1 was \$273,770 and for Phase 2 was \$268,437.

## 4.2 Membrane Bioreactor Technology (2007 Earth Tech Letter Report)

#### 4.2.1 Overview of Membrane Bioreactor Technology

Membrane bioreactors (MBRs) combine the membrane filtration process with a suspended growth bioreactor to degrade contaminants. The 2007 Earth Tech (now AECOM) report on Membrane Bioreactor Technology prepared for the City of Iqaluit outlines a mechanical treatment option for the treatment of runoff from the West 40 Landfill. An immersed MBR was recommended as the most appropriate MBR technology because of the lower energy demand when compared to side stream MBR configurations. To treat the West 40 Landfill runoff an anoxic and aerobic tank would be required in front of the MBR for nitrogen removal. The MBR system would be able to produce effluent that is well below any guideline limits.

The MBR would only be in operation for the summer months (120 days) and would require proper storage and maintenance work during the winter months. Commissioning the MBR for each season would be a difficult task.

The order of magnitude cost estimate prepared in 2007 for an MBR for only one season of operation was 2.4 million dollars (including a 40% contingency allowance for construction and engineering services). MBRs are associated with high capital and operation/maintenance costs.

Appendix G contains the full Membrane Bioreactor Report.

#### 4.3 WESATech Geotube® Physical – Chemical Treatment System (WESATech Proposal)

WESA Technologies (WESATech) is an Ontario based company which focuses on the design and implementation of water and wastewater treatment systems. In 2010 WESATech prepared a proposal for the City of Iqaluit to implement a physical – chemical treatment system using a Geotube® filtration system for the West 40 landfill runoff to meet specified effluent discharge criteria.

## 4.3.1 Overview of WESATech Geotube® Physical-Chemical Treatment System

The WESATech Geotube® physical-chemical treatment process involves chemical treatment, solid filtration and neutralization all carried out continuously. The landfill runoff properties are characterized initially and the contaminants which require removal are identified. A chemical treatment process is designed to precipitate the contaminants from solution and to flocculate the contaminants into larger filterable particles. The Geotube® then works as a physical barrier to remove suspended solids. The solids that remain in the Geotube® can be returned to the landfill or transported for disposal at an appropriate facility. The Geotube® system can be stored in a shipping container and commissioned each time it is required to be used.

In the 2010 proposal the contaminants requiring removal from the West 40 Landfill runoff were iron, manganese and zinc. A two-stage chemical treatment step was proposed by WESATech. In the first chemical step calcium hydroxide solution would be added to raise the pH of the runoff water to induce the precipitation of the metals. In the second chemical treatment stage aluminum sulphate and polymer were added to flocculate the metals into larger particles. The chemical treatment stages were air mixed to promote the oxidation of the iron and manganese in the solution,

which leads to precipitation. The filtered water then entered a final neutralization step were the pH was adjusted to between 7 and 8 using hydrochloric acid.

The cost of the WESATech Geotube® equipment (pumps, tanks, Geotube®, piping, fittings, and chemicals for one season and transportation) to Iqaluit was estimated to be \$75,000. This amount does not include the cost of manpower on site. The cost of a WESATech operator was estimated to be \$1000/day. For the 2010 discharge event the cost of operator time and expenses per seasonal treatment and discharge event would be \$25,000. Supplies for seasonal treatment events were estimated to be \$10,000.

The complete WESATech proposal is included as Appendix H.

## 4.4 Tube Filtration System Currently in Use at the West 40 Landfill

The City of Iqaluit has purchased and utilized a tube filtration system on two discharge events from the retention pond. The first event was in July 2010 and the second event was in June 2011. The tube filter used by the City has a nominal pore size of 450 microns. The pore size decreases during operation as the tube captures suspended solids. The City has not used any chemical pretreatment on the runoff. As proposed by WESATech, pretreatment could enhance contaminant removal through the flocculation of dissolved contaminants.

The performance of the tube filter in removing contaminants based upon the very limited sampling in 2010 (unfiltered discharge versus filtered discharge) is encouraging with substantial reductions in aluminum, iron, zinc and turbidity reported by the City of Iqaluit (2010 NTWWA conference presentation). The results reported by the City in 2011 do not show significant signs of contaminant removal which suggests that the City may wish to consider chemical pretreatment in the future as part of the tube filtration process.

# 5. Conclusions and Recommendations

#### 5.1 Collection and Control of Landfill Runoff

The landfill runoff management system has been designed and constructed for the collection and control of off-site runoff (clean) and on-site runoff (contaminated) water. The on-site runoff is controlled so that water drains into a series of detention ponds on site and is then transferred to one retention pond off-site for storage prior to be discharge into the environment. Prior to any discharges the City consults and notifies the regulatory authorities. Improvements to the collection system are currently being completed by the City to improve the management of the on-site runoff.

#### 5.2 Treatment of Landfill Runoff

The City has investigated potential treatment processes which may be applied to the landfill runoff, including wetland treatment, membrane treatment and WESATech Geotube® physical-chemical treatment. Based upon the capital cost of the three options, the membrane treatment option is not financially viable for the City. The wetland treatment option may be financially viable; however negotiation is required with the current land owner. Negotiation could take a considerable amount of time and may not be successful, depending upon the stakeholders involved. The City has implemented a physical filtration process on a trial basis. The performance of filtration alone for the treatment of the landfill runoff has been inconclusive; therefore it is recommended that the City advance the use of a chemical treatment in advance of the filtration process. The WESATech Geotube® physical-chemical proposal is financially viable for the City and operationally practical for the City staff.

## 5.3 Effluent Quality Criteria for Treated Runoff

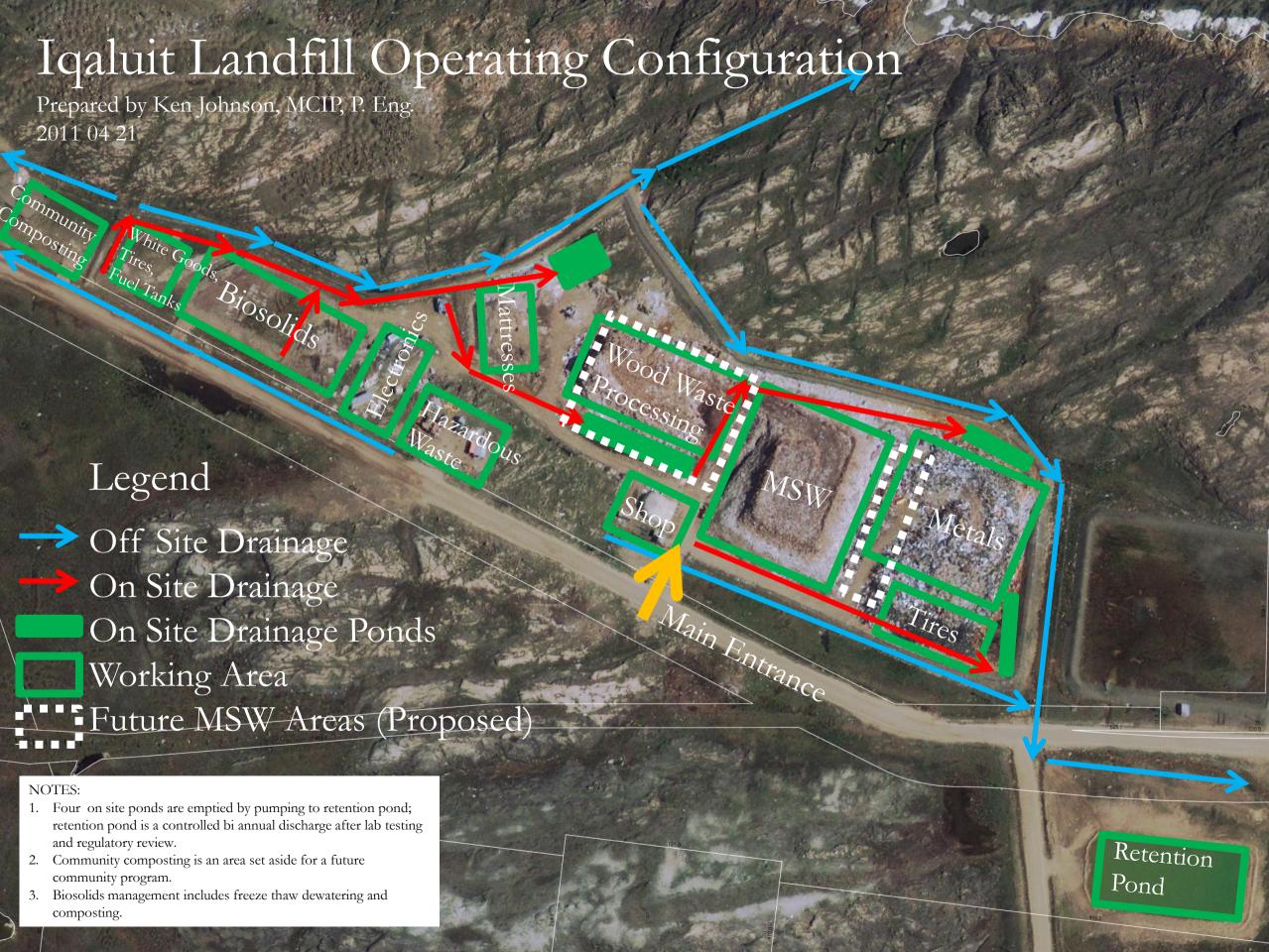
The City has completed an investigation into the appropriate parameters that should be tested for and a frequency of testing for the landfill runoff management system. This investigation was reviewed and supported by Environment Canada and Indian and Northern Affairs Canada. The City should continue to monitor for the parameters recommended in the 2008 Water License Monitoring Report. The Guidelines for the Discharge of Treated Municipal Wastewater in the NWT have been developed for arctic locations discharging into a marine environment, and are the most applicable standards of concentration limits to apply to the City of Iqaluit's discharge from the retention pond at the landfill. The Cape Dyer water licence has criteria that may also be used to supplement the GDTMWNWT in cases where a standard does not exist.



# **Appendix A**

**West 40 Landfill Drainage Management Review** 

**Landfill Operating Conditions** 





# **Appendix B**

**West 40 Landfill Drainage Management Review** 

Photo Presentation of Current Landfill Drainage Management System



On site runoff detention pond on northeast side of landfill site. Runoff is naturally flows from this pond to runoff detention pond at south west corner.

On site runoff detention pond at south east corner of landfill site. Runoff drains from this pond to runoff detention pond at south west corner.







On site runoff detention pond at south west corner of landfill site. Runoff is pumped from this pond to runoff retention pond.



Runoff **retention** pond , south of landfill site, receives runoff from landfill detention pond . Retention pond is sample and discharge twice each year.



Off site runoff management control system on southeast side of the landfill site (view to south)





Off site runoff management control system on southeast side of the landfill site (view to north)

Off site runoff management control system on south of the landfill site (view to west)







Off site runoff management control system on north side of the landfill site (view to northwest)

Discharge to minor wetland of off site runoff management control system on north side of the landfill site (view to south east)







On site runoff detention pond on northeast side of landfill site. Runoff is pumped from this pond to runoff detention pond at south west corner.

On site runoff detention pond at south east corner of landfill site. Runoff drains from this pond to runoff detention pond at south west corner.







On site runoff detention pond at south west corner of landfill site. Runoff is pumped from this pond to runoff retention pond.



Runoff **retention** pond , south of landfill site, receives runoff from landfill detention pond . Retention pond is sample and discharge twice each year.





# **Appendix C**

West 40 Landfill Drainage Management Review

**Landfill Water Sample Testing Results** 

# City of Iqaluit West 40 Landfill Water Historical Water Sampling Results

## Part			2011-08-09	2011-06-21	2011-06-23	2011-06-24	2010-06-03	2010-06-10	2010-06-10	2009-07-30	2008-06-09	2007	2007	2006-06	2004-07	<del></del>		T
March   Mar								Retention Pond				2007 Retention Pond				IOAL LIIT	WATER	GUIDELINES FOR
Company   Comp			Pond #1				Sample #1	Sample #2	Sample #3							LISCEN	CE 2006	TREATED MUNICIPAL WASTEWATER IN
Secretary Control Control   Fig.	PARAMETER	UNITS														AVE.	GRAB	(.,
Securing Property of the Control of	INORGANICS																	
Charles   Char	Alkalinity (Total as CaCO3)	_										99						
Contention   1970	Biochemical Oxygen Demand		70	5	11	11	8	5	5		1					120	180.0	120
Threate Grant Processor Services   15		II.																
Colored Colored   Colored Co	•			75	70	90	63	60	62		824	1050	1180	2050	1667.0			
NAME OFFICIAL STATE OF THE STAT		II.		73	70	00	03	00	03		280	410	480	660				
March   1966   1975	N-NH3 (Ammonia)		3.74	5.81	6.01	4.77	4.03	3.85	4.00						4.42			
Second   Column   C	Nitrite (N)										0.02	0.04	ND	<0.02	<0.2			
Triversions	Nitrate (N)	mg/L									ND	ND	ND	<0.05	<0.2			
March   19	Nitrite +Nitrate	II.									ND	ND	ND	<0.07				
Separate   Park		mg/L																
Triang   T	ľ	ma/l	7.99	7.65	8.01	8.01	7.74	7.84	7.96							6	-9 I	
Triangle and Services and Servi															396.0			500
Tried Opens Cholmin		II.	7.16	9.44	8.21	7.57	5.36	6.11	5.90		0.0	0.0	332					
Tree Progress Confere		_									18.6	26.5	41.9					
Trees Supposed Supp		II.			1						20	24	27					
Triangle MPU 85 516 516 521 524 524 521 524 525 525 525 525 525 525 525 525 525																		
Memory   1979	Total Suspended Solids										1			868	32.0	180	270	180
Non-transpare   Non-to-Company   Company   C	Turbidity	NTU	8.9	31.6	39.1	55.4	26.1	27.8	28.8		14.7	40	53			I		
Marriage   mg/s   0,0006		ma/l	0.07	0.04	0.05	0.22	0.26	0.08	0.08		0.20	0.21	0.11	5.01	0.05			2
Artener   mg/L   4001   4081		_								0.002	1							2
Second   S		II.																0.05
Second   mg1	Barium	II.																
Description	Beryllium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	0	ND	ND	ND	<0.0002	<0.001			
Bromein	Bismuth	mg/L									ND	ND	ND	<0.001	<0.001			
Cacherum	Boron	mg/L	0.97	0.99	0.82	0.69	0.43	0.59	0.60	0.31	0.30	0.39	0.48					5
Carelam   mg/L   17   122   139   123   112   146   144   130   150   200   203   186   18	Bromide	II.																
Color		II.								0.0001								0.005
Cobast		_								0.008								0.1
Corper   Might   D.002																		
Incompose   Migra																		
Unliverage   mg/L   0.6	Iron		1.52	3.28	3.68	4.98	4.05	4.03	4.08	122	2.3	4.30	7.50	12.8	8.86			0.3
Morganisma	Lead	mg/L	<0.001	0.002	0.002	0.002	0.004	0.003	0.003	0.002	0.0019	0.007						0.05
Magnesium   mgls	Lithium	_																
Mercury	-														0.90			0.05
Molycham										0.0001	11	12	11		~0.0001			0.0006
Nickel mg/L 0.010 0.011 0.012 0.010 0.012 0.010 0.012 0.013 0.013 0.013 0.013 0.013 0.008 0.011 0.014 0.0226 0.016 Pelasatim mg/L 0.0 2 2 28 22 16 19 19 19 9.5 11 13 617 38.8 Selection mg/L 4.0 01 4.0 0.05 4.0 0.0 4.0 0.0 4.0 0.0 5.0 0.0 5.0 0.0 0.0 0.0 0.0 0.0 0										0.0001	0.002	0	0					
Pelasaisim mgl. 30 22 28 22 16 19 19 19 9,5 11 13 617 368 Selenium mgl. 401 4005 40005 40005 40006 40.00 40.001 40	Nickel	_								0.013		-	-					
Silecon   mg/L   49   2.3   2.5   2.7   1.7   2.3   2.3   2.3   0.001   0.0001   0	Potassium											11	13		36.8			
Silver mg/L 0,0001 0,00	Selenium	mg/L	<0.01	<0.005	<0.005	< 0.005	<0.01	<0.01	<0.01	0.002	ND	ND	ND	0.0009	<0.002			0.05
Soldum   mg/L   172   112   132   122   70   103   103   41   41   40   207   125   Strontum   mg/L   0.914   0.813   0.920   0.761   0.409   0.841   0.853   0.800   0.770   1.100   1.010   0.86   Thallium   mg/L   0.0001   0.00	Silicon	II.																
Strontum	Silver									0.001								0.1
Thallum mg/L		-																
Tin mg/L		II.								0.0005								
Titanium mg/L <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.001 <0.0003	Tin		10.0001	30.0001	30.0001	-0.0001	30.0001	-0.0001	-0.0001	3.0000								5
Uranium   mg/L   0.006   0.004   0.006   0.003   0.003   0.003   0.0003   0.0003   0.0002   <0.001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.0001   <0.	Titanium	II.	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01									
Vanadium   mg/L   0.006   0.004   0.003   0.003   0.003   0.003   0.005   0.004   0.005   0.005   0.006   0.005   0.	Uranium		1							0.005								
No	Vanadium	mg/L																
MicroBioLoGicAL   Background   CFU/100mL   10   190   250   280   500.00   300.00   500.00	Zinc		0.05	1.9	1.57	1.6	2.0	1.8	1.7	0.5		6.90	15.0		15.2			0.5
Background   CFU/100mL   10	Zirconium	mg/L	L		1		<u> </u>				ND	]		0.005		L		
Total Coliforms   CFU/100mL   10   190   250   280   500.00   300.00		CELIMOS	1	<u> </u>	1		ı				1	4000	2500	ı				
Fecal Coliforms   CFU/100mL   < 10   7   12   3   20.00   < 10   < 1			1	10			190	250	280									
VOLATILE ORGANIC COMPOUNDS   September   Ug/L	Fecal Coliforms				1						1			<1				
Benzene	VOLATILE ORGANIC COMPOUNDS		ı		1				<u>.                                     </u>	<u> </u>	1				<u>.                                    </u>	ı	1	
Ethylbenzene	Benzene	ug/L		<0.5			<0.5	<0.5	<0.5									
m/p-xylene     ug/L     <1.0	Ethylbenzene				1			<0.5	<0.5		1							
Toluene	m/p-xylene			<1.0	1		<1.0	<1.0	<1.0		1							
VOC SURROGATES         102         98         95         95           Toluene-d8         %         102         98         95         95           Polychlorinated Biphenyls - PCBs           Phenols         mg/L         4.42         4.42	o-xylene	II.			1						1							
Toluene-d8         %         102         98         95         96         96         96         96         96	Toluene	ug/L		<0.5	1		<0.5	<0.5	<0.5		]							
Polychlorinated Biphenyls - PCBs           Phenols         mg/L         4.42         4.42	VOC SURROGATES	۵,		400	1		60	05	0.5		1							
Phenois         mg/L         4.42		%	L	102	<u> </u>		98	95	95		<u> </u>	l		<u> </u>	<u> </u>	L		<u> </u>
		ma/l		<u> </u>	1		I	<u> </u>				I		4.42	I			
				<0.1	<0.02	<0.02	<0.1	<0.1	<0.1		]			7.72				
			•	•	•	-					•		-					

Notes:

(1) Guidelines for the Discharge of Treated Municipal Wastewater in the NWT, 1992 (Season: Summer, 150-600 Lcd) (Receiving Env: Marine/Bay).

## City of Iqaluit Landfill Storage Retention Pond Decant Historical Water Sampling Results

	,,,												GUIDELINES FOR
		2011-06-22 Start	2011-06-23 Mid	2011-06-24 End	2010-07-27 Start	2010-07-27 End	2010-06-03 Start	2010-06-10 Mid	2010-06-10 End	2008-06-09	IQALUIT LISCEN DISCH	CE 2006 IARGE	THE DISCHARGE OF TREATED MUNICIPAL WASTEWATER IN
											CRIT	ERIA	THE NWT (1)
PARAMETER	UNITS										AVE.	GRAB	
INORGANICS													
Alkalinity (Total as CaCO3)	mg/L												
Biochemical Oxygen Demand	mg/L	5	11	11	11	9	8	5	5	16	120	180.0	120
Chloride (Dissolved)	mg/L												
Conductivity	umho/cm												
Chemical Oxygen Demand	mg/L	75	70	80	83	75	8	5	5	16			
Hardness (CaCO3)	mg/L												
N-NH3 (Ammonia)	mg/L	5.81	6.01	4.77	3.21	3.33	4.03	3.85	4				
Nitrite (N)	mg/L												
Nitrate (N)	mg/L				<0.1	<0.1	<0.1						
Nitrite +Nitrate	mg/L												
Oil and Grease	mg/L												
pH		7.65	8.01	8.08	8.11	8.15	7.74	7.84	7.96	7.9	6	-9	6-9
Sulphate (Dissolved)	mg/L												500
Total Dissolved Solids	mg/L												
Total Kjeldahl Nitrogen	mg/L	9.44	8.21	7.57	6.61	4.86	5.36	6.11	5.9				
Total Organic Carbon	mg/L	25.5	24.8	23.6	23.4	23.8	20.7	23.1	21.7	18.6			
Total Inorganic Carbon	mg/L										1		
Total Phosphorus	mg/L	0.05	0.04	0.14	0.05	0.05	0.13	0.07	0.08	0.05			
Total Suspended Solids	mg/L	11	14	177	14	12	54	15	14	15	180	270	180
Turbidity	NTU	31.6	39.1	55.4	6.9	6.4	26.1	27.8	28.8	14.7			
METALS			<b>.</b>		<b>.</b>		<b>.</b>						<b>.</b>
Aluminum	mg/L	0.04	0.05	0.22	0.02	0.02	0.26	0.08	0.08				2
Antimony	mg/L	0.0007	0.0006	<0.0005	0.0008	0.0008	0.0009	0.0009	0.0009				
Arsenic	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				0.05
Barium	mg/L	0.03	0.04	0.03	0.03	0.03	0.02	0.03	0.03				1
Beryllium	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001				
Bismuth	mg/L												
Boron	mg/L	0.99	0.82	0.69	0.77	0.75	0.43	0.59	0.6				5
Bromide	mg/L												
Cadmium	mg/L	0.0006	0.0006	0.0006	< 0.0001	< 0.0001	0.0011	0.0011	0.0011				0.005
Calcium	mg/L	122	128	123	185	184	112	146	144				
Chromium	mg/L	0.006	0.007	0.005	0.002	0.007	0.003	0.006	0.035				0.1
Cobalt	mg/L	0.0015	0.0014	0.0018	0.0015	0.0015	0.0022	0.0023	0.0024				0.1
Copper	mg/L	0.011	0.011	0.011	0.004	0.003	0.027	0.027	0.027				0.2
Iron	mg/L	3.28	3.68	4.98	0.54	0.52	4.05	4.03	4.08				0.3
Lead	mg/L	0.002	0.002	0.002	< 0.001	< 0.001	0.004	0.003	0.003				0.05
Lithium	mg/L												
Manganese	mg/L	1.48	1.61	1.34	0.38	0.37	0.61	0.78	0.81				0.05
Magnesium	mg/L	18	22	22	27	27	13	19	18				
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	<0.0001	<0.0001	<0.0001	< 0.0001	< 0.0001				0.0006
Molybdenum	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	< 0.005	< 0.005				0.2
Nickel	mg/L	0.011	0.012	0.01	0.009	0.009	0.012	0.013	0.013				0.3
Potassium	mg/L	22	26	22	29	30	16	19	19				
Selenium	mg/L	< 0.005	< 0.005	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01				0.05
Silicon	mg/L	2.3	2.5	2.7	3.1	3	1.7	2.3	2.3				
Silver	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		1		0.1
Sodium	mg/L	112	132	122	161	162	70	103	103				
Strontium	mg/L	0.813	0.92	0.761	1.33	1.27	0.499	0.841	0.853				
Thallium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
Tin	mg/L												5
Titanium	mg/L	<0.01	0.004	0.006	<0.01	<0.01	0.01	<0.01	<0.01				
Uranium	mg/L												
Vanadium	mg/L	0.004	0.004	0.006	<0.001	<0.001	0.003	0.003	0.003				
Zinc	mg/L	1.9	1.57	1.6	0.06	0.05	2	1.8	1.7				0.5
Zirconium	mg/L												
MICROBIOLOGICAL													
Background	CFU/100mL										1		
Total Coliforms	CFU/100mL	10					190	250	280		1		
Fecal Coliforms	CFU/100mL	<10					7	12	3				
VOLATILE ORGANIC COMPOUNDS													
Benzene	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5						
Ethylbenzene	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				1		
m/p-xylene	ug/L	<1	<1	<1	<1	<1	<1						
o-xylene	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				1		
Toluene	ug/L	<0.5	<0.5	<0.5	<0.5	0.8	<0.5						
VOC SURROGATES	1 -												
Toluene-d8	%	102			100	100	95	95	98		1		
Polychlorinated Biphenyls - PCBs								•			•		
Phenois	mg/L												
Polychlorinated Biphenyls (PCBs)	ug/L	<0.1	< 0.002	< 0.002	<0.1	<0.1	<0.1	<0.1	<0.1				
								•					

Notes

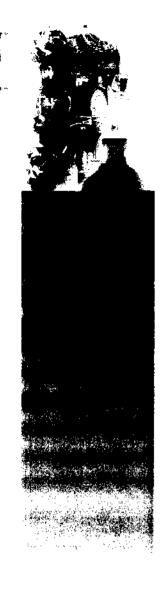
<sup>(1)</sup> Guidelines for the Discharge of Treated Municipal Wastewater in the NWT, 1992 (Season: Summer, 150-600 Lcd) (Receiving Env: Marine/Bay)



### **Appendix D**

**West 40 Landfill Drainage Management Review** 

**City of Iqaluit Water License Monitoring Program** 



## City of Iqaluit Water Licence Monitoring Program

Nunavut Water Board

JUN 2 7 2008

**Public Registry** 



## City of Iqaluit Water Licence Monitoring Program

Prepared for: City of Iqaluit City Hall P.O. Box 460 Iqaluit, Nunavut, XOA 0H0

Prepared by: Earth Tech (Canada) Inc. 17203 – 103<sup>rd</sup> Avenue Edmonton, AB T5S 1J4

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#### 1.0 INTRODUCTION

#### 1.1 Background

The City of Iqaluit is located at the south end of Baffin Island, on Frobisher Bay at 64° 31'N latitude and 68° 31'W longitude, in a region of continuous permafrost with a typical arctic climate. The community has only four months when the average monthly temperature is above freezing.

The city has a population of approximately 6,200 with a predicted increase in population to 11,300 in 2022. The infrastructure municipal facilities are currently operated under the Water Licence (File No: 3AM-IQA0611) issued by the Nunavut Water Board (NWB) in 2006. Based on the requirements of the Water Licence, one of the most important responsibilities of the City of Iqaluit is to monitor the quantity and quality of the "water" associated with potable water supply, sewage treatment and solid waste management to protect public health and the environment.

In 2007, the City of Iqaluit retained Earth Tech (Canada), Inc. to provide services for preparing the "water" monitoring plan. The primary purpose of the monitoring plan is to help the City of Iqaluit identify appropriate water quality parameters to be monitored and sampling locations for the collection of representative samples. This monitoring plan will be submitted to the NWB for approval before it is applied for water monitoring in the City.

#### 1.2 Scope and Objectives

It is very important for the City of Iqaluit to comply with the Water Licence for operating and monitoring the municipal facilities (i.e. water treatment, wastewater treatment, landfill etc.) properly. The water monitoring programme, once in place, will provide the appropriate framework for the City to achieve compliance associated with the water sampling requirements in the water licence.

Overall, the primary objective of the project is to develop a cost-effective compliance monitoring plan for:

- Protection against adverse impacts on public health from physical, chemical and biological hazards;
- Environment protection; and Compliance with Water Licence regulation and guidelines.

The Monitoring plan for the City of Iqaluit has been prepared based on the following key tasks:

- Identification of current criteria for water monitoring presented in Water Licence;
- Identification of the gap between the requirements of the Water Licence and the practical needs
  of Iqaluit for water monitoring;
- Recommendations of appropriate water quality parameters for Iqaluit;
- Confirmation of the sampling points for the recommended monitoring; and
- Preparation of final monitoring plan based upon NWB feedback.
- Organization of the Report.



The remainder of the report has been organized in the following sections:

- Section 2.0: Municipal Facilities and "Water" Characteristics. The treatment process and
  operation strategy of the drinking water treatment plant (WTP), wastewater treatment plant
  (WWTP) and solid waste management facility are briefly introduced in this section. In addition,
  the characteristics of "water", associated with water treatment, sewage disposal and landfill
  management, are also summarized;
- Section 3.0: Identification of the Water Monitoring Criteria and Locations. This section
  compares the requirements of the Water Licence applied for the City of Iqaluit with some
  standards and guidelines published by some organizations or government branches. Also, some
  suggestions and comments regarding the monitoring criteria required by the Water Licence are
  discussed.
- Section 4.0: Budget for Sampling. An annual budget for monitoring (sampling and analysis) is
  presented based on laboratory quotations from several commercial laboratories which the City of
  Iqaluit could use for sample analysis.



#### 2.0 MUNICIPAL FACILITIES AND "WATER" CHARACTERISTICS

#### 2.1 Water Treatment Facility (WTP)

The City of Iqaluit's water treatment plant (WTP) was initially commissioned in the 1960s, with Lake Geraldine Lake used as the raw water source. Due to the limited treatment capacity, the main treatment process of the WTP was upgraded between 2002 to 2004. After the upgrade, the treatment capacity of the WTP was increased to approximately 9,500 m<sup>3</sup> day<sup>-1</sup> based on a projected population of 11,300 in 2021.

The upgraded treatment facility consists of the following processes:

- Lake Geraldine dam structure and valve chamber:
- Raw water intake pipeline and tempering system (upgraded in 1999);
- Plant inlet flow control valve;
- Ultraviolet (UV) pre-disinfection (one duty and one standby);
- Flocculation tanks (to be used for flocculation only when coagulation is required in future);
- Dual media rapid gravity filters and filter backwash and "filter to waste" storage tanks;
- Chemical (chlorine gas, zinc orthophosphate, hydrofluorosilicic acid and caustic soda) dosing systems; and
- Treated water clearwells (west clearwell and east clearwell).

Normally, raw water is drawn from the dam on the Geraldine Lake and flows to the WTP through a 250 mm main by gravity. Upon entering the WTP, the raw water is metered and controlled by a flow control valve. The raw water then flows through either of the UV reactors to inactivate pathogens. Downstream of the UV equipment the water flows through a set of flocculation tanks (these tanks will only be required to operate as flocculation tanks in the event that future coagulation is required to meet the final water quality targets), or through a flocculation tank bypass line on to the filters. From the filters the filtered water flows into the contact chamber where chlorine gas (for residual disinfection) is injected to the water along with hydrofluorosilic acid (for fluoridation) and caustic soda (for pH adjustment). The treated flow from the contact chamber can then be diverted to either of the clearwells or into the filter backwash chamber. Zinc orthophosphate (for pipeline corrosion protection) is added before the treated water is delivered to the distribution system or an off-site reservoir. The "filter to waste" storage tank is used for accepting the filter ripening flow, of which the quality is usually above the regulatory requirements, generated by filters after backwash cycles.

This drinking water treatment process is automatically controlled by a Plant Control System (PCS) and requires minimal intervention unless there is an alarm indicated. Monitoring, fine-tuning and scheduled maintenance of the WTP operating systems provide reliability and dependability with reduced system malfunctions and breakdowns.



#### 2.2 Wastewater Treatment Facility (WWTP)

The City of Iqaluit has historically used a primary sewage lagoon for its wastewater treatment. To improve the wastewater treatment efficiency and achieve effluent quality requirements, the City initiated construction of a new WWTP. In 1998, the city awarded a design-build contract for a new WWTP.

The design-build contractor proposed the use of an acrated membrane bioreactor (MBR) process for the wastewater treatment. In this proposed treatment process, the wastewater, after flowing through the preliminary treatment screens, is treated by a MBR system, in which most organic contaminants are degraded by microorganisms, and the treated wastewater and biomass are separated by membranes. Then, the filtrate from the membranes may be discharged to the surface water, and waste sludge generated in the treatment process may be dewatered and transferred to the landfill site for disposal.

However, due to design and construction problems, the MBR wastewater treatment process was never commissioned. In 2002, Earth Tech (Canada), Inc. conducted a detailed investigation of the WWTP, and recommended that the City reconfigure the facility to use a conventional biological wastewater treatment process to replace the MBR process. Following that, CH2M Hill developed a workable conceptual design in 2003 and Earth Tech carried out the conversion and expansion work from 2004 to 2006.

The major treatment facilities of the conventional biological treatment process (phase 1 and phase 2) consist of:

- Wastewater lift station;
- Preliminary treatment headworks (screening and grit removal);
- Primary filter (Salness filter);
- Activated-sludge aeration tanks and aeration systems (phase 2);
- Secondary clarifiers (phase 2);
- Waste sludge dewatering system (phase 2); and
- Others (chemical storage, pH adjustment, disinfection equipment).

The construction and commissioning of the new conventional biological WWTP is being carried out two phases. Phase 1 of the WWTP, the preliminary treatment process, was commissioned in May 2006, and phase 2, the biological treatment process, is scheduled for implementation within the next 5 to 10 years. The major facility equipment in phase 1 was designed for a peak flow of 14,400 m³ day¹ with a service population of 12,000; the remaining equipment in phase 1 were designed for a peak flow of 9,600 m³ day¹ with a service population of 8,000.

Currently, the raw wastewater enters the plant through an existing 300 mm gravity sewer main into the influent pumping chamber, where a basket screen catches any solids that have a diameter greater than 75 mm. The raw wastewater is then pumped and metered up to the coarse screens by which the particles larger than 5 mm are removed. The wastewater from the coarse screens is further screened to 300 micron particle size by fine screens and then flows by gravity into the retention channel. This primary effluent flows through the retention channel, under an underflow weir (to contain any floatable flammables), then over an overflow weir and finally out through the outfall to the Koojesse Inlet.



The sludge from the screens and the primary filter is compacted and dewatered to a solids content of approximately 20%, and dropped into a the dump trailer which is periodically emptied at the landfill site. The sludge is dewatered further by freeze-thaw over the course of one winter, and composted at the landfill site.

#### 2.3 Landfill Facility

The City of Iqaluit produces approximately 10,000 m<sup>3</sup> of compacted waste which enters the landfill annually, including residential, commercial and industrial wastes. Recycling is currently limited to the collection and diversion of aluminium cans. The current landfill facility was constructed on the south end of the West 40 Dump Site #3 in 1995 and expanded to the north in 2001. Further construction work in manage the site drainage was completed in 2006.

The waste disposal techniques at the landfill include compaction and covering with wood waste fill. The area method is used for the landfill operation, and includes placing waste above grade against a perimeter berm, compacting the waste using a wheeled loader and covering the waste using a wood waste material. The mulch, developed from wood construction waste, is a 250 to 300 mm layer that is placed over the waste and prevents wind blown material.

The landfill does not have an impermeable liner system to control the subsurface runoff; it relies on the local permafrost regime to provide a low permeability barrier to control the subsurface runoff. To control the surface discharge of runoff from the landfill site to the receiving environment, a surface water control system for both on-site and off-site drainage was completed in 2006.

The landfill surface runoff management system consists of a series of continuous ditches associated primarily with the perimeter berm structure of the landfill facility. The system is used to divert the "off-site" surface runoff and "on-site" surface runoff, essentially keeping the clean "off-site" water "clean" and keeping the potentially contaminated "on-site" surface runoff from leaving the landfill site. The "on-site" surface runoff is collected in several control ponds through the ditches and then pumped to a retention pond. The retention pond is discharged annually after testing and notification to the regulatory authorities.



#### 3.0 IDENTIFICATION OF THE WATER MONITORING CRITERIA

#### 3.1 Drinking Water Monitoring Criteria

#### 3.1.1 Raw Water

**Table 3.1** presents the water quality parameters and testing frequency that are required by the Water Licence (File No: 3AM-IQA0611) and recommended by Earth Tech for the raw water supply from Lake Geraldine Reservoir at the City of Iqaluit's WTP prior to treatment.

Table 3.1 Raw Water Monitoring Criteria and Frequency

Parameters Required by	Required Frequency	Earth Tech's		
Water Licence	by Water Licence			
Routine Parameters	by water Licence	Recommendation		
	B da mathili.	Nist and a second of the		
Acidity	Monthly	Not recommended		
Alkalinity	Monthly	Monthly		
Bicarbonate	Monthly	Quarterly		
Carbonate	Monthly	Quarterly		
Chloride	Monthly	Quarterly		
Conductivity	Monthly	Monthly		
Hardness	Monthly	Quarterly		
Hydroxide	Monthly	Quarterly		
ORP	Monthly	Not recommended		
рН	Monthly	Weekly		
Sulphate	Monthly	Quarterly		
TDS	Monthly	Monthly		
TSS	Monthly	Monthly		
TOC	Monthly	Monthly		
TIC	Monthly	Not recommend		
Temperature	Monthly	Weekly		
Turbidity	Monthly	Weekly		
Potable Water Parameters		•		
Fecal coliforms	Monthly	Quarterly		
Total ICP metals	Monthly	Quarterly		
Dissolved ICP metals	Monthly	Quarterly		
Additional Parameters	-	•		
UV transmittance	N/A	Monthly		
Color	N/A	Quarterly		
Total coliforms	N/A	Quarterly		
Giardia Lamblia	N/A	Quarterly		
Cryptosporidium	N/A	Quarterly		



As presented in **Table 3.1**, the Water Licence requires the City to monitor all of these listed parameters monthly. However, from the point view of operation of a WTP, some of these parameters may need to be monitored more frequently and some less frequently. Based on the importance of these parameters specific to the City of Iqaluit's WTP, different monitoring frequencies ranging from daily to annually are recommended as listed in **Table 3.1**. The reasoning behind these recommendations is discussed in the following paragraphs.

Parameters not recommended: Acidity, ORP and TIC.

The acidity of raw water can be directly or indirectly reflected by pH and alkalinity, which are recommended for routine monitoring. ORP monitoring is usually needed for water containing a relatively high concentration of a redox-active species, which may have some adverse effects on pipelines. The water quality of Lake Geraldine is good and there are no such redox-active species observed currently. Since many important parameters related to inorganic components, such as metals, chloride, carbonate, etc., are recommended for routine monitoring, TIC, as an overall index of the inorganic matters present in water, is not necessary. Acidity, ORP and TIC are not recommended during the normal operation of the WTP, although these parameters are to be monitored if some unusual condition arises.

Weekly monitored parameters: pH, Temperature and Turbidity.

These three parameters have significant effects on the performance of the existing water treatment process at the WTP. For example, raw water pH and temperature have great impacts on the chlorine concentration and contact time for the disinfection of treated water. Turbidity is very important for the operation of coagulation, flocculation and filtration. In addition, UV disinfection is also affected significantly by turbidity. The higher the turbidity of water in a UV reactor, the more UV light is attenuated. This means that higher UV doses will be required to achieve reliable disinfection levels when the turbidity is high. Under the current operating conditions, it is recommended to monitor these parameters weekly; if and when the coagulation and flocculation process is applied, it would be better to measure these parameters on a daily basis.

Monthly monitored parameters: Alkalinity, Conductivity, TDS, TSS, TOC and Fecal coliform.

The alkalinity of a water is its ability to neutralize an acid and is due to its CO<sub>3</sub><sup>2-</sup>, HCO<sup>3-</sup> and OH<sup>-</sup> content. This is an index of the buffering capacity of water and if it is too low, the pH value could be changed significantly during the treatment. TDS and conductivity are used directly or indirectly to estimate the dissolved solids concentration in water. Both of them have certain correlations with the parameter of hardness. Water with high TDS usually tastes bitter, salty or metaflic and sometimes, it may have some unpleasant odours. TSS is used to indicate the suspended solids present in water and it can usually affect the performance of some treatment processes, such as UV disinfection, coagulation, flocculation and filtration. TOC, indicating the concentration of organics present in water, is another important parameter for the WTP operator to monitor. In addition, TOC can also be used to estimate the generation of some organic disinfection by-products (DBPs), such as THMs and HAAs. Due to the importance of these parameters to the operation of the WTP, it is recommended to monitor them monthly in the first one or two years after the monitoring program is applied and then, to optimize the monitoring costs, these parameters could be monitored quarterly if the raw water quality, confirmed by the results obtained in the first one or two years, is good enough for the operation of the WTP. The reason that these parameters are recommended to be monitored at least quarterly is that the water quality of Lake Geraldine could have a variation due to the transition between different seasons, such as the runoff in spring. Some of these parameters may need to be monitored more frequently if some unusual condition of the WTP requires doing so.



Quarterly monitored parameters: Hardness, Bicarbonate, Carbonate, Chloride, Hydroxide, Sulphate, Total ICP Metals, Dissolved ICP metals and Fecal Coliforms.

Compared with the parameters discussed above, the focus of this group of parameters is more on the suitability of raw water to be used as a source for the WTP rather than the effects of raw water on the operation of the WTP treatment process. Since the water of Lake Geraldine is characterized to be good for drinking water treatment by the WTP, it is recommended to monitor these parameters (except Fecal Coliforms) quarterly in the first one or two years after the monitoring program is applied. If these parameters are in acceptable ranges and there is no significant contaminant source affecting the water quality of Lake Geraldine, these parameters could be monitored annually. If these parameters are monitored annually, it is recommended to monitor them alternatively in warm seasons and cold seasons. For the fecal coliforms, it is quite important for the public health and safety and it is recommended to monitor this parameter quarterly for the first two years after the monitoring program is applied; the monitoring frequency can then be reduced if the observed results are stable and no significant contamination source is around the drinking water source.

Additional parameters: UVT, Color, Total Coliforms, Giardia Lamblia, and Cryptosporidium.

Since a UV reactor is used for pre-disinfection at this WTP, the UV transmittance (UVT) of raw water becomes very important for the performance of the UV reactor. The lower the UVT of the raw water, the less effective UV light can get to the target pathogens and therefore, the more pathogens could pass through the UV reactor. To ensure the UV reactor is working under design conditions, it is recommended to monitor the raw water UVT at least monthly. Color is another important parameter for the monitoring of raw water quality and it is usually regulated as an aesthetic parameter by many regulatory authorities. The current treatment process of the WTP has minor capability for the removal of color. Therefore, the raw water color monitoring is recommended at least quarterly in the first one or two years after monitoring program is applied. In warm seasons, the raw water color may need to be monitored more frequently if it has been observed to experience a significant variation during this time. However, if the color is always observed far below the regulatory requirement, it may be monitored annually in the following years for economic purposes. Total coliforms, Giardia Lamblia and Cryptosporidium are three important biological parameters for any water treatment plant to monitor, to protect the public from biohazards. It is recommended to monitor these three biological parameters quarterly for the first two years after the water monitoring program is applied and then, if these biological parameters are within acceptable ranges, the monitoring frequency may be reduced to annually.

#### 3.1.2 Treated Water

There are no specific requirements for the quality of treated water in the Water Licence. However, it is more important for the protection of public health to monitor the quality of treated water than it is to monitor the quality of raw water. Therefore, some important parameters are recommended hereinafter for the monitoring of treated water quality. The *Guidelines for Canadian Drinking Water Quality* (March 2007) published by Health Canada on behalf of the Federal-Provincial-Territorial Committee on Drinking Water was used as a reference in the following discussion.



Generally speaking, the parameters required for monitoring the quality of treated water can be categorized as microbiological, physical, chemical (inorganic, organic, disinfectant and disinfectant by-products (DBP)) and radiological parameters. Since most drinking water sources have very low radioactive contaminants, the radiological parameters in most WTPs are not monitored in routine operation. Lake Geraldine is recognized as a good drinking water source and no radioactive contamination has been observed. Therefore, to reduce the operation cost, the City of Iqaluit does not need to monitor the radioactive parameters routinely unless such kind of contamination is suspected in Lake Geraldine. The inorganic and organic chemical parameters of treated water to be monitored primarily depend on the raw water quality. The parameters of disinfectant and DBPs are monitored based on the species of disinfectant applied at the WTP and organics present in the raw water. Physical and microbiological parameters are usually monitored in most WTPs to protect the public from aesthetic and pathogenic problems. Table 3.2 summarizes the microbiological and physical parameters and the guideline limitations required by Health Canada.

Table 3.2 Treated Water (in WTP) Monitoring Parameters and Frequency

		• •
-	Limitations Required by Health Canada	Recommended Monitoring Frequency
<b>Microbiological Parameters</b>		•
Fecal coliforms	0 CFU/100mL	Quarterly
Total coliforms	0 CFU/100mL	Quarterly
Heterotrophic plate count	No numerical guideline <sup>1</sup>	Twice per year
Giardia Lamblia	No numerical guideline <sup>2</sup>	Dependent on the raw water
Cryptosporidium	No numerical guideline <sup>2</sup>	Dependent on the raw water
Enteric viruses	No numerical guideline <sup>3</sup>	Dependent on the raw water
Turbidity	0.3/1.0/0.1 NTU <sup>4</sup>	Weekly
Physical Parameters <sup>5</sup>		•
Color	≤ 15 TCU	Quarterly
рН	6.5 - 8.5	Weekfy
Temperature	≤ 15 °C	Weekly
Total dissolved solids	≤ 500 mg/L	Monthly
Taste and Odor	Inoffensive	Not recommended
Chemical Parameters		
Free and/or total chlorine		Weekly
THM formation potential	0.08 mg/L <sup>8</sup>	Annually
HAA formation potential	0.06 mg/L <sup>6</sup>	Annually

Note:

- No MAC is specified for HPC bacteria currently; but increases in HPC concentration above baseline levels are considered undesirable;
- 2. If the presence of these protozoa is observed or suspected in drinking water sources, the WTP should achieve at least a 3-log reduction in and/or inactivation of cysts and oocysts, unless source water quality requires a greater log reduction and/or inactivation;
- Where treatment is required, the WTP should achieve at least a 4-log reduction and/or inactivation of viruses;
- Requirements listed in the table are based on conventional treatment/slow sand or diatomaceous earth filtration/membrane filtration;
- All limits of physical parameters listed in Table 3.2 are aesthetic objectives or operational guidance values; and
- Maximum contaminant levels required by USEPA.



#### 3.1.3 Microbiological Parameters

As shown in Table 3.2, Health Canada has set relatively stringent requirements on treated water for microbiological parameters. For the treated water produced by the City of Iqaluit's WTP, the parameters of E. coli, total coliforms and turbidity should be monitored on a routine schedule. To reduce the operation cost, turbidity of treated water is recommended to be monitored at least weekly (daily measurement is preferred); E. coli and total coliforms should be monitored no less frequently than those done in raw water of the WTP (quarterly for the first two years and then annually if possible). Generally speaking, Heterotrophic Plate Count (HPC) does not have health effects; it is an index to reflect the variety of bacteria present in water. The lower the HPC, the better maintained the water system is. Therefore, to monitor the maintenance condition of the water system it would be better to determine the HPC level in treated water twice per year. The threat from Giardia Lamblia and Cryptosporidium against public health and safety has attracted great attention in North America since several fatal illnesses caused by drinking water contaminated by these protozoa were reported in recent years. Although there are currently no specific MACs required for these protozoa, Health Canada has set strict reduction and/or inactivation requirements for the water treatment process if possible contamination by these protozoa is suspected or known in the drinking water source. According to the City of Igaluit Water Treatment Plant Design Report dated September 2001, the current treatment process at the City's WTP should be able to achieve at least a 3-log removal of Giardia and Cryptosporidium, which is a minimum requirement for a WTP without source water assessment for these parasites. Therefore, at the moment, it is important for the City's WTP to monitor the Giardia and Cryptosporidium levels in the raw water; the treatment redundancy for Giardia and Cryptosporidium can then be determined based on the obtained raw water data. If the City of Iqaluit has watershed protection plan in place it may not be necessary to monitor these protozoa levels in treated water routinely. For enteric viruses, as long as the water treatment facilities, especially filtration and chlorination, are operated properly, it should be able to achieve at least a 4-log removal at this WTP. Therefore, it is more important to monitor the parameters (chlorine residual, contact time, turbidity etc.) which can indicate the operational status of treatment facilities, than to determine the level of enteric viruses present in treated water. Due to this reason, it is not considered necessary to monitor the enteric viruses routinely in treated water.

#### 3.1.4 Physical Parameters

Regarding the physical parameters listed in **Table 3.2**, they do not cause health risks but aesthetic problems for human consumption in most cases. Very similar aesthetic objectives or operational guidance values are regulated by both Health Canada and USEPA. Of these parameters, Odour and Taste are two very subjective parameters and are easy to be detected. So, it is not necessary to collect some specific water samples for odour and taste analysis in normal conditions. However, operators may need to check for these two aesthetic parameters in routine operation, especially in algal blooming period. Temperature and pH are two basic parameters for treated water; they may affect the chlorine disinfection process and cause pipeline corrosion and some aesthetic problems. It is recommended to determine these parameters at least weekly. For TDS and Color in treated water, they should be monitored as frequently as TDS and Color in raw water.



#### 3.1.5 Chemical Parameters

Chemical parameters monitored in treated water can be categorized as inorganic, organic, disinfectant and disinfection by-product (DBP). As described previously, the City of Iqaluit's WTP currently uses UV irradiation for pre-disinfection, and chlorine gas for secondary disinfection and disinfection residual kept in potable water distribution systems. Many academic researchers have indicated that no significant DBPs could be generated by UV disinfection. For chlorination, some harmful DBPs, such as trihalomethanes (THMs) and haloacetic acids (HAAs), can be produced. The following parameters regarding the disinfectant and DBP in treated water are recommended to be monitored:

- Free chlorine concentration or total chlorine concentration in treated water before entering potable water distribution systems at least weekly (daily is preferred);
- THMs formation potential (FP) at least annually; it is recommended to analyze the THMs FP alternatively in warm seasons and cold seasons if it is monitored annually;
- HAAs formation potential (FP) at least annually; it is recommended to analyze the HAAs FP alternatively in warm seasons and cold seasons if it is monitored annually; and
- UV reactors should be checked routinely according to both the operation manual, and the
  requirements to make sure that reactors are working properly and appropriate UV doses can be
  delivered to the water.
- Inorganic chemical parameters include metals and anions. All of these parameters are quite
  important for the public safety and health and Health Canada has strict requirements on these
  parameters. Since there has been no systematic analysis conducted before for these parameters in
  treated water at the WTP, it is recommended to:
- Conduct a full metal scan<sup>1</sup> (for total concentrations) quarterly in the first two years of the Water Licence applied; the analysis frequency then can be reduced to annually (alternatively in warm seasons and cold seasons) if the metals are within the regulatory required ranges and the determined metal concentrations do not have significant variations; and
- Conduct a anion scan<sup>2</sup> quarterly in the first two years of the Water Licence applied; the analysis
  frequency then can be reduced to annually (alternatively in warm seasons and cold seasons) if the
  anions are within the regulatory required ranges and the determined anion concentrations do not
  have significant variations.

Generally speaking, the purpose of monitoring the dissolved metals (such as Aluminium, Iron, Calcium, and Manganese) in drinking water is to study the effects of these dissolved ions on the performance of some specific treatment units (such as membrane filtration, softening and coagulation). Therefore, monitoring these dissolved metals does not have significant meaning for the current treatment process at the WTP. If the total concentrations of metals can achieve the regulatory requirements, it may not be necessary to routinely monitor the dissolved metals.

Including Chloride, Cyanides, Fluoride, Nitrates, Nitrites, Phosphates, Sulphates, etc.



Including Aluminium, Arsenic, Antimony, Barium, Boron, Calcium, Cadmium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Silver, Sodium, Zinc, etc.

#### 3.1.6 Potable Water in Distribution Systems

The Water Licence does not mention the requirements for the monitoring of potable water in potable water distribution systems. Due to the possibility that treated water supplied by the WTP could be contaminated in potable water distribution systems, it is also important to monitor the quality of potable water in distribution systems. The following parameters are suggested to be monitored:

- Temperature and pH. These two basic water quality parameters are usually related to many important reactions of water chemistry. It is recommended to monitor them at least weekly;
- Free chlorine residual and/or total chlorine residual concentration. This is an important parameter
  indicating the residual disinfection ability of the potable water in distribution systems. It is
  recommended to monitor this parameter at least weekly;
- THM and HAA concentrations. Sometimes, due to the presence of some organics (TOC) in treated water, significant amounts of THMs and/or HAAs could be generated in distribution systems after a long contact time of the organics with chlorine. It is recommended to monitor the THM and HAA concentrations at least annually;
- Turbidity. It is used to monitor the possibility of potable water in distribution systems
  contaminated by surface runoff and it is suggested to monitor the potable water turbidity at least
  weekly; and
- Fecal coliform, total coliform and HPC. These parameters are used to monitor the potable water
  in distribution systems contaminated by human and animal fecal wastes. Quarterly determination
  of these parameters is recommended to protect the public from these microbiological threats.

**Table 3.3** summarizes the parameters which are recommended to be monitored in potable water distribution systems of the City.

Table 3.3 Treated Water (In Distribution Systems) Monitoring Parameters and Frequency

Recommended Parameters	Recommended Monitoring Frequency		
Temperature	Weekly		
рН	Weekly		
Free and/or total chlorine residual	Weekly		
THMs concentration	Annually		
HAAs concentration	Annualty		
Turbidity	Weekly		
Fecal coliforms	Quarterly		
Total coliforms	Quarterly		
HPC	Quarterly		



#### 3.2 Wastewater Monitoring Criteria

#### 3.2.1 Influent to the WWTP

Only a primary treatment process is operated at the City of Iqaluit's WWTP currently and domestic sewage is the major wastewater treated at the WWTP. In order to achieve the discharge requirements required by NWB, a secondary biological treatment process may be added to the WWTP in the future. To protect the wastewater treatment process from damage, especially microorganisms in secondary treatment process, and to ensure that contaminants contained in wastewater influent are under the design loading rate of treatment facilities, some important influent parameters are usually monitored in the routine operation of most WWTPs. **Table 3.4** lists the parameters required by the Water Licence and recommended by Earth Tech to be monitored in the influent of the City's WWTP.

Table 3.4 WWTP Influent Monitoring Parameters and Frequency

	Required By Water Licence	Earth Tech's Recommendation		
Biological Parameters	· · · · · ·			
Biochemical oxygen demand	Annually	Quarterly		
Total coliforms	Annually	Quarterly		
Fecal coliforms	Annually	Quarterly		
Nutrient Parameters		-		
Ammonia nitrogen	Annually	Quarterly		
Nitrate nitrogen	Annually	Not recommended		
Nitrite nitrogen	Annually	Not recommended		
Total phosphorus	Annually	Quarterly		
Orthophosphate	Annually	Not recommended		
Other Parameters				
Total suspended solids	Annually	Quarterly		
Temperature	Annually	Biweekly		
Conductivity	Annually	Not recommended		
рН	Annually	Biweekly		
ICP Parameters		•		
A full metals scan (total conc.)	Annually	Not recommended		
Site Specific Parameters				
Chlorinated paraffins	Annually	Not recommended		
LC50 Bioassay	Annually	Not recommended		
New Added Parameters				
COD	N/A	Annually		
TKN	N/A	Annually		

As shown in **Table 3.4**, the Water Licence requires the WWTP to monitor these listed parameters in its influent annually. Based on the current operating condition and future development of the WWTP, the following recommendations, as presented in **Table 3.4**, are suggested for the WWTP:

Parameters not recommended: Nitrate nitrogen, Nitrite nitrogen, Orthophosphate, Conductivity, ICP metals, Chlorinated paraffins and LC50 bioassay.



The concentrations of NO<sub>3</sub>-N, NO<sub>2</sub>-N and orthophosphate in wastewater are usually used to monitor the nitrification, denitrification and phosphorus removal processes in a microbiological treatment process for nutrient removal. As described previously, it is just a primary treatment process operated at the City's WWTP, and there are no significant microbiological activities expected to occur during this phase. So, currently to monitor these three parameters in wastewater influent has no meaning. However, after the WWTP is upgraded to a secondary treatment process with biological nutrient removal sectors, these parameters may need to be monitored routinely based on some samples collected in relevant microbiological cells. Conductivity in influent usually is not a concern for wastewater treatment and it can be ignored in normal conditions. Metals, especially some heavy metals, have significant adverse effects on microorganisms in secondary biological treatment process. To keep microorganisms healthy and ensure the WWTP is running properly, Environment Canada has regulated the contaminant limits of industrial waste (including various metals) discharged to municipal sewers. In addition, the Department of Sustainable Development, Environmental Protection Service, Nunavut, also published detailed requirements on the industrial wastewater discharged to local sewage systems. However, for the current primary treatment process, it is not essential to routinely monitor the concentrations of various metals in the influent of the WWTP. Similarly, chlorinated paraffins and LC50 bioassay, though they may need to be monitored in the effluent of the WWTP to protect the receiving water from toxic contaminations, do not affect the current treatment process significantly and presently are not recommended for routine monitoring in the influent of the WWTP.

Quarterly monitored parameters: Total coliform, Fecal coliform, BOD5, Ammonia nitrogen, Total phosphorus and TSS.

No regulations specifically limit the numbers of total coliforms or fecal coliforms present in the influent of a WWTP; however, in order to have a basic understanding of the influent quality and performance of the wastewater treatment facilities, it is recommended to monitor these two parameters in the influent routinely at the City's WWTP. Since the numbers of total coliforms and fecal coliforms in wastewater could vary significantly in different seasons, the City of Iqaluit should monitor these parameters quarterly instead of annually. BOD<sub>5</sub>, ammonia nitrogen and total phosphorus are some important parameters indicating the organic and nutrient concentrations contained in wastewater; however, they do not have significance for the current primary physical treatment process of the WWTP. In consideration of the future upgrade of the WWTP, it would be better to routinely collect the influent BOD<sub>5</sub>, NH<sub>3</sub>-N and TP data from now on for the design and operation of future secondary biological treatment process. TSS is another important parameter for the influent quality of WWTP, and it may significantly affect the performance of both primary and secondary treatment processes. Therefore, it is recommended to be monitored quarterly.

Biweekly monitored parameters: Temperature and pH.

These two basic water quality parameters are easy to measure and important to the operation of a WWTP. For example, both temperature and pH can affect the microorganism behaviours in a biological treatment process; also, the wastewater temperature and pH can be significantly related to the corrosion of plumbing fixtures of the primary treatment process. Therefore, it is recommended to monitor these parameters on a biweekly basis.

Other recommended parameters: COD and TKN.



Chemical oxygen demand (COD) is used to measure the oxygen equivalent of the organic material in wastewater that can be oxidized chemically using dichromate in an acid solution. Total Kjeldahl nitrogen (TKN) is the total of the organic and ammonia nitrogen in wastewater. Both COD and TKN in the influent wastewater do not have significant meanings for the current primary treatment process. However, the concentration of COD, combined with the influent BOD<sub>5</sub>, is usually used to evaluate the possibility of wastewater treatment by biological means: TKN, combined with NH<sub>3</sub>-N, usually can be used for the estimation of organic nitrogen loading in wastewater, which is important to biological nutrient removal process. Therefore, it is recommended to monitor these two parameters in the influent wastewater annually for the design and operation of future biological treatment process applied at the WWTP.

#### 3.2.2 Effluent from the WWTP

As indicated by Nunavut Water Board Reasons for Decision including Record of Proceedings dated May 2006, Sewage Treatment Plant Investigation dated December 2002 and City of Iqaluit Wastewater Treatment Plant Completion Study dated October 2003, the effluent of the City's WWTP, with the current primary treatment facilities, is hard-pressed to achieve the limits of discharge quality required by NWB. Also, there is a concern that the WWTP effluent which is being discharged to receiving water may not comply with the Fisheries Act. Based on the requirements of the Water License issued by NWB and the current operating condition of the WWTP, the monitoring parameters and frequency of sampling for the WWTP effluent are recommended and summarized in Table 3.5. The reasons for recommendations of these parameters are discussed after the Table.

Table 3.5 WWTP Effluent Monitoring Parameters and Frequency

	•	- <b>1</b>
	Required Frequency by Water Licence	Earth Tech's Recommendation
Biological Parameters	· · · · · · · · · · · · · · · · · · ·	
Biochemical oxygen demand	Bi-monthly	Quarterly
Total coliform	Bi-monthly	Quarteriy
Fecal coliform	Bi-monthly	Quarterly
Nutrient Parameters	•	•
Ammonia nitrogen	Bi-monthly	Quarterly
TKN	N/A	Quarterly
Nitrate nitrogen	Bi-monthly	Not recommended
Nitrite nitrogen	Bi-monthly	Not recommended
Total phosphorus	Bi-monthly	Quarterly
Orthophosphate	Bi-monthly	Not recommended
Other Parameters		
Total suspended solids	Bi-monthly	Quarterly
Temperature	Bi-monthly	Quarterly
Conductivity	Bi-monthly	Not recommended
pH	Bi-monthly	Quarterly
ICP Parameters		ŕ
A full metals scan (total conc.)	Quarterly	Annually
Site Specific Parameters		•
Chlorinated paraffins	Annually	Annually
LC50 Bioassay	Annually	Annually

Quarterly monitored parameters: BOD<sub>5</sub>, Total coliforms, Fecal coliforms, Ammonia nitrogen, Total phosphorus, Total suspended solids, Temperature and pH.



The effluent BOD<sub>5</sub> and total suspended solids are two important parameters which are usually required by regulatory authorities to meet certain discharge qualities. Currently, a primary mechanical treatment process is operated at the wastewater treatment facility. Normally, a primary treatment process has a certain capacity to physically remove the influent BOD<sub>5</sub> and TSS and the treatment efficiency is usually very stable under certain operating conditions. So, these two parameters are recommended for monitoring at a quarterly basis. In addition, the existing treatment process is expected to have a minor capacity for the removal of ammonia nitrogen, total phosphorus, fecal coliforms and total coliforms; however, it is necessary to routinely determine these parameters as they provide information on nutrients and pathogens discharged from the WWTP to receiving water bodies. As these parameters in influent have been recommended to be monitored routinely, it is recommended to monitor them in effluent less frequently (quarterly) than bi-monthly required by the Water License.

Temperature and pH are two easily measured and commonly monitored parameters at most wastewater treatment facilities. A WWTP effluent with unacceptable temperature and pH values usually causes adverse effects on the plants and animals in receiving water bodies. To ensure the effluent temperature and pH are in normal ranges, the City should monitor these two parameters quarterly.

Annually monitored parameters: Full metal scan, Chlorinated paraffins and LC50 bioassay.

Some metals, especially heavy metals, may have significant adverse impacts on microorganisms and aquatic organisms. The chlorinated paraffins are classified as toxic to aquatic organisms and have been recognized as a possible carcinogen to humans. An LC50 bioassay is usually used to reflect the toxicity of wastewater to aquatic organisms. As these parameters were not monitored during previous operation of the WWTP, it is absolutely necessary to monitor these parameters to ensure the effluent quality can achieve the requirements of *Fisheries Act*. However, the primary wastewater treated at the WWTP is domestic sewage and under normal conditions, there is low probability that domestic wastewater will contain such high levels of toxic contaminants. Therefore, in this report, these parameters are recommended for monitoring on an annual basis. If there are no significant such toxic contaminants detected in the effluent, the monitoring frequency can be reduced based on a reasonable basis.

Not recommended parameters: Nitrite nitrogen, Nitrate nitrogen, Orthophosphate and Conductivity.

Although these parameters, such as NO<sub>2</sub>-N, NO<sub>3</sub>-N and PO<sub>4</sub>-P, are very important for a biological nutrient removal treatment process, they do not have significant meanings for the currently operated mechanical treatment process at the WWTP. The parameter of conductivity is not a very important parameter for the effluent quality of a WWTP and it is not routinely monitored at most WWTPs. In addition, as a full metal scan of the wastewater effluent is recommended to be conducted on an annual basis, this report does not recommend routine monitoring of the effluent conductivity.

#### 3.3 Landfill Monitoring Criteria

The current Water License only includes some general requirements for the landfill runoff and it does not address specific monitoring parameters and frequency. According to *Nunavut Water Board: Reasons for Decision Including Record of Proceedings* dated May 2006, there was a concern regarding environmental contamination by runoff from the landfill facility. This file documented that the City would propose a weekly sampling frequency for pH, Electrical conductivity, metals, BTEX, and Fractional hydrocarbon analysis and a monthly sampling frequency for phenols, PAHs and PCBs; when the drainage improvements are complete, the sampling frequency would be reduced to monthly for pH, Electrical conductivity, metals, BTEX, and Fractional hydrocarbon analysis and annually for phenols, PAHs and PCBs.



From 2004 to 2007, some samples were collected from the runoff of the landfill site and parameters such as BOD<sub>5</sub>, TOC, nutrients, solids, anions, and metals were analyzed. Based on the comparison of these sampling reports, it can be concluded that:

Some parameters (BOD<sub>5</sub>, TSS, and some metals) of the landfill runoff in detention pond significantly exceed the MWWE guidelines, and the direct discharge into environment from the detention pond may need to be controlled; and

The quality of runoff in retention pond is significantly better than that in detention pond; most of the parameters in retention pond are within the MWWE guidelines except for total iron, manganese and zinc concentrations which slightly exceed the guidelines.

Based on the historical sampling results and NWB's requirements, the monitoring parameters and frequency for the landfill runoff are recommended as shown in **Table 3.6**. The reasons for the monitoring recommendations are discussed in following paragraphs.

#### 3.3.1 Monitoring Parameters In Detention Ponds

According to *Iqaluit Landfill Improvements* dated August 2006, detention ponds of the landfill facility are primarily used to collect the landfill "on-site" runoff and protect the "off-site" runoff from contamination. With a short retention time in detention ponds, the collected "on-site" runoff streams are directed to the retention pond where the wastewater is cleaned by holding for a long retention time. From this point of view, the "on-site" runoff collected in detention ponds is similar to the raw wastewater of a WWTP. Since the waste streams are treated primarily in the retention pond, some basic parameters are recommended for annual monitoring of the "on-site" runoff collected in detention ponds.

#### 3.3.2 Monitoring Parameters In Retention Pond

The wastewater held in the retention pond has been annually discharged to the environment. It is important to ensure the discharge quality of the wastewater is within the regulatory requirements. Therefore, more detailed water quality parameters in the retention pond are recommended for routine monitoring. As BTEX and PCBs are concerns in the leachate of the landfill facility, it is also necessary to routinely monitor these two parameters. It is recommended to monitor these parameters before the discharge of each year. If the wastewater in the retention pond is discharged more than once per year, it is also necessary to monitor these parameters before each discharge.

Table 3.6 Landfill Runoff Monitoring Parameters and Frequency

	Earth Tech's Recommendation
Detention Ponds	
рН	Annually
Turbidity	Annualiy
Total suspended solids	Annually
BOD <sub>5</sub>	Annually
COD	Annuaily
TOC	Annually
Retention Pond	•
pH	Annually
Turbidity	Annually
Total suspended solids	Annually
BOD₅	Annually
COD	Annually



	Earth Tech's Recommendation
TOC	Annually
Ammonia nitrogen	Annually
TKN	Annualiy
Total phosphorus	Annually
Full Metal Scan + Hg	Annually
Total coliform	Annually
Fecal coliform	Annually
BTEX	Annually
PCBs	Annually

#### 3.3.3 Monitoring Parameters for Sewage Studge

The current Water License does not include requirements for the sludge monitoring with regard to parameters and frequency. Since sewage sludge treatment is an inherent part of the landfill management, sampling and testing should be required as part of the sludge management plan.

Table 3.7 Sewage Sludge Monitoring Parameters and Frequency

	Earth Tech's Recommendation
рН	Twice during summer
Total solids	Twice during summer
TKN	Annually
Total phosphorus	Annually
Full Metal Scan	Every second year
Total coliforms	Annually
Fecal coliforms	Twice during summer



#### 4.0 BUDGET FOR SAMPLING

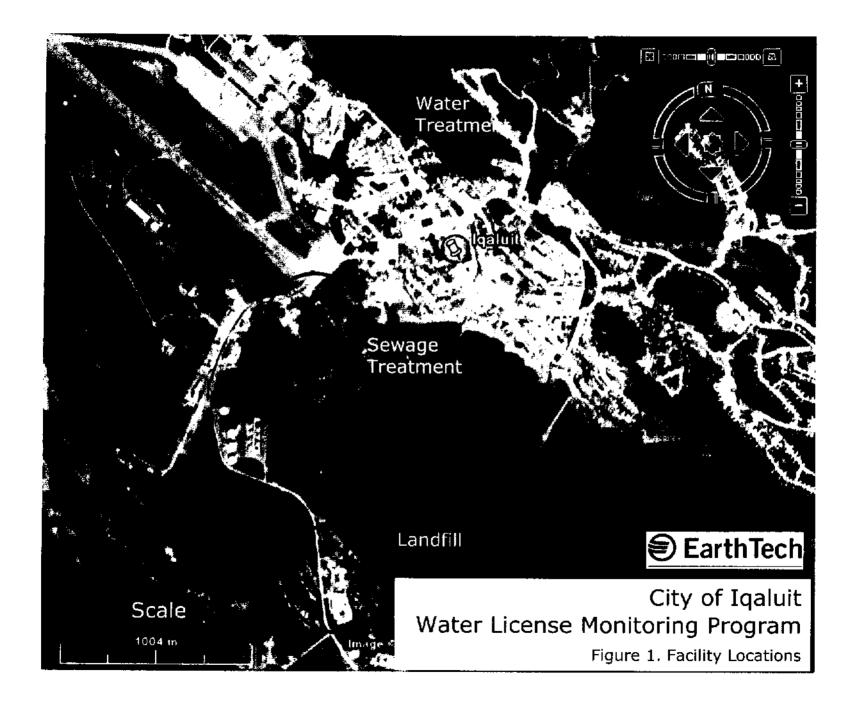
Based on the monitoring parameters and sampling frequency recommended in the previous section, the sampling cost per year is estimated and summarized in **Table 4.1**. It should be noted that:

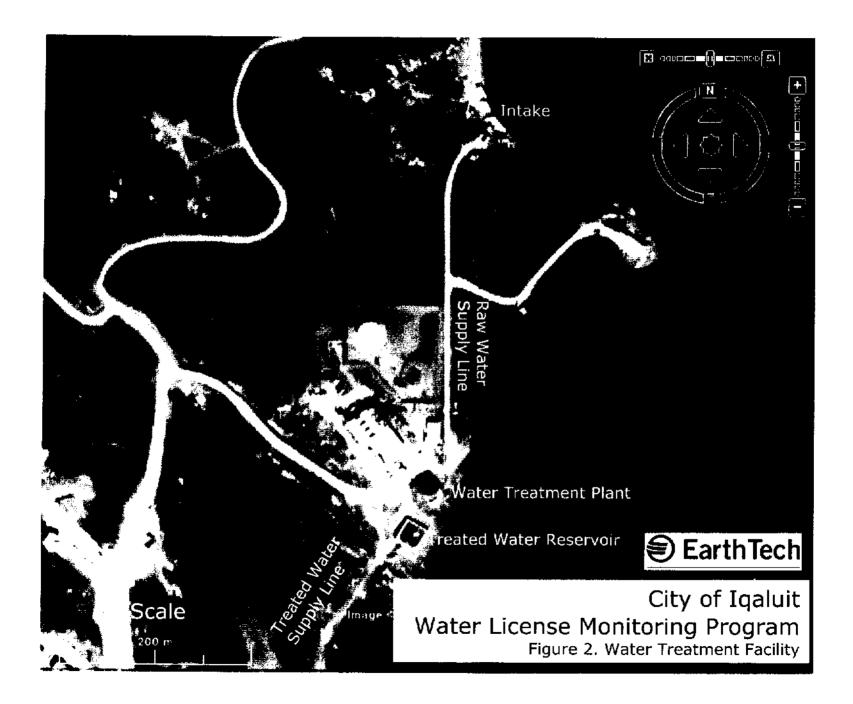
- The budgetary cost is primarily based on cost information provided by Bodycote Testing Group (Ottawa). Sampling bottles, coolers, freezer packs and forms would be provided at no additional cost;
- "Temperature" of all samples should be determined immediately on-site;
- It is assumed that a total of 100 hours of manpower is required to collect and send all samples every year and \$40.00 per hour is used for the estimation of manpower cost; and
- The shipping cost of sampling supplies and samples mainly depends on the weight and/or the
  volume of the shipment. Due to the variation of the amount of samples collected each time, the
  shipping cost will also vary significantly; therefore the cost presented is for budgeting purposes
  only.

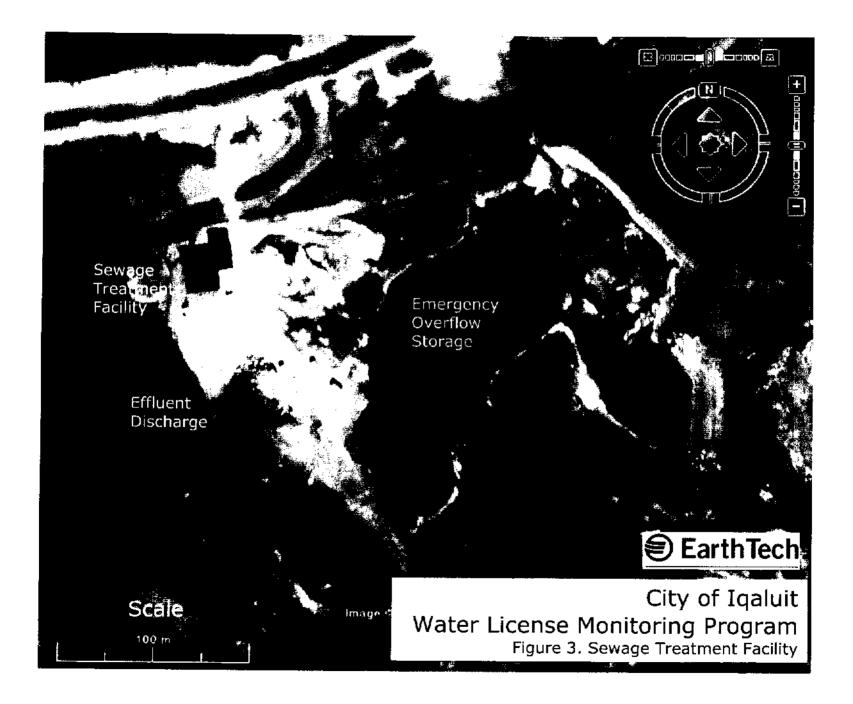
Table 4.1 Budgetary Costs For The Monitoring

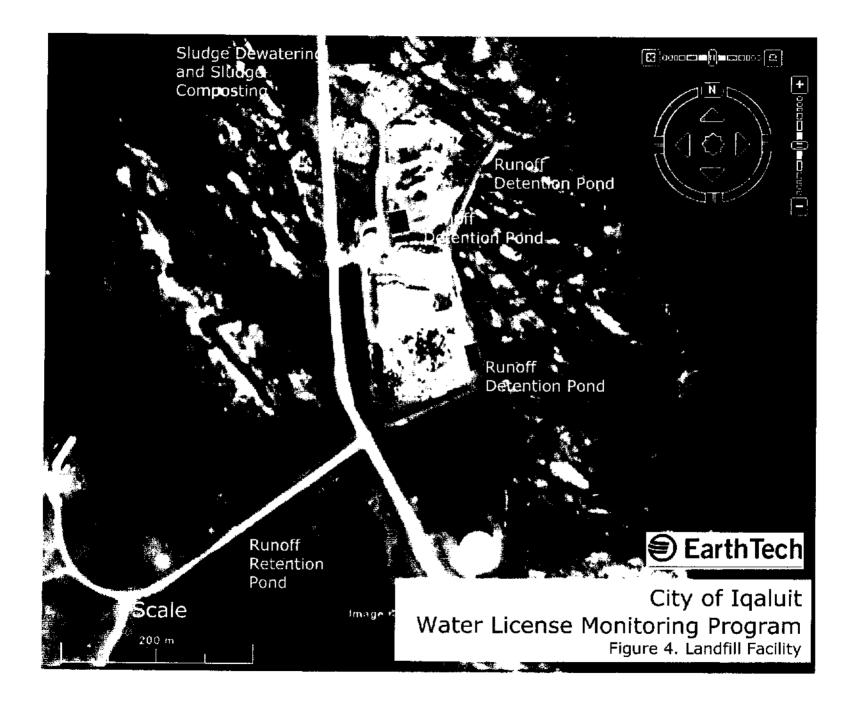
			Sampling cost	
1.	Sam	ple Analysis Budget		_
	1.1	Drinking Water		
		WTP Raw water	\$ 4,500	
		WTP Treated water	\$ 3,500	
		Distribution system	\$ 2,000	
		Sub-total	\$ 10,000	
	1.2	Wastewater		
		WWTP Influent	\$ 1,000	
		WWTP Effluent	\$ 1,000	
		Sub-total	\$ 2,000	
	1.3	Landfill		
		Detention pond	\$ 200	
		Retention pond	\$ 800	
		Sludge	\$ 1,000	
		Sub-total	\$ 2,000	
2.	Othe	er costs		
	Man	power	\$ 4,000	
	Sampling supplies		No extra cost	
	Ship	ping	\$ 2,000	
3.	Tota	i sampling cost	\$ 20,000	





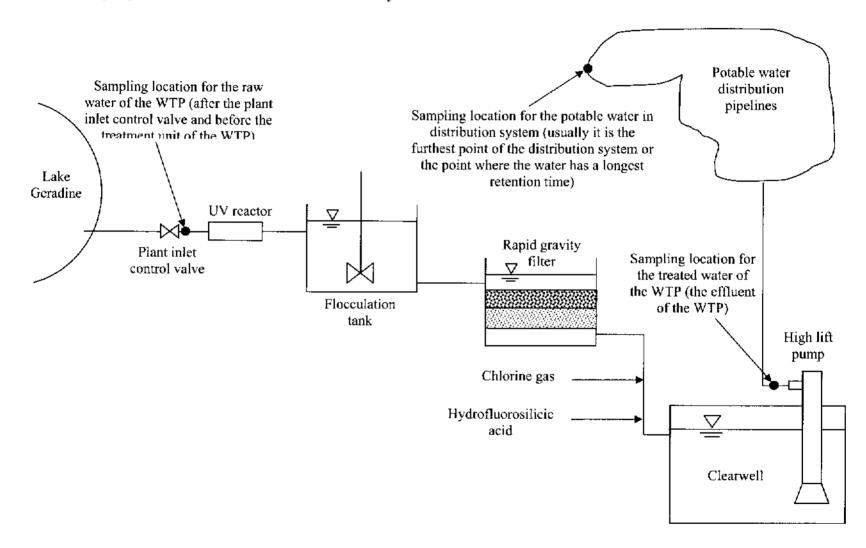






# APPENDIX A SAMPLING LOCATIONS FOR THE WATER TREATMENT FACILITY

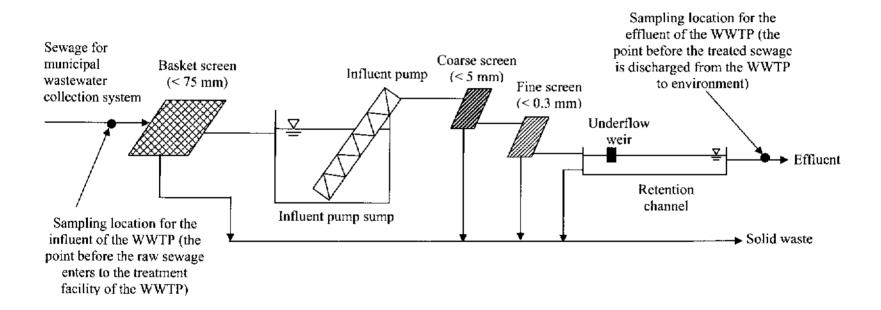
#### Schematic sampling locations for the Water Treatment Facility



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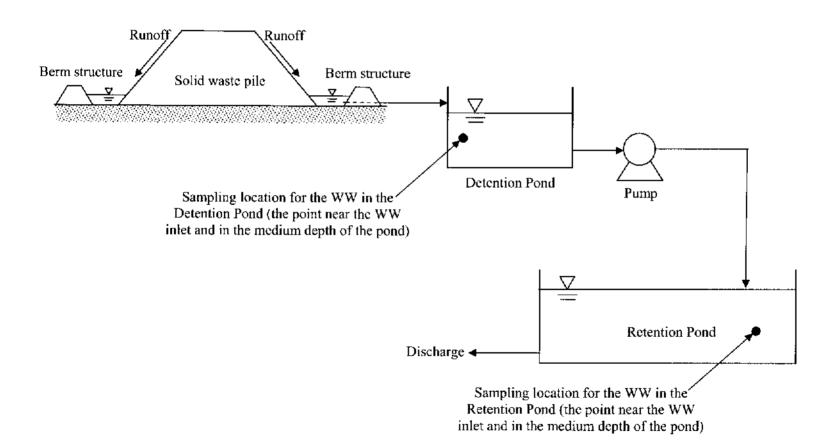
# APPENDIX B SAMPLING LOCATIONS FOR THE SEWAGE TREATMENT FACILITY

#### Schematic sampling locations for the Sewage Treatment Facility



# APPENDIX C SAMPLING LOCATIONS FOR THE LANDFILL FACILITY

#### Schematic sampling locations for the Landfill Facility





### **Appendix E**

**West 40 Landfill Drainage Management Review** 

Canadian Environmental Quality Guidelines Summary Table



### Canadian Environmental Quality Guidelines Summary Table

Users are advised to consult the Canadian Environmental Quality Guidelines introductory text, factsheet, and/or protocols for specific information and implementation guidance pertaining to each environmental quality guideline.

		Water Quality Guidelines for the Protection of Aquatic Life					
			Freshwater			Marine	
		Concentration (μg/L)	Concentration (μg/L)	Date	Concentration (µg/L)	Concentration (μg/L)	Date
Chemical name	Chemical groups	Short Term	Long Term		Short Term	Long Term	
1,1,1- Trichloroethane CASRN 71556	Organic Halogenated aliphatic compounds Chlorinated ethanes	No data	Insufficient data	1991	No data	Insufficient data	1991
1,1,2,2- Tetrachloroethene PCE (Tetrachloroethylene) CASRN 127184	Organic Halogenated aliphatic compounds Chlorinated ethenes		110	1993		Insufficient data	1993
1,1,2,2- Tetrachlorethane CASRN 79345	Organic Halogenated aliphatic compounds Chlorinated ethanes	No data	Insufficient data	1991	No data	Insufficient data	1991
1,1,2- Trichloroethene TCE (Trichloroethylene) CASRN 790106	Organic Halogenated aliphatic compounds Chlorinated ethenes		21	1991		Insufficient data	1991
1,2,3,4- Tetrachlorobenzene CASRN 634662	Organic Monocyclic aromatic compounds Chlorinated benzenes	No data	1.8	1997	No data	Insufficient data	1997
1,2,3,5- Tetrachlorobenzene	Organic Monocyclic aromatic compounds Chlorinated benzenes	No data	Insufficient data	1997	No data	Insufficient data	1997



CCME Comments or questions? Contact us at <a href="mailto:info@ccme.ca">info@ccme.ca</a>

Users are advised to consult the Canadian Environmental Quality Guidelines introductory text, factsheet, and/or protocols for specific information and implementation guidance pertaining to each environmental quality guideline.

		Water Quality Guidelines					
		for the Protection of Aquatic Life			fe Marine		
		Concentration	Freshwater Concentration	Date	Concentration	Concentration	Date
Chemical name	Chemical groups	(μg/L) Short Term	(μg/L) Long Term	Date	(μg/L) Short Term	(μg/L) Long Term	Date
1,2,3- Trichlorobenzene CASRN 87616	Organic Monocyclic aromatic compounds Chlorinated benzenes	No data	8	1997	No data	Insufficient data	1997
1,2,4,5- Tetrachlorobenzene	Organic Monocyclic aromatic compounds Chlorinated benzenes		Insufficient data	1997		Insufficient data	1997
1,2,4- Trichlorobenzene CASRN 120801	Organic Monocyclic aromatic compounds Chlorinated benzenes	No data	24	1997	No data	5.4	1997
1,2- Dichlorobenzene CASRN 95501	Organic Monocyclic aromatic compounds Chlorinated benzenes		0.7	1997		42	1997
1,2-Dichloroethane CASRN 1070602	Organic Halogenated aliphatic compounds Chlorinated ethanes	No data	100	1991	No data	Insufficient data	1991
1,3,5- Trichlorobenzene	Organic Monocyclic aromatic compounds Chlorinated benzenes		Insufficient data	1997		Insufficient data	1997
1,3- Dichlorobenzene CASRN 541731	Organic Monocyclic aromatic compounds Chlorinated benzenes	No data	150	1997	No data	Insufficient data	1997
1,4- Dichlorobenzene CASRN 106467	Organic Monocyclic aromatic compounds Chlorinated benzenes	No data	<u>26</u>	1997	No data	Insufficient data	1997
1,4-Dioxane		NRG	NRG	2008	NRG	NRG	2008
3-lodo-2-propynyl butyl carbamate IPBC CASRN 554065360	Organic Pesticides Carbamate pesticides	No data	1.9	1999	No data	No data	No data
Acenaphthene PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	5.8	1999	No data	Insufficient data	1999



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		Water Quality Guidelines for the Protection of Aquatic Life						
			Freshwater	ine i rotectic	Marine			
		Concentration (μg/L)	Concentration (μg/L)	Date	Concentration (μg/L)	Concentration (μg/L)	Date	
Chemical name	Chemical groups	Short Term	Long Term		Short Term	Long Term		
Acenaphthylene PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	No data	1999	No data	No data	1999	
Acridine PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	4.4	1999	No data	Insufficient data	1999	
Aldicarb  CASRN 116063	Organic Pesticides Carbamate pesticides	No data	1	1993	No data	0.15	1993	
Aldrin	Organic Pesticides Organochlorine compounds	No data	0.004	1987	No data	No data	No data	
Aluminium	Inorganic	No data	<u>Variable</u>	1987	No data	No data	No data	
Ammonia (total)	Inorganic Inorganic nitrogen compounds	No data	<u>Table</u>	2001	No data	No data	No data	
Ammonia (un- ionized)  CASRN 7664417	Inorganic Inorganic nitrogen compounds	No data	19	2001	No data	No data	No data	
Aniline CASRN 62533	Organic	No data	2.2	1993	No data	Insufficient data	1993	
Anthracene PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	0.012	1999	No data	Insufficient data	1999	
Arsenic  CASRN none	Inorganic	No data	<u>5</u>	1997	No data	12.5	1997	
Atrazine CASRN 1912249	Organic Pesticides Triazine compounds	No data	1.8	1989	No data	No data	No data	
	Organic							
CASRN 71432	Monocyclic aromatic compounds	No data	370	1999	No data	110	1999	
Benzo(a)anthracene PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	0.018	1999	No data	Insufficient data	1999	



			Water Quality Guidelines for the Protection of Aquatic Life							
			Freshwater	T the Frotestic	Marine					
		Concentration	Concentration	Date	Concentration	Concentration	Date			
Chemical name	Chemical groups	(μg/L) Short Term	(μg/L) Long Term		(μg/L) Short Term	(μg/L) Long Term				
Benzo(a)pyrene PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	0.015	1999	No data	Insufficient data	1999			
Boron	Inorganic	29,000μg/L or 29mg/L	1,500μg/L or 1.5mg/L	2009	NRG	NRG	2009			
Bromacil CASRN 314409	Organic Pesticides	No data	<u>5</u>	1997	No data	Insufficient data	1997			
Bromoxynil	Organic Pesticides Benzonitrile compounds	No data	<u>5</u>	1993	No data	Insufficient data	1993			
Cadmium CASRN 7440439	Inorganic	No data	Equation	1996	No data	0.12	1996			
Captan CASRN 133062	Organic Pesticides	No data	1.3	1991	No data	No data	No data			
Carbaryl CASRN 63252	Organic Pesticides Carbamate pesticides	3.3	0.2	2009	5.7	0.29	2009			
Carbofuran CASRN 1564662	Organic Pesticides Carbamate pesticides	No data	1.8	1989	No data	No data	No data			
Chlordane	Organic Pesticides Organochlorine compounds	No data	0.006	1987	No data	No data	No data			
Chlorothalonil CASRN 1897456	Organic Pesticides	No data	0.18	1994	No data	0.36	1994			
Chlorpyrifos CASRN 2921882	Organic Pesticides Organophosphorus compounds	0.02	0.002	2008	NRG	0.002	2008			
Chromium, hexavalent (Cr(VI)) CASRN 7440473	Inorganic	No data	1	1997	No data	1.5	1997			
Chromium, trivalent (Cr(III)) CASRN 7440473	Inorganic	No data	8.9	1997	No data	<u>56</u>	1997			
<u>Chrysene</u> PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	Insufficient data	1999	No data	Insufficient data	1999			



			fo	Water Qualit or the Protection	ty Guidelines	ifo	
			Freshwater	Tile Protection	Aquatic E	Marine	
		Concentration (µg/L)	Concentration (µg/L)	Date	Concentration (µg/L)	Concentration (µg/L)	Date
Chemical name	Chemical groups	Short Term	Long Term		Short Term	Long Term	
CASRN N/A	Physical	No data	<u>Narrative</u>	1999	No data	<u>Narrative</u>	1999
Copper	Inorganic	No data	Equation	1987	No data	No data	No data
Cyanazine CASRN 2175462	Organic Pesticides Triazine compounds	No data	2	1990	No data	No data	No data
Cyanide	Inorganic	No data	5 (as free CN)	1987	No data	No data	No data
Debris CASRN N/A	Physical	No data	No data	No data	No data	<u>Narrative</u>	1996
Deltamethrin  CASRN 52918635	Organic Pesticides	No data	0.0004	1997	No data	Insufficient data	1997
<u>Deposited bedload</u> <u>sediment</u>	Physical Turbidity, clarity and suspended solids Total particulate matter	No data	Insufficient data	1999	No data	Insufficient data	1999
Di(2-ethylhexyl) phthalate CASRN 117817	Organic Phthalate esters	No data	16	1993	No data	Insufficient data	1993
Di-n-butyl phthalate  CASRN 84742	Organic Phthalate esters	No data	19	1993	No data	Insufficient data	1993
Di-n-octyl phthalate  CASRN 117840	Organic Phthalate esters	No data	Insufficient data	1993	No data	Insufficient data	1993
Dibromochloromethane	Organic Halogenated aliphatic compounds Halogenated methanes	No data	Insufficient data	1992	No data	Insufficient data	1992
Dicamba  CASRN 1918009	Organic Pesticides Aromatic Carboxylic Acid	No data	10	1993	No data	No data	No data
Dichloro diphenyl trichloroethane; 2,2- Bis(p-chlorophenyl)- 1,1,1-trichloroethane DDT (total)	Organic Pesticides Organochlorine compounds	No data	<del>0.001</del>	1987	No data	No data	No data
<u>Dichlorobromomethane</u>	Organic Halogenated aliphatic compounds Halogenated methanes	No data	Insufficient data	1992	No data	Insufficient data	1992
Dichloromethane Methylene chloride CASRN 75092	Organic Halogenated aliphatic compounds Halogenated methanes	No data	98.1	1992	No data	Insufficient data	1992



					ty Guidelines			
			fo Freshwater	or the Protection	n of Aquatic Life  Marine			
		Concentration	Concentration	Date	Concentration	Concentration	Date	
Chemical name	Chemical groups	(μg/L) Short Term	(μg/L) Long Term		(μg/L) Short Term	(μg/L) Long Term		
<u>Dichlorophenols</u>	Organic Monocyclic aromatic compounds Chlorinated phenols	No data	0.2	1987	No data	No data	No data	
Diclofop-methyl  CASRN 51338273	Organic Pesticides	No data	6.1	1993	No data	No data	No data	
Didecyl dimethyl ammonium chloride DDAC CASRN 7173515	Organic Pesticides	No data	1.5	1999	No data	Insufficient data	1999	
Diethylene glycol  CASRN 111466	Organic Glycols	No data	Insufficient data	1997	No data	Insufficient data	1997	
DIISOPROPANOIAMINE DIPA CASRN 110974	Organic	No data	1600	2005	No data	Insufficient data	2005	
Dimethoate  CASRN 60515	Organic Pesticides Organophosphorus compounds	No data	6.2	1993	No data	Insufficient data	1993	
Dinoseb  CASRN 88857	Organic Pesticides	No data	0.05	1992	No data	No data		
Dissolved gas supersaturation CASRN N/A	Physical	No data	Narrative	1999	No data	Narrative	1999	
Dissolved oxygen DO CASRN N/A	Inorganic	No data	<u>Variable</u>	1999	No data	>8000 & Narrative	1996	
<u>Endosulfan</u>	Organic Pesticides Organochlorine compounds	0.06	0.003	2010	0.09	0.002	2010	
<u>Endrin</u>	Organic Pesticides Organochlorine compounds	No data	<del>0.0023</del>	1987	No data	No data	No data	
Ethylbenzene CASRN 100414	Organic Monocyclic aromatic compounds	No data	90	1996	No data	25	1996	
Ethylene glycol CASRN 107211	Organic Glycols	No data	192 000	1997	No data	Insufficient data	1997	
<u>Fluoranthene</u> PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	0.04	1999	No data	Insufficient data	1999	



			fe	Water Qualit or the Protection	ty Guidelines	ife	
			Freshwater	or the Protection	III OI Aquatic Li	Marine	
		Concentration	Concentration	Date	Concentration	Concentration	Date
Chemical name	Chemical groups	(μg/L) Short Term	(μg/L) Long Term	Bute	(μg/L) Short Term	(μg/L) Long Term	Dute
Fluorene PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	3	1999	No data	Insufficient data	1999
<u>Fluoride</u>	Inorganic	No data	120	2002	No data	NRG	2002
Glyphosate  CASRN 1071836	Organic Pesticides Organophosphorus compounds	No data	<u>65</u>	1989	No data	No data	No data
Heptachlor Heptachlor epoxide	Organic Pesticides Organochlorine compounds	No data	<del>0.01</del>	1987	No data	No data	No data
<u>Hexachlorobenzene</u>	Organic Monocyclic aromatic compounds Chlorinated benzenes		Insufficient data	1997	No data	Insufficient data	1997
Hexachlorobutadiene HCBD CASRN 87683	Organic Halogenated aliphatic compounds	No data	1.3	1999	No data	No data	No data
<u>Hexachlorocyclohexane</u> Lindane	Organic Pesticides Organochlorine compounds		0.01	1987	No data	No data	No data
<u>Imidacloprid</u>		No data	0.23	2007	No data	0.65	2007
<b>CASRN</b> 13826413		NO Uata	0.23	2007	NO data	0.65	2007
Inorganic Mercury  CASRN 7439976	Inorganic		0.026	2003	No data	0.016	2003
<u>Iron</u>	Inorganic	No data	300	1987	No data	No data	No data
<u>Lead</u>	Inorganic	No data	<u>Equation</u>	1987	No data	No data	No data
<u>Linuron</u> <b>CASRN</b> 41205214	Organic Pesticides	No data	<u>z</u>	1995	No data	No data	1995
Methoprene CASRN 40596698		No data	0.09 (Target Organism Management value: 0.53)	2007	No data	Insufficient data	2007
Methyl tertiary-butyl ether MTBE CASRN 1634044	Organic Non-halogenated aliphatic compounds Aliphatic ether	No data	10 000	2003	No data	5 000	2003



			f		ty Guidelines on of Aquatic Li	ife	
			Freshwater			Marine	
		Concentration (µg/L)	Concentration (µg/L)	Date	Concentration (µg/L)	Concentration (µg/L)	Date
Chemical name	Chemical groups	Short Term	Long Term		Short Term	Long Term	
Methylchlorophenoxyacetic acid (4-Chloro-2-methyl phenoxy acetic acid; 2- Methyl-4-chloro phenoxy acetic acid) MCPA CASRN 94746	Organic Pesticides	No data	2.6	1995	No data	4.2	1995
Methylmercury	Organic	No data	0.004	2003	No data	NRG	2003
Metolachlor CASRN 51218452	Organic Pesticides Organochlorine compounds	No data	7.8	1991	No data	No data	No data
Metribuzin CASRN 21087649	Organic Pesticides Triazine compounds	No data	1	1990	No data	No data	No data
Molybdenum	Inorganic	No data	<u>73</u>	1999	No data	No data	No data
Monobromomethane Methyl bromide	Organic Halogenated aliphatic compounds Halogenated methanes	No data	Insufficient data	1992	No data	Insufficient data	1992
Monochlorobenzene CASRN 108907	Organic Monocyclic aromatic compounds Chlorinated benzenes		1.3	1997	No data	<u>25</u>	1997
Monochloromethane Methyl chloride	Organic Halogenated aliphatic compounds Halogenated methanes	No data	Insufficient data	1992	No data	Insufficient data	1992
<u>Monochlorophenols</u>	Organic Monocyclic aromatic compounds Chlorinated phenols	No data	7	1987	No data	No data	No data
<u>Naphthalene</u> PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	1.1	1999	No data	1.4	1999
<u>Nickel</u>	Inorganic	No data	<u>Equation</u>	1987	No data	No data	No data
Nitrate CASRN 14797558	Inorganic Inorganic nitrogen compounds	No data	13 000	2003	No data	16 000	2003



			fo		ty Guidelines on of Aquatic Li	fe		
			Freshwater		Marine			
		Concentration (µg/L)	Concentration (µg/L)	Date	Concentration (µg/L)	Concentration (μg/L)	Date	
Chemical name	Chemical groups Inorganic Inorganic	Short Term  No data	Long Term  60 NO <sub>2</sub> -N	1987	Short Term  No data	Long Term No data	No data	
	nitrogen compounds							
Nonylphenol and its ethoxylates  CASRN 84852153	Organic Nonylphenol and its ethoxylates	No data	1	2002	No data	0.7	2002	
<u>Nutrients</u>		No data	Guidance Framework	2004	No data	Guidance framework	2007	
Pentachlorobenzene CASRN 608935	Organic Monocyclic aromatic compounds Chlorinated benzenes	No data	<u>6</u>	1997	No data	Insufficient data	1997	
Pentachlorophenol PCP	Organic Monocyclic aromatic compounds Chlorinated phenols	No data	0.5	1987	No data	No data	No data	
Permethrin CASRN 52645531	Organic Pesticides Organochlorine compounds	No data	0.004	2006	No data	0.001	2006	
Phenanthrene PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	0.4	1999		Insufficient data	1999	
Phenols (mono- & dihydric)  CASRN 108952	Organic Aromatic hydroxy compounds	No data	4	1999	No data	No data	No data	
Phenoxy herbicides 2,4 D; 2,4- Dichlorophenoxyacetic acid	Organic Pesticides	No data	4	1987	No data	No data	No data	
<u>Phosphorus</u>	Inorganic	No data	Guidance Framework	2004	No data	Guidance Framework	2007	
Picloram  CASRN 1918021	Organic Pesticides	No data	29	1990	No data	No data	No data	
Polychlorinated biphenyls PCBs	Organic Polyaromatic compounds Polychlorinated biphenyls	No data	<del>0.001</del>	1987	No data	<del>0.01</del>	1991	
Propylene glycol CASRN 57556	Organic Glycols	No data	500 000	1997	No data	Insufficient data	1997	
Pyrene PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	0.025	1999	No data	Insufficient data	1999	



			fo	Water Qualit or the Protection	ty Guidelines on of Aquatic Li	fe	
		C	Freshwater Concentration			Marine Concentration	
Chemical name	Chemical groups	Concentration (μg/L) Short Term	(μg/L)	Date	Concentration (μg/L) Short Term	(μg/L)	Date
pH	Inorganic Acidity, alkalinity and pH	No data	6.5 to 9.0	1987	No data	7.0 to 8.7 & Narrative	1996
Quinoline PAHs	Organic Polyaromatic compounds Polycyclic aromatic hydrocarbons	No data	3.4	1999	No data	Insufficient data	1999
Reactive Chlorine Species total residual chlorine, combined residual chlorine, total available chlorine, hypochlorous acid, chloramine, combined available chlorine, free residual chlorine, free available chlorine, froe available chlorine, froe available chlorine, froe available chlorine, froe available chlorine, chlorine- produced oxidants	Inorganic Reactive chlorine compunds	No data	0.5	1999	No data	<u>0.5</u>	1999
Salinity	Physical	No data	No data	No data	No data	<u>Narrative</u>	1996
Selenium	Inorganic	No data	1	1987	No data	No data	No data
Silver	Inorganic	No data	0.1	1987	No data	No data	No data
Simazine CASRN 122349	Organic Pesticides Triazine compounds	No data	10	1991	No data	No data	No data
Streambed substrate	Physical Turbidity, clarity and suspended solids Total particulate matter	No data	<u>Narrative</u>	1999	No data	<u>Narrative</u>	1999
Styrene CASRN 100425	Organic Monocyclic aromatic compounds	No data	<u>72</u>	1999	No data	No data	No data
Sulfolane Bondelane CASRN 126330	Organic Organic sulphur compound	No data	50 000	2005	No data	Insufficient data	2005
Suspended sediments TSS	Physical Turbidity, clarity and suspended solids Total particulate matter	No data	<u>Narrative</u>	1999	No data	<u>Narrative</u>	1999
Tebuthiuron  CASRN 34014181	Organic Pesticides	No data	1.6	1995	No data	Insufficient data	1995
<u>Temperature</u>	Physical Temperature	No data	<u>Narrative</u>	1987	No data	Narrative	1996

					ty Guidelines		
			Freshwater	r the Protection	on of Aquatic L	te Marine	
		Concentration	Concentration		Concentration	Concentration	
		(μg/L)	(μg/L)	Date	(μg/L)	(μg/L)	Date
Chemical name	Chemical groups	Short Term	Long Term		Short Term	Long Term	
Tetrachloromethane Carbon tetrachloride CASRN 56235	Organic Halogenated aliphatic compounds Halogenated methanes	No data	13.3	1992	No data	Insufficient data	1992
<u>Tetrachlorophenols</u>	Organic Monocyclic aromatic compounds Chlorinated phenols	No data	1	1987	No data	No data	No data
<u>Thallium</u>	Inorganic	No data	0.8	1999	No data	No data	No data
Toluene CASRN 108883	Organic Monocyclic aromatic compounds	No data	2	1996	No data	215	1996
<u>Toxaphene</u>	Organic Pesticides Organochlorine compounds	No data	0.008	1987	No data	No data	No data
Triallate CASRN 2303175	Organic Pesticides Carbamate pesticides	No data	0.24	1992	No data	No data	No data
<u>Tribromomethane</u> Bromoform	Organic Halogenated aliphatic compounds Halogenated methanes	No data	Insufficient data	1992	No data	Insufficient data	1992
<u>Tributyltin</u>	Organic Organotin compounds	No data	0.008	1992	No data	0.001	1992
Trichloromethane Chloroform CASRN 67663	Organic Halogenated aliphatic compounds Halogenated methanes	No data	1.8	1992	No data	Insufficient data	1992
<u>Trichlorophenols</u>	Organic Monocyclic aromatic compounds Chlorinated phenols	No data	18	1987	No data	No data	No data
<u>Tricyclohexyltin</u>	Organic Organotin compounds	No data	Insufficient data	1992	No data	Insufficient data	1992
Trifluralin CASRN 1582098	Organic Pesticides Dinitroaniline pesticides	No data	0.2	1993	No data	No data	No data



			Water Quality Guidelines for the Protection of Aquatic Life							
			Freshwater			Marine				
		Concentration (µg/L)	Concentration (µg/L)	Date	Concentration (µg/L)	Concentration (µg/L)	Date			
Chemical name	Chemical groups	Short Term	Long Term		Short Term	Long Term				
Triphenyltin	Organic Organotin compounds	No data	0.022	1992	No data	No data	1992			
Turbidity	Physical Turbidity, clarity and suspended solids Total particulate matter	No data	<u>Narrative</u>	1999		<u>Narrative</u>	1999			
<b>Uranium CASRN</b> 7440-61-1	Inorganic	33	15	2011	NRG	NRG	2011			
Zinc	Inorganic	No data	30	1987	No data	No data	No data			

Chemical name	Chemical groups
No Chemicals with Data	
No chemicals with bata	





## Canadian Environmental Quality Guidelines Summary Table

Users are advised to consult the Canadian Environmental Quality Guidelines introductory text, factsheet, and/or protocols for specific information and implementation guidance pertaining to each environmental quality guideline.

			Water Quality Guidelines for the Protection of Aquatic Life									
		Concentration	Freshwater Concentration		Concentration	Marine Concentration						
Chemical name	Chemical groups	(μg/L) Short Term	(μg/L)  Long Term	Date	(µg/L) Short Term	(μg/L)  Long Term	Date					
Aluminium	Inorganic	No data	<u>Variable</u>	1987	No data	No data	No data					
Ammonia (total)	Inorganic Inorganic nitrogen compounds	No data	<u>Table</u>	2001	No data	No data	No data					
Arsenic  CASRN none	Inorganic	No data	<u>5</u>	1997	No data	12.5	1997					
Benzene CASRN 71432	Organic Monocyclic aromatic compounds	No data	370	1999	No data	110	1999					
Boron	Inorganic	29,000μg/L or 29mg/L	1,500μg/L or 1.5mg/L	2009	NRG	NRG	2009					
Cadmium CASRN 7440439	Inorganic	No data	Equation	1996	No data	0.12	1996					
Copper	Inorganic	No data	Equation	1987	No data	No data	No data					
Ethylbenzene CASRN 100414	Organic Monocyclic aromatic compounds	No data	90	1996	No data	25	1996					
Iron	Inorganic	No data	300	1987	No data	No data	No data					
Lead	Inorganic	No data	Equation	1987	No data	No data	No data					
Nickel	Inorganic	No data	Equation	1987	No data	No data	No data					
Nitrate CASRN 14797558	Inorganic Inorganic nitrogen compounds	No data	13 000	2003	No data	16 000	2003					
<u>Nitrite</u>	Inorganic Inorganic nitrogen compounds	No data	60 NO <sub>2</sub> -N	1987	No data	No data	No data					
Phenols (mono- & dihydric) CASRN 108952	Organic Aromatic hydroxy compounds	No data	4	1999	No data	No data	No data					



		Water Quality Guidelines for the Protection of Aquatic Life					
			Freshwater Marine				
		Concentration (μg/L)	Concentration (µg/L)	Date	Concentration (µg/L)	Concentration (µg/L)	Date
Chemical name	Chemical groups	Short Term	Long Term		Short Term	Long Term	
<u>Phosphorus</u>	Inorganic	No data	Guidance Framework	2004	No data	Guidance Framework	2007
Polychlorinated biphenyls PCBs	Organic Polyaromatic compounds Polychlorinated biphenyls		<del>0.001</del>	1987	No data	<del>0.01</del>	1991
<u>Selenium</u>	Inorganic	No data	1	1987	No data	No data	No data
Silver	Inorganic	No data	0.1	1987	No data	No data	No data
<u>Thallium</u>	Inorganic	No data	0.8	1999	No data	No data	No data
Toluene CASRN 108883	Organic Monocyclic aromatic compounds		2	1996	No data	215	1996
Turbidity	Physical Turbidity, clarity and suspended solids Total particulate matter	No data	<u>Narrative</u>	1999	No data	<u>Narrative</u>	1999
Uranium  CASRN 7440-61- 1	Inorganic	33	15	2011	NRG	NRG	2011
Zinc	Inorganic	No data	30	1987	No data	No data	No data

Chemical name	Chemical groups
No Chemicals with Data	





## **Appendix F**

**West 40 Landfill Drainage Management Review** 

City of Iqaluit Landfill Runoff Wetland Treatment Conceptual Design Report

## City of Iqaluit Landfill Runoff - Wetland Treatment Conceptual Design Report

## Prepared for:

City Hall
City of Iqaluit
P.O. Box 460
Iqaluit, Nunavut, X0A 0H0

## Prepared by:

Earth Tech (Canada) Inc. 17203 – 103<sup>rd</sup> Avenue Edmonton, AB T5S 1J4



February 21, 2007

Project No. 93107-04



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- **Appendix B** Surface On-site Runoff Wastewater Quality Data and Report
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## **SECTION 1**

## INTRODUCTION

## **BACKGROUND**

The water license No. 3AM-IQA0611 Type "A" (Valid till May 15, 2011) issued to the City of Iqaluit by Nunavut Water Board, requires that the City of Iqaluit manage, collect and monitor the runoff from the West 40 Landfill site and adjacent Sludge Management Facility.

The City of Iqaluit produces approximately 10,000 cubic meters of compacted waste, which enters the landfill annually, including residential, commercial and industrial wastes. The landfill applies a surface water management system to divert off-site surface runoff from entering the site, and collect on-site surface runoff for a controlled discharge into the environment. West 40 landfill site development relies on the local permafrost regime to provide a low permeability barrier to control the subsurface runoff.

The on-site surface runoff is comprised of contaminated surface runoff originating from the melt water from the spring freshet and runoff from summer precipitation. The surface runoff sampling results in June 2006 suggest that the landfill runoff needs to be appropriately managed, and direct discharge into the environment should be controlled. The most feasible means to manage the landfill surface runoff is to treat runoff using an engineered solution. Wetland treatment of the runoff is an appropriate option for Iqaluit because of its passive mode, low maintenance requirements, and cost effectiveness in comparison with other available technologies. This process has been successfully applied to landfill runoff treatment in Southern Canada. The precedent for northern wetland systems was established by the Town of Fort Smith landfill wetland system, which was the first instant where a wetland treatment of landfill runoff has been incorporated into a northern community water licence (2003).

## **PROJECT SCOPE & OBJECTIVES**

Earth Tech (Canada) Inc. was retained by the City of Iqaluit in 2006 for the "Solid Waste Disposal Facility (Landfill) Improvements" project. The scope of the project was to provide engineering consulting services for the management of the landfill surface runoff. Runoff collection and storage improvements were constructed in 2006. The next phase of the project is to engineer a runoff treatment process.

The first phase of the runoff treatment work is to develop a conceptual plan for a constructed wetland to treat on-site surface runoff from West 40 Landfill site.

This report addresses the following scope and objectives:



- To confirm the seasonal on-site surface runoff volume;
- To develop a wetland treatment concept to meet discharge guidelines;
- To evaluate the financial and technical considerations for these processes;
- To provide recommendations for the City of Iqaluit to implement a runoff treatment solution.

This report documents the conceptual level assessment of landfill runoff generation and wetland treatment suitable for the cold climate conditions. To assist with the completion of this report, the following background information was reviewed. The other documents cited in the report are listed in the Section References.

- 1. The average weather condition during 1971 to 2000 from Environment Canada (Appendix A).
- 2. The historical runoff quality parameter data and current water sampling data (Appendix B).
- 3. The Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories, 1992.
- 4. Nunavut Water Board Water Licence: City of Iqaluit, No.3AM-IQA0611 TYPE "A", issued by Indian and Northern Affair Canada (INAC).



# SECTION 2 EXISTING CONDITIONS

The existing on-site surface runoff management system consists of a series of continuous perimeter ditches associated primarily with perimeter berm structures (see Figure 2-1). The on-site runoff control ditches drain to several runoff control ponds. Two dedicated runoff storage ponds serve the existing landfill operating area, and two dedicated runoff storage ponds serve the landfill expansion area (see Figure 2-2). The ponds provide a control area where the runoff may be sampled and pumped into a runoff retention pond. The surface runoff in the retention pond will be pumped to the proposed runoff wetland area for treatment during the frost free period every year.



Figure 2-1. Continuous ditches formed with a perimeter berm structure to control on-site and off-site surface runoff at the West 40 landfill site in Iqaluit.

## **CLIMATE**

Weather conditions influence wetland processes and the treatment performance, especially in cold climates. The engineering limitations in the design of constructed wetlands (CWs) in cold climates are the ice formation, hydrology and temperature effects on the biological and microbiological mediated treatment processes. However, these limitations may be overcome by design and operation of the system.



The average monthly temperatures in Iqaluit vary from 2.2 to 7.7 degree Celsius from June through September and -4.4 to -28 degree Celsius from October through May based on Environment Canada data in the period of 1971 to 2000. The average annual precipitation is 198 mm of rainfall and 236 cm of snowfall for a mean annual precipitation total of 412 mm. **Appendix A** presents detailed Canadian Climate Normals for Iqaluit from 1971 to 2000. Figure 2-3 shows the average monthly temperature from 1971 to 2000. The frost free period ranges from middle May to early September.

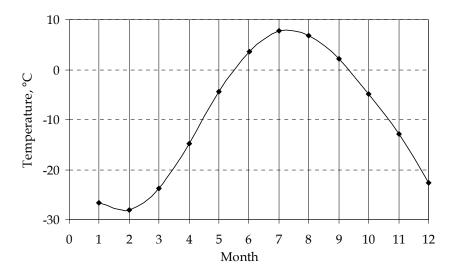


Figure 2-3. Average monthly temperature in Iqaluit from 1971 to 20000

#### LANDFILL RUNOFF CHARACTERIZATION

Landfill runoff sampling at the landfill site was completed in 2004 and 2006. The 2004 sampling was collected by the City of Iqaluit, and the 2006 sampling was completed by Earth Tech (Canada) Inc. The report "Runoff Sample Analysis – Comparison of 2004 and 2006 Samples" prepared on July 31, 2006 provides a detailed comparison of the 2004 and 2006 results (**Appendix B**).

The sampling results shows that the concentrations of many of the parameters have increased over the past two years, especially Aluminum (Al) concentration in 2006 increased to 5.01 mg/L from 0.048 mg/L detected in 2004 sample. The major parameters exceeding the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories (1992) in 2006 sampling event are Biochemical Oxygen Demand (BOD<sub>5</sub>), Total Suspended Solid (TSS) and metal contents including Aluminum, Iron, Copper, Lead, Manganese and Zinc.



## DRAINAGE CONTROL PONDS AND RETENTION POND

Four drainage control ponds are located in the landfill area at West 40 Landfill site (see Figure 2-2). An existing pond was augmented by three new ponds in 2006. The total volume of these control ponds is approximately 3000 m<sup>3</sup>. A runoff retention pond was also constructed in 2006 as the area where accumulated runoff in the control ponds may be pumped to (Figure 2-4). The volume of the retention pond is approximately 5000 m3. Figure 2-5 shows a runoff control pond and Figure 2-6 shows the retention pond.



Figure 2-5. Runoff control pond (October 2006)

The runoff retention pond was constructed in original ground with a compacted base. The base materials are typically loamy sands based on the grain size distribution. The loamy sand is a material

permeability, and has significant fractions of silt

and gravel sized materials (see Figure 2-7).

graded

with

limited



Figure 2-6. Drainage retention pond (October 2006)

## 100 80 Percent smaller 60 40 20 0.001 0.01 0.1 10 100 Grain size (mm)

Figure 2-7. Grain size distribution of compacted base in the runoff retention pond

## **CONTAMINANT REMOVAL IN THE RETENTION POND**

A portion of the runoff contaminants may be reduced by sedimentation and infiltration in the retention pond. Sedimentation of the suspended particulate matter to the base of the retention pond may occur in the quiescent conditions of the pond.

Infiltration into the base of the pond is another mechanism for the reduction of contaminants in the retention pond. The loamy sand base material has the capacity to allow the runoff to flow through the material and the contaminants reduced. The mechanisms of filtration, biodegradation and absorption/adsorption in the soil may reduce contaminants. Contaminant migration into the active layer may be limited by the permafrost regime, the permeability of the



base material, and the removal mechanisms in the soil material.

## AVAILABLE LAND AREA FOR WETLAND TREATMENT

The proposed wetland treatment area is located east of the runoff retention pond. The slope in the proposed wetland location is generally from west to east (see Figure 2-4), which provides a positive drainage slope by gravity for the proposed wetland. The actual slope required for the wetland depends on the hydraulic conductivity of selected bedding materials. The existing elevations of the runoff retention pond and the proposed wetland area are summarized in Table 2-1.

Table 2-1. Elevations of the proposed wetland location

Location	Elevation (m)	Notes
Top of runoff retention pond	13.5	
Bottom of runoff retention pond	11.0	
Inlet of wetland area	11.0	
Outlet of wetland area	9.0	Can be further extended to elevation of 7.0 m if more wetland area needed.



## SECTION 3 WETLAND SYSTEMS

Both natural and constructed wetland systems have been used to treat a variety of wastewaters including runoff from landfills. The use of constructed wetland, rather than natural wetlands, may be preferred because constructed systems may be specifically engineered for the particular wastewater characteristics. Constructed wetlands allow a greater degree of control of substrate, vegetation types, flow characteristics, and flexibility in sizing. Constructed wetlands are engineered systems that have been designed and constructed to utilize the natural functions of wetland vegetation, soils, and their microbial populations to treat contaminants in various wastewater streams. Constructed wetlands also have significantly lower lifecycle costs than conventional treatment systems, and may be operated using less power and less labor.

Constructed wetlands are categorized into two main groups: surface flow (SF) and subsurface flow (SSF). Figure 3-1 shows the detail of typical constructed wetland cells for SF and SFF. Factors to be considered include land area availability, capital cost, runoff composition concentrations, and the potential public health risks. Unlike a natural wetland system in which hydrology is largely fixed by the tolerance limits of the existing plant community, a constructed wetland may be designed to regulate water depth and retention time based on the influent quality.

This section will discuss two options for a constructed wetland system for the treatment of onsite surface runoff generated from the Iqaluit landfill site. The advantages and disadvantages of the options will also be discussed in this section. Section 4 will discuss the design criteria for wetland treatment of runoff in Iqaluit, and the mechanisms for removal of contaminants by wetland treatment.

#### **OPTION 1: SURFACE FLOW WETLAND**

A constructed SF wetland is a shallow, engineered pond (about 30 cm deep) that is planted with local emergent and rooted vegetation. Runoff is introduced at one end and flows across the wetland area to the discharge point.

The emergent plants of SF wetlands are not harvested to remove nutrients. Instead, the natural assimilative capacity of the microbial flora (bacteria and fungi) that attach to the plants, provides efficient and reliable removal of biodegradable organics and nitrogen (ammonia and nitrate). Metals and phosphorus may be sequestered in plant materials and wetland sediments. Most of the treatment is a function of the microbial, physical and chemical action rather than plant uptake; therefore, these processes may occur during cold weather.



## **OPTION 2: SUBSURFACE FLOW WETLAND**

SSF wetlands are gravel or organic soil based systems, in which the wastewater substrate passes through the permeable media. The flow is subsurface in and around the roots of the wetland plants. Flow through the media may also be horizontal flow, referred as subsurface horizontal-flow wetland; or vertically downward, referred as subsurface vertical-flow wetland. The large surface area of the media and the plant roots provides sites for microbial activity, and SSF systems use many of the same emergent plant species as SF systems.

SSF wetland systems have better performance in cold weather because most of the treatment occurs below the ground surface where the treatment processes are less affected by cold air temperatures. In addition, media based systems have relatively low in maintenance requirements and are less likely to have odor and mosquito problems in comparison with SF wetlands. When properly designed, media based wetland systems have high removing efficiency rates for biodegradable organic matter and nitrate-nitrogen.

A consideration that makes the SSF system attractive is the reduced potential for human contact with partially treated wastewater, which reduces public health concerns.

#### **SELECTION OF WETLAND PROCESS**

The advantage and disadvantage of SF wetland and SSF wetland are compared in Table 3-1. As previously discussed, on-site surface runoff is collected and stored in the runoff retention pond before discharge to the wetland. The suspended solids will be reduced by sedimentation in the retention pond (as discussed in section 2), therefore, the clogging may not be a significant operational problem for subsurface flow (SSF) wetlands. Since the wetland may be only operated during the frost free period every year in Iqaluit, the snow or ice insulation of SF wetland is not an advantage over SSF system.

There are some general considerations for the design of a constructed wetland, and every wetland system is site-specific and the assistance of an experienced wetland designer is critical to the success of a wetland project. Some key components to consider are:

- Available land area
- Available vegetation
- Available soil materials
- Contaminant removal objectives
- Operating window dictated by freezing conditions
- Hydraulic retention time (HRT)
- Gravity flow availability
- Nuisance controls (i.e. mosquito and odour control)
- Maintenance and self-sustainability



Table 3-1. Comparison of surface flow and subsurface flow wetlands

Wetlands	Advantages	Disadvantages
Surface flow	<ul> <li>Minimal clogging problems</li> <li>Air stripping potential of organic toxic contents</li> <li>Snow/ice cover as an insulation</li> </ul>	<ul><li>More area than SSF</li><li>Potential air quality degradation</li></ul>
Subsurface flow	<ul> <li>Less area need than SF</li> <li>Better contact between soil and water</li> <li>Greater thermal protection than SF</li> </ul>	<ul> <li>Tendency of plugging of pore space</li> <li>Higher cost than SF for a certain pollutant mass removal</li> </ul>

For Iqaluit, the proposed wetland treatment system will be located adjacent to the existing landfill site. The available and optimal location is the area east of the runoff retention pond, which is sloped from west to east. An existing stream just north of this area may be used for effluent discharge. The runoff stored in the retention pond will be pumped to the wetland inlet by setting up a potable pump over the berm structure.

As stated in Section 2, the average temperature from June to September is approximately 5°C with an average daytime high of 11.6 °C and an average overnight low of -0.4 °C. The construction of a SSF system will reduce or eliminate the potential of the runoff freezing. Layers of snow, ice, and organic materials will provide an insulating barrier to the cold. This may help to extend the wetland operation period from May to October.

To meet the perspective discharge criteria, it is important to design the wetland system with a hydraulic retention time (HRT) sufficient to reduce the organic contaminant and nitrogen concentrations under cold water temperature conditions. This will require additional land area as compared to a system operated with a warmer water temperature. The minimum HRT is 7 to 10 days for SF wetlands and 2 to 4 days for SSF wetlands. Based upon this criterion, the land area required for a SF wetland system will be at least twice as large as a SSF wetland system.

The porous media of SSF wetland will provide more contact area between contaminants and microbes/medium particles. The contaminants will first partition from the liquid phase into the solid phase, and then be absorbed by the plant roots. The SSF wetland systems have a higher removal efficiency for biodegradable organic matter and nitrate-nitrogen than SF wetland system in comparing the areal removal rate constant (Kadlec and Knight 1996).

Considering the advantages and disadvantages listed in Table 3-1, and the local conditions in Iqaluit, a SSF wetland system is recommended for Iqaluit landfill surface runoff treatment process. This conclusion is supported by the conceptual process information from Riparia Aquatic Ltd., a wetland treatment specialist. The technical memo from Riparia regarding the wetland conceptual design for the City of Iqaluit is presented in **Appendix C**.



## SECTION 4 DESIGN CRITERIA

## WATER QUALITY PARAMETERS

Wetland performance may be characterized by contaminant concentration reduction, by mass reduction or by areal load reduction. There are no guidelines for treated landfill surface runoff in Nunavut. The benchmark conditions on the treated discharge are the discharge limits for Sewage Lagoon effluents of the City of Iqaluit Water Licence issued by NWB, 2006. The major parameters are summarized in Table 4-1.

Table 4-1. Proposed treated wetland outflow water quality parameters

Parameters	Limits of Water Licence	Maximum Concentration of Any Grab Sample	
BOD <sub>5</sub> (mg/L)	120	180	
TSS (mg/L)	180	270	
Oil and Grease	No visible sheen		

The following paragraphs discuss the removal potential of major contaminants contained in the runoff by constructed wetlands in general.

#### **TOTAL SUSPENDED SOLIDS**

Suspended solids are principally removed in a wetland system by physical filtration processes. Both surface flow (SF) and subsurface flow (SSF) wetland systems effectively remove suspended solids from contaminated water. Suspended solids within SSF system may block the pores or bedding media, and as a result, will decrease the hydraulic conductivity or the flow through the system, especially near the inlet.

#### **ORGANICS - BOD**

Organic matter is removed in the wetland systems by deposition and filtration for settleable BOD, and by microbial metabolism for soluble BOD. The removal efficiencies for BOD<sub>5</sub> vary significantly depending on the organic loading rates, dissolved oxygen concentration, water temperature, bedding media and plant species. The oxygen sources for these reactions are important for the efficient removal of organic matters. The major oxygen source in surface flow wetlands is aeration at the water surface. However, the water mixing at the surface will be



reduced by the vegetation and snow or ice cover. Oxygen conveyed through the plant root system supports the aerobic microbial activity adjacent to roots. The average temperature from June to September of 5°C in Iqaluit will lower biological activity, which ultimately means a decreased oxygen transfer efficiency and lower biochemical activity. This may be compensated by providing a longer hydraulic retention time and a lower hydraulic loading rate for the proposed wetland.

#### **METALS**

Metals are removed by cation exchange to wetland sediments, precipitation as insoluble salts and plant uptakes. The major concerned metals are Iron, Zinc, Copper, Aluminum and Lead in Iqaluit, based on the 2006 sampling results. The average removals of these metals were reported in the range of 50 to 90 percent by constructed wetlands in the literature.

#### **NUTRIENTS - N & P**

The reduction of nutrients, nitrogen (N) and phosphorus (P) requires the longest hydraulic retention time of any of the anticipated pollutants. The phosphorus concentration measured in 2006 sampling event was 0.8 mg/L, which is lower than the Canadian Guideline 1.0 mg/L. For most wetland treatment, P is not regarded as an important pollutant; however, P is a required supplement to support biological processes.

The total nitrogen concentration was measured 20.7 mg/L as Kjeldahl Nitrogen (TKN) for the 2006 sampling event, which includes organic nitrogen and ammonia. The nitrite ( $NO_2^-$ -N) and nitrate ( $NO_3^-$ -N) are less than 0.07 mg/L, which is not a concern. The NWT guidelines (1992) do not provide a discharge limit on the ammonia, however, ammonia in wastewater effluent may be deleterious to fish in the receiving water body if the concentration is more than 0.2 mg/L. A certain level of ammonia removal is expected from a SSF wetland. However, it is not possible to achieve high total nitrogen removal in cold climate constructed wetland without adding supplemental oxygen for nitrification, and carbon sources for denitrification.

#### HYDRAULIC DESIGN PARAMETERS

The retention pond provides storage for runoff generated from landfill site during the period of October through May. It is anticipated that the wetland treatment for the retention pond accumulation will be operated during the frost free period of June through September.

#### SURFACE RUNOFF VOLUME

Based on the monthly precipitation from November through May (8 months), the average total precipitation is 161 mm. The total landfill area (existing and new area) is approximately 48,000 m<sup>2</sup>; therefore, the anticipated total volume of runoff generated from snowfall is approximately



7,700 m<sup>3</sup>. During the summer and fall months (June through October), the anticipated surface runoff volume is approximately 6,600 m<sup>3</sup> (Table 4-2), assuming that 50% precipitation will retain in the runoff control ponds and retention pond.

A significant portion of the summer and fall runoff will infiltrate into the landfill subsurface, therefore, the surface runoff volume generated will be much less than the amount shown in Table 4-2. Assuming fifty percent (50%) of rainfall precipitation accumulates into surface runoff, the runoff control ponds and the retention pond have enough capacity for storing the surface runoff from landfill site for spring runoff. The actual runoff resulting from summer and fall precipitation and stored in the control ponds and the retention pond may be monitored as part of the on-going facility operations. Summer runoff may be directed through the wetland with retention.

Table 4-2. Surface Runoff Volume Projection at Landfill Site (1971 to 2000)

	November to May	June to October
Precipitation (mm)	161	252 *
Estimated runoff volume (m³)	7,700	6,600

Note: \* 50% precipitation was used to estimate the runoff volume.

#### HYDRAULIC RETENTION TIME (HRT)

Hydraulic retention time for constructed wetlands is typically in the range of 1 to 10 days. The HRT for the proposed SSF wetland system is 4 days to maximize the removal of the contaminants based on the local conditions, as recommended by Riparia (Appendix C) and Alberta Environment guidelines.

#### HYDRAULIC LOADING RATE

Hydraulic loading rate is a primary design factor for constructed wetlands. The selection of an appropriate design loading rate should be based on several factors, including treatment objectives, wetland used for levels of treatment, wetland types (SF or SSF), and safety factors. Since constructed wetlands technology is a variable science, the facility may be conservatively designed with low loading rates. The average loading rates for wetland treatment of municipal wastewater is approximately 3 cm/day. Considering the cold climate and runoff parameters at the landfill site, the proposed design hydraulic loading rate is 2.5 cm/day.



# SECTION 5 CONCEPTUAL DESIGN

Based on the information in the preceding sections of this report, it is possible to develop a conceptual design for the selected SSF wetland. The design of the wetland will include the sizing of wetland, a pumping system to pump runoff from the retention pond to the wetland, the plant selection suitable for the local climate and removal of contaminants, bedding materials, and the reduction of suspended materials in the retention pond.

The proposed approach to the facility design is to complete a pilot study to determine the performance of the wetland system. A series of sampling tests will be needed to determine the surface runoff water characteristics in the retention pond and the wetland itself over the duration of the wetland operating season.

#### **CONCEPTUAL DESIGN OPTIONS**

Based on the discussion in Section 4, the estimated surface runoff volumes are 7,700 m<sup>3</sup> from November to May and 6,600 m<sup>3</sup> for June to October. Runoff testing to meet the guidelines of NWT, may provide some flexibility in the discharge strategies. The potential total runoff treatment needs for the wetland may be up to 14,300 m<sup>3</sup> per year.

It should be pointed out that these volume numbers are based on the following assumptions:

- Average precipitation will occur as the statistics from Environment Canada.
- All the snow runoff will be collected and stored in the drainage control ponds and the retention pond.
- Fifty percent of summer rainfall runoff will filtrate into the landfill area and 50% will flow into the control ponds.
- There is no peak factor selected due to the buffer capacity of the retention pond.

Table 5-1 compares the referred guidelines for the proposed wetland discharge with Environment Canada guidelines and Alberta Environment guidelines. The current discharge limits for BOD5 and TSS from Sewage Lagoon in Water Licence of the City of Iqaluit are the same as those in NWT guidelines. The more strict guidelines may be warranted within the next 10 or 20 years. In 2005, Yukon government prepared Draft Interim Guidelines for Community Wastewater Discharges, which is intended to help communities in the planning of new and upgraded sewage treatment systems to comply with the Canada-wide Strategy. The Canada-wide Strategy for wastewater discharge will include all the provinces and territories.

Based on the above assumptions, the proposed wetland system may be implemented as follows:

• Phase 1 surface runoff volume 7,700 m³ with phase 2 expansion (6,600 m³) in the future.



Table 5-1. Comparison of Guidelines of Treated Wastewater Discharge in Canada

Guidelines	NWT Guidelines <sup>3</sup>	Yukon Interim Guidelines <sup>7</sup>	Environment Alberta <sup>4</sup>	Environment Canada <sup>5</sup>
BOD <sub>5</sub> , mg/L	120	45	25 <sup>1</sup>	20
TSS, mg/L	180	60	25 <sup>1</sup>	25
TP, mg/L	Site specific	-	1 <sup>2</sup>	16
NH <sub>3</sub> +-N, mg/L	-	-	Site specific	-
Fecal coli., cfu/100 mL	-	20,000	200	400
Iron, mg/L	0.3	-	ı	-
Zinc, mg/L	0.5	-	-	-
Aluminum, mg/L	2.0	_	-	-
Lead, mg/L	0.05	-	-	-

<sup>&</sup>lt;sup>1</sup> Population < 20,000;

#### CONSTRUCTED WETLAND STRUCTURE

The proposed wetland will be a subsurface flow wetland with permeable soil matrix growing medium as discussed in Section 3. Runoff will be introduced via perforated head pipe to a gravel flow dispersion trench. Runoff will permeate through the side of the flow spreader trench, through a peat bed, then into the permeable medium. The sacrificial peat bed will buffer the wetland against spike concentrations of contaminants (Figure 5-1). Since there is a slope from the inlet to the discharge point of the proposed wetland area, the SSF will be designed as a horizontal subsurface flow. The design slope will be calculated based on the anticipated hydraulic conductivity of available materials for the bedding media. At the outlet of the wetland, another gravel trench will be placed with a perforated pipe. The treated runoff may then be discharged to a stream on the northeast corner of proposed SSF wetland (See Figure 2-4).

<sup>&</sup>lt;sup>2</sup> Populations > 20,000;

<sup>&</sup>lt;sup>3</sup> Guidelines for the Discharge of Treated Municipal Wastewater in the NWT, 1992 (Season: Summer, 150-600 Lcd, Receiving Environment: Marine/Bay);

<sup>&</sup>lt;sup>4</sup> Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage System, Alberta Environment, 2006;

<sup>&</sup>lt;sup>5</sup> Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments, 1976, Report EPS-1-EC-76-1, Federal Activities Environmental Branch;

<sup>&</sup>lt;sup>6</sup> Applicable when phosphorus removal is required.

<sup>&</sup>lt;sup>7</sup> Draft 2005 Interim Guidelines for Communities Wastewater Discharge, Yukon Environment, 2005.



## **NATURE IN ACTION**

The ability of wetlands to remove contaminants from water relies on the emergent plants, which play a key role in a wetland treatment process. Plants provide an oxygen source to help sustain aerobic conditions in the wetland, and plant roots provide passages for water to filtrate through the bedding media.

As water slowly flows through a wetland, pollutants are removed through physical, chemical, and biological processes. The physical processes include entrapment, sedimentation and adsorption. The biological processes include nitrification and denitrification, the uptake of nutrients and metals by plants, and by organisms that occupy on the bedding media. The different species of organisms and plants may have markedly different success depending on factors such as type and toxicity of individual pollutant, water level and temperature.

## WETLAND SIZING

The performance of a constructed wetland for contaminant removal often depends on the proper interaction among hydraulic retention time (HRT) and flow, contaminant compositions, vegetation and seasonal temperatures. It is difficult to determine the exact area needed for effective treatment of runoff since specific hydraulic and pollution fluctuations, as well as varying local climatic conditions have to be taken into consideration. There are two methods to estimate the preliminary area for the constructed wetland. One method is to use the model based on reaction kinetics developed by Kadlec and Knight (1996). The other method is to calculate the land area required using the selected hydraulic loading rate. **Appendix D** illustrates the model and calculation used in this report to estimate the land area required for wetland construction.

#### PHASE 1: RUNOFF 7,700 M<sup>3</sup>

## Reaction Model Method of Area Determination

Kadlec and Knight provided a model to determine the preliminary area requirements based on desired effluent quality, first areal rate constants and background limits of the contaminants. To achieve a conservative estimate of land area required, modeling was conducted on BOD and TSS. The other factors can be used in modeling are TP, TN, ammonia, and organic nitrogen. However, the sampling programs conducted in 2004 and 2006 shown that the results of these parameters are below the guidelines of NWT, 1992. **Appendix D** presents the detail calculation using this model.

The land area calculated is  $840 \text{ m}^2$  to meet the BOD discharge guideline 120 mg/L. Should the BOD discharge concentration be 45 mg/L (as in 2005 Yukon Interim), the area required is  $2,070 \text{ m}^2$ .



## Hydraulic Loading Rate Method of Area Determination

The hydraulic loading rate is assumed to be 2.5 cm/day (0.025 m<sup>3</sup>/m<sup>2</sup>/day) for optimal removal efficiency (as discussed in Section 4). Therefore, the area estimated for surface runoff treatment during average 105 frost free days is

$$(7700 \text{ m}^3) / (105 \text{ days}) / (0.025 \text{ m}^3/\text{m}^2/\text{d}) = 2940 \text{ m}^2$$

The land area required for a SSF wetland system to treat 7,700 m<sup>3</sup> of surface runoff, as sampled in June 2006, is approximately 2,940 m<sup>2</sup>.

### PHASE 2: ADDITIONAL 6,600 M<sup>3</sup> TO A TOTAL OF 14,300 M<sup>3</sup>

## Reaction Model Method of Area Determination

As the same method used in Phase 1, the required land area is 720 m<sup>2</sup> for a 120 mg/L BOD discharge limitation. If the discharge limit of BOD is 45 mg/L, the total land required for a wetland treatment system will be 1,770 m<sup>2</sup> to meet the BOD discharge guideline.

## Hydraulic Loading Rate Method of Area Determination

The hydraulic loading rate is assumed to be 2.5 cm/day ( $0.025 \text{ m}^3/\text{m}^2/\text{day}$ ) for optimal removal efficiency. Therefore, the area needed for surface runoff during average 105 frost free days is

$$(6600 \text{ m}^3) / (105 \text{ days}) / (0.025 \text{ m}^3/\text{m}^2/\text{d}) = 2520 \text{ m}^2$$

The wetland sizing estimated by above two methods was quite different. The land area required to treat 6,600 m<sup>3</sup> of runoff is estimated to be 2,520 m<sup>2</sup> by selecting larger land area. This wetland system will also meet the land area required for the future BOD discharge limit as discussed above.

## **MODEL COMPARISONS**

Comparing the reaction model method with hydraulic loading rate method, the difference for the calculated land area to treat the same runoff volume is significant. The calculated land area by the reaction model method is the area required to treat BOD to meet the effluent guidelines as indicated in Appendix D, BOD is the governing parameter based upon its larger area requirement.

The temperature has significant effect on the reaction rate model based on van't Hoff Arrhenius equation, where  $K_{T1}$  and  $K_{T2}$  are first-order rate constants at temperature T1 and T2 (see Appendix D).

$$K_{T1} = K_{T2} \cdot \boldsymbol{\theta}^{(T1-T2)}$$

The rate constant and temperature coefficient in the calculation are based on the broad range of study results, not specifically for the cold climate. Therefore, these parameters may not



represent the actual biochemical reaction and rate constants in the proposed wetland system, particularly the temperature coefficient,  $\theta$ .

The land area requirement calculated from hydraulic loading rate is much larger than the land area calculated from the reaction model. In order to be conservative, the larger land area requirements will be applied to the proposed wetland system during the conceptual design. The pilot study results will allow for an optimization of the wetland system based upon the local conditions.

## CONCEPTUAL LEVEL COST ESTIMATE

A conceptual level cost estimate of various components has been completed for the two phases of the wetland (Table 5-2). The spreadsheet showing the breakdown of this cost estimate is presented in **Appendix E**. The total construction cost for both phases does not include capital for land acquisition since it is assumed that the land for the wetland is the property of City of Igaluit.

Table 5-2. Cost Estimation of Proposed Wetland System

Wetland Component	Phase 1	Phase 2	
Wetland Construction	\$ 176,550	\$ 173,425	
Vegetation	\$ 9,000	\$ 8,316	
Pumping system	\$ 10,000	\$ 10,000	
Engineering contingency (40%)	\$ 78,220	\$ 76,696	
Total construction cost estimate	\$ 273,770	\$ 268,437	



## **SECTION 6**

## **RECOMMENDATIONS & IMPLEMENTATION**

#### **RECOMMENDATIONS**

It was recommended that the subsurface flow wetland system be designed to treat the surface runoff from the landfill site of Iqaluit, as discussed in Section 3. Horizontal flow may be designed to utilize the slope of the wetland area.

Based on the information presented in this report, Iqaluit may develop the wetland system for the treatment of landfill on-site surface runoff in two phases. Phase 1 will have a 7,700 m³ treatment capacity to meet the current discharge quality requirement. Phase 2 will have a 6,600 m³ treatment capacity for the future process improvements. During the pilot operation, by collecting the water quality parameters of the wetland influent and discharge, the operation of the wetland treatment system will be monitored and evaluated for the need of Phase 2 expansion.

It is important to point out that wetland technology is still in a developing phase, and it is not possible to predict the ultimate wetland performance.

## **IMPLEMENTATION**

The conceptual design for Iqaluit West 40 Landfill site surface runoff provides a practical and valuable solution for the management and protection of water bodies surround the landfill site. Following the recommendations made within this report, the next steps are:

- 1) Submit the conceptual design report for regulators' review;
- 2) Monitoring the quality of runoff contained in control ponds and the retention pond;
- 3) Complete preliminary engineering for the pilot program (Phase 1) for the proposed wetland treatment;
- 4) Complete detailed design and tendering for Phase 1 and construction;
- 5) Operate the Phase 1 facility and monitor results;
- 6) Plan for facility optimization based on Phase 1 results.



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# **Appendix A**

City of Iqaluit Weather Climate Normals

from Environment Canada

(1971 - 2000)

# Climate Normals for City of Iqaluit from 1971 to 2000 (Data adapted from Environment Canada)

Temperature: Temperature:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-26.6	-28	-23.7	-14.8	-4.4	3.6	7.7	6.8	2.2	-4.9	-12.8	-22.7	
Standard Deviation	5	3.8	3.7	2.6	2.1	1.7	1	0.9	1.1	2.5	3.6	4.7	
Daily Maximum (°C)	-22.5	-23.8	-18.8	-9.9	-0.9	6.8	11.6	10.3	4.7	-2	-8.9	-18.5	
Daily Minimum (°C)	-30.6	-32.2	-28.6	-19.6	-7.8	0.3	3.7	3.3	-0.4	-7.7	-16.7	-26.9	
Extreme Maximum (°C)	3.9	4.4	3.9	7.2	13.3	21.7	25.8	25.5	17.2	7.3	5.6	3.4	
Date (yyyy/dd)	1958/21	1965/22	1955/19	1981/23	1954/30	1955/22+	2001/28	1991/08	1964/03+	1981/05	1952/19	2001/29	
Extreme Minimum (°C)	-45	-45.6	-44.7	-34.2	-26.1	-10.2	-2.8	-2.5	-12.8	-27.1	-36.2	-43.4	
Date (yyyy/dd)	1953/24+	1967/10+	1991/01	1983/10	1949/02	1978/02	1961/03	1996/31	1965/30	1978/30	1978/18+	1993/30	
Rainfall (mm)	0.1	0	0	0.2	2.8	24.7	59.2	64.8	41.5	4.5	0.5	0	
Snowfall (cm)	22.8	16.8	25.3	32.4	25.1	9.8	0.1	0.8	13.7	34.9	32.4	21.7	
Precipitation (mm)	21.1	15	21.8	28.2	26.9	35	59.4	65.7	55	36.7	29.1	18.2	
Average Snow Depth (cm)	22	23	25	29	18	2	0	0	0	6	16	20	13
Median Snow Depth (cm)	21	23	25	28	16	1	0	0	0	6	15	19	13
Snow Depth at Month-end													
(cm)	23	25	29	27	10	0	0	0	1	10	21	21	14
		_											
Extreme Daily Rainfall (mm)	2.5	2	0.5	5.1	11.7	28.4	52.8	48.2	40.4	23.3	11.9	0.5	
Date (yyyy/dd)	1958/21	1963/03	1958/09	1950/20	1986/14	1961/30	1968/14	1995/08	1979/01	1985/24	1955/01	1963/16	
Extreme Daily Snowfall (cm)	30.7	32.2	24.6	21.8	29.5	19.2	3.6	6.2	21.3	20.6	27.9	21.8	
Date (yyyy/dd)  Extreme Daily Precipitation	1958/18	1981/12	1973/08	1973/07	1965/09	1984/09	1970/08	1981/29	1946/26	1961/08	1960/24	1951/03	
(mm)	30.7	27.4	23.9	23.9	27.4	30.2	52.8	48.2	40.4	27.2	27.9	21.8	
Date (yyyy/dd)	1958/18	1981/12	1953/29	1973/07	1965/09	1980/06	1968/14	1995/08	1979/01	1985/25	1960/24	1951/03	
Extreme Snow Depth (cm)	57	74	69	86	86	43	1	3	15	33	52	48	
Date (yyyy/dd)	1977/15+	1956/27	1963/01+	1958/30	1958/01+	1987/02	1978/01+	1957/24+	1992/29	1961/29+	1989/27	1958/23	

# **Appendix B**

Surface On-site Runoff Wastewater

Quality Data and Report

#### City of Iqaluit Solid Waste Disposal Facility (Landfill) Improvements

#### Runoff Sample Analysis – Comparison of 2004 and 2006 Samples

July 31, 2006

#### INTRODUCTION

Earth Tech (Canada) Inc. was retained by the City of Iqaluit for the "Solid Waste Disposal Facility (Landfill) Improvements" project. The scope of the project is to provide engineering consulting services for the landfill expansion, and onsite and offsite drainage improvements.

According to the City's Water License (3AM-IQA0611 Type "A; valid till May 15, 2011), the City has to submit an annual report to the Nunavut Water Board highlighting the collection and analysis of samples from a specified location at landfill. As a part of the project scope/license requirement, Earth Tech collected a sample of runoff in duplicate from the City's landfill on June 28, 2006.

This report provides a summary of sample results, and their comparison with the 2004 sample results. The purpose is to determine the change in runoff quality over the time.

#### SAMPLING HISTORY

The 2004 sample was collected by the City (Geoff Baker, Manager of Capital Projects) on July 6, and was shipped on the same day to the PSC Analytical Services, Ontario. Figure 1 shows the location of sampling points.

The 2006 sample was collected in duplicate by Earth Tech on June 28 from the sampling point that corresponds to "x 103" on Figure 1. The samples were transported to Edmonton on the same day, and delivered at the Norwest Labs (Edmonton) on the morning of June 29.

#### SAMPLING DATA AND DISCUSSION

Table 1 presents a summary of the sample results. The results are compared with the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories, 1992, considering values for summer season with a rate of 150-600 Lcd and a marine/bay as the receiving environment.

#### CONCLUSIONS AND RECOMMENDATIONS

The results show that the concentrations of two thirds of measured runoff parameters are within the MWWE Guidelines. The concentrations of many of the parameters have increased over the past two years. The parameters that currently exceed the MWWE Guidelines are TSS,  $BOD_5$ ,  $Fe_{dissolved}$ ,  $Al_{total}$ ,  $Cu_{total}$ ,  $Pb_{total}$ ,  $Mn_{total}$  and  $Zn_{total}$ .

The most significant increase is in the  $Al_{total}$  concentration, which has increased over 100 times from the concentration detected in the 2004 sample. Other significant increases have occurred in the concentration of TSS,  $BOD_5$ ,  $Cu_{total}$ ,  $Sn_{total}$  and  $V_{total}$ . It should be noted that the results comparison is based upon no consideration of the potential errors in 2004 sample results arising from no sample preservation before shipping to the laboratory, and high temperature at the time of receiving by the laboratory (9°C).

Overall, the historic runoff sample results suggest that the landfill runoff needs to be appropriately managed, and direct discharge into the environment should be controlled.

Table B-1. Comparison of runoff samples in 2004 and 2006

Table B-1.	Joinparison (		ples in 2004 an	
Runoff Discharge Parameter	Units		mple Results	MWWE
		Jul-04	Jun-06	Guidelines <sup>(1)</sup> 6.5 - 8.5 <sup>(2)</sup>
pH	pH units	7.41	7.52	6.5 - 8.5
Specific Conductivity	μmoh/cm	1667.0	2050.0	0.0*
Iron (dissolved), Fe <sup>-</sup>	mg/L	0.2	0.7	0.3*
Chloride, Cl	mg/L	215.0	249.0	
Nitrite Nitrogen, NO <sub>2</sub> -N	mg/L	< 0.2	< 0.02	
Nitrate Nitrogen, NO <sub>3</sub> -N	mg/L	< 0.2	< 0.05	
Ammonia Nitrogen, NH <sub>3</sub> -N	mg/L	4.42		
Kjeldahl Nitrogen (TKN)	mg/L		20.7	
Phosphate, PO <sub>4</sub> <sup>-3</sup>	mg/L	< 0.1	0.8	
Sulphate, SO <sub>4</sub> -2	mg/L	398.0	307.0	500.0*
Sulfur, S	mg/L		105.0	
Phenols	mg/L	4.42		
Mercury, Hg	mg/L	< 0.0001	0.0001	0.0006
Biochemical Oxygen Demand, BOD <sub>5</sub>	mg/L	5.2	269	120.0
Oil and Grease	mg/L	2		
Total Suspended Solids, TSS	mg/L	32.0	868.0	180.0
Total Dissolved Solids (Calc.), TDS	mg/L		1330.0	
Hardness	mg/L		660.0	
Silver, Ag <sub>total</sub>	mg/L	< 0.0001	0.0006	0.1
Aluminum, Al <sub>total</sub>	mg/L	0.048	5.01	2.0
Antimony, Sb <sub>total</sub>	mg/L	0.0051	0.0238	
Arsenic, As <sub>total</sub>	mg/L	0.002	0.018	0.05
Boron, B <sub>total</sub>	mg/L	0.71	1.06	5.0*
Barium, Ba <sub>total</sub>	mg/L	0.035	0.12	1.0*
Beryllium, Be <sub>total</sub>	mg/L	< 0.001	<0.0002	
Bismuth, Bi <sub>total</sub>	mg/L	<0.001	<0.001	
Bromide, Br	mg/L	2.3	V0.001	
Calcium, Ca <sub>total</sub>	mg/L	166	203	
Cadmium, Cd <sub>total</sub>	mg/L	0.0024	0.0024	0.005*
Cobalt, Co <sub>total</sub>	mg/L	0.0024	0.0024	0.1*
Copper, Cu <sub>total</sub>	mg/L	0.0039	0.294	0.2*
Chromium, Cr <sub>total</sub>	mg/L	< 0.005	0.0241	0.1
Iron (total), Fe <sub>total</sub>		8.86		0.1
	mg/L		0.0993	0.05*
Lead, Pb <sub>total</sub>	mg/L	0.0191		0.03
Lithium, Li <sub>total</sub>	mg/L	267	0.02	
Magnesium, Mg <sub>total</sub>	mg/L	26.7	49 <sup>±</sup>	0.05*
Manganese, Mn <sub>total</sub>	mg/L	0.903	1.02	0.05
Molybdenum, Mo <sub>total</sub>	mg/L	0.006	<0.001	
Nickel, Ni <sub>total</sub>	mg/L	0.016	0.0226	0.3*
Phosphorous, P <sub>total</sub>	mg/L	0.25	0.8	Site-Specific
Potassium, K <sub>total</sub>	mg/L	36.8	61.7	
Sodium, Na <sub>total</sub>	mg/L	125.0	207.0	
Selenium, Se <sub>total</sub>	mg/L	< 0.002	0.0009	0.05

Down off Disabours Downwater	TT\$4-	Runoff Sar	mple Results	MWWE
Runoff Discharge Parameter	Units	Jul-04	Jun-06	Guidelines <sup>(1)</sup>
Silicon, Si <sub>total</sub>	mg/L		9.42	
Strontium, Sr <sub>total</sub>	mg/L	0.8600	1.0100	
Tin, Sn <sub>total</sub>	mg/L	0.001	0.02	5.0
Titanium, Ti <sub>total</sub>	mg/L	< 0.005	0.382	
Thallium, Tl <sub>total</sub>	mg/L	< 0.00005	< 0.0001	
Uranium, U <sub>total</sub>	mg/L	< 0.0001	< 0.001	
Vanadium, V <sub>total</sub>	mg/L	< 0.0005	0.01	
Zinc, Zn <sub>total</sub>	mg/L	15.2	0.763	0.50
Zirconium, Zr <sub>total</sub>	mg/L		0.005	

#### **Notes:**

the concentration of runoff discharge parameter exceeds the MWWE guidelines.

no specific guidelines are available.

no results are available.

<sup>(2)</sup> Water License requirement.

<sup>\*</sup> Dissolved content.

# **Appendix C**

## **Technical Memo**

# Iqaluit Landfill Leachate Treatment Wetland Cell Conceptual Design

By Riparia Aquatic, Wetland and Shoreland Environments

Date: October 12, 2006 Project #: 93107-04

To: Ken Johnson cc:

From: Bernie Amell

Riparia Aquatic, Wetland and Shoreland Environments #202, 403 - 30th Ave NE, Calgary AB T2E 9B3

Subject: Iqaluit Landfill Leachate Treatment Wetland Cell Conceptual Design

The following are my recommendations based on available site area of 2000 sq m.

Limiting issues will be temperature and high BOD loads. High nutrient loads are not anticipated. Advice by Earth Tech that heavy metals and other industrial chemicals are not evident.

Leachate should be stored in a pond area throughout the cold period. Releases to the treatment wetland would be pumped, when the leachate is at 5 degrees C. Propose creating a subsurface flow wetland with 0.5m deep permeable soil growing medium. Permeable medium will be mix of sand, fine gravel and peat. Local sedges and wetland mosses will be established on the surface.

Leachate would be introduced via perforated header pipe to gravel flow spreader trench wrapped with geotextile. Liquid will permeate into the side of the flow spreader trench, through a "sacrificial" peat bed of 3 meters width, then into the permeable medium. The sacrificial bed will buffer the main wetland against spike concentrations of hazardous materials.

The subgrade and surface of the permeable medium will be sloped to induce horizontal flow within the soil voids, without liquid emerging to surface. Slope will be calculated when information on locally available materials allows estimation of hydraulic conductivity. At the downstream end there will be another gravel trench wrapped with geotextile and with a perforated weeping tile pipe. This will drain to the recirculation/release vault. A small pump in this vault may continuously recirculate 1/2 volume of the leachate, providing an opportunity entrain atmospheric oxygen to improve BOD removal performance of the system. The remaining half volume will be released as treated leachate.

#### **Capacity Calculations**

12 weeks (84 days) of flow

Permeable soil medium assumed to have 25% voids @ 0.5m depth = 0.125 m<sup>3</sup> liquid/m<sup>2</sup> wetland area Desirable 4 day hydraulic retention time (HRT).

84/4 = 21 cycles per year

 $21 \times 0.125 = 2.625 \text{ m}^3 / \text{m}^2$  net hydraulic loading per treatment bed surface area Subtract assumed net precipitation/evaporation per bed area  $(0.325 \text{ m}) = 2.3 \text{ m}^3$  net hydraulic loading per year

If  $2000 \text{ m}^2$  area is available, assume 75% as effective treatment bed area, then total treated capacity =  $1500 \text{ X } 2.3 = 3450 \text{ m}^3$  leachate per year.

Please verify the basis of my assumptions – and provide other feedback. Thanks!

# **Appendix D**

Wetland Sizing

# **Subsurface Flow (SSF) Treatment Wetland Preliminary Feasibility Calculation Sheet**

# $\begin{array}{c} Phase \ 1 \\ (BOD \ limit = 120 \ mg/L) \end{array}$

Location: City of Iqaluit West 40 Landfill Site

Runoff Volume, m<sup>3</sup>

7,700

Design Flow, m<sup>3</sup>/d

Q = 73

**Influent Concentration** 

Target Effluent Concentration Wetland background limit, mg/L

	TSS	BOD	TP	TN	NH <sub>4</sub> <sup>+</sup> -N	Org-N
Ci =	868	269	0.8	20.7	4.42	16.21
Ce =	180	120				
C* =	62	18	0.05	2	0	1.5

for TSS, 
$$C^* = 7.8 + 0.063Ci$$

for BOD,  $C^* = 3.5 + 0.053Ci$ 

Areal rate constant @ **20**°C, m/yr.

Required wetland area, ha

Λ _	0.0365×Q	C-C*	)
A-	k	^ m\	١

	1 <sub>z</sub> —	3000	180	12	27	10	17
F	A =	0.0017	0.0134	12	21	18	17

maximum calculated area from above boxes (Amax) =

0.013 ha

 $134 \text{ m}^2$ 

Areal rate constant @  $5^{\circ}$ C, m/yr.

Required	wetland	area,	ha

					 15-
$\theta =$	1.050	1.130	1.000	1.050	
k =	1443	29	12	13	
A =	0.0036	0.0836			

maximum calculated area from above boxes (Amax) = 0.084 ha

= 836 m<sup>2</sup>

use van't Hoff Arrhenius equation:

$$K_{T1} = K_{T2} \cdot \boldsymbol{\theta}^{(T1-T2)}$$

Effluent concentration, mg/L

Co @						
maximum						
area =	62	78	1	17	4	18

$$C_0 = C * + (C_i - C *) \exp \left| -\frac{kA_{max}}{0.0365 \times Q} \right|$$

#### Subsurface Flow (SSF) Treatment Wetland **Preliminary Feasibility Calculation Sheet**

Phase 2 (BOD limit = 120 mg/L)

Location: City of Iqaluit West 40 Landfill Site

Runoff Volume, m<sup>3</sup>

6,600

Design Flow, m<sup>3</sup>/d

Q = 63

**Influent Concentration** 

**Target Effluent Concentration** 

Wetland background limit, mg/L

	TSS	BOD	TP	TN	NH <sub>4</sub> <sup>+</sup> -N	Org-N
Ci =	868	269	0.8	20.7		
Ce =	180	120				
C* =	62	18	0.05	2	0	1.5

for TSS,  $C^* = 7.8 + 0.063Ci$ 

for BOD,  $C^* = 3.5 + 0.053Ci$ 

Areal rate constant @ 20°C, m/yr.

Required wetland area, ha

k =	3000	180	12	27	18	17
A =	0.0015	0.0115				

	0.0365×Q	(G-C*)
A=	k	× In( C <sub>0</sub> - C *

maximum calculated area from above boxes (Amax) = 0.011 ha

0.072 ha  $717 ext{ m}^2$ 

Areal rate constant @ 5°C, m/yr. Required wetland area, ha

$\theta =$	1.050	1.130	1.000	1.050	
$\mathbf{k} =$	1443	29	12	13	
A =	0.0031	0.0717			

use van't Hoff Arrhenius equation:

$$K_{T1} = K_{T2} \cdot \boldsymbol{\theta}^{(T1-T2)}$$

maximum calculated area from above boxes (Amax) =

Effluent concentration, mg/L

Co@ maximum 62 78 16 area =

$$C_0 = C * + (C_i - C *) \exp \left| -\frac{kA_{max}}{0.0365 \times Q} \right|$$

#### Subsurface Flow (SSF) Treatment Wetland Preliminary Feasibility Calculation Sheet

#### Phase 1 (BOD limit = 45 mg/L)

Location: City of Iqaluit West 40 Landfill Site

Runoff Volume, m<sup>3</sup>

7,700

Design Flow, m3/d

mg/L

Q = 73

Influent Concentration
Target Effluent Concentration
Wetland background limit,

					NH <sub>4</sub> +-	Org-
	TSS	BOD	TP	TN	N	N
Ci =	868	269	0.8	20.7	4.42	16.21
Ce=	45	45				
C* =	62	18	0.05	2	0	1.5

for TSS,  $C^* = 7.8 + 0.063Ci$ for BOD,  $C^* = 3.5 + 0.053Ci$ 

Areal rate constant @ **20**°C, m/yr.

Required wetland area, ha

k =	3000	180	12	27	18	17
A =	-	0.0330				

$$A = \left| \frac{0.0365 \times Q}{k} \right| \times ln \left( \frac{C_i - C^*}{C_e - C^*} \right)$$

maximum calculated area from above boxes (Amax) = 0.033 ha

= 330 m<sup>2</sup>

Areal rate constant @ 5°C, m/yr.

Required wetland area, ha

$\theta =$	1.050	1.130	1.000	1.050	
1	4.440	20	10	10	
k =	1443	29	12	13	
A =	-	0.2066			

maximum calculated area from above boxes (Amax) = 0.207 ha = 2066 m<sup>2</sup>

use van't Hoff Arrhenius equation:  $K_{T1} = K_{T2} \cdot \theta^{(T1-T2)}$ 

Effluent concentration, mg/L

Co @ maximum area = 62 42 0 10 4 18

$$C_0 = C * + (C_i - C *) exp | - \frac{kA_{max}}{0.0365 \times Q} |$$

## Subsurface Flow (SSF) Treatment Wetland Preliminary Feasibility Calculation Sheet Phase 2

(BOD limit = 45 mg/L)

Location: City of Iqaluit West 40 Landfill Site

Runoff Volume, m<sup>3</sup>

6,600

Design Flow, m3/d

Q = 63

Influent Concentration
Target Effluent Concentration
Wetland background limit,
mg/L

					NH <sub>4</sub> +-	Org-
	TSS	BOD	TP	TN	N	N
Ci =	868	269	0.8	20.7	4.42	16.21
Ce =	45	45				
C* =	62	18	0.05	2	0	1.5

for TSS,  $C^* = 7.8 + 0.063Ci$ for BOD,  $C^* = 3.5 + 0.053Ci$ 

Areal rate constant @ **20**°C, m/yr.

Required wetland area, ha

Λ _	0.0365×Q	(G-C*)
A=	k	^ m ( C <sub>0</sub> - C *

k =	3000	180	12	27	18	17
A =	-	0.0283				

maximum calculated area from above boxes (Amax) = 0.028 ha

= 283  $m^2$ 

Areal rate constant @ 5°C, m/yr. Required wetland area, ha

$\theta =$	1.050	1.130	1.000	1.200	
k =	1443	29	12	2	
A =	-	0.1771			

maximum calculated area from above boxes (Amax) = 0.177 ha

= <mark>1771 m</mark><sup>2</sup>

use van't Hoff Arrhenius equation:

$$K_{T1} = K_{T2} \cdot \boldsymbol{\theta}^{(T1-T2)}$$

Effluent concentration, mg/L

Co @ maximum area = 62 42 0 20 4 18

$$C_o = C * + (C_i - C *) exp | - \frac{kA_{max}}{0.0365 \times Q} |$$

# **Appendix E**

**Conceptual Level Cost Estimation** 

## **Conceptual Level Cost Estimation**

Runoff Volume land area required	$m^3$ $m^2$		Phase 1 7700 2934			Phase 2 6600 2518		
	Unit	Unit Price	Quantity	Ex	tension	Quantity	Ex	ktension
Common excavation to waste disposal	$m^3$	\$ 15.00	3000	\$	45,000	2520	\$	41,580
Control Berm	$m^3$	\$ 20.00	410	\$	8,200	380	\$	8,360
Ditch	m	\$ 40.00	300	\$	12,000	250	\$	11,000
Bedding materials								
Permeable Medium (mix of sand, fine gravel and peat)	m <sup>3</sup>	\$ 50.00	1500	\$	75,000	1260	\$	75,600
Gravel	$m^3$	\$ 40.00	<i>7</i> 5	\$	3,000	70	\$	3,360
Peat	$m^3$	\$ 30.00	150	\$	4,500	130	\$	3,900
Geotextile	$m^2$	\$ 5.00	270	\$	1,350	250	\$	1,375
Culvert 200 mm	m	\$ 150.00	50	\$	7,500	50	\$	8,250
Mobilization				\$	20,000			\$20,000
Subtotal				\$	176,550		\$	173,425
Vegetation Pump and temporary	$m^2$	\$ 3.00	3000	\$	9,000	2520	\$	8,316
piping				\$	10,000		\$	10,000
Subtotal Engineering Contingency					195,550		\$	191,741
(40%)				\$	78,220		\$	76,696
Total				\$	273,770		\$	268,437

Notes

Assume 20% increase of the base price for all the components at Phase 2.



# **Appendix G**

**West 40 Landfill Drainage Management Review** 

**Membrane Bioreactor Technology Report** 

City of Iqaluit Landfill Surface Runoff Treatment - Membrane Bioreactor Technology

Prepared by Earth Tech Canada, April 24, 2007 Ken Johnson, M.A.Sc., P.Eng., Project Manager

#### **Introduction**

Earth Tech has prepared this letter report at the request of the City of Iqaluit regarding the use of mechanical wastewater treatment technology for treating the West 40 landfill runoff. The purpose of this letter report is to provide information for the City to compare with the proposed wetland treatment system. In March 2007, Earth Tech Canada submitted a Conceptual Design Report recommending the use of subsurface flow wetland system for landfill runoff treatment.

The Membrane Bioreactor (MBR) technology was chosen as an alternative process because it represents an advanced biological and membrane coupled process that has been successfully applied for the treatment of a wide range of industrial and municipal wastewaters (Stephenson et al., 2000). The applications include old or stabilized landfill leachates, as it may be the case with landfill runoff from the West 40 Landfill site.

This letter report is intended to develop the basis for the conceptual design of the MBR system and to illustrate the system process along with order of magnitude capital and operational costs.

#### **MBR Process**

MBR technology offers an alternative process which replaces two stages of the conventional activated sludge process (ASP) (biotreatment and settlement) with a single, integrated suspended growth biological reactor and membrane clarification step. Using membranes in biological wastewater treatment reactors offers the potential to overcome operational problems experienced with conventional ASP treatment, such as:

- 1. relatively large land areas for the bioreactors,
- 2. downstream solids separation by sedimentation, increasing the land area further,
- 3. the requirement to equalize hydraulic and organic loadings to maintain a constant treated effluent quality, and
- 4. inhibition of the solids settling process by "bulking", i.e. the inhibition of sedimentation by filamentous microorganisms,

In addition, MBR technology consistently produces a high quality effluent. The high biomass concentration in the reactor reduces both bioreactor tank size and sludge production, and enables influent of varying quality to be treated while maintaining a disinfected final effluent. Furthermore, an increased rate of nitrification may be achieved since a large amount of slow-growing nitrifying bacteria may be retained in the aeration tank.

#### **MBR** Configuration

The MBR process may be configured with the membrane unit located either external to the bioreactor (SideStream - SS) or mounted directly within it (submerged or IMmersed - IM) (see Figure 1).

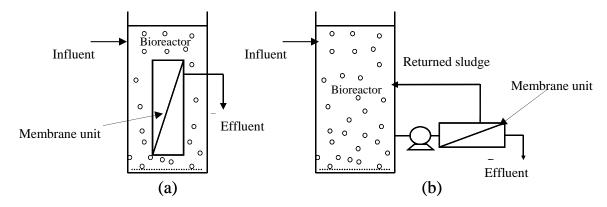


Figure 1. Two MBR configurations: (a) immersed (Im) and (b) Sidestream (SS).

In the SS configuration, a high cross flow fluid velocity (between 2 and 4.5 m/s) provided by a recirculation pump reduces the deposition of suspended solids at the membrane surface. Although this configuration is simple and provides more direct control of fouling of the membrane, the energy demand is relatively high. This configuration has the longest history and is primarily used for industrial wastewater treatment. From the early 1990s, Im MBR systems have been introduced and preferred to SS configuration for treating municipal wastewater on a larger scale. The IM configuration relies on coarse bubble aeration to produce in-tank recirculation and reduces fouling of the membrane. Although the energy demand of the IM system may be up to 2 orders of magnitude lower than that of SS systems, IM systems operate at a low flow, demand more membrane area, and rely on coarse bubble aeration. The membranes themselves may have tubular or flat configuration. Membranes used for MBR application have pore sizes ranging from the ultrafiltration (UF) range (0.01 to 0.1  $\mu$ m) to microfiltration (MF) range (from 0.1  $\mu$ m up to 1  $\mu$ m).

A hollow fiber UF membrane system may be appropriate as a proposed membrane system for Iqaluit landfill runoff treatment.

#### Water quality parameters and design considerations

A common basis of design for MBRs during the treatment of landfill runoff are Volumetric Loading Rates (VLRs) for carbonaceous material (measured as COD) and ammonia nitrogen,

along with "fouling" potential indexes of organic and inorganic contaminants. Since none of these parameters are available in the existing laboratory analyses of the landfill runoff, the quality was assumed to be similar to a typical old landfill leachate. Runoff sampling results from July 2004 and June 2006 were compared to old landfill leachate matrices shown in literature reviews. (Table 1).

Table 1. Average leachate runoff quality vs. key characteristics of old leachates.

Parameter	City of Iqaluit Runoff	Robinson (1995)	Irene and Lo (1996)	Urbini et al. (1999)		
pН	7.5	7.5	7.9 – 8.1	8		
BOD (mg/L)	120 - 180	260	160	150		
TSS (mg/L)	180 - 270	ND*	ND*	ND*		
$NH_4^+(mg/L)$	4.42	5 - 370	26 - 557	10 - 40		
Metal values (mg/L)	0.09 - 15	0.1 - 26.5	0.7 - 24	0.03 - 25.9		
Chlorides (mg/L)	215 - 250	70 - 2,780	2 - 119	180 - 2,650		

ND\*: No available data.

Experiences of MBRs treating old leachates show that a membrane flow of  $5 \text{ L/m}^2/\text{h}$  is common and have a low impact on membrane fouling (Alvarez-Vazquez et al., 2004). Therefore,  $5 \text{ L/m}^2/\text{h}$  was chosen as the membrane flux value of the proposed conceptual design. A hydraulic retention time (HRT) value of 5 days was also chosen to counteract the biological impact on the biomass at low operating temperatures in Iqaluit. Such a HRT lies slightly above reported data for old leachate treatment where contaminant removals of up to 80% for COD have been observed at HRTs between 2-3 days. It is expected that only a partial reduction of nitrogen compounds may be achieved due to the low operating temperatures. Metals and TSS will be completely removed as they will either be assimilated by the biomass or physically retained by the membrane.

#### **Bioreactor volume**

According to the calculations shown in the Conceptual Design Report for Wetland Treatment, leachate runoff volumes are estimated to be 7,700 m<sup>3</sup> for Phase 1. Such flow is to be treated during summer periods, thus a period of 120 days was selected to perform the total treatment of the runoff. The MBR capacity will be approximately 65 m<sup>3</sup>/d; therefore, a total bioreactor volume basin of 325 m<sup>3</sup> is required to conform to the predetermined 5 days HRT.

#### Membrane surface area

The required membrane surface area is calculated considering the most critical conditions of peak influent flow and lowest temperature. Because the influent flow is fixed, temperature becomes the dictating design factor. A minimum water temperature of  $5^{\circ}$ C was used for the operating period, along with a correction factor for water viscosity at that temperature. The membrane area is  $755 \text{ m}^2$  to comply with a  $5 \text{ L/m}^2/h$  flux, corresponding to 24 membrane modules with individual areas of  $31.6 \text{ m}^2$  per module.

#### MBR configuration schematic

The proposed MBR corresponds to the immersed (IM) configuration, and a general schematic showing the complete process is shown in Figure 2. The system is integrated with anoxic and aerobic reactor tanks for nitrogen removal.

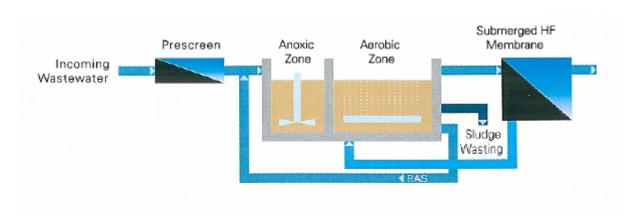


Figure 2. Immersed MBR configuration, including nitrogen removal steps.

#### **Cost Estimate**

The cost estimate for the MBR system treating Iqaluit landfill runoff have been projected based on previous old leachate experiences, and are an "order of magnitude" estimates only for one season of operation (i.e. 120 days) (Table 2). The estimate is 2.4 million dollars including a 40% contingency allowance for construction and engineering services.

The capital costs are equipment costs including membrane modules, feed pumps, permeate/recirculation pumps and chemical cleaning pumps, blowers, air diffusers, mixers, valves, fittings, controls and control panel with remote access capabilities. In order to obtain more detailed costs and to recommend spare parts and membrane replacements; membrane cleaning

frequency, and volumes of chemicals and nutrients needed, a comprehensive chemical and physical analysis of the leachate runoff matrix would be required.

Due to the simplicity of operation for MBRs, manpower requirements are similar or even less than a conventional wastewater treatment plant. The cost for manpower to the cost associated with one 8 hour shift in a 40-hour week for one operator for the annual operating period of 120 days. One operator is sufficient to fulfill with standard operational and maintenance needs of the MBR, such as valve replacements, water sampling, nutrient dosing, data collection and in situ membrane chemical cleaning. Major events such as ex-situ membrane cleaning or membrane replacements will require anywhere from 2 to 4 operators.

Table 2. Estimated costs of the proposed immersed MBR system

Item No.	Component	Estimated cost (Million \$)
1	Complete MBR system	1.6
2	Operation and maintenance costs and operator time	0.1
3	Contingency allowance (40%)	0.7
4	Total estimate	2.4

Note: Item 2 includes electrical and mechanical standard spare parts replacement, chemical reagents for periodical cleaning and nutrient dosing.

#### **Summary**

The proposed MBR system will produce wastewater effluent exceeding the discharge guideline for the landfill runoff treatment in Iqaluit, provided the MBR system is operated and maintained as required from the manufacture specifications. However, the City will face challenges associated with the MBR system for landfill runoff treatment.

Challenge 1 – Higher capital costs and operation/maintenance costs

Challenge 2 – The maintenance of MBR system during the off-season, since the MBR system will be only operating from a period of 120 days per year. The membrane system needs to be well maintained during 245 days of the rest of the year.

Challenge 3 – The treatment of wasted sludge. Normally, the costs associated with sludge treatment for the MBR could be in the same order of magnitude as the capital cost of MBR system itself.

#### References

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- Urbini G, Ariati L, Teruggi S and Pace C (1999) Leachate quality and production from real scale MSW landfills; in Proceedings Sardinia 99: 7<sup>th</sup> Management and Landfill Symposium, S Margherita di Pula, Cagliari, Italy, CISA, Environmental Sanitary Engineering Centre Cagliari, Italy, 73 80.



# **Appendix H**

**West 40 Landfill Drainage Management Review** 

**WESATech Proposal Iqaluit Landfill Runoff** 



The Tower, The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7
Tel: 613-531-2725 Fax: 613-531-1852
Email: wesaking@wesa.ca www.wesa.ca

City of Iqaluit
Attn: Meagan Leach
Director of Engineering and Sustainability
PO Box 460
Iqaluit, NU
XOA 0H0

Dear Ms. Leach,

WESA Technologies is pleased to submit a proposal to design, build and operate a small treatment facility to manage the volume of water contained in the Iqaluit landfill runoff detention pond. The objective of this exercise is to reduce the volume contained in the pond by treating and discharging it to the environment. The primary treatment goal is to reduce the concentration of the iron, manganese and zinc. This will be achieved through pH adjustment and coagulation.

#### **Design and Process**

The proposed design will consist of a two-stage chemical treatment, solid filtration and neutralization step, all carried out in a continuous process. The treatment of 5000m<sup>3</sup> will be conducted within a 3 week period. A process flow diagram of our proposed treatment facility is attached.

In the first chemical treatment stage, a calcium hydroxide solution (lime, CaOH) will be added to raise the pH of the runoff water to 10.5 – 11.5 in order to induce the precipitation of the metals. Further, the first and second chemical treatment stages are air mixed to promote the oxidation of the iron and manganese in the solution. The oxidation of these metals leads to their precipitation out of the solution. In the second chemical treatment stage, aluminum sulfate (Alum, KAI(SO<sub>4</sub>)<sub>2</sub>) and polymer (Magnafloc® 338) will be added to flocculate the precipitated metals into larger, filterable particles. The effluent from the second chemical treatment stage is clarified by filtration using a Geotube® to remove suspended solids. The metal solid waste will be contained within the Geotube® and can be returned to the pond or appropriately containerized and transported for disposal at a suitably engineered facility. The filtered water will enter a final neutralization tank to achieve a pH between 7 and 8. This final pH adjustment will be conducted with the addition of hydrochloric acid (HCI). While the plant is in operation, we will be monitoring for the three parameters of concern in the discharge; total iron concentration, total zinc concentration and total manganese concentration, as well as pH and Total Suspended Solids (TSS).

#### Cost

The cost for the associated plant equipment and consumables (pumps, tanks, Geotube®, piping, fittings, and chemicals for one season) and its transportation is estimated to be \$75,000. This does not include the cost of manpower (time and expenses on site). Also, this does not cover the cost of field analytical equipment or sample analysis at a water testing laboratory. From the city of Iqaluit, we will require



The Tower, The Woolen Mill, 4 Cataraqui Street
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a shipping container to store all the required gear over the winter season as well as a power supply to operate the electrical equipment. This system can readily be commissioned seasonally to treat the spring and fall landfill runoff volumes projected over the next few years with a treatment cost of \$10,000 for consumables for each additional treatment event. The treatment system will be operated by two people. WESA Technologies will provide an operator (\$1000/day plus expenses). The Municipality of Iqaluit can provide an additional support person to assist with the operation of the plant and to be trained in the treatment process or WESA Technologies can provide a second operator.

#### **Cost Summary**

Initial Capital Cost: \$75,000

Operator Time and Expenses per Seasonal Treatment and Discharge Event: \$25,000

Supplies for Subsequent Season Treatment Event: \$10,000

All prices exclude applicable taxes.

#### Schedule

Upon approval, equipment and supplies will be airlifted to Iqaluit within 2 weeks. Construction and commissioning will proceed immediately and is anticipated to be ready to discharge within one week. Discharge will only commence with the approval of the regulatory agents.

Thank you for contacting WESA Technologies to provide support to AECOM and the Municipality of Iqaluit in resolving their landfill runoff discharge concerns. We hope that this provides sufficient information to support your decision to proceed with this innovative and effective time sensitive solution to the current retention pond capacity and landfill runoff discharge issue. Please feel free to contact me if you require any additional information or clarification.

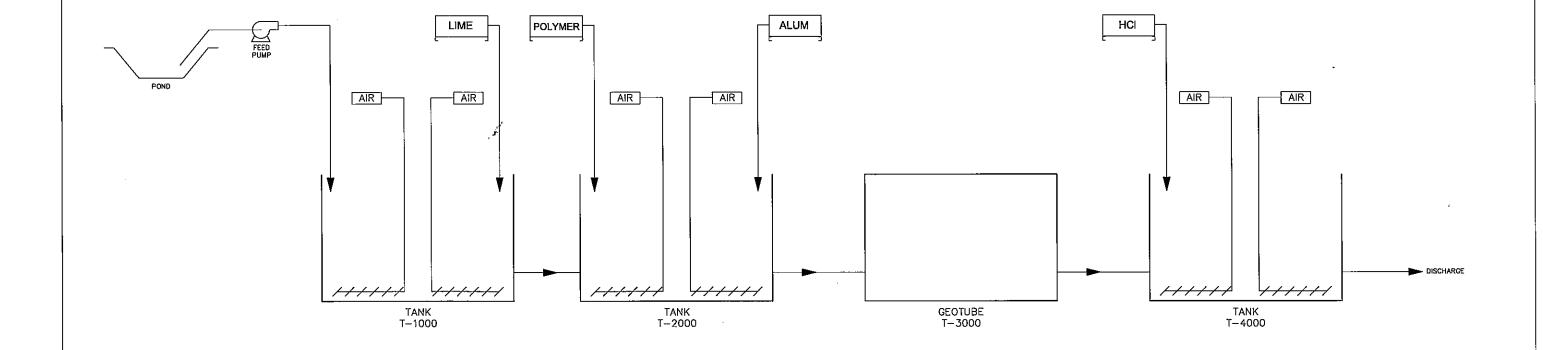
Regards,

Harry Marshall CET

Lawy Mushall.

President, WESA Technologies Inc.

Wayne Ingham, PhD Principal, WESA Inc.



# NOT FOR CONSTRUCTION

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Appendix

**Iqaluit Solid Waste Management Plan West 40 Landfill Decommissioning** 

## City of Iqaluit

# Iqaluit Solid Waste Management Plan West 40 Landfill Decommissioning **Technical Memorandum**

Prepared by:

AECOM 17007 – 107th Avenue 780 486 7000 tel Edmonton, AB, Canada T5S 1G3 780 486 7070 fax www.aecom.com

**Project Number:** 

60196419

Date: January, 2014

#### Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("Consultant") for the benefit of the client ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the "Agreement").

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- represents Consultant's professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to Consultant which has not been independently verified;
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- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
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## **Revision Log**

Revision #	Revised By	Date	Issue / Revision Description
1	Septa Rundra	June 27, 2011	DRAFT
2	Septa Rundra	July 15, 2011	DRAFT REV 2
3	Jim Clare	January 30, 2014	FINAL

**AECOM Signatures** 

Report Prepared By:

Jim Clare, R.E.T. Project Manager

R PROVED

NWTMU

**Report Reviewed By:** 

Rudy Schmidtke, M.Sc., P.Eng.

Associate Vice President, Environment, Canada West

Signature .

Date Jon 30, 2014

PERMIT TO PRAC AECOM CANADA

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NWT/NU Association of Professional
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## 1. Introduction

#### 1.1 Background

Exp. Services Inc. (exp) and AECOM were retained by City of Iqaluit (the City) to develop a Decommissioning Plan for the West 40 Landfill. This landfill is currently at capacity and the City is working towards developing a new solid waste management site. When the new solid waste management facility opens, the West 40 landfill will be decommissioned. This Decommissioning Plan is a requirement of the City's Water License.

#### 1.2 Scope of Work

The following tasks were completed in order to assess the site:

- Confirmation between exp./AECOM and the City regarding project scope, budget, and schedule;
- Established formal lines of communication;
- Collected, requested, and assembled all necessary and available information from the City in order to conduct the site assessment:
- Reviewed existing information;
- Used existing topographical data to produce conceptual closure design; and
- Conducted a landfill site visit.

Utilizing this information, a decommissioning plan was developed to address the following components:

- Final reclamation plans providing final contours and evaluating airspace volume;
- Final contour plans will be developed to allow final grades of 5% where possible to minimize the amount of fill
  material required to establish final grades;
- Final capping material design, including the possibility of using biosolids from the sewage treatment plant and gravel if available:
- Drainage management;
- Description of final cover;
- Ground water monitoring;
- Erosion control;
- Post closure care;
- Re-vegetation;
- Operation and maintenance checklist for final cover system to protect and maintain survey bench marks; and,
- A cost estimate for this decommissioning plan and care responsibilities.

## 2. Site Description

#### 2.1 Location

Iqaluit is a growing Baffin Island community and is the Capital of Nunavut. It is located at the south end of Baffin Island, on Frobisher Bay at 64° 44' N latitude and 68° 31' E longitude. Access is provided by commercial aircraft year round and sea-lift from the port of Montreal in the summer. Annual precipitation in the Iqaluit area is approximately 255 cm of snowfall and 19.2 cm of rainfall. Average annual temperatures range from a low in January of approximately -29.7°C to a high of approximately 11.4°C in July.

The landfill site is located in West 40 approximately 4 km from the City center. This site was built in 1995 and was intended as a temporary disposal site until funding for a permanent solution could be allocated.

#### 2.2 Operational History

Existing solid waste management practices at the site consist of placement of wastes into working face, compacting the wastes and covering with granular fill and/or mulch from shredded waste. The site accepts Municipal Solid Waste (MSW) which is either collected through a municipal collection or dropped off by the public. Scrap metal, tires, white goods, wood, sewage sludge, hazardous waste and end of life vehicles are collected and stored in designated areas of the landfill.

The site is operated using area method without engineered liner and leachate collection systems.

#### 2.3 Site Facilities

All solid waste management facilities associated with the landfill are located generally within the site. These facilities include:

- A site office and garage located near the entrance to the landfill site;
- MSW pile;
- Scrap metal areas;
- Tires collection area;
- Wood waste processing area;
- · Hazardous waste depot;
- Sewage sludge area;
- Composting; and
- Surface water management (berms, on-site and off-site retention ponds).

The site facilities are presented in Figure 1.1, Appendix A.

#### 2.3.1 Recycling Storage Facilities

The site includes storage areas for recycling of bulky materials including:

- Scrap metals;
- Car bodies;
- Appliances/refrigerators and freezers; and
- Scrap tires.

Public sorting of waste or scavenging is not permitted within the disposal area of the landfill.

## 2.3.2 Hazardous Waste Depot

The site includes storage areas for hazardous waste materials. These wastes include but are not limited to:

- Automobile batteries;
- · Lead acid batteries;
- Paint; and
- Waste oils.

## 3. Engineering Review and Design Consideration

Based on the "Operation and Maintenance Manual, May 2005", it was estimated that the site would reach its design capacities in November 2001. However, the site expansion was implemented for continuing operation of this site. 

The expansion was developed in order to optimize daily operations and efficiently use airspace, while complying with the management of the runoff in and around the site in order to keep clean surface water out of the site and manage runoff on-site.

#### 3.1 Solid Waste Generation

The landfill currently utilizes all of the available area designated for disposal and it has exceeded its capacity. However, there is an undisturbed area adjacent to the disposal footprint that can be used to dispose of waste until a new landfill is constructed. The remaining site life of undisturbed ground in years must be determined in order to plan for the final closure and post-closure management and costs.

To estimate the waste that will be generated over the lifetime of the site operation, the population data from City of Iqaluit General Plan<sup>2</sup> was used as a base for the projection. An average increase of 2.87% growth per year was applied to represent projected population and waste generation increases. A waste generation rate of 0.03 m³/capita/day and a waste density of 100 kg/m³ were used to estimate the volume of waste generation. Projected data describing the wastes generation is presented in Table 3.1.

**Table 3.1 - Projected Waste Generation** 

Year	Accumulated Waste Generated (m <sup>3</sup> )	Accumulated Waste Generated (tonnes)	Note
2011	83,412	8,314	
2012	169,218	16,922	
2013	257,486	25,749	
2014	348,288	34,829	
2015	441,713	44,171	New Solid Waste Site Scheduled to be Opened (Iqaluit Solid Waste Management Plan 2014) West 40 site closes and decommissioning begins.
2016	96,107		
2017	194,972		
2018	296,674		

#### 3.2 Site Life

In order to establish the capacity requirements of the design, the expected future waste generation was calculated in order to predict the length of time the cell can viably service the site operations. Using the data provided in Table 3.1 the site life will be calculated.

The remaining capacity at year end is calculated by subtracting the waste accumulated for that year from the previous year's remaining site capacity. It is estimated that horizontal expansion to the north and south of existing waste, where the wood wastes and metals are placed, will accommodate waste disposal until approximately 2015-2016 (see Drawing 00-C-1003, Appendix B).

<sup>&</sup>lt;sup>1</sup> Darcy Reist and Ken Johnson (2006). Journal of the Northern Territories Water & Waste Association, pp. 10 – 13.

<sup>&</sup>lt;sup>2</sup> City of Iqaluit General Plan By Law 703, October 2010.

The site life of the landfill is calculated using the following assumptions:

- Development based on existing conditions of the site topography and area fill of the proposed disposal area;
- Calculation of disposal airspace based on the final elevation of the disposal area which is still to be determined;
   and
- Compacted waste density of 700 kg/m<sup>3</sup>.

It is estimated that the new solid waste facility will be opened in 2015 and that the decommissioning of the West 40 Landfill will begin in 2015.

If the City needs to extend the lifespan of the West 40 landfill there are variations of options that can be developed. These options include:

- Increase compaction of the wastes:
  - It is estimated that current waste density at the site is approximately 400 kg/m³ based on Operation and Maintenance Manual 2005 revision 2. The current compaction can be increased to 700 kg/m³ by using new equipment and/or drive the compactor over the thin layer of the waste several times (more than 6 times over the waste). Table B.3 in Appendix B shows that increasing the waste density to 700 kg/m³ could almost double the remaining airspace capacity.
- Remove metal waste (tires as well) and fill the area:
  - The Government of Nunavut has funded a scrap metal removal program in Iqaluit which has successfully
    removed significant amounts of metal from various waste management sites around Iqaluit. Although this
    program no longer has funding, the City may be able be able initiate a new project with a similar objective
    and possibly expand the objective to include landfilled tires.
- Relocate office and garage and fill the area:
  - The office and garage area would be useable fill areas for the landfill operation but would require relocation. The buildings could be relocated to the north using the entrance to the biosolids management area. This relocation would require a significant reorganization to the entire waste management site including consideration of using the community composting area as part of the City's waste management operations.
- Fill the area further north into areas currently used for electronics, woodwaste and biosolids:
  - The landfill area may potentially expand further north than is currently delineated in the decommissioning
    plan. This area is significantly smaller than the current operating area because of the encroaching bedrock
    outcrops on either side. This expansion would require a significant reorganization to the entire waste
    management site including consideration of using the community composting area as part of the City's
    waste management operations.
  - Lateral expansion of the waste fill area may be developed by using undisturbed areas of the site or by repurposing the existing wood waste area as indicated in Drawings 00-C-1001 to 00-C-1003, Appendix A.
- Bring in incineration unit for temporary operation:
  - The application of a portable incineration unit could provide the City with significant waste reduction opportunity if required. This would be the most expensive option for increasing the operating window of the West 40 landfill site.

# 4. Closure Plan

#### 4.1 General

Closure activities should be considered as part of the landfill operations and routine working practices. As the waste disposal face is filled above ground to the proposed final elevations, the perimeter slopes and surfaces are reclaimed. In this way the landfill is closed and reclaimed progressively throughout the active landfill life.

For scheduled fill development and in preparation of final landfill closure, the site should be supervised when open. Equipment will be used to reshape and compact the waste on a regular basis. In this manner, most grading and reshaping of the landfill required prior to installing the final cap may be completed by judicious placement of incoming waste over the site life, therefore, minimizing re-contouring following closure.

## 4.2 Final Grading Plan

The proposed final grades of the landfill maintain a minimum slope of 3% across the top of the waste fill area to allow surface water drainage off of the site. The design is based on the following:

- Steeper slopes (to meet 5% grade) at this site would require a significant amount of earthwork to construct, as well as a large quantity of soil fill which there is not available on-site;
- Settlement is expected to be a significant issue due to assumed high waste thickness with low compaction; and
- Cover maintenance is included as part of post-closure care.

### 4.3 Final Cover Design

The final cover design provides a protective "cap" over the waste fill area. The objectives of the final cover design are to:

- Provide a barrier layer over the waste to minimize infiltration of precipitation into the landfill to minimize leachate generation;
- Create and maintain positive drainage of precipitation off of the landfill and minimize erosion; and
- Provide a layer of soil/gravel on which to establish an acceptable level of vegetative cover.

For the purpose of landfill closure, the entire disposal area will require capping. If the undisturbed ground identified throughout the site (under roads, areas not surveyed, etc) is not filled prior to re-grading, it will be included within the cover design in order to ensure proper drainage off of the cap. Otherwise, areas left uncapped within the final covered footprint may collect surface water and compromise the final cover system.

The final contours of the landfill should promote drainage away from the site to discourage infiltration and leachate production while also preventing erosion. To suit these criteria, a 3H:1V slope is proposed for the side slopes with a 3% grade upwards to the crown of the landfill, directing drainage to the northeast and southwest.

The construction of final cover, or "cap", includes placement of "topsoil" and "subsoil" and needs to be constructed to satisfy the future management and integrity of the waste fill area. For "topsoil", the City may use fine granular and/or sewage sludge or composted material and for "subsoil" the City may use granular fill and/or gravel from quarry area. While the topsoil layer should be constructed as soon as possible, it is not necessary to place it immediately after the subsoil layer has been constructed. The purpose of the "cap" is to prevent erosion of the landfill and maintain the integrity of the site.

Generally accepted best practices have been employed for the decommissioning requirements, and the following final cover design is recommended:

- "Topsoil" of fine granular or compost material of 200 mm over subsoil;
- "Subsoil" of 350 mm over barrier layer;
- Barrier layer that is constructed by compacting soils or gravel to a thickness of not less than 600 mm measured perpendicular to the compacted waste surface.
- · Contoured such that no water pools on the disposal area; and
- Final cover material graded to achieve a minimum slope of 3% and not to exceed 30%.

A combined estimate of 16,146 m<sup>3</sup> of in place material for the barrier, subsoil and topsoil layer will required to cover the landfill site.

Alternative final cover systems, such as gravel, biosolids, and compost or high density polyethylene (HDPE) may be used due to unavailability of soils in the area. However, HDPE is likely too expensive to be used as cover. If biosolids are used for the purpose of topsoil it is anticipated that the City will require approximately 3 m³ per day of biosolids or compost or a combination of biosolids and compost to be collected and stored for the period of 2014 to 2015 in order to provide the required amount of topsoil. However, if fine granular is substituted or combined with the material then less biosolids and/or compost will be required.

### 4.4 Drainage Restoration

The site was developed with surface water management infrastructure. The existing drainage systems include offsite and on-site surface water diversion ditches, on-site drainage pond and off-site retention pond. This drainage system can be seen in Figure 1.1, Appendix A.

Runoff and run-on surface water would be re-directed away from the cap via drainage ditching around the waste disposal area. The runoff drainage ditching will drain in a northern direction, and be further directed towards the off-site retention pond. Run-off collected in the retention pond will be tested and if found to be within acceptable parameters, can be discharged directly to the environment. If the water does not meet acceptable criteria it will be treated as required.

To maintain the integrity of the cover system, the entire fill area will be incorporated into a single cover design which will direct water toward the outer edges and off of the surface, allowing no accumulation on the surface. This translates into incorporating some undisturbed ground area into the footprint of the cover design in order to create smooth contours.

## 4.5 Re-vegetation

Following the completion of grading operations and the placement of final cover materials, vegetation of the surface will be required in order to prevent erosion of materials and also to integrate the area with the surrounding landscape. Vegetation of the cap should include native tundra species to ensure uptake and longevity of the plants.

A seed mix approved by the City will be selected, comprised of native species and low maintenance grasses to better acclimatize the vegetation to the natural environment and reduce the need for replacement over time.

#### 4.6 Subsidence Remediation

The final cover design objectives include creating and maintaining positive drainage across the fill area. Areas where waste has subsided will be re-graded as part of the final cover installation.

Due to the high elevation of the landfill cell and low compaction, it is expected that future subsidence will occur. Inspection of the final cover for signs of subsidence, erosion or other damage will be performed annually by landfill operators. Should these inspections detect subsidence that interferes with the intended drainage of the site, maintenance will be performed to restore positive drainage while maintaining the final cover design over the site.

# 5. Post-Closure Plan

#### 5.1 Overview

Best practise standards for decommissioned landfills suggest that, a post-closure plan should operate for a period no less than 25 years. Typically, the post-closure care period should continue until the following circumstances occur:

- Leachate quality performance standards are met at the points of compliance; and/or
- The leachate constituents are lower than the groundwater performance standard criteria concentrations.

During the post-closure care period, the City is responsible to complete the following activities:

- Protecting and maintaining the integrity of the final cover system;
- Providing repairs to the final cover system as necessary to correct settlement, subsidence, erosion, leachate break-out; and
- Monitoring surface water quality and taking corrective action where necessary.

During the post-closure care period the landfill operator should inspect the final cover system at least once per year, and complete an annual report that includes a record of:

- Annual surface water monitoring;
- Maintenance and repairs completed; and
- Any remedial or corrective action taken.

### 5.2 Post-Closure Care Activities

Post-closure care activities include the following:

- Final Cover Maintenance:
  - Monitoring final cover integrity
  - Prevention of erosion of cover soils
  - Maintenance of vegetation
  - Filling of low areas resulting from settlement or subsidence of the landfill
- Surface Water Monitoring:
  - Annual surface water monitoring
- Monitoring Records:
  - The post-closure care plan includes a program for maintaining records of surface water monitoring, site inspections, maintenance and repairs, and remedial actions.

Table 5.1 below summarizes the post-closure care activities and potential issues and solutions.

**Table 5.1 - Post-Closure Activities and Potential Issues and Solutions** 

Item		Activities		Possible Issues		Response Actions
Final Cover Maintenance	•	Monitoring final cover integrity (min 1 time per year) Maintenance of vegetation (seed, cut, fertilize) as required	•	Erosion of final cover Ponding of water after precipitation in settlement areas	•	Replace top and subsoil, vegetate, and apply erosion control product such as mulch and/or erosion matting Fill settled areas with topsoil, grade to drain. and vegetate
Surface Water Monitoring	•	Conduct water sampling program as required by the City's Water License.	•	Exceed regulatory requirements		low groundwater monitoring plan response which may lude: Resample and confirm Increase monitoring frequency Expand monitoring program Identify potential risks/risk analysis Investigate possible causes and mitigate
Leachate Management	•	Monitor waste fill area for seeps or stains	•	Surface springs of leachate	•	Prevent drainage to surface water ditches Investigate cause and design and implement appropriate remediation measures Fill and grade settlement areas Maintain final cover vegetation where possible Increase frequency of site inspections until resolved

For purposes of closure, it is assumed that the entire cleared area will require capping.

# 6. Implementation Schedule and Cost Estimate

#### 6.1 Closure Schedule

The closure schedule is contingent on the timing for the development of the City's new waste management facility and the waste filling option(s) selected by the City. The closure of the landfill may be initiated as early as 2015, but is subject to confirmation by additional surveying of the area.

Following closure, the landfill must be covered and seeded (it will take a couple of years to become vegetated) within the subsequent summer period. Upon completion of the closure, post-closure care will commence directly following and a closure report will be submitted to the Nunavut Water Board and Nunavut Department of Environment as required.

### 6.2 Post-Closure Schedule

Post-Closure monitoring will be required for a minimum of 25 years and shall include annual, surface water monitoring and management, and inspections of the final cover. Environmental remediation or cover repair activities shall be scheduled as necessary following detection of groundwater impacts or damage to the landfill cap.

#### 6.3 Closure Cost Estimates

Closure costs for the landfill consist of the capital costs required to grade the existing site to meet minimum slope guidelines and construct the necessary final cap, installation of monitoring wells and re-vegetation. The total cost to carry out the closure plan is approximately \$894,000, in 2011 dollars excluding GST.

A representation of the cost structure has been included within Table B.5, Appendix B. The cover material cost is based on a unit cost per square metre. It has been assumed that a 600 mm barrier layer, 350 mm of "substrate", and 200 mm of "topsoil" will be used to cap the existing landfill, based on standard best practice.

#### 6.4 Post-Closure Cost Estimates

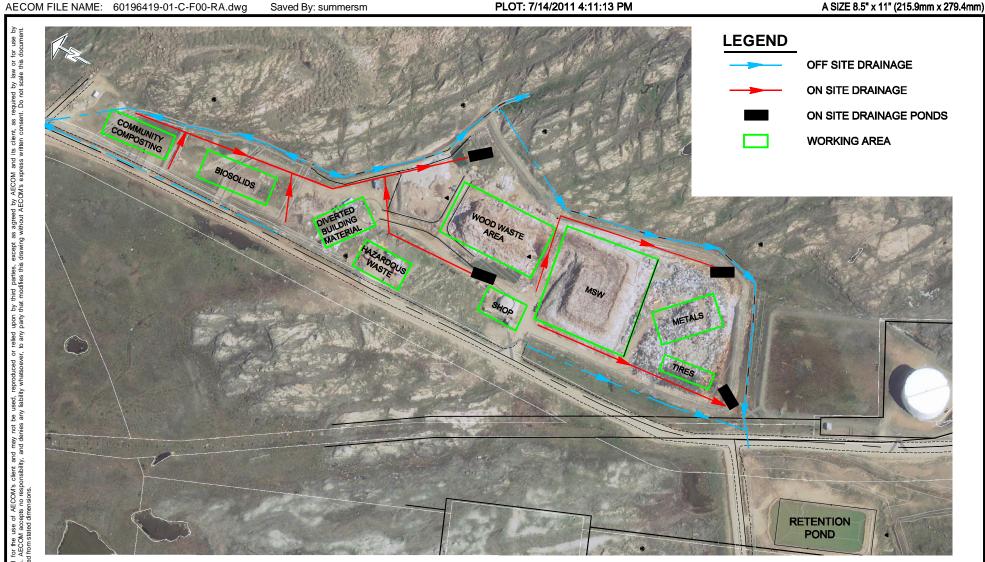
It is estimated that annual cost of the post-closure is approximately \$65,000 (in 2011) and total post-closure cost for 25 years is approximately \$2,820,466 (with 3% annual inflation).

A representation of the cost structure (annual and total costs) has been included within Table B.6, Appendix B.

# **Appendix A**

**Figure and Drawings** 

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# **NOTES**

1. FOUR ON SITE PONDS ARE EMPTIED BY PUMPING TO RETENTION POND; RETENTION POND IS CONTROLLED BI ANNUAL DISCHARGE AFTER LAB TESTING AND REGULATORY REVIEW.

- 2. COMMUNITY COMPOSTING IS AN AREA SET ASIDE FOR A FUTURE COMMUNITY PROGRAM.
- 3. BIOSOLID MANAGEMENT INCLUDES FREEZE THAW DE-WATERING AND COMPOSTING.

City of Iqaluit Iqaluit SWMP 2011

**AECOM** 



SCALE 1:3000

**Landfill Decommissioning Plan Existing Condition Plan** Figure - 1.1

# City of Iqaluit **Iqaluit SWMP 2011**

# **Landfill Decommisioning Plan**

### **LIST OF PROJECT DRAWINGS**

# **Issued for Report**

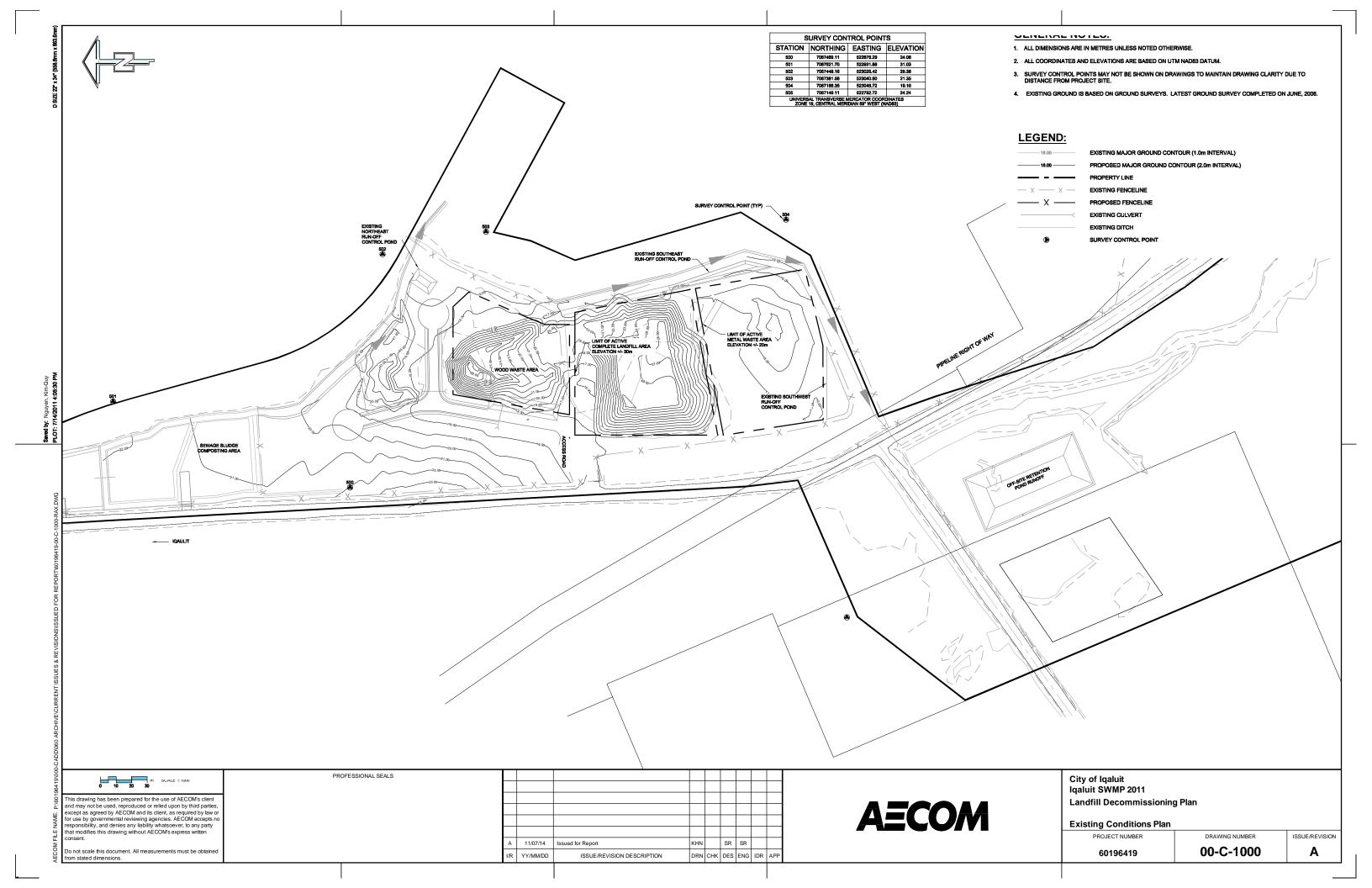
Issue Date: 11-07-14

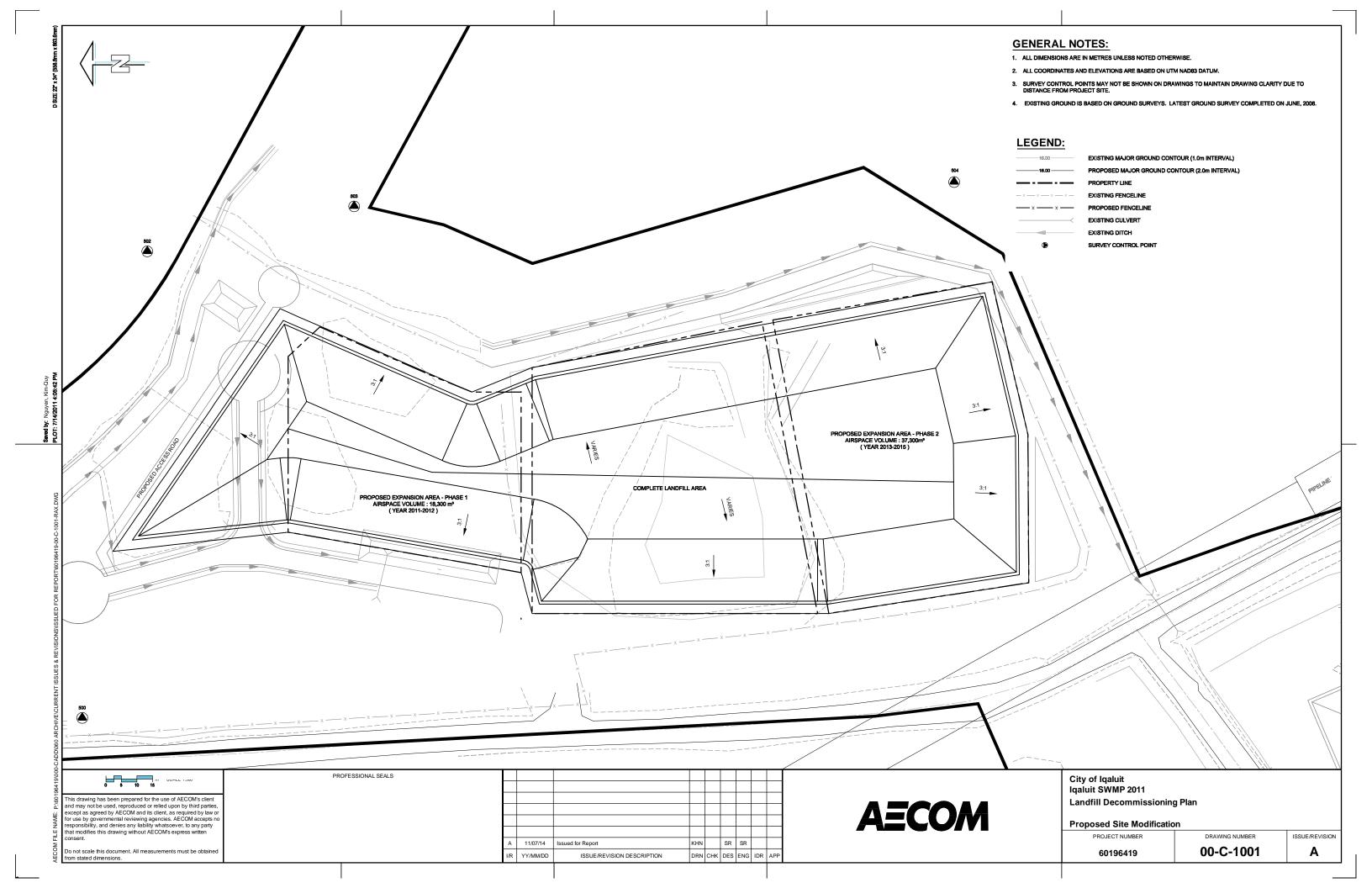


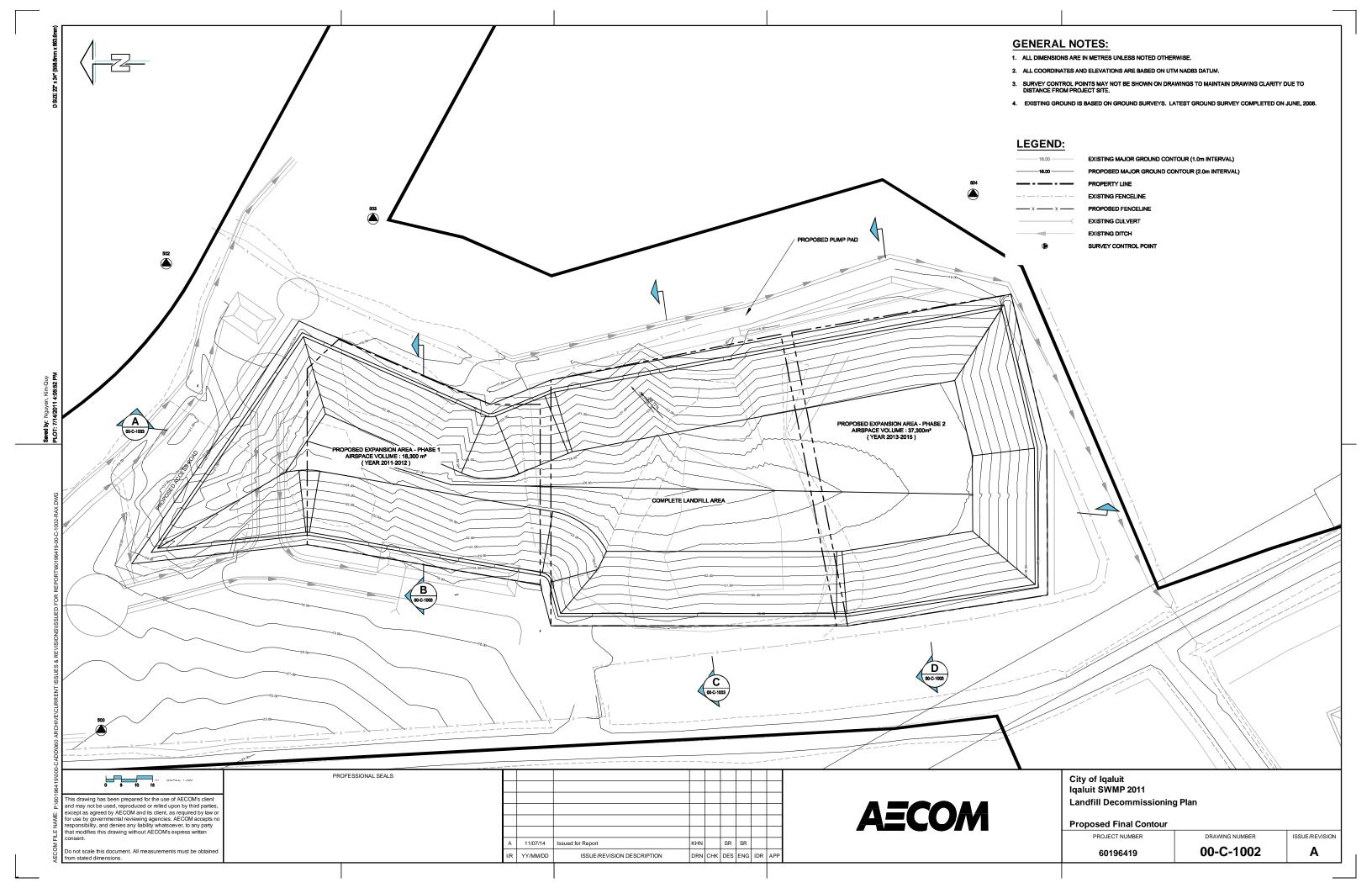
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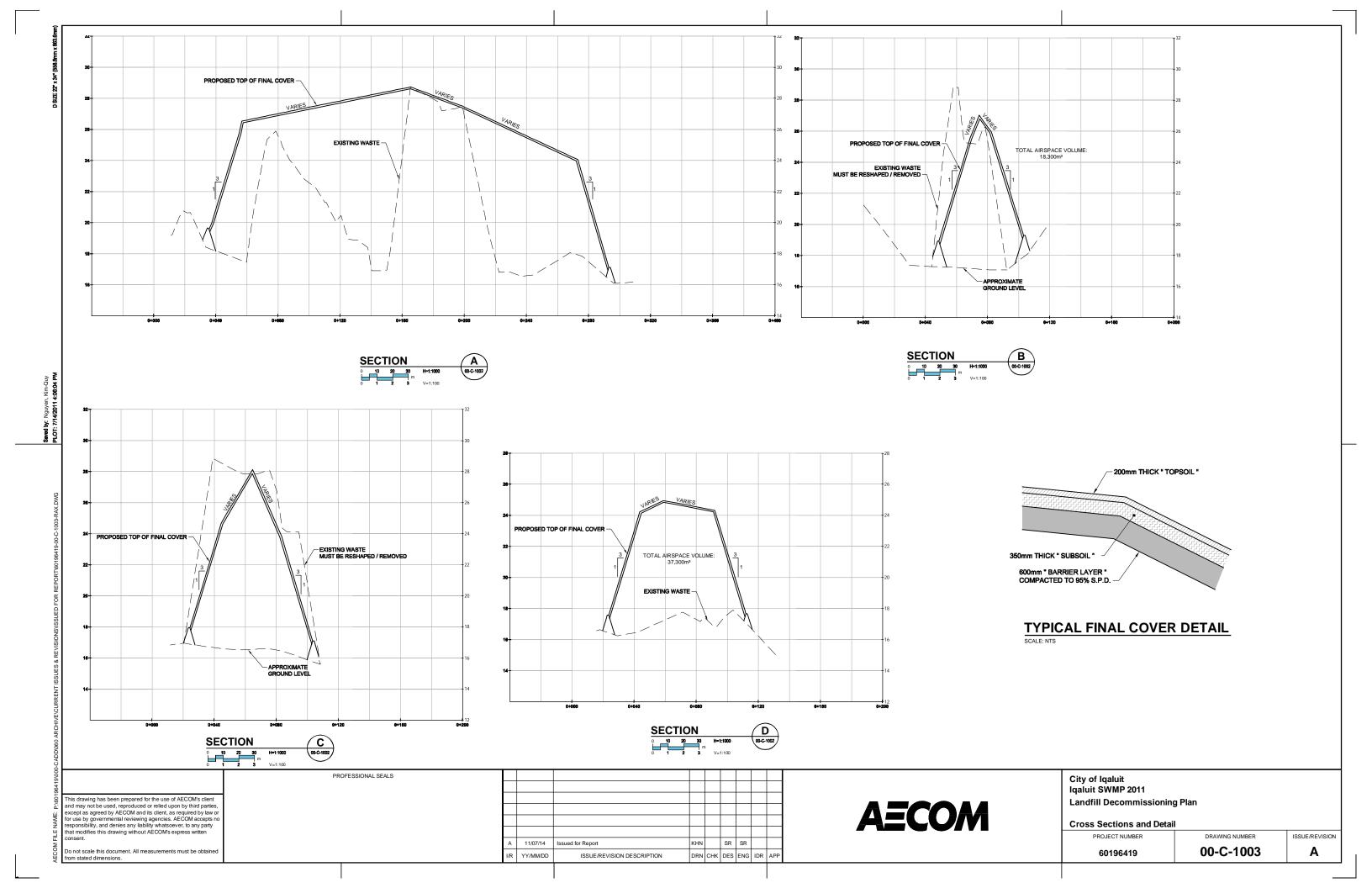
PROJECT NUMBER

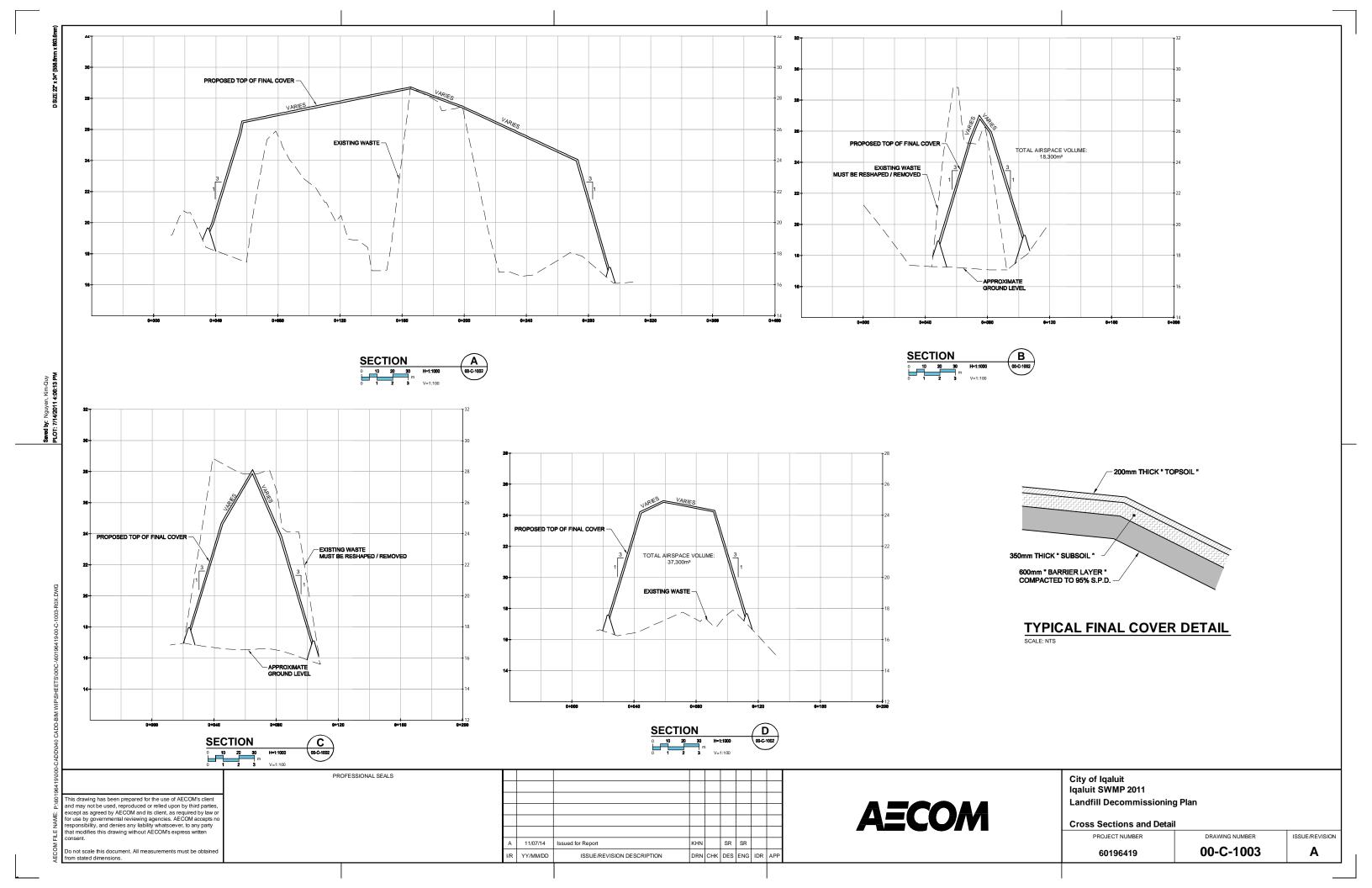
DRAWING NUMBER











# **Appendix B**

**Design Calculations and Cost Estimate** 



**Table B.1 - Population and Waste Projections** 

Vacr	Donulation	Waste Generated (m³) <sup>b</sup>	Accumulated Waste (m³)	Waste Generated	Accumulated Waste
Year	Population	. ,	waste (m )	(tonnes) <sup>c</sup>	(tonnes)
2006 <sup>a</sup>	6,520	71,394		7,139	
2007 <sup>a</sup>	6,802	74,482		7,448	
2008	6,997	76,620		7,662	
2009 <sup>a</sup>	7,198	78,818		7,882	
2010 <sup>a</sup>	7,405	81,085	22.112	8,108	2.24
2011 <sup>a</sup>	7,618	83,412	83,412	8,341	8,341
2012	7,836	85,806	169,218	8,581	16,922
2013	8,061	88,268	257,486	8,827	25,749
2014	8,292	90,802	348,288	9,080	34,829
2015 <sup>a</sup>	8,532	93,425	441,713	9,343	44,171
2016	8,777	96,107	96,107	9,611	9,611
2017	9,029	98,865	194,972	9,886	19,497
2018	9,288	101,702	296,674	10,170	29,667
2019	9,554	104,621	401,295	10,462	40,130
2020 <sup>a</sup>	9,830	107,639	508,934	10,764	50,893
2021	10,112	110,728	619,662	11,073	61,966
2022	10,402	113,906	733,567	11,391	73,357
2023	10,701	117,175	850,742	11,717	85,074
2024	11,008	120,538	971,279	12,054	97,128
2025 <sup>a</sup>	11,326	124,020	1,095,299	12,402	109,530
2026	11,651	127,579	1,222,878	12,758	122,288
2027	11,985	131,241	1,354,119	13,124	135,412
2028	12,329	135,007	1,489,126	13,501	148,913
2029	12,683	138,882	1,628,008	13,888	162,801
2030 <sup>a</sup>	13,050	142,898	1,770,905	14,290	177,091
2031	13,425	146,999	1,917,904	14,700	191,790
2032	13,810	151,218	2,069,122	15,122	206,912
2033	14,206	155,557	2,224,679	15,556	222,468
2034	14,614	160,022	2,384,701	16,002	238,470
2035	15,033	164,615	2,549,316	16,461	254,932
2036	15,465	169,339	2,718,655	16,934	271,865

a Calculation based on available airspace for accepted waste, determined by design

<sup>&</sup>lt;sup>a</sup> Source : City of Iqaluit General Plan By Law 703, October 2010. Table 1 - Medium Projection, page 16.

<sup>&</sup>lt;sup>a</sup> Average annual rate of 2.87% was used to estimate the population (General Plan By Law 703)

<sup>&</sup>lt;sup>b</sup> Assumed waste generation rate is 0.03 m³/person/day or 1,095 m³/person/year

<sup>&</sup>lt;sup>c</sup> Density of uncompacted waste is 100 kg/m<sup>3</sup>



Table B.2 - Estimate of Total Air Space Required

	Design of wa	aste disposal	Waste disp	osal volume	Soil cover vo	lume required				
	Yearly	Accumulated	(density of	f 700 kg/m³)	(waste to soil	cover ratio12:1)	Total air sp	ace required	Total air sp	ace required
			Yearly	Accumulated	Yearly	Accumulated	Yearly	Accumulated	Yearly	Accumulated
Year	tonnes	tonnes	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>	Tonnes	Tonnes
2011	8,341	8,341	11,916	11,916	993	993	12,909	12,909	9,036	9,036
2012	8,581	16,922	12,258	24,174	1,021	2,014	13,279	26,188	9,296	18,332
2013	8,827	25,749	12,610	36,784	1,051	3,065	13,661	39,849	9,562	27,894
2014	9,080	34,829	12,972	49,755	1,081	4,146	14,053	53,902	9,837	37,731
2015	9,343	44,171	13,346	63,102	1,112	5,258	14,459	68,360	10,121	47,852
2016 <sup>a</sup>	9,611	9,611	13,730	13,730	1,144	1,144	14,874	14,874	10,412	10,412
2017	9,886	19,497	14,124	27,853	1,177	2,321	15,301	30,174	10,710	21,122
2018	10,170	29,667	14,529	42,382	1,211	3,532	15,740	45,914	11,018	32,140
2019	10,462	40,130	14,946	57,328	1,245	4,777	16,191	62,105	11,334	43,474
2020	10,764	50,893	15,377	72,705	1,281	6,059	16,658	78,764	11,661	55,134
2021	11,073	61,966	15,818	88,523	1,318	7,377	17,136	95,900	11,996	67,130
2022	11,391	73,357	16,272	104,795	1,356	8,733	17,628	113,528	12,340	79,470
2023	11,717	85,074	16,739	121,535	1,395	10,128	18,134	131,662	12,694	92,164
2024	12,054	97,128	17,220	138,754	1,435	11,563	18,655	150,317	13,058	105,222
2025	12,402	109,530	17,717	156,471	1,476	13,039	19,194	169,511	13,435	118,657
2026	12,758	122,288	18,226	174,697	1,519	14,558	19,744	189,255	13,821	132,478
2027	13,124	135,412	18,749	193,446	1,562	16,120	20,311	209,566	14,218	146,696
2028	13,501	148,913	19,287	212,732	1,607	17,728	20,894	230,460	14,626	161,322
2029	13,888	162,801	19,840	232,573	1,653	19,381	21,494	251,954	15,046	176,368
2030	14,290	177,091	20,414	252,986	1,701	21,082	22,115	274,069	15,481	191,848
2031	14,700	191,790	21,000	273,986	1,750	22,832	22,750	296,818	15,925	207,773
2032	15,122	206,912	21,603	295,589	1,800	24,632	23,403	320,221	16,382	224,155
2033	15,556	222,468	22,222	317,811	1,852	26,484	24,074	344,296	16,852	241,007
2034	16,002	238,470	22,860	340,672	1,905	28,389	24,765	369,061	17,336	258,343
2035	16,461	254,932	23,516	364,188	1,960	30,349	25,476	394,537	17,833	276,176
2036	16,934	271,865	24,191	388,379	2,016	32,365	26,207	420,744	18,345	294,521

<sup>&</sup>lt;sup>a</sup> New landfill is expected to be constructed in 2015. Thus, waste generated in 2016 will be disposed at the new landfill.



Table B.3 - Area Required

Description	Quantity	Quantity	Unit
Total waste generation 2016 to 2036 (20 years)	2,718,655		m <sup>3</sup>
Total waste generation until 2036 with the density of 100 kg/m <sup>3</sup>	271,865		tonnes
Airspace requirement until 2036 with a density of 400 and 700 kg/m <sup>3</sup>	Der	sity	l .
for future landfill	700	400	kg/m <sup>3</sup>
Total airspace for requirement for accepted waste	388,379	679,664	m <sup>3</sup>
Total "soil" requirement for cover material (waste to soil ratio of 12:1)	32,365	56,639	m <sup>3</sup>
Total airspace for the future landfill (in m <sup>3</sup> )	420,744	736,302	$m^3$
Total airspace for the future landfill (in tonnes)	294,521	294,521	tonnes
Area requirement for the future landfill with average height of 15 m			
Determined by design; H =	15	15	m
Determined by design; L =	400	500	m
Calculated; W =	220	350	m
Landfill Cell Area =	88,000	175,000	m²
Additional space for utilities, road, temporary recycle compound, etc.			
is assumed 30% of the area required			
Additional Area =	26,400	52,500	m²
Total Area required =	114,400	227,500	m²
L=	500	500	m
W =	229	455	m
Area requirement determined by design for 20 years lifespan:			
L=	500	500	m
W =	250	500	m
A =	125,000	250,000	m <sup>2</sup>

Table B.4 - Construction Sequence and Site Utilization

	Waste disposed <sup>a)</sup>	Accumulated Waste	Created Airspace Capacity	Accumulated Airspace Capacity	Capacity Remaining	Estimated Airspace Remaining at year	
Year	(tonnes)	(tonnes)	(tonnes)	(tonnes)	at year end <sup>b)</sup> (tonnes)	end <sup>c)</sup> (m³)	Note
2011	9,036	9,036					Utilized Stage 1
2012	9,296	18,332					Utilized Stage 1
2013	9,562	27,894					Utilized Stage 2
2014	9,837	37,731					Utilized Stage 2
2015	10,121	47,852					Utilized Stage 2 and closed entire West 40 landfill; and Construct New Landfill in New Site
2016	10,412	10,412	294,521	284,109	284,109	405,871	Open and Operate New Landfill
2017	10,710	21,122		284,109	273,399	390,570	
2018	11,018	32,140		273,399	262,381	374,830	
2019	11,334	43,474		262,381	251,047	358,639	
2020	11,661	55,134		251,047	239,386	341,981	
2021	11,996	67,130		239,386	227,391	324,844	
2022	12,340	79,470		227,391	215,051	307,216	
2023	12,694	92,164		215,051	202,357	289,082	
2024	13,058	105,222		202,357	189,299	270,427	
2025	13,435	118,657		189,299	175,864	251,234	
2026	13,821	132,478		175,864	162,042	231,489	
2027	14,218	146,696		162,042	147,825	211,178	
2028	14,626	161,322		147,825	133,199	190,284	
2029	15,046	176,368		133,199	118,153	168,791	
2030	15,481	191,848		118,153	102,673	146,675	
2031	15,925	207,773		102,673	86,748	123,926	
2032	16,382	224,155		86,748	70,366	100,523	
2033	16,852	241,007		70,366	53,514	76,449	
2034	17,336	258,343		53,514	36,178	51,683	
2035	17,833	276,176		36,178	18,345	26,207	
2036	18,345	294,521		18,345	0	(0)	Landfill Closed

a) Waste to be disposed include soil cover
b) Calculation based on airspace for accepted waste determined by design
c) Conversion from metric tonnes to cubic meters using a compacted waste density of 700 kg/m²

Table B.5 - Estimated Cost of West 40 Landfill Decommissioning Plan

No	Description	Unit	Approx. Quantity	Unit Price	Amount
Α	DECOMMISSIONIONG (CLOSURE) COST				
1	Reporting: closure and post-closure plan	Lump Sum	1	\$50,000	\$50,000
2	General Requirements Includes:	Lump Sum	1	\$200,000	\$200,000
	Mobilization and demobilization     All other works for construction intent				
3	Surveying	Cash Allowance	1	\$50,000	\$50,000
4	Final Cover Construction				
a)	Barrier Layer: 600 mm gravel/shales from nearest quary - Not Available onsite	m²	5.382	\$20	\$107,640
	- Not Available offsite - QA/QC	day	30	\$20 \$1.200	\$107,640 \$36.000
b)	Subsoil 350 mm thick mulch: supply and placement	m <sup>2</sup>	5,382	\$10	\$53,820
	Topsoil 200 mm thick biosolid: supply, placement and seeding	m²	5,382	\$10	\$53,820
5	Monitoring Wells Construction - six wells	Lump Sump	6	\$1,000	\$6,000
6	Miscellaneous Activities				
	Removal of:	1		<b>#00.000</b>	<b>#00.000</b>
	- Site Building - Recycle area	Lump Sum Lump Sum	1	\$20,000 \$10,000	\$20,000 \$10,000
	- Tire, Wood, Metal, and Appliance Piles	Lump Sum	1	\$50,000	\$50,000 \$50,000
	Sub Total Closure Cost				\$637,280
	Professional Service (Design and Construction)			10%	\$63,728
	Contingency Plan			20%	\$127,456
	TOTAL CLOSURE COST				\$828,464
В	POST-CLOSURE COST				
1	Annual Groundwater Monitoring include inspection of: - Inspection of Cover, Vegetation, Site Security, and Surface Drainage - Lab Analysis - Reporting	Times/Year	2	\$20,000	\$40,000
_				040.000	<b>040.000</b>
2	Annual Report	Lump Sump	1	\$10,000	\$10,000
	Sub Total Post Closure Cost				\$50,000
	Professional Service			10%	\$5,000
	Contingency Plan			20%	\$10,000
	TOTAL POST-CLOSURE COST PER YEAR Note:				\$65,000

Note: Assumed inflation rate of 3%. Calculated in July 14, 2011



Table B6 - Estimated Maintenance Cost for 25 Years Post-Closure

Year	Initial Cost	Years	Annual Cost	Accumulated Cost	Note
2011	\$65,000	0	\$65,000		
2012		1	\$66,950		
2013		2	\$68,959		
2014		3	\$71,027		
2015		4	\$73,158	\$73,158	Landfill Closed
2016		5	\$75,353	\$148,511	
2017		6	\$77,613	\$226,124	
2018		7	\$79,942	\$306,066	
2019		8	\$82,340	\$388,406	
2020		9	\$84,810	\$473,216	
2021		10	\$87,355	\$560,571	
2022		11	\$89,975	\$650,546	
2023		12	\$92,674	\$743,221	
2024		13	\$95,455	\$838,675	
2025		14	\$98,318	\$936,994	
2026		15	\$101,268	\$1,038,262	
2027		16	\$104,306	\$1,142,567	
2028		17	\$107,435	\$1,250,003	
2029		18	\$110,658	\$1,360,661	
2030		19	\$113,978	\$1,474,639	
2031		20	\$117,397	\$1,592,036	
2032		21	\$120,919	\$1,712,955	
2033		22	\$124,547	\$1,837,502	
2034		23	\$128,283	\$1,965,785	
2035		24	\$132,132	\$2,097,916	
2036		25	\$136,096	\$2,234,012	
2037		26	\$140,178	\$2,374,190	
2038		27	\$144,384	\$2,518,574	
2039		28	\$148,715	\$2,667,290	
2040		29	\$153,177	\$2,820,466	

Note:

Assumed inflation rate of 3%. Calculated in June 20, 2011

# **Appendix C**

**Monitoring and Inspection Forms** 

# **Closed Landfill Inspection Report**

# Section 1:

Facility:		
Owner:		
Location:		
Legal Land Description:		
Approximate closure date:	Approximate size	
Inspector:	Inspection date:	
Other people present:		

# **Section 2 Vegetation:**

T () ( 11	
Type(s) of growth	Remarks:
(check all that apply):	
1137	
□ grasses	
= 9.0.000	
□ herbaceous plants	
la ricibaccous plants	
- moss	
□ moss	
Condition of succession	Damandra
Condition of growth:	Remarks:
_ , , , , , ,	
□ Excellent (thick	
growth)	
,	
□ Good	
□ Poor (thin growth,	
bare soil, mosses)	
	<u> </u>
Invasive plants	Remarks:
present?	
□ Yes □ No	
Dead spots present?	Remarks:
Bedd opoto present:	Tromano.
□ Yes	
□ No	
LINU	

# **Section 3 Final Cover Condition:**

Is there subsidence (depressions in the cap)?	Remarks:
□ Yes	
□ No	
Is there any evidence of water ponding on the cap?	Remarks:
□ Yes	
□ No	
Are there colored leachate seeps through the cap?	Remarks:
□ Yes	
□ No	
Are there colored leachate seeps at toe slope?	Remarks:
□ Yes	
□ No	
Are there signs of burrowing animals?	Remarks:
□ Yes	
□ No	
Is there any waste pushing through the cap?	Remarks:
□ Yes	
□ No	
Does the cap cover all of the solid waste?	Remarks:
□ Yes	
□ No	
Is there evidence of erosion?	Remarks:
□ Yes	
□ No	
Is there ATV damage to the cap or vegetation?	Remarks:
□ Yes	
□ No	

# **Section 4 Drainage and Surface Water:**

Conditions/Stability of streams/swales/ditches etc.	Remarks:
□ Excellent (unobstructed)	
□ Good	
□ Poor (overgrown or sediment filled)	
Is there evidence of colored leachate in surface waters?	Remarks:
□ Yes	
□ No	
Is there surface water monitoring?	Remarks:
□ Yes	
□ No	
Section 5 Other Facility Cond	litions:
Access road condition:	Remarks:
□ Excellent	
□ Good	
□ Poor	
Gates and fences:	Remarks:
□ Present	
□ Not present	
Gate and fence condition:	Remarks:
□ Excellent	
□ Good	
□ Poor	
Section 6 Structures:	
Are there man made structures on the cover?	Remarks
□ Yes	
□ No	

# **Section 7 General cleanliness of the site:**

Is there litter present?	Remarks:
□ Yes	
□ No	
Is there evidence of unauthorized dumping?	Remarks
□ Yes	
□ No	
Section 8 Maintenance:	
Section 8 Maintenance:  Is there an ongoing maintenance program?	Remarks:
Is there an ongoing	
Is there an ongoing maintenance program?	

# **Section 9 Other Information:**

- Attach a hand drawn site sketch made on plain paper 8 1/2" x 11"
- Attach labeled photographs of landfill conditions and any nearby development

<ul> <li>Describe any corrective actions planned or taken as a result of conditions noted during the inspection (attached additional pages if necessary):</li> </ul>			

# **AECOM**

Appendix G

Solid Waste By-law 341 and By-law 544

# BY-LAW 341 - SOLID WASTE BY-LAW

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# THE CORPORATION OF THE TOWN OF IQALUIT, N.W.T.

# BY-LAW 341

BEING A BY-LAW of the incorporated Town of Iqaluit in the Northwest Territories to provide for the regulation, collection and disposal of solid waste.

WHEREAS the <u>Cities, Towns and Villages Act</u>, R.S.N.W.T., 1988,c.C-8, Sections 85 through 88, 169, 173 and 182 through 187 provides that Municipalities may; regulate, establish and operate garbage facilities, provide for the collection, removal and disposal of garbage, provide for sale or reuse of any waste by-product, levi and collect fees for garbage services and impose punishment for offenses.

NOW, THEREFORE PURSUANT to the provisions of the <u>Cities</u>, <u>Towns and Villages Act</u>, and notwithstanding any by-laws, sections thereof, resolutions or prior enactments,

THE COUNCIL OF THE TOWN OF IQALUIT, in regular session duly assembled, enacts as follows:

### PART I, INTERPRETATION

# 101. Short Title

This by-law may be cited as the Solid Waste By-Law.

# 102. Severability

If any provision of this by-law is declared invalid because of any word, phrase, clause, sentence, paragraph or section of this By-Law or any documents which form part of this By-Law or an application thereof to any person or circumstance is declared invalid, the remaining provisions shall not be affected thereby but shall remain in force.

# 103. Definitions

In this by-law, unless the content otherwise requires;

"at cost"

means the posted equipment and manpower rates of the Town, as adjusted from time to time, and any administrative overhead costs plus 15%.

"authorized contractor"

means a contractor, authorized by By-Law, to perform solid waste services, on behalf of the Town of Iqaluit in accordance with specified terms, conditions and fees.

"bulky waste"

means waste which will not normally fit into a garbage box.

"combustible waste"

means waste suitable for burning that can be readily burned without appreciably endangering operations or the environment.

"commercial"

means a single premise used for the purpose of carrying on a business for profit and represented by the owner(s) and/or tenant(s).

"commercial/government/industrial

hazardous waste"

means solid waste generated by commercial, government or industrial organizations which could be flammable, toxic, corrosive, explosive, or otherwise has the potential for endangering municipal operations, the community or the surrounding environment.

"construction debris"

means unwanted, useless, abandoned, discarded or rejected goods or materials of every kind that are normally generated on a construction site but, excluding sewage and/or commercial, government and industrial hazardous waste.

"Council"

means the Council of the Town of Iqaluit.

"covered"

means secured in such a fashion that wind, animals or birds cannot scatter.

"covered conveyance"

means a vehicle used to transport solid waste to the waste facility where the waste is contained so that it cannot fall out, be blown out or otherwise scattered.

"garbage"

means the same as "solid waste".

"garbage room/building"

means a locked room or building, as per any specifications relating to this by-law, used exclusively for the temporary holding of garbage in readiness for scheduled collection.

"government"

means a single premise used for the purpose of government and represented by senior official(s) and/or elected representative(s).

"honey bag"

means bagged raw sewage.

"household hazardous waste"

means solid wastes generated only in residential domiciles which are flammable, toxic, corrosive, explosive, or otherwise has the potential for endangering municipal operations, the community or the environment.

"household waste"

means solid waste normally generated in or from residential domiciles but, excluding hazardous waste.

"industrial"

means a single premise used for manufacturing and represented by the owner(s) and/or tenant(s).

"land fill"

means a duly licensed site used for the disposal of municipal type solid waste.

"littering"

means disposing of garbage in any area other than prescribed by this by-law.

"Manager"

means the Senior Administrative Officer of the Town of Iqaluit or their designate.

"municipal type solid waste"

means garbage which can be hand placed in garbage truck but, does not include sewage or hazardous waste.

"residential"

means a single domicile represented by the owner(s) or tenant(s). This also includes "not for profit" premises. "segregate"

means the separation of solid waste into combustible, salvageable, recyclable, bulky, metal or hazardous waste.

"solid waste"

means unwanted, useless, abandoned, discarded or rejected goods or materials of every kind but, excluding sewage and or commercial, government and industrial hazardous waste.

"solid waste facility"

refers to the Town operated modified sanitary land fill, which is clearly marked with signs, which is located in the West 40 between an old abandoned waste site and fuel tank #22. The site is referred to as site #3 in the Town Waste Management Plan.

"Town"

means the Town of Iqaluit or its duly authorized contractor(s).

"waste container"

means a covered garbage box, locked garbage room or house and dumpsters as specified in any specifications relating to this by-law.

"waste generator"

means one who produces waste of any nature which relates to and is under

the control of this by-law.

# PART II, GENERAL PROVISIONS

# 201. Authority to Provide Municipal Services

No person or contractor, except those authorized by By-Law, shall directly or indirectly engage in the provision of municipal solid waste services within the Town.

# 202. Authority and Duties of the Manager

- The Manager is authorized and directed to; (1)
  - supervise, control and administer the provisions and regulations and to do all things necessary to fulfil their responsibilities and duties under this by-law;

- (b) control all contracting, construction, operation, maintenance and regulatory compliance related to the provision of solid waste services;
- (c) perform all acts that may be necessary for the efficient management, operation and protection of the municipality;
- (d) enter upon private property for the purpose of this bylaw; and
- (e) levy tariffs, fines and penalties as well as take any other legal actions necessary to enforce this by-law.
- (2) The Manager may prescribe;
  - (a) orders,
  - (b) specifications for
    - (i) waste containers
    - (ii) segregation of waste
    - (iii) and other specifications,
  - (c) waste collection days, and
  - (d) hours of operation and service.
- (3) The Manager may prescribe forms for;
  - (a) application for service,
  - (b) termination of service,
  - (c) receipt of service,
  - (d) charges for service,
  - (e) description, volume and type of waste,
  - (f) violations,
  - (g) any other forms and information sheets necessary to carry out the provisions of this by-law.

# 203. Financing and Accounting

(1) All costs for the provision of solid waste services shall be financed through tariffs, service charges, fees, (as per Schedule "C") loans, and grants, subsidies or other funding provided to the Town by the Government of the Northwest Territories and/or others.

- (2) All monies collected for solid waste services shall only be used to provide waste services to customers including administration, operation, maintenance, training, extension, repair, capital improvements and regulatory compliance.
- (3) All monies collected for the provision of solid waste services shall be separately accounted for and disbursed by action of the Council.
- (4) Bills for tariffs, service charges, fees and all other penalties and/or charges levied under this by-law are due and payable not later than thirty (30) days after the date of mailing.
- (5) Overdue accounts shall have interest charged at the same rates that are charged for overdue taxes as established by the prevailing Town Taxation By-Law.

### 204. Service Area

- (1) The Town shall provide municipal type solid waste collection services to premises within the built up areas of the Town.
- (2) Collection of municipal type solid waste outside the service area will only be provided at cost and when such services will not impede the provision of this service within the designated service area.

# 205. Description of Service

- (1) The Town shall collect municipal type solid waste, within the service area, from residences, commercial establishments, industrial establishments and government locations on a scheduled basis.
- (2) The Town shall operate and maintain a solid waste facility, known as the Town Land Fill, for municipal type waste, household hazardous waste and bulky waste, which is located at site 3 in the West 40. All solid waste, with the exception of raw sewage and/or commercial, government and industrial generated hazardous waste, shall be disposed of at the Town Land Fill.
- (3) Notwithstanding subsections (1) and (2), when in the opinion of the manager, or regulatory agencies, the environment or public health and safety are seriously impaired, the manager may;
  - (a) restrict or terminate municipal type solid waste collection,

- (b) restrict or terminate operation of the solid waste facility.
- (4) The Town shall make every reasonable effort to provide safe, continuous and efficient solid waste services; nevertheless, the Town shall not be liable for damages, including business losses,
  - (a) caused by restriction or termination of municipal type solid waste collection,
  - (b) caused by restriction or termination of operation of the solid waste facility,
  - (c) caused through noncompliance with specifications,
  - (d) caused by impeded access to waste containers,
  - (e) caused by the interference or cessation of solid waste services in connection with the repair, expansion, replacement, or proper operation and maintenance of the solid waste collection system or solid waste disposal facility,
  - (f) caused by the interference or cessation of service due to adverse weather conditions, road conditions or vehicle mechanical problems,
  - (g) caused by improper segregation of waste,
  - (h) generally for any accident due to the operation of the municipal system, unless such action has been shown to be directly due to the negligence of the Town or its employees,
  - (i) caused by the interference or cessation of service due to any contravention of this by-law.
- (5) The Town shall conduct a mass participation annual spring clean-up of litter and unsightly bulky waste.
- (6) The Town shall conduct a household hazardous waste round up four (4) times per year.
- (7) The Town shall not collect, transport, handle, store nor dispose of commercial, government or industrial generated hazardous waste.
- (8) Collection, transportation, handling, storage and disposal of commercial, government or industrial generated hazardous waste is the sole responsibility of the generator and must be done in accordance with all applicable legislation.

- (9) Stockpiling of any commercial, government or industrial generated hazardous waste must not be left to accumulate, within Town boundaries, for over four (4) years.
- (10) No-one shall indiscriminately dispose of hazardous waste.
- (11) The Town shall not collect, handle nor dispose of honey bags.
- (12) Anyone who litters must clean up their litter immediately upon notification by the manager and/or be liable to a fine as specified in schedule "A".
- (13) Should a building or structure have been damaged by fire or other means, the owner must, within one hundred and twenty (120) days, apply to the Town for the necessary permits to restore, repair, or demolish the structure or the building may be deemed to be construction debris under the terms of this by-law.

#### 206. Authority to Restrict Service

- (1) The Manager may, without notice, cease or restrict service to any customer or part of Town should he decide that an emergency makes such action necessary.
- (2) The Manager may, in a non-emergency situation, including adverse weather conditions, scheduled repairs, or alteration of the collection or disposal system, restrict service to any customer or part of the Town, provided that the Manager shall, when it is practical to do so, provide public notice of such intended cessation or restriction of service to all affected customers.
- (3) The Manager may discontinue service for any of the following reasons;
  - (a) failure to establish service,
  - (b) fraud in establishing service,
  - (c) non-payment of charges or fees levied pursuant to this by-law,
  - (d) failure to provide a deposit, if required,
  - (e) failure to provide unimpeded access; or
  - (f) contravention of any other section of this by-law.
- (4) When service is discontinued, neither the Town nor its employees or any municipal officials shall be liable for any costs or damages resulting from the discontinuance of service.

(5) Where this by-law authorises service to be discontinued, the Manager shall, when it is practical to do so, give notice prior to service being discontinued. Such notice shall indicate the infraction, remedy, and the date that service will be discontinued unless remedy is made. When service is discontinued, service shall not be reinstated until such time as there is no longer a contravention of this by-law or any outstanding service charges and fees, and a specified reinstatement service fee is paid to the Town.

#### 207. Notification

- (1) Notice from the Town to a customer or owner for bills due, contravention of any provisions of this by-law, or for any other reasons, shall be in writing to the last known address.
- (2) Notice to the Town shall be made in writing to the Municipal Office, except that notice of complaint may be made by telephone or in person.

#### 208. Effective Date

(1) This by-law shall come into effect April 1, 1995 and shall remain in effect until it is repealed.

#### PART III, ESTABLISHMENT AND TERMINATION OF SERVICE

#### 301. To Establish Waste Collection Service

- (1) Subject to subsection (2), every person requiring establishment of service, shall submit to the Manager an application for service form and the appropriate fees specified in Schedule C.
- (2) Where premises are occupied by a tenant or lessee, the Manager may require that the application for service be submitted by the owner of the premises.
- (3) Where a premise has multiple occupancies the application for service shall be submitted, along with detailed drawings and specifications for waste containment, by the owner of the premise.
- (4) An application for service must allow a minimum of five (5) working days prior to date when service is expected.

(5) An application for service will not be required for units which were already obtaining service at the effective date of this by-law.

# 302. Content of Application for Waste Collection Service

The application for service shall include such particulars as the following;

- (a) location of the premise,
- (b) date applicant will be ready for service,
- (c) type of waste storage erected or intended for erection,
- (d) whether the premise had been previously serviced,
- (e) name and mailing address to which notices and bills are to be sent,
- (f) whether the applicant is owner or tenant of, or agent for the premises,
- (g) category of customer and applicable rate,
- (h) agreement to abide by and accept all the provisions of this by-law,
- (i) any other fees or service charges,
- (j) detailed drawings and specifications for garbage rooms or buildings, and
- (h) any other information in such detail and form the Manager deems appropriate.

#### 303. Deposit

As a condition of providing services the Manager may require a deposit from the applicant provided that;

- (a) the amount of the deposit shall be determined by the Manager based on the expected service charge for a ninety (90) day period,
- (b) the deposit shall be refunded after it has been held for a twelve consecutive month period during which all bills for service have been paid within the time allowed,

- (c) the deposit, less the amount of any unpaid balance due to the Town, shall be refunded upon discontinuance of service, and
- (d) interest of six (6) percent per year will be paid on any deposit.

#### 304. Application to Terminate Service

- (1) In order to terminate service, the customer shall submit to the Manager a written request stating the date the applicant desires to terminate service and any other information and in such form as may be prescribed by the Manager.
- (2) All applications for termination of service must allow a minimum of five (5) working days prior to the date termination of service is required.
- (3) The Town may continue to levy service charges in accordance with this by-law until services are terminated.

#### PART IV, RESPONSIBILITIES OF THE WASTE GENERATOR

#### 401. Residential Waste

- (1) Every residential generator of municipal type waste shall maintain, in good condition, sufficient covered or enclosed waste containers as per Town specifications.
- (2) All waste placed in a waste container must first be placed in a garbage bag.
- (3) All waste containers shall be kept within the property boundaries of the lot or parcel of land on which the serviced premises are located and be positioned adjacent to the public roadway.
- (4) Every waste generator shall maintain, at his own expense, unimpeded access to their waste containers, including the removal of ice, snow, mud, vehicles, pets and yard materials and, the sanding of icy patches.
- (5) Any person having garbage upon their premise or lands shall dispose of it in the manner prescribed by the Manager.
- (6) No person shall dispose of hot ashes, burning matter or loose waste in any waste container.

- (7) No person shall dispose of any explosive, inflammable, dangerous or hazardous waste in any waste container or any other place without the express authority of the Manager who shall designate the manner and place it shall be disposed of.
- (8) Household hazardous waste shall be stored by the residential waste generator until the Town holds a "Household Hazardous Waste Round-up" when these wastes shall be brought to an area prescribed by the Manager for disposal.
- (9) Subject to subsections (15) and (16) of this section, no person shall burn any waste of any nature within the boundaries of the Town. This excludes barbecues or cooking fires.
- (10) Any construction or building material being used or stored on private property must be stored on the said property, in a neat and orderly fashion or it may be defined as construction debris under the terms of this by-law.
- (11) Subject to subsection (12) of this section, all debris on a construction or work site must be segregated and placed in covered containers, on a daily basis, then hauled in a covered conveyance to the Town Land Fill site.
- (12) Where a waste container is not available, all debris on a construction or demolition site shall be segregated, hauled in a covered conveyance and disposed of at the Town Land Fill site on a daily basis.
- (13) Notwithstanding section 205. subsection (5) and (6), and subsections (8), (10), (11) and (12) of this section, no person other than the Town or its authorized contractor shall directly or indirectly remove and/or dispose of any residential waste within the boundaries of the Town.
- (14) Bulky wastes, generated by residential generators, must be segregated, removed and disposed of at the Town Landfill.
- (15) The Town may carry out controlled burning of waste for volume reduction and/or training.
- (16) The Fire Department may grant permission for the supervised burning of bon-fires on special occasions.
- (17) All premises which utilize a garbage room or building shall ensure that all waste is stored in secured and segregated waste containers.
- (18) Conditions of the operations and maintenance manual for the Town Land Fill site and directions of the Waste Facility Operator are to be strictly observed by all residential users.

#### 402. Commercial/Government/Industrial Waste

- (1) Every commercial, government or industrial generator of municipal type waste shall maintain, in good condition, sufficient covered or enclosed waste containers as per Town specifications.
- (2) All waste placed in a waste container must first be segregated then placed in garbage bags or baled.
- (3) All waste containers shall be kept within the property boundaries of the lot or parcel of land on which the serviced premises are located and be positioned adjacent to the public roadway.
- (4) Every commercial, government or industrial waste generator shall maintain, at his own expense, unimpeded access to their waste containers, including the removal of ice, snow, mud, vehicles, pets and yard materials and, the sanding of icy patches.
- (5) Any commercial, government or industrial establishment having litter or unsightly garbage upon their premise or lands shall dispose of it in the manner prescribed by the Manager.
- (6) No commercial, government or industrial establishment shall dispose of hot ashes, burning matter or loose waste in any waste container.
- (7) Subject to subsection (8) and (9) of this section, no commercial, government or industrial establishment shall dispose of any explosive, inflammable, dangerous or hazardous waste in any waste container or any other place without the express authority of the Manager who shall designate the manner and place it shall be disposed of.
- (8) Collection, transportation, handling, storage and disposal of commercially, governmentally or industrially generated hazardous waste is the sole responsibility of the generator and must be done in accordance with all applicable legislation.
- (9) Stockpiling of any commercially, governmentally or industrially generated hazardous waste must not be left to accumulate, within Town boundaries, for over four (4) years.
- (10) Subject to subsections (17) and (18) of this section, no commercial, government or industrial establishment shall burn any waste of any nature within the boundaries of the Town. This excludes barbecues or cooking fires.

- (11) Any construction or building material being used or stored on private property must be stored on the said property, in a neat and orderly fashion or it may be defined as construction debris under the terms of this by-law.
- (12) Subject to subsection (8) and (13) of this section, all construction debris on a construction or work site must be segregated and placed in covered containers, on a daily basis, then hauled in a covered conveyance to the Town Land Fill site.
- (13) Subject to subsection (8) of this section, where a waste container is not available, all debris on a construction or demolition site shall be segregated, hauled in a covered conveyance and disposed of at the Town Land Fill site on a daily basis.
- (14) Commercial establishments shall segregate, remove and dispose of all bulky wastes, generated by them, at the Town land fill.
- (15) The Town may dispose of construction debris and/or bulky wastes if it has not been properly disposed of within twenty four (24) hours of notification to do so, and the premise owner charged "at cost" for work performed by or on behalf of the Town.
- (16) Notwithstanding section 205. subsection (5) and (6), and subsections (7), (8), (12), (13) and (14) of this section, no person other than the Town or its authorized contractor shall directly or indirectly remove and/or dispose of any commercial, government or industrial municipal type waste within the boundaries of the Town.
- (17) The Town may carry out controlled burning of waste for volume reduction and/or training.
- (18) The Fire Department may grant permission for the supervised burning of bon-fires on special occasions.
- (19) All premises which utilize a garbage room or building shall ensure that all waste is stored in secured and segregated waste containers.
- (20) Conditions of the operations and maintenance manual for the Town Land Fill site and directions of the Waste Facility Operator are to be strictly observed by all commercial, government or industrial users.

#### PART V, ENFORCEMENT

#### 501. Penalty Provisions

- (1) A By-law Officer employed by the Town is authorized to issue a violation Ticket to any person who the By-law Officer has reasonable and probable grounds to believe and has contravened any provision in this By-law.
- (2) Any person who contravenes any provision of the By-law is guilty of an offence and is liable on summary conviction to a fine as set out in Schedule "A" of this By-law.
- (3) Any Commercial Business, Government or Industry who contravenes any provision of the By-law is guilty of an offence and is liable on summary conviction to a fine as set out in Schedule "B" of this By-law.
- (4) Every person who contravenes any of the provisions of this Bylaw is guilty of an offence, punishable on summary conviction and is liable to a fine of not less than One Hundred (\$100.00) Dollars or more than Two Thousand (\$2,000.00) Dollars and in default of fine imposed, a period of imprisonment not exceeding six (6) months.
- (5) Every Commercial Business, Government or Industry who contravenes any of the provisions of this By-law is guilty of an offence, punishable on summary conviction and is liable to a fine of not less than One Thousand (\$1000.00) Dollars or more than Ten Thousand (\$10,000.00) Dollars and in default of fine imposed, a period of imprisonment not exceeding six (6) months.
- (6) A By-law Officer who has reasonable and probable grounds to believe that a person, business, government or industry is violating or has violated any provision of this By-law may give such person written notice of intention to prosecute in the form of a ticket as defined in the Summary Convictions Act and amendments thereto, setting forth the date, and place of the offence; briefly stating the nature of the offence; stating that payment may be made under section \_\_V\_ of this By-law.
- (7) A person, business, government or industry who has received a ticket pursuant to section V in respect of an alleged offence under this By-law may after receipt of such ticket in lieu of prosecution under this By-law, pay to the Town such penalty as is set out in the appropriate Schedule "A" or "B" attached hereto and which forms part of this By-law.

#### PART VI, REPEAL

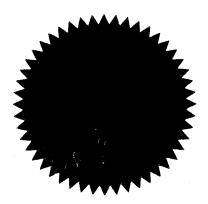
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(1) On the effective date this by-law repeals by-laws 169 and 333.

THIS BY-LAW NUMBER 341 IS READ A FIRST TIME this \_\_\_\_\_\_, day of \_\_\_\_\_\_, 1995 A.D. by the Council of the Town of Iqaluit, N.W.T.

THIS BY-LAW NUMBER 341 IS READ A SECOND TIME this 13 day of Market, 1995 A.D. by the Council of the Town of Iqaluit, N.W.T.

THIS BY-LAW NUMBER 341 IS READ A THIRD AND FINAL TIME this  $27^{*2}$  day of March, 1995 A.D. by the Council of the Town of Iqaluit, N.W.T.



MAYOR

OFFICE OF THE OF

# SCHEDULE "A" OF BY-LAW 341

# FINES FOR INDIVIDUALS

<u>Sections</u>		Amount
205(4)10	indiscriminate disposal of hazardous waste	\$500.00
205(12)	littering	\$500.00
401(1)	failing to provide a waste container	\$100.00
401(2)	failing to place garbage in proper container	\$100.00
401(5)	failing to dispose as directed	\$250.00
401(6)	placing burning items in waste container	\$500.00
401(7)	placing hazardous waste in unsuitable container	\$500.00
401(9)	burning waste within town boundaries without permission of Fire department	\$500.00
401(10)	storing garbage on property in untidy manner	\$200.00
401(11)	unsegregated garbage	\$500.00
401(11)	uncontained construction debris	\$500.00
401(12)	hauling waste in uncovered conveyance	\$500.00
401(17)	unsecured waste storage container	\$200.00
401 (18)	non-observation of directions	\$300.00

## SCHEDULE "B" OF BY-LAW 341

#### FINES FOR CORPORATIONS

<u>Sections</u>		AMOUNT
205(4)10	indiscriminate disposal of hazardous waste	\$10,000.00
205(12)	littering	\$ 5,000.00
402(1)	failing to provide a waste container	\$ 1,000.00
402(2)	failing to properly put garbage in container	\$ 1,000.00
402(5)	failing to dispose as directed	\$ 2,500.00
402(6)	placing burning items in waste container	\$ 2,500.00
402(7)	unsuitable hazardous waste storage	\$10,000.00
402(8)	improper hazardous waste procedures	\$10,000.00
402(9)	stockpiling hazardous waste for over 4 yrs.	\$10,000.00
402(10)	burning waste within town boundaries without permission of Fire department	\$ 5,000.00
402(11)	storing garbage on property in untidy manner	\$ 2,000.00
402(12)	unsegregated garbage uncontained construction debris	\$ 3,000.00 \$ 5,000.00
402(12)& (13)	hauling garbage in uncovered conveyance	\$ 5,000.00
402(19)	unsecured or segregated waste storage	\$ 2,500.00
402(20)	non-observation of directions	\$ 3,000.00

#### SCHEDULE "C" OF BY-LAW 341

#### TARIFFS AND FEES

(1) Subject to subsection II, the rates payable by customers for collection and disposal of municipal type solid waste are as follows:

#### CATEGORY OF CUSTOMER;

Residential and Non-Profit; (based on collections twice per week excluding Statutory Holidays)

(Das	sed on corrections twice per week excluding Statutor	ry Holidays)
1.	<ul> <li>single and duplex units (separate storage)</li> <li>(under 35 cubic feet)</li> </ul>	\$27.50/M/U
2.	- triplex to six-plex units (separate storage) (under 35 cubic feet)	\$27.50/M/U
3.	- triplex to six-plex units (combined storage) (35 cubic feet up to 200 cubic feet)	\$25.00/M/U
4.	- Larger than six-plex (separate storage) (under 35 cubic feet)	\$27.50/M/U
5.	<ul> <li>larger than six-plex (combined storage)</li> <li>(200 cubic feet and over)</li> </ul>	\$22.50/M/U
	mercial; sed on five collections per week excluding Statutor	ry Holidays)
6.	<ul> <li>single business</li> <li>(separate storage of 35 cubic ft. or under)</li> </ul>	\$60.00/M/B
7.	<ul> <li>single business</li> <li>(separate storage of over 35 cubic ft. and under 200 cubic ft.)</li> </ul>	\$75.00/M/B
8.	- single business (200 cubic ft. & over)	\$100.00/M/B
9.	<ul> <li>multiple businesses (combined storage of under 200 cubic ft.)</li> </ul>	\$70.00/M/B
10.	<ul> <li>multiple businesses (combined storage of 200 cubic ft. &amp; over)</li> </ul>	\$65.00/M/B
	Government/Industrial; (based on five collections per week excluding Holidays)	g Statutory
11.	- separate storage of 35 cubic ft. or under	\$60.00/M/U
12.	- separate storage of over 35 cubic ft. and under 200 cubic ft.	\$75.00/M/U
13.	- separate storage of 200 cubic ft. & over	\$100.00/M/U

# SCHEDULE "C" By-Law 341 continued

(2)	Unscheduled garbage collection fee/colle	ection \$125.00
(3)	Application for service fee	\$ 15.00
(4)	Reinstatement of service fee	\$ 15.00
(5)	Tipping fees at Town Land Fill;	
	- up to 1/2 ton pick-up truck	\$ 5.00/load
	- over 1/2 ton to 1 ton pick-up tru	ck \$10.00/load
	- over 1 ton to 15 ton truck	\$25.00/load
	- over 15 ton truck	\$35.00/load
	- car body	\$10.00/car
	- pick-up truck body	\$15.00/truck
	- bulky items larger than pu truck	body \$25.00/item
	- designated contractor fee	\$150.00/load
(6)	Wood salvage	\$1.00/cubic ft.
(7)	Other miscellaneous salvage Nominal fe	e to be determined
(8)	Recyclable materials Market val	ue at time of sale
(9)	at th charg as e	est will be charged e same rate as that ed for overdue taxes stablished by the iling Town Taxation w.
(10)	Disposal of construction debris or bulky	waste "at cost"
NOTE;	; M = month B = business U = unit (single)	

#### THE CORPORATION OF THE CITY OF IQALUIT, NU

#### **BY-LAW #544**

#### AMENDMENT TO SOLID WASTE BY-LAW

A By-law of the City of Iqaluit, a municipal corporation in Nunavut to waive municipal service charges for collection of waste, pursuant to the provisions of the Cities, Towns and Villages Act, R.S.N.W.T. 1988, c. C-8, s.65(1) and 85 (1)(d)

A by-law is necessary to waive municipal service charges for collection of waste due to non-collection during the labour dispute f5om April 17 to July 31, 2001 as it was not included in the Essential Service Agreement.

NOW THEREFORE, the Council fo the City of Iqaluit in a session duly assembled, enacts as follows:

1. For a period of April 17, 2001 to July 31, 2001, only that Council waive municipal services collection charges for Residential, Commercial, Government and Industrial waste.

Government and Industrial waste.	Tor Residential, Commercial,
This By-law amends By-law 341 for a period of	April 17, 2001 to July 31, 2001.
THIS BY-LAW READ A FIRST TIME this 14	4 day of <u>August</u> , 2001. A.D.
	MAYOR
	CHIEF ADMINISTRATIVE OFFICER
THIS BY-LAW READ A SECOND TIME this_	<u>14</u> day of <u>August</u> , 2001. A.D.
	MAYOR
	CHIEF ADMINISTRATIVE OFFICER
THIS BY-LAW READ A THIRD AND FINAL	TIME this 28 day August, 2001.A.D
	MAYOR

CHIEF ADMINISTRATIVE OFFICER



Appendix

Nunavut Water Board – Type "A" Water Licence No. 3AM-IQA1626



1000

# NUNAVUT WATER BOARD TYPE "A" WATER LICENCE NO. 3AM-IQA1626

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#### Licence No. 3AM-IQA1626

Pursuant to the Nunavut Waters and Nunavut Surface Rights Tribunal Act and the Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to the

#### **CITY OF IQALUIT**

(Licensee)					
P.O. BOX 460 IQALUIT, NU X0A OHO					
(Mailing Address)					
		vert or otherwise use Water or deposit ns contained within this Licence:			
Licence Number / Type:	3AM-IQA1626 / TY	PE "A"			
Water Management Area:	FROBISHER BAY	WATERSHED (53)			
Location:	WITHIN CITY OF IQALUIT'S MUNICIPAL BOUNDARIES, QIKIQTANI REGION, NUNAVUT				
Classification:	MUNICIPAL UNDERTAKING				
Purpose:	Purpose: USE OF WATERS AND DEPOSIT OF WASTE				
Quantity of Water not to be Exceeded: 1,100,000 CUBIC METRES ANNUALLY					
Date Licence Issuance:	JUNE 17, 2016				
Expiry of Licence:	JUNE 16, 2026				
This Licence issued (Motion Number: 2016-02-P6-14) and recorded at Goji Haven, Nunavut, includes and is subject to the annexed conditions.					
NIE		*			
Norman Mike Nunavut Water Board, Hearing Chair	APPROVED BY:	Minister of Indigenous and Northern Affairs Canada			
	APPROVAL DATE:				



#### PART A: SCOPE, DEFINITIONS, AND ENFORCEMENT

#### 1. SCOPE

a. This Type "A" Water Licence No. 3AM-IQA1626 ("Replacement and Amended Licence" or "Licence") authorizes the City of Iqaluit ("Licensee" or the "City") to use Water and deposit Waste in support of a Municipal undertaking, as classified under Schedule 1 of the *Regulations*, within the City's municipal boundaries at the following approximate geographic coordinates:

Undertaking	Latitude	Longitude
	63° 50' 56.31" N	68° 39' 49.87" W
	63° 50' 57.30" N	68° 33' 41.94" W
Orașia II Estanta	63° 43' 48.91" N	68° 18' 12.53" W
Overall Extents	63° 41' 06.60" N	68° 18' 18.82" W
	63° 41' 04.08" N	68° 32' 44.20" W
37	63° 44' 46.02" N	68° 39' 43.1 0" W
West 40 Landfill	63° 43' 58.15" N	68° 32' 08.54" W
Water Treatment Plant	63° 45' 12.24" N	68° 30' 22.79" W
Wastewater Treatment Plant	63° 44' 45.15" N	68° 32' 19.80" W

The scope of activities, works, and undertakings authorized in accordance with the terms and conditions of this Replacement and Amended Licence is as follows:

- a. Use, management, and protection of the Lake Geraldine drainage basin;
- b. Management and protection of Waters surrounding the West 40 Landfill site;
- c. Management, collection, and monitoring of leachate from the West 40 Landfill site and adjacent Sludge Management Facility;
- d. Management of improved drainage works at the West 40 Landfill site;
- e. Management, operation, and eventual closure and reclamation of the current West 40 Landfill site and associated solid waste disposal facilities;
- f. Upgrades, operation, maintenance, monitoring, and eventual closure and reclamation of a Wastewater Treatment Plant (WWTP);
- g. Operation, maintenance, monitoring, and eventual closure and reclamation of a Sludge Management Facility;
- h. Operation, maintenance, monitoring and eventual closure and reclamation of a Sewage Lagoon Facility;
- i. Implementation of contingency measures for the Wastewater and Landfill management facilities; and
- j. Implementation of changes to the monitoring requirements including frequency, parameters, and stations being monitored.
- b. This Licence is issued subject to conditions contained herein with respect to the taking of Waters and the depositing of Waste of any type in any Waters or in any place under any



conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the Act, or other statutes imposing more stringent conditions relating to the quantity, type or manner under which any such Waste may be so deposited, this Licence shall be deemed to be subject to such requirements; and

c. Compliance with the terms and conditions of this Licence does not absolve the Licensee from the responsibility for compliance with all applicable legislation, guidelines, and directives.

#### 2. DEFINITIONS

a. The Licensee shall refer to Schedule A for definitions of terms used in this Licence.

#### 3. ENFORCEMENT

- a. Failure to comply with this Licence shall be a violation of the Act, subjecting the Licensee to the enforcement measures and the penalties provided for in the Act.
- b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the Act.
- c. For the purpose of enforcing the terms and conditions of this Licence with respect to the use of Water and deposit or Discharge of Waste in Waters, Inspectors appointed under the Act, hold all powers, privileges, and protections that are conferred upon them by the Act or by other applicable laws.

#### PART B: GENERAL CONDITIONS

- 1. The Licensee shall file, with the Board for review, no later than the 31<sup>st</sup> of March of the year following the calendar year being reported, an Annual Report formulated in accordance with the requirements under <u>Schedule B</u> of this Licence.
- 2. The Licensee shall maintain a copy of this Licence at the Municipal Office, potable Water Treatment Facility, and the Waste Treatment Facilities at all times.
- 3. The Licensee shall file an application for renewal of this Licence at least one (1) year prior to the Licence expiry.
- 4. The Licensee shall, to the satisfaction of an Inspector, install, operate, and maintain metres, devices or other appropriate methods for measuring the volumes of Water used and Waste Discharged or deposited.



- 5. The Licensee shall post the necessary signs to identify the stations of the Monitoring Program included under <u>Schedule I</u> of this Licence. All signage shall be in the Official Languages of Nunavut.
- 6. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted cannot be undertaken without subsequent written approval and/or directions from the Board. The Board may alter or modify a Plan if necessary to achieve legislative objectives and will notify the Licensee in writing of acceptance, rejection, or alteration of the Plan.
- 7. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as approved by the Board in writing.
- 8. The Licensee shall, within thirty (30) days of notification or within the timeframe specified by the Board, submit for review and/or Board's approval revisions for any plan found to be unacceptable to the Board.
- 9. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of the Licence, and any additional terms and conditions imposed upon approval of a Plan by the Board shall also become part of the Licence. All relevant terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.
- 10. The Licensee shall review the Plans referred to in this Licence as required by changes in operation and/or technology and modify the Plans accordingly. Revisions to any Plan shall be submitted in the form of an addendum to be included within the Annual Report required under Part B, Item 1, complete with the lists of revisions detailing where significant content changes are made.
- 11. The Licensee shall immediately report to the NWT/NU 24-Hour Spill Report Line (867-920-8130) any spills of Waste associated with the Undertakings under this Licence including the potable Water Treatment Facility and Waste Treatment Facilities, which are reported to or observed by the Licensee.
- 12. Any communication with respect to this Licence shall be made in writing to the attention of:

Manager of Licensing Nunavut Water Board P. O. Box 119 Goji Haven, NU X0B 1J0

Telephone: Fax:

(867) 360-6338

ax: (867) 360-6369

Email: licensing@nwb-oen.ca

13. Any notice made to an Inspector shall be made in writing to the attention of:



Water Resources Officer Nunavut District, Nunavut Region P.O. Box 100 Igaluit, NU X0A 0H0 Telephone:

(867) 975-4295

Fax:

(867) 979-6445

- 14. The Licensee shall submit, to the Board for information or as otherwise directed, one (1) paper copy and one (1) electronic copy of all reports, studies, and Plans generated for the works, activities, and undertakings under this Licence. All Reports, studies or Plans submitted to the Board by the Licensee shall include an executive summary in English, Inuktitut, and French.
- The Licensee shall ensure that any document(s) or correspondence submitted by the Licensee to the Board is received by the Board and maintain on file a copy of the acknowledgment of receipt issued by the Manager of Licensing or his/her designate.
- 16. This Licence is assignable as provided for in section 44 of the Act.
- 17. The expiry or cancellation of this Licence does not relieve the Licensee from any obligation imposed by the Licence, or any other regulatory requirement.

#### PART C: **CONDITIONS APPLYING TO SECURITY**

1. The Licensee is not required to post reclamation security for the activities, works, and undertakings authorized under this Licence.

#### PART D: CONDITIONS APPLYING TO THE USE OF WATERS AND WATER MANAGEMENT PLANS

- 1. The Licensee is authorized to withdraw, from the Lake Geraldine Reservoir at Monitoring Station No. IQA-01, up to 1,100,000 cubic metres of Water annually for the relevant activities, works, and undertakings authorized under the scope of this Licence.
- 2. The Licensee shall submit to the Board for approval, within sixty (60) days of the Effective Date of the Licence, an updated manual for the potable Water Treatment Facility. The Manual shall be prepared in accordance with relevant aspects of the format outlined in the Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories (GNWT, 1996). The manual shall, address among other items, the following:
  - Purpose of facility: a.
  - Site setting; b.



- Operational procedures for storage, treatment and distribution of potable Water;
   Waste generated and hazardous substances associated with the facility; site inspections; and personnel training;
- d. Maintenance procedures including equipment servicing;
- e. Sampling and monitoring requirements; and
- f. Emergency response measures.
- 3. The Licensee shall equip all freshwater intake structures with screens of appropriate mesh size that meet the requirements of Fisheries and Oceans (DFO) Canada's Freshwater Intake End-of-Pipe Fish Screen Guidelines (1995 or the most current) so as to prevent the entrainment of fish and control Water withdrawal rates such that fish do not become impinged within the screens.
- 4. The Licensee shall undertake Dam Safety Inspections (DSI) and/or Dam Safety Reviews (DSR) of the Lake Geraldine water supply facility in accordance with requirements of the Canadian Dam Association (CDA), Dam Safety Guidelines (2007, or the most current version). The Licensee shall submit for the Board's review, within the Annual Report required under Part B, Item 1, the report generated for the DSIs or DSRs along with the Licensee's recommended actions to address any deficiencies identified in the inspections and/or reviews.
- 5. The Licensee shall not remove any material from below the ordinary High Water Mark of any Water body unless otherwise approved by the Board in writing.
- 6. The Licensee shall not cause erosion to the banks of any body of Water and shall provide the necessary controls to prevent such erosion.
- 7. The Licensee shall implement necessary measures to control sediment and erosion prior to and during operations to prevent entry of sediments into Water.
- 8. The Licensee shall maintain the potable Water Treatment Facility in accordance with applicable guidelines, procedures, and regulations and to the satisfaction of an Inspector.
- 9. The Licensee shall, as part of any proposal to supplement the Lake Geraldine Reservoir, evaluate the potential impact on freshwater resources, including fish and fish habitat. The results of the evaluation must be included as part of any application to augment the Lake Geraldine Reservoir with Water from proximal water bodies.

# PART E: CONDITIONS APPLYING TO THE DEPOSIT OF WASTE AND WASTE MANAGEMENT PLANS

1. The Licensee is authorized to use the Sewage Lagoon Facility and the Wastewater Treatment Plant to treat and dispose of Wastewater generated by the Undertaking authorized under this Licence until such time that the Upgraded Wastewater Treatment Plant authorized by the



Licensee is constructed and commissioned, or as otherwise approved by the Board in writing.

- 2. The Licensee shall provide written notice to an Inspector and the Board at least ten (10) days prior to any planned Discharges from the Solid Waste Facility, Sewage Lagoon Facility, Wastewater Treatment Plant, and the Upgraded Wastewater Treatment Plant once commissioned.
- 3. The Licensee shall establish the relevant monitoring stations for the facilities authorized under this Licence in accordance with Schedule I.
- 4. The Licensee shall ensure that Surface Drainage or surface Water runoff associated with site activities or generated during the construction of any facility designed to withhold, divert, or retain Water or Waste, does not exceed the following Effluent criteria:

Parameter	Maximum Average Concentration	Maximum concentration of Any Grab Sample	
Total Suspended Solids (TSS)	50.0 mg/L	100.0 mg/L	
pН	Between 6 and 9.		

- 5. Upon commissioning of the Upgraded Wastewater Treatment Plant, the Sewage Lagoon Facility shall be used as a back-up facility or closed and reclaimed in accordance in Part J, Item 4.
- 6. The Licensee shall submit to the Board for approval in writing, within four (4) months of the Effective Date of the Licence, an Operation and Maintenance Manual for the Sewage Lagoon Facility that addresses requirements for both the Sewage Lagoon and Sludge Management Facilities. The manual shall be prepared in accordance with the Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories (GNWT, 1996).
- 7. The Licence shall submit to the Board for approval in writing, by December 21, 2018 or as otherwise directed by the Board in writing, an Operations and Maintenance Manual for the Upgraded Wastewater Treatment Plant that incorporates the requirements of Part E, Item 6. The manual shall be prepared in accordance with the Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories (GNWT, 1996).
- 8. The manual referred to in Part E, Item 7 shall supersede the manual referenced in Part E, Item 6, following approval by the Board in writing.
- 9. The Licensee shall submit to the Board for approval in writing, by December 31, 2018, an updated version of the plan entitled *City of Iqaluit Solid Waste Management Plan*, dated January 2014 that addresses relevant intervener's comments and recommendations made during the licensing process, such as inclusion of details related to future uses of the landfill, timeframe for closure, and ongoing activities within the scope of this Licence.



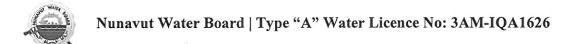
- 10. The Licensee shall undertake Dam Safety Inspections (DSI) and/or Dam Safety Reviews (DSR) of the Wastewater Treatment Facilities in accordance with requirements of the Canadian Dam Association (CDA), Dam Safety Guidelines (2007, or most current version). The Licensee shall submit for the Board's review, within the Annual Report required under Part B, Item 1, the report generated for the DSIs or DSRs along with the Licensee's recommended actions to address any deficiencies identified in the inspections and/or reviews.
- 11. The Licensee shall dispose of and contain all municipal solid waste generated by the City at the West 40 Landfill as associated site(s) authorized under this licence or as otherwise approved by the Board in writing.
- 12. The Licensee shall submit to the Board for approval, within sixty (60) days of the Effective Date of the Licence, an updated Landfill Operation and Maintenance Manual that addresses concerns raised by intervening parties during the licensing process including the following:
  - a. Management of Leachate from the facility;
  - b. Updated sampling and monitoring requirements; and
  - c. Open burning practices.
  - d. Ongoing activities within
- 13. The Licensee shall collect and contain all leachate generated by the West 40 Landfill within the Landfill.
- 14. The Licensee shall submit to the Board for review, by December 31, 2017, an updated version of the document entitled *West 40 Landfill Drainage Management Review*, dated September 16, 2011, that addresses the concerns raised by intervening parties including information on the absence of permafrost related data.
- 15. The Inspector may authorize an emergency Discharge ,following the Licensee's written submission to the Inspector and to the Board, at least fifteen (15) days prior to discharge or as instructed by the Inspector, that includes the following information:
  - a. Proposed quantity of discharge;
  - b. Reason for discharge;
  - c. Identification of the Final Discharge Location;
  - d. Proposed sampling and analysis to be conducted; and
  - e. Proposed mitigation measures to implemented.
- 16. The Licensee shall submit to the Board and the Inspector for review, within sixty (60) days following any emergency Discharge authorized by the Inspector, a report that includes, among other items, an analysis of results for the emergency Discharge.
- 17. The Licensee shall maintain the Licensed Facilities to the satisfaction of an Inspector.



- 18. The Licensee shall remove from the site associated with the undertaking, all Hazardous Wastes, waste oil and non-combustible waste generated through the course of the operation, for disposal at a licensed waste disposal facility.
- 19. The Licensee shall maintain records of all Waste removed from site and records of confirmation of proper disposal of removed Waste. These records shall be made available to an Inspector or the Board upon request.

#### PART F: CONDITIONS APPLYING TO CONSTRUCTION

- 1. The Licensee shall, submit to the Board for review, within thirty (30) days prior to commencing construction of any facilities or infrastructure authorized under this Licence, for-construction designs and drawings, signed and stamped by an Engineer.
- 2. The Licensee shall ensure that all relevant approved facilities are designed and constructed to engineering standards such that, at a minimum, they comply with the most current version of the *Canadian Dam Safety Guidelines*.
- 3. The Licensee shall implement measures to ensure that all materials used in the construction of relevant facilities or infrastructure included under the scope of this Licence are free of contaminants, to the extent that they do not cause harmful or significant effects to Water.
- 4. The Licensee shall maintain shoreline stability during construction.
- 5. The Licensee shall ensure that all final designs and drawings are qualified by an Engineer confirming that:
  - a. Works are designed under sound engineering principles;
  - b. Design limitations are understood and communicated within the report; and
  - c. Measures are implemented to minimize impact to Water.
- 6. The Licensee shall, submit to the Board for review, within ninety (90) days of completion of any structure authorized under this licence, to contain, withhold, divert or retain Water or Wastes; a construction summary report prepared by an Engineer that includes, among other relevant information, as-built drawings, documentation of field decisions that deviated from original plans, and any data used to support these decisions.
- 7. The Licensee shall, if contamination of surface and/or ground water is encountered during construction and excavation, notify the Inspector immediately and implement the Spill Contingency Plan.
- 8. The Licensee shall develop and implement measures necessary to prevent and mitigate erosion and/or the release of sediment into Water during the construction of the Upgraded Wastewater Treatment Plant or during any construction activities associated with the Undertaking.



#### PART G: CONDITIONS APPLYING TO MODIFICATIONS

- 1. The Licensee may, without written consent from the Board, carry out Modifications to the potable Water Treatment Facility and Waste Treatment Facilities provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:
  - a. the Licensee has notified the Board in writing of such proposed Modifications at least sixty (60) days prior to beginning the Modifications;
  - b. Such Modifications are consistent with the NPC Land Use Planning (NPC) Conformity Determination and the NIRB Screening Decision;
  - c. such Modifications do not place the Licensee in contravention of the Licence or the *Act*:
  - d. the Board has not, during the sixty (60) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
  - e. The Board has not rejected the proposed Modifications.
- 2. Modifications for which all of the conditions referred to in Part G, Item 1 have not been met can be carried out only with written approval from the Board.
- 3. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modifications. These plans and drawings shall be stamped by an Engineer.

#### PART H: CONDITIONS APPLYING TO SPILL CONTINGENCY PLANNING

- 1. The Licensee shall, submit to the Board for approval in writing, within thirty (30) days of the Effective Date of this Licence, an amalgamated and updated Spill Contingency Plan. The Plan shall address spill contingency planning requirements for all relevant aspects of works, activities, and undertakings associated with the scope of this Licence including the Sewage Lift Station.
- 2. The Licensee shall, subject to section 16 of the Regulations, report any unauthorized deposits of Waste or foreseeable unauthorized deposits of waste and/or Discharges of Effluent, and:
  - a Employ, as required, the approved Spill Contingency Plan;
  - b Report the incident immediately via the NWT/NU 24-Hour Spill Reporting Line (867) 920-8130 and to the Inspector at (867) 975-4295; and
  - c For each spill occurrence, submit a detailed report to the Inspector, no later than thirty (30) days after initially reporting the event. The report shall include the amount and



type of spilled product, the GPS location of the spill, and the measures taken to contain, clean up and restore the spill site.

3. The Licensee shall, in addition to Part H, Item 2, regardless of the quantity of release of a harmful substance, report to the NWT/NU Spill Line if the release is near or into a Water body.

#### PART I: <u>CONDITIONS APPLYING TO MONITORING</u>

- The Licensee shall monitor the relevant potable Water Treatment Facility and Waste Treatment Facilities authorized under this Licence in accordance with requirements included under <u>Schedule I</u>.
- 2. The Licensee shall, submit Board for approval in writing, within sixty (60) days of the Effective Date of this Licence, an updated Monitoring Program that addresses monitoring requirements for the Water Treatment Facility and Waste Treatment Facilities. The Monitoring Program shall address, among other items, the requirements outlined in Schedule I.
- 3. All analyses required under <u>Schedule I</u> shall be conducted using methods as described in the most recent edition of "Standard Methods for the Examination of Water and Wastewater", or by such other methods as approved by the Board in writing.
- 4. All laboratory analyses shall be performed at a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.
- 5. The Licensee shall, submit to the Board for review, within sixty (60) days of the Effective Date of the Licence, an updated Quality Assurance/Quality Control (QA/QC) Plan prepared in accordance with Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan (INAC, 1996 or most current version). The updated plan shall be accompanied by a letter from an Analyst of an accredited laboratory confirming acceptability of the Plan.
- 6. The Licensee shall measure by instrument and record in cubic metres, the monthly quantities of freshwater extracted from the Lake Geraldine Reservoir, at Monitoring Program Station No. IQA-01, used for all purposes under this Licence.
- 7. The Licensee shall measure, by instrument and record in cubic metres, the quantities of Effluent released from the Sewage Lagoon Facility at Monitoring Station No. IQA-02, Wastewater Treatment Plant and/or Upgraded Wastewater Treatment Plant at Monitoring Station No. IQA-04 and the West 40 Landfill at Monitoring Station No. IQA-08.
- 8. The Licensee shall measure and record in cubic metres, the monthly and annual volumes of sludge removed from the Wastewater Treatment Facilities.



- 9. The Licensee shall provide the GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) of all locations of sources of Water utilized and Waste deposited under this Licence.
- 10. The Licensee shall include all of the data and information required by the Monitoring Program under Schedule I within the Annual Report required under Part B, Item 1 of the Licence or as otherwise requested by an Inspector and/or the Board.
- 11. Additional Monitoring may be requested by the Board and/or the Inspector.
- 12. The Monitoring Program and compliance dates specified in the Licence may be modified at the discretion of the Board in writing and do not constitute an application for Amendment as defined in the *Act*.

#### PART J: CONDITIONS APPLYING TO CLOSURE AND RECLAMATION

- 1. The Board has accepted the document entitled *Iqaluit Solid Waste Management Plan West 40 Landfill Decommissioning Technical Memorandum*, dated January 2014, submitted as additional information with the Application.
- 2. The Licensee shall submit to the Board for approval in writing, at least one (1) year prior to commencing the decommissioning of the West 40 Landfill, a Final Closure and Reclamation Plan prepared by an Engineer in accordance with industry's best practices and relevant guidelines.
- 3. The Licensee shall, for the Plan required under Part J, Item 2, include a presentation of data and a discussion of environmental conditions existing before the use of the site by the Licensee as a municipal landfill, as well as remediation objectives.
- 4. The Licensee shall notify the Board in writing, at least one year prior to the implementation of final closure, of its intentions to proceed with final closure of any Water use or Waste disposal facilities included within the scope of this Licence, excluding the Facility under Part J, Item 2.



#### **SCHEDULES**

Schedule A: Scope, Definitions, and Enforcement

Schedule B: General Conditions

Schedule C: No Schedule for Security

Schedule D: No Schedule for Use of Water and Water Management Plans

Schedule E: No Schedule Waste Disposal and Waste Management Plans

Schedule F: No Schedule for Construction

Schedule G: No Schedule for Modifications

Schedule H: No Schedule for Spill Contingency Planning

Schedule I: Monitoring

Schedule J: No Schedule for Closure and Reclamation



#### Schedule A: Definitions

In this Licence, 3AM-IQA1626:

- "Act" means the Nunavut Waters and Nunavut Surface Rights Tribunal Act;
- "Addendum" means the supplemental text that is added to a full plan, manual, or report, usually included at the end of the document and is not intended to require a full resubmission of the revised report. It may also be considered as an appendix or supplement;
- "<u>Amendment</u>" means a change to any terms and conditions of this Licence through application to the NWB, requiring a change, addition, or deletion of specific terms and conditions of the Licence not considered as a modification;
- "Analyst" means an Analyst designated by the Minister under section 85 (1) of the Act;
- "Annually" means, in the context of monitoring frequency, one sampling event occurring every 365 days with a minimum of 200 days between sampling events;
- "<u>Application</u>" means, for the purposes of this License, the totality of the NWB Public Register opened as a result of the filing of the application to replace and amend expired Water Licence 3AM-IQA0611(3AM-IQA0612);
- "Biannually" means, in the context of the monitoring frequency, two sampling events occurring per calendar year, with a minimum of 150 days and a maximum of 210 days between sampling events;
- "Board" means the Nunavut Water Board established under Article 13 of the Nunavut Land Claims Agreement and under section 14 of the Act;
- "Discharge" means the release of any Water or Waste to the receiving environment;
- "Effective Date" means the date on which the Minister of Indigenous and Northern Affairs Canada approves the Licence;
- "Effluent" means treated or untreated liquid Waste material that is Discharged into the environment from the site water management facilities such as a settling pond or a treatment plant;
- "Engineer" means a professional engineer registered to practice in Nunavut in accordance with the Consolidation of Engineers and Geoscientists Act S. Nu 2008, c.2 and the Engineering and Geoscience Professions Act S.N.W.T. 2006, c.16 Amended by S.N.W.T. 2009, c.12;
- "Engineered Structure" means any facility, designed and approved by a Professional Engineer who is registered with the Association of Professional Engineers, Geologists and Geophysicists of Nunavut;



- "Grab Sample" means an undiluted quantity of material collected at a particular time and place that may be representative of the total substance being sampled at the time and place it was collected;
- "Greywater" means the component of Effluent produced from domestic use (i.e. washing, bathing, food preparation and laundering), excluding Sewage;
- "Hazardous Waste" means materials or contaminants categorized as dangerous goods under the *Transportation of Dangerous Good Act* (1992), no longer used for their original purpose and intended for recycling, treatment, disposal or storage at appropriate facilities;
- "<u>High Water Mark</u>" means the usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land (ref. Department of Fisheries and Oceans Canada, Operational Statement: Mineral Exploration Activities);
- "Inspector" means an Inspector designated by the Minister under section 85 (1) of the Act;
- "<u>Licence</u>" means this Type "A" Water Licence No. 3AM-IQA1626, issued by the Nunavut Water Board to the City of Iqaluit in accordance with the Act;
- "Licensee" means the entity to whom Licence No. 3AM-IQA1626 is issued or assigned;
- "Minister" means the Minister of Indigenous and Northern Affairs Canada (INAC);
- "Modification" means an alteration to a physical work that may introduce a new structure or eliminates an existing structure and does not alter the purpose or function of the work;
- "Monitoring Program" means the program to collect data on surface water and groundwater quality to assess impacts to the environment of an appurtenant undertaking;
- "Monthly" means, in the context of monitoring frequency, one sampling event occurring within calendar month with a minimum of twenty-one (21) days between sampling events;
- "Nunavut Land Claims Agreement" (NLCA) means the "Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada," including its preamble and schedules, and any Amendments to that agreement made pursuant to it;
- "Quality Assurance / Quality Control (QA/QC)" Quality Assurance means the system of activities designed to better ensure that quality control is done effectively; Quality Control means the use of established procedures to achieve standards of measurement for the three principle components of quality: precision, accuracy and reliability;



- "<u>Quarterly</u>" means divisions of the calendar year, comprised of three month intervals from January to December, inclusive (January March, April June, July September and October December);
- "Regulations" means the Nunavut Waters Regulations (SOR/2013/669 18th April, 2013);
- "Sewage" means all toilet wastes and greywater;
- "Sewage Lagoon Facility" refers to the waste disposal facility and associated structures designed and constructed to treat Sewage in the City of Iqaluit since 1978, which has also been upgraded in subsequent years;
- "<u>Sludge Management Facility</u>" means the facility located within the West 40 Landfill that is used for the disposal and treatment of sludge generated by the Wastewater Treatment Plant;
- "<u>Solid Waste Facility</u>" means the West 40 Landfill, Sludge Management Facility and all other facilities identified in the Application that are designed and constructed to manage solid waste generated by the City of Iqaluit;
- "Surface Drainage" means all surface waters resulting from the flow over, through or out of an operations area and is collected by means of Engineered structures;
- "<u>Undertaking or Undertakings</u>" means an undertaking or undertakings in respect of which Water is to be used or Waste is to be deposited, as classified in Schedule 1 of the *Regulations*;
- "<u>Upgraded Wastewater Treatment Plant (UWWTP)</u>" means the current Wastewater Treatment Plant, which was designed, constructed, and commissioned under Phase 1, for the preliminary treatment of Wastewater, in addition to the infrastructure scheduled for construction and commissioning by December 2018, under Phase 2, for the secondary treatment of Wastewater as described in the Application;
- "Use" means use as defined in section 4 of the Act;
- "Waste" means Water as defined in section 4 of the Act;
- "Waste Treatment Facilities" refers to all facilities constructed and operated by the City of Iqaluit to manage solid and liquid Waste associated with this licence.
- "Wastewater" means the water generated by site activities or originates on-site that requires treatment or any other water management activity;
- "<u>Wastewater Treatment Facilities</u>" means the Sewage Lagoon, Wastewater Treatment Plant, Upgraded Wastewater Treatment Plant and associated facilities authorized under this Licence;



"Wastewater Treatment Plant" means the engineered system, located adjacent to the Sewage Lagoon Facility that is designed for the containment and preliminary treatment of Sewage generated by the City of Iqaluit as described in the Application;

"Water or Waters" means water as defined in section 4 of the Act;

"<u>Water Treatment Facility</u>" means the engineered facilities and appurtenances designed and constructed for the withdrawal storage treatment and distribution of fresh water for domestic purposes, described in the Application; and

"West 40 Landfill" means the Solid Waste Facility or original landfill facility along with its Northern Expansion and Sludge Management Facility that is designed to manage solid waste generated by the City of Iqaluit.



#### Schedule B: Annual Reporting Requirements

The Annual Report referred to in Part B, Item 1, shall include the following:

- a. The monthly and annual quantities in cubic metres of fresh Water withdrawn from the Lake Geraldine Reservoir at Monitoring Station No. IQA-01;
- b. The monthly and annual quantities in cubic metres of any Discharges from the Wastewater Treatment Facilities at Monitoring Stations IQA-02, IQA-04, and IQA-08;
- c. Copy of reports generated from Dam Safety Inspections and Dam Safety Reviews along with the Licensee's proposed actions to address issues identified and/or updates on continuing actions to address issues;
- d. The monthly and annual quantities in cubic metres of sludge removed from the Wastewater Treatment Facilities;
- e. The monthly and annual quantities of Wastes disposed of at the West 40 landfill;
- f. A summary report which includes all data and information generated under the Monitoring Program, including the QA/QC program, in electronic and printed formats acceptable to the Board;
- g. A summary of all construction activities carried out for facilities under the Licence;
- h. A summary of modifications and/or major maintenance work carried out on the potable Water Treatment and Waste Treatment Facilities, including all associated structures;
- i. A progress report and revisions (if applicable) to any studies requested by the Board that relate to Waste management, Water use or reclamation and a brief description of any future studies planned by the Licensee including, a non-technical executive summary for the general public, translated into Inuktitut;
- j. Any revisions required, in the form of addenda, to Plans, Manuals and Reports approved under the Licence;
- k. A list and description, including volumes and Spill Report Line Identification Number, of all un-authorized Discharges, spills and summaries of follow-up action taken;
- 1. A summary of any closure and reclamation work undertaken and an outline of any work anticipated for the next year, including any changes to implementation and scheduling;
- m. A summary of actions taken to address concerns or deficiencies listed in the inspection reports and/or compliance reports filed by an Inspector;
- n. A brief update on the implementation plan of all facilities within the scope of this Licence including changes projected implementation and status of the Upgraded Wastewater Treatment Plant;
- o. A summary of any studies, reports and plans requested by the Board that relate to Waste disposal, Water use or reclamation and a brief description of any future studies planned; and
- p. Any other details on the use of Water or Waste disposal requested by the Board by November 1<sup>st</sup> of the year being reported.



# Nunavut Water Board | Type "A" Water Licence No: 3AM-IQA1626

# Schedule I: Condition Applying to Monitoring

Test Groups Analytical Parameters		Units
Routine (R)	Alkalinity, Acidity, Chloride, Carbonate, Bicarbonate, Total Hardness, Hydroxide, Sulphate, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Total Organic Carbon (TOC), Total Inorganic Carbon (TIC)	. mg/L
routine (re)	pH (field and lab)	pH units
	Oxidation-Reduction Potential (ORP) (field)	mV
	Conductivity (field and lab)	uS/cm
	Temperature (field)	°C
	Turbidity	NTU
	Total Suspended Solids (TSS)	mg/L
Effment (E)	Temperature (field)	°C
Effluent (E)	Conductivity (field and lab)	uS/cm
	pH (field and lab)	pH units
Based on Environment Canada's Procedure for pH Stabilization During the Testing of Acute Lethality of Wastewater Effluent to Rainbow Trout (EPS 1/RM/50, March 2008), if single concentration test fails and unionized ammonia concentration is less than or equal to 1.25 mg/ L		"Pass" / "Fail"
ICP- Metals Scan (Total)	Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sn, Ag, Sr, Tl, Ti, U, V, Zn, Hg	mg/L
Nutrienta (NI)	Ammonia-N, Nitrate-N, Nitrite-N	mg N/L
Nutrients (N)	Total Phosphorus, Orthophosphate	mg/L
Piological (P)	Biochemical Oxygen Demand	mg/L
Biological (B)	Total and Fecal Coliform	CFU/100 mL
	Fecal Coliform	CFU/100 mL
Potable Water (PW)	ICP Metals (Total and dissolved)	mg/L
	Total Suspended Solids –TSS	mg/L
Flow (F)	Volume	m <sup>3</sup>
Landfill Specific (LS)	Polychlorinated Biphenyls (PCBs) Benzene, Toluene, Ethylbenzene and Xylene (BTEX)	mg/L



# Nunavut Water Board | Type "A" Water Licence No: 3AM-IQA1626

Table  $2^1$  - Water Quality Monitoring Criteria

Station ID	Description	Status	Parameter	Testing / Measurement Frequency	Reporting Frequency	
	Lake Geraldine		R, PW	Monthly	Biannually	
IQA-01	Reservoir – Raw Water	Active	F	Monthly	Diamidany	
IQA-01(#)	Based on Part I, Item 4 of Expired Licence	Inactive	N/A	N/A	N/A	
IQA-02	Sewage Lagoon – Effluent Discharge Point	Active	B, N, E, ICP	Once prior to discharge; once during discharge; and once prior to the completion of discharge	Annually	
			F	During decant		
IQA-03	Sewage Lagoon – Influent	Inactive	N/A	N/A	N/A	
			B, N, E, ICP	Quarterly – Prior to commissioning of the WWTP		
IQA-04	Wastewater Treatment Plant - Effluent	Active	B, N, E, ICP	Monthly – Following commissioning of the WWTP	Annually	
Plant - Efficient		*	AL	Annually – following commissioning of the WWTP		
			F	During Discharge		
V.				Biannually – Prior to commissioning of the WWTP	Annually	
IQA-05	Wastewater Treatment Plant - Influent	Active	B, E, N, ICP	No testing requirements following commissioning of the WWTP	N/A	
IQA-06	Sludge – From WWTP	Active	B, E, N, ICP	Quarterly	Annually	
IQA-07	Surface Water entering West 40 Landfill – Based on Part E, Item 4 of the Expired Licence	Inactive	N/A	N/A	N/A	



# Nunavut Water Board | Type "A" Water Licence No: 3AM-IQA1626

Station ID	Description	Status	Parameter	Testing / Measurement Frequency	Reporting Frequency
IQA-08	West 40 Landfill – Effluent Discharge Point, Based on Part E, Item 4 of the Expired Licence	Active	B, E, N, ICP, F, LS	Once prior to discharge; once during discharge; and once prior to the completion of discharge	Annually
	Electrice		F	During Discharge	-
IQA-08(#)	Based on E, Item 17, Part F, Item 10 & Part I, Item 4 of the Expired Licence	Inactive	N/A <sup>2</sup>	N/A	N/A
IQA-08A	Station situated upgradient of West 40 Landfill	Active	B, E, N, ICP,	Annually	Annually
IQA-08B	Station situated down- gradient of West 40 Landfill	Active	F, LS		
IQA-09	Contaminated soil accepted at the West 40 Landfill	Inactive	NA	N/A	N/A

 $<sup>^1</sup>$  Table 2 may be modified by the Board and re-issued where necessary. Re-issuance is not considered an Amendment to the application or Licence as defined in the Act.  $^2$  Means not applicable



# **Landfill Emergency Response Plan**

# 1. Overview

# 1.1 Introduction

The purpose of the landfill emergency response plan sets out appropriate procedures to address foreseeable emergencies. The key elements of this plan are:

- 1. What is the nature and severity of the emergency?
- 2. What is to be done?
- Who does it?

The emergency response plan addresses the following items:

- Fires (Section 2);
- Accidents and Medical Emergencies (Section 3); and
- Environmental and Operational Emergencies (Section 4).

# 1.2 Emergency Plan Updates

The Departments of Public Works, and Emergency and Protective Services will review the emergency plan annually or following an emergency incident to ensure that:

- Emergency response procedures for the landfill are effective and updated as necessary;
- Appropriate individuals are appointed to manage emergency situations;
- Regular fire prevention meetings are conducted with all landfill employees and the Fire Department; and
- Regular safety and emergency meetings are held with landfill employees.

# 1.3 Emergency Coordination

The key to success of the emergency plan is to assign a responsible person to take charge of an emergency situation. The Landfill Foreman is designated to have the primary responsibility to manage emergency situations at the landfill.

The Landfill Foreman will have <u>full authority</u> of the emergency until Emergency and Protective Services arrives. This, together with proper training of operating personnel, practice drills to test emergency response activities, and continual review and updating of the plan, will be undertaken to ensure an efficient and effective response to any emergency that may occur.

The Landfill Foreman's responsibilities include to:

- Declare an emergency;
- Review and update the emergency response procedures;
- Ensure that all emergency response procedures are appropriate;

- Respond to all emergencies and contact appropriate emergency response agencies; •
- Establish control of the emergency prior to the arrival of appropriate emergency response agencies;
- Direct personnel and site visitors to a safe marshalling area;
- Liaise with the emergency response representatives upon their arrival;
- Correct any potential emergency or unsafe situations; and
- Complete necessary documentation with respect to emergencies.

The Landfill Foreman will report any emergency or contingency situations to the Superintendent. The Superintendent will contact appropriate agencies to report incidents related to environmental or health and safety issues associated with the emergency or contingency activities.

#### 2. **Evacuation Procedures**

In the event that an area or structure at the landfill must be evacuated due to a fire, gaseous, or other situations, landfill employees, customers, and site visitors will be evacuated via the closest exit and will proceed to a designated marshalling area.

In the event of a fire or gaseous release from active areas of the landfill, the Landfill Foreman will direct all staff and site visitors to immediately leave the area and proceed to the designated marshalling area. Visitors will be requested to remain at the marshalling area until otherwise notified.

The marshalling area is to be designated for each emergency situation according to the nature of the emergency, the location of the emergency, and the location of a safe exit route. A marshalling area must not be used when it is unsafe or is downwind of a fire or gaseous release.

Marshalling areas are:

- 1. Primary: The road outside the main gate and building; and
- 2. An alternate area designated by the Landfill Foreman.

When the evacuation is complete, the Landfill Foreman will proceed to the marshalling area.

The prime consideration for the Landfill Foreman is to ensure that all employees and site visitors are safely evacuated. The Landfill Foreman will:

- Await appropriate emergency response personnel; and
- As required, establish perimeter security, conduct searches, and/or take other actions that may be warranted by specific circumstances.

It is imperative that all employees and visitors remain at the marshalling area until the Landfill Foreman gives permission to return to the working disposal areas or to leave the site.

# 3. Fire

# 3.1 Fire Prevention

The landfill will be operated in a manner that will minimize the potential for landfill fires. Fire prevention techniques will include:

- Thoroughly compacting all waste;
- Maintaining a comprehensive load checking program to prevent the dumping of hot/burning, explosives or combustible waste;
- Maintaining a program of separating the dumping of ash barrels from general waste tipping face;
- Site inspection, in particular of the working face, with regard to any trail of smoke etc before finishing work;
- Training employees on early fire hazard recognition; and
- Conducting emergency response drills at least bi-annually, which are to be documented and reviewed with landfill staff.

NOTE: FOR ALL FIRE OCCURANCES, AN INCIDENT REPORT MUST BE COMPLETED AND FILED, WITH A COPY SENT TO THE SAFETY OFFICER

# 3.2 General Fire Response Procedures

Fires may occur at the following locations:

- Fires in the site building;
- Fires in the recycling storage area or hazardous waste storage compounds; or
- Fires at the active landfill working face.

All fires will be reported as an emergency situation. Should an emergency occur, employees shall report to the primary marshalling area. Should the primary marshalling area be inaccessible, employees shall report alternate safe site as directed by the Landfill Foreman.

# 3.3 General Instructions

The greatest danger lies not in fighting the fire, but in the panic that arises from a fire. Spend a few minutes getting a handle on the situation. A landfill fire will not travel fast, so a 10 minute delay is not going to make any difference to the outcome of the fire. Go through the steps to notify the appropriate authorities and follow the basic steps in the fire control plan, including:

- Contact other nearby employees;
- Summon the appropriate landfill equipment;
- Notify Emergency Services and tell them the location and type of fire and whether or not it looks like it will spread out of the immediate area;
- Notify surrounding property owners, particularly if it appears that the fire could spread beyond the landfill;
- When Emergency Services arrive, follow their instructions:
- · Do not fight fire alone; and
- Do not place yourself or others in danger while fighting the fire.

# 3.4 General Fire-Fighting Guidelines

A landfill fire is controlled better with the use of a bulldozer and dirt. If it is safe to do so, dig out to the source and isolate the burning waste. Then either let it burn out or cover with dirt. Lots of water will not necessarily extinguish the fire and can cause more problems than it solves.

- Do not overuse water. Remember that most landfill fires can be controlled with a relatively small amount of water. In most cases, soil is more effective than water to smother the fire;
- If two or more water trucks are being used, try to use shifts so that at least one water truck is at the fire at all times;
- Do not waste time trying to fight a large fire with a fire extinguisher;
- Do not approach any fire with a tractor unless a water truck is close by for backup;
- Never risk personal injury or death attempting to save a machine or building; and
- Remember, SAFETY FIRST.

## 3.5 Small Contained Fires

- Do not attempt to fight a fire alone;
- Secure the area and re-direct customers to a safe area;
- Work with other site staff to extinguish the fire ONLY if safe to do so;
- If the fire becomes uncontained, or if it gives off toxic fumes, do not attempt to extinguish the fire; and wait for the Emergency Services to arrive.

## 3.6 Uncontained Fires

- Do not attempt to fight the fire;
- Follow evacuation procedures; and
- Call the Fire Department: (867) 979-5650.

# 3.7 Site Building Fires

#### Prevention

- Staff training and awareness.
- Coordination with the Fire Department.

# Response

Action	Time Frame	Who?	Resources
Evacuate building	Immediately	All staff	
Call Emergency Services &	Immediately	Landfill	
Superintendent		Foreman/Operator	
Secure area	Immediately	Landfill	
		Foreman/Operator	

# 3.8 Fires at the Working Face

# **Prevention**

- Staff training and awareness.
- Waste acceptance procedures and policies.
- Diversion of hot loads, combustible and/or explosive material from working face.
- Application of cover soils to minimize size of the active working face.

# Response

Action	Time Frame	Who?	Resources
Evacuate and secure the area	Immediately	Landfill Foreman	Site staff
Call:	Immediately	Landfill Foreman	Site staff
Emergency Services			
Superintendent			
Isolate the burning wastes	As soon as it is determined safe to do so	Landfill Foreman Emergency Services	Landfill Equipment
Determine the nature and extent of the fire	Immediately	Landfill Foreman Emergency Services	Site staff
Excavate, remove, and soak	As soon as it is	Landfill Foreman and	Site staff
the burning waste	determined safe	Emergency Services	Fire Department
	to do so		Water Truck Water pumps
Cover the burning area	Immediately after the source of burning waste has been excavated and removed, and as soon as it is safe to do so	Landfill Foreman and Emergency Services	Site staff Fire Department Landfill equipment
Appoint staff for fire guard	After fire is extinguished	Landfill Foreman	Site staff Fire Department
Confirm the fire is extinguished	Immediately	Landfill Foreman	Fire Department
Review the cause of fire and prepare appropriate mitigative measures	Within 1 month	Landfill Foreman Superintendent Director of Emergency and Protective	Site staff Fire Department
		Services	

# 3.9 Stored Material Fires

## Prevention

- Site security.
- Separation of stored materials according to the Fire Code.

# Response

Action	Time Frame	Who?	Resources
Evacuate and secure the area	Immediately	Landfill Foreman	Site staff
Call:	Immediately	Landfill Foreman Superintendent	Site staff
Determine the nature of the burning material and potential for emission of toxic fumes	Immediately	Landfill Foreman	Fire Department Safety Officer Superintendent Material Safety Data Sheets (MSDS)
Isolate the burning material	Immediately when safe to do so	Landfill Foreman Emergency Services	Fire Department Landfill Equipment
Determine the nature and extent of the fire	Immediately	Emergency Services	Site staff
Extinguish the fire as appropriate; according to the nature of the material	As soon as it is safe to do so	Emergency Services	Site staff Fire Department Landfill equipment Water truck Water pumps Safety Officer MSDS
Confirm the fire is extinguished	Immediately	Emergency Services	Fire Department
Review cause of fire and prepare appropriate mitigative measures	within 1 month	Landfill Foreman Superintendent Director of Emergency and Protective Services	Site staff Fire Department

# 4. Medical Emergencies

All injuries, even minor ones, should be considered important and should be reported as a safety incident to the Landfill Foreman.

First Aid should be applied in a manner that is appropriate to the nature of the injury. If the injury requires medical assistance, the individual should be taken to a medical emergency centre or an ambulance service contacted.

A medical doctor should be consulted for all injuries that may result in infections as a result of working with waste materials. This includes injuries such as cuts and scrapes, skin punctures with sharp items, and fire or chemical burns.

If the person injured on-site is a customer or visitor, Landfill Foreman employees are to provide any assistance necessary and will apply appropriate First Aid.

NOTE: FOR ALL MEDICAL EMERGENCY OCCURRENCES AN ACCIDENT/INCIDENT REPORT MUST BE COMPLETED AND FILED, WITH A COPY SENT TO THE SAFETY OFFICER AND WSCC.

# 4.1 Minor Medical Injuries

# Prevention

- Safety plan and procedures;
- Employee safety training and awareness; and
- First Aid training.

# **Response Plan**

Action	Time Frame	Who?	Resources
Apply appropriate First Aid	Immediately	Trained First Aider	
Recommend that the injured person consult a physician	Immediately	Trained First Aider	
Take the injured person to a medical emergency centre or contact an ambulance service if deemed appropriate	Immediately	Trained First Aider Emergency Services	
Contact Safety Officer and Superintendent	Immediately	Landfill Foreman	
Report Injury to WSCC	Within 3 days	Landfill Foreman Safety Officer	
Record injury in the daily report	To the end of the work day	Landfill Foreman	Landfill Foreman
Review cause of the injury and prepare appropriate mitigative measures	Within 1 month	Landfill Foreman Superintendent Director of Emergency and Protective Services	Landfill Foreman Occupational Health and Safety Committee

# 4.2 Serious Medical Injury

# Prevention

- Safety plan and procedures.
- Employee safety training and awareness.
- First Aid training.

# Response Plan

Action	Time Frame	Who?	Resources
Assess site conditions for personal safety and safety of others, and take appropriate actions to secure unsafe areas	Immediately	Landfill Foreman Trained First Aider	Landfill Foreman
Attend to the injured person and apply First Aid	Immediately when safe to do so	Trained First Aider	
Contact:  • Emergency Services/ Ambulance • Superintendent • Safety Officer • WSCC	Immediately	Trained First Aider Landfill Foreman	
Stay with the injured person until medical assistance arrives	Duration of medical emergency	Trained First Aider	
Report to WSCC	Within 24 hours	Landfill Foreman Safety Officer	
Record injury in the daily report	By the end of the work day	Landfill Foreman or Designated Alternate	Landfill Foreman
Conduct an investigation to determine the cause of injury and prepare appropriate mitigative measures	Investigate immediately following the incident Complete mitigative measures within 1 month of the incident	Landfill Foreman Superintendent Director of Emergency and Protective Services	Site Personnel Occupational Health and Safety

# 4.3 Vehicle or Equipment Accidents

All vehicle accidents should be reported to Municipal Enforcement and an investigation as to the cause should be carried out. Following the investigation, appropriate mitigative measure should be determined and implemented to avoid future accidents.

## Prevention

- Safety plan and procedures.
- Employee safety training and awareness.
- Traffic control signs.
- Vehicle spotting during heavy traffic situations.

# Response Plan

Action	Time Frame	Who?	Resources
Report the accident to the Landfill Foreman	Immediately	All employees	
If damage is minor, have the vehicle driver report the accident to the Iqaluit Municipal Enforcement Department	Immediately	Landfill Foreman	Accident Investigation Program
If the damage is significant, call the Iqaluit Municipal Enforcement Department	Immediately	Landfill Foreman	Accident Investigation Program
If an injury is involved, the RCMP ((867) 979-1111), and implement medical response actions	Immediately	Landfill Foreman	Accident Investigation Program
Secure the area for a follow-up investigation	Immediately	Landfill Foreman RCMP or Iqaluit Municipal Enforcement	Accident Investigation Program
Record the injury in the daily report	By the end of the work day	Landfill Foreman or Designated Alternate	Landfill Foreman Accident Investigation Program
Conduct an investigation into the cause of the accident and prepare appropriate mitigative measures	Within 1 month of the accident	Landfill Foreman Superintendent RCMP Director of Emergency and Protective Services	Occupational Health and Safety Accident Investigation Program

# 5. Environmental and Operational Contingencies

Environmental and Operational contingencies may vary in nature and degree of seriousness. Therefore, actual situations will dictate the appropriate actions and responses that should be undertaken. Generally, the response plan includes the following steps:

- Secure and contain the problem;
- Verify and validate the problem;
- Investigate the cause and potential risk;
- Assess appropriate corrective actions;
- Implement the corrective action; and
- Review operations procedures and preventative measures.

# 5.1 Spills

In the event of a spill, the Landfill Foreman is to immediately implement the spill response plan. The Superintendent should be notified of the nature of the release as well as the activities and corrective actions being taken.

A spill report must be filled out and sent to the Spill Line once the spill is contained and clean up has started. Please see Appendix B: Forms for a copy of the Spill Report Form that includes contact information.

# 5.2 Prohibited Wastes Delivered to the Landfill

# Prevention

- Waste acceptance policies and procedures.
- Employee training and awareness.

# Response Plan

Action	Time Frame	Who?	Resources
Deny entry of the load	Immediately	Landfill	Operations and Maintenance
		Foreman	Plan
			Waste Acceptance
			Procedures
			NWB
Determine if load is safe for transport on local	Immediately	Landfill	Transport Canada
roads		Foreman	Transport of Dangerous
			Goods Regulations
Inform the waste generator of the infraction	Immediately	Landfill	
		Foreman	
Document the nature of incident and actions	Within 1 hour	Landfill	Daily Activity Log Book
taken		Foreman	Hazardous Material Load
			Check Form
Review waste acceptance procedures and	Within 1	Landfill	Safety Officer
implement necessary mitigative measures	month	Foreman	
		Superintendent	

# 5.3 Prohibited Waste Discovered at the Landfill

# Prevention

- Waste acceptance policies and procedures.
- Employee training and awareness.

# Response Plan

Action	Time Frame	Who?	Resources
Isolate waste and cease operations in the area of the waste	Immediately	Landfill Foreman	Safety Officer Environmental Consultant
Construct containment around perimeter of the waste if necessary	Immediately	Landfill Foreman	Landfill equipment
Determine how to safely handle the waste	Immediately	Landfill Foreman	MSDS Safety Officer Superintendent
Determine source of waste, and if possible the waste hauler and generator	Within 1 week	Landfill Foreman	Daily Activity Log Book Staff observations Tipping Receipt Book
If identified, contact the hauler and waste generator to review options	Within 1 to 2 weeks	Landfill Foreman	
Document nature of incident and actions taken	Within 1 hour	Landfill Foreman	Daily Activity Log Book Hazardous Material Load Check Form
Inform Nunavut Water Board	When results have been confirmed	Landfill Foreman	
Review waste acceptance procedures and practices, and implement mitigative measures	Within 1 month	Landfill Foreman Superintendent	Safety Officer

# 5.4 Hot Loads Delivered to the Landfill

## Prevention

- Waste acceptance policies and procedures; and
- Employee training and awareness.

# Response Plan

Action	Time Frame	Who?	Resources
Direct the load to the	Immediately	Landfill Foreman	
designated area away			
from the working face			
Contain burning material	Immediately	Operating staff	
within soil berms			
Apply appropriate	Within 1 hour	Landfill Foreman	Water truck
measures to extinguish			Landfill Equipment
the fire: wet, smother			
with soil, or allow to burn			
out			
Monitor fire	For duration of	Landfill Foreman	
	fire		
Remove extinguished	Within 2 to 3	Landfill Foreman	Landfill Equipment
material and dispose at	days after being		
working face	extinguished		

# 5.5 Elevated Parameters Detected in Surface Water Monitoring System

# Prevention

- Annual groundwater monitoring program; and
- Environmental auditing.

# Response Plan

Action	Time Frame	Who?	Resources
Re-sample to verify or	Within 1 month	Landfill Foreman	Environmental Consultant
validate		Environmental	Laboratory
		Consultant	
Assess the nature and	Following re-sampling	Landfill Foreman	Environmental Consultant
risk of the problem		Environmental	AANDC Water Inspector
		Consultant	NWB
Investigate corrective	Following assessment	Superintendent	Environmental Consultant
measures	of the problem		AANDC Water Inspector
		_	NWB
Implement corrective	Following assessment	Superintendent	Environmental Consultant
measures	of the problem		AANDC Water Inspector
			NWB

# 5.6 Leachate Seepage through Cover System

# Prevention

- Minimize leachate generation by application of intermediate and final cover;
- Remove or penetrate intermediate cover before overfilling and/or implement vertical drain; and
- Prohibition of liquid waste disposal.

# Response Plan

Action	Time Frame	Who?	Resources
Isolate the area and implement containment to prevent leachate from entering off-site and on-site drainage systems	Immediately	Landfill Foreman	Environmental Consultant AANDC Water Inspector NWB
Investigate the cause of the seep	Within 2 days	Landfill Foreman	Environmental Consultant
Investigate corrective measures	Within 1 week	Landfill Foreman	Environmental Consultant AANDC Water Inspector NWB
Implement corrective measures	Within 2 weeks	Landfill Foreman	Environmental Consultant
Review operating procedures and revise if appropriate	Within 2 months	Landfill Foreman Superintendent	Environmental Consultant

# 5.7 Breach of the Final Cover System Prevention

Inspection of final cover, twice a year, for vegetative growth, animal burrows, erosion, settlement, or cracking.

# **Response Plan**

Action	Time Frame	Who?	Resources
Identify the nature and significance of the problem	Within 1 month	Landfill Foreman	Environmental Consultant
Develop a corrective plan for the breach	Within 2 to 6 months	Landfill Foreman	Environmental Consultant
Reconstruct the breached area	Within 2 to 6 months	Landfill Foreman Superintendent	Environmental Consultant

# 5.8 Wind-Blown Litter

## Prevention

- Encourage covers on inbound loads;
- Maintain as small a working face as is practical;
- Maintain portable litter catchment fences around active areas; and
- Maintain perimeter fencing.

# **Response Plan**

Action	Time Frame	Who?	Resources
Review working face	Immediately	Landfill Foreman	Environmental Consultant
and litter catchment			
fence placement			
Implement off-site litter	Within 1 week	Landfill Foreman	Temporary staff
pick-up			
Implement on-site litter	Within 1 month	Landfill Foreman	Temporary staff
pick-up			
Review litter control	Within 2 month	Landfill Foreman	Environmental Consultant
program and revise if		Superintendent	
necessary			

# 5.9 Extreme Dust Emissions

# Prevention

- Paved access road to disposal area;
- Controlled speed limits on on-site gravel roads;
- Road maintenance;
- Seed soil stockpiles;
- Cover inbound loads;
- Special handling procedures for waste loads prone to emission of dust; and
- Employee training and awareness.

# Response Plan

Action	Time Frame	Who?	Resources
Apply water to road	Within 2 hours	Landfill Foreman	
surfaces as necessary			
Deposit dusty loads in sheltered area	Upon unloading	Vehicle Foreman	
Pre-wet waste load	Prior to delivery when pre-arranged with waste generator	Waste Generator	
Cover dusty wastes with other waste or soil	Immediately upon unloading	Landfill Foreman	
Review waste handling procedures with waste generator for a specific problem material	Immediately	Landfill Foreman Superintendent	



Appendix •

**Spill Contingency Plan** 



# City of Iqaluit

Spill Contingency Plan

**Updated: March 2007** 

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# 1.0 INTRODUCTION

The purpose of this spill contingency plan is to outline a formal practical response system which can be implemented immediately in the event of a deleterious material, such as sewage or fuels, being spilled to the natural environment. The scope of the document includes spills resulting from activities carried out by the City of Iqaluit or from the failure of a system component in the City's infrastructure only. This plan is intended to promote the safe handling of potentially hazardous materials to minimize health hazards, environmental damage and clean up costs. The plan is written so it can be easily understood and be reasonably comprehensive in providing access to all information required for handling a spill.

Included with this plan is a one page "If You Discover a Spill" response sheet that is intended to be carried in City vehicles and posted in municipal work areas. In an emergency situation, prompt action is important and quick access to a response checklist may reduce the seriousness of a spill.

A sites plan has been included in Appendix A showing the existing layout of all buildings and waste handling/disposal facilities in the City.

## 2.0 REPORTING PROCEDURES

City of Iqaluit employees have access to mobile radios and key personnel can be reached through dispatch by pager on a 24-hour basis. The dispatch number is monitored 24 hours a day. All spills are determined to be the responsibility of the City and only these spills are reported to the dispatch number.

All spills exceeding reportable quantities are to be reported immediately to the NWT 24-hour Spill Report Line (867) 920-8130. Spill Report Line personnel will provide direction and will ensure that an investigation is undertaken by the appropriate government authority. Appendix C contains a listing of material and the quantities that are reportable in the event of a spill:

The following are contact numbers for municipal response personnel:

C	CITY OF IQALUIT		
CONTACT	PAGER#	WORK #	CELL#
Dispatch	NA	979-5680	
Chief Administrative Officer (CAO)	N/A	979-5666	
Director of Public Works	N/A	975-8501	975-1877
Operations Superintendent, Public Works	N/A	979-5653	975-1774
Director of Engineering	N/A	975-8502	975-1780
Fire Chief	45	979-5657	975-1446
Chief By-Law	N/A	979-5670	975-1930
Utilidor Foreman	32	979-5648	975-1443
Garage/Roads Foreman	12	979-5638	975-1463
Truck Sewer Water Foreman	N/A	979-5612	975-1473

Equipment may be dispatched for City spill clean-up by the Director of Public Works only. As and when contracts are negotiated on a yearly basis with local contractors to provide equipment and manpower to the City of Iqaluit. See Appendix G for a list of current as and when Contracts.

The 24-Hous Spill Line is currently being run by the GWNT – Resources, Wildlife and Economic Development division. Callers to the spill line will be provided with expert advice regarding hazardous materials spills. The personnel at the spill line will also ensure that the government agencies with jurisdiction over the spill are contacted.

EXTERNAL ASSISTANCE – GOVERNMENT RESOURCES		
AGENCY TELEPHONE #		
24-Hour Spill Line	(867) 920-8130	

The effectiveness of this spill contingency plan will greatly depend upon the following factors:

- The proper distribution of the plan to those personnel most likely to encounter a spill or release of deleterious substance during the course of their normal work.
- Training of these same personnel as to the objectives and contents of this plan and how they
  should react upon encountering a spill or system failure that may result in a subsequent release of
  deleterious substances.
- Training of the response personnel as to what steps they are to take in the event of the plan being put into action.

# 2.1 Spill Finder's Response

- a. Be alert and consider your personal safety first.
- b. Assess the hazard to persons in the vicinity of the spill and where possible take action to control danger to human life. If possible, identify the material or products involved in this particular incident.

- c. If the spill creates a fire, explosion or other hazard to human life, remove all potential ignition sources, if possible, evacuate the area, contact the RCMP.
- d. If safe and practical try to take appropriate action to stop the release of material
- e. Contact Dispatch and report the spill.
- f. Mark the spill scent to warn the public and prevent access.

# 2.2 Director of Public Works Response

Once notified by the Fire Department or Dispatch, the Director of Public Works shall:

- a. Proceed to the spill location.
- b. Liaise with the Fire Chief.

The Fire Chief and Director of Public works are then responsible to ensure the following steps are carried out:

- a. 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.
- b. If not already done and if 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.
- c. Gather information on the status of the situation.
- d. Fill out as completely as possible, a spill report form (attached) and then contact the 24-Hour Spill Line at (867) 920-8130.
- e. If required, contact the CAO.

The Director of Public Works will be the overall municipal coordinator for any spill response action and as such he will:

- Work in conjunction with the lead agency to coordinate clean up personnel.
- Be responsible for evaluating the initial situation and assessing the magnitude of the problem.
- Activate the response plan and call out the key personnel in the response team, as deemed appropriate to meet the situation.
- Assist in developing the overall plan of action for containment and clean up of the specific incident and delegate the responsibility for implementing the plan.
- Ensure that the assigned responsibilities are carried out and that coordination exists between supervisory team members.
- Assess the requirements for men, equipment, materials and tools to contain the spill in light of
  what resources are immediately available. The urgency will depend on the nature and magnitude
  of the spill

Additionally it will be the Director of Public Works responsibility to ensure that all City spill response personnel receive adequate training in order to fulfill their responsibilities as part of the spill response team.

#### 3.0 SITE INFORMATION AND FAILURE PREVENTION

## 3.1 Sewage Spills

It is the purpose of this section to outline possible failures of the waste handling/treatment system and the control measures in place to prevent such failures. The location of the lift stations and force main are shown in Figure 1 in Appendix A. Material that is released due to a spill will be collected and disposed of in the sewage lagoon.

## 3.1.1 Sewage Lift Station

There are two lift stations currently servicing the sewage system in Iqaluit. Lift Station No. 1 is located by the break water and Lift Station No. 2 is located by the sea lift beach. In the event of a pump shut down, both sewage lift stations will overflow into Koojesse Inlet. The pumps are electrically powered and will not operate if there is a power failure.

In the event of a pump shutdown, there is approximately 20 minutes storage capacity in the wet wells before the sewage will overflow. Each lift station is equipped with fluid high level alarms that trigger auto dialers which contact the 20 Hour Dispatch number. Sewage trucks are dispatched to manually pump out the wet wells. The lift stations are equipped with diesel powered pumps and piping that may be connected for manual operation during power outages.

The lift stations are physically checked on a daily basis.

# 3.1.2 Sewage Force main

The sewage force main is routed entirely beneath the ground surface and is not monitored.

## 3.1.3 Sewage Lagoon

The sewage lagoon is located at the head of Kojessee Inlet on the southwest side of the Municipality. Sewage is conducted to the lagoon by truck and through the force main. The inlet is located on the north side of the lagoon. Outflow from the lagoon is primarily through the west dyke, which was designed to be "leaky". Seepage through the dyke provides some level of solids removal. The effluent discharges directly into Koojesse Inlet.

## 3.2 Fuel and Gasoline Storage

Diesel fuel and gasoline is stored in aboveground self-contained tanks at the main municipal garage. Diesel is kept in a 20,000L tank and gasoline is kept in a 4,500L tank. Spill clean-up material at the garage consists of "Absorball" pellets which are taken to the landfill and burned after use.

A 2,000L above ground self contained tank is located adjacent to the water treatment plant. It is used to store heating fuel.

The fuel storage tanks are not located near areas that are considered environmentally sensitive.

#### 3.3. Chlorine Gas

Chlorine gas is stored at the water treatment plant. Two class A response suites, 2 Scott pack and personal chlorine detectors are stored at this location. A fixed chlorine detector is also mounted in the storage area.

# 3.4 Calcium Chloride

Calcium chloride for use on the roads is stored in Tyvex bags at the main garage.

# 3.5 Glycol

Glycol in 45 gallon drums is stored at the main garage. There are generally no more than 10 drums present at any given time.

# 3.6 Hydorfluosilicic Acid

Hydrofluosilicic acid for fluoridating the City water supply is stored at the water treatment plant.

#### **3.7** Lime

A maximum of 150 - 25lb bags of lime are stored at the water treatment center for use in controlling the pH of the municipal water supply.

# 3.8 Sodium Hypochlorite, 12%

Up to 12 -20L containers of sodium hypochlorite are stored at the entrance to the water treatment plan.

# 3.9 Propane

Two 40lb. propane cylinders, used to fuel the Zamboni, are stored in the Zamboni room at the arena.

# 4.0 Sodium Hydroxide Solution

(Caustic Soda 50%) is stored at the water treatment plant.

## 4.1 Carus UPZ 985

(Zinc Ortho Phosphate) is stored a the water treatment plant.

## 4.0 SYSTEM COMPONENT FAILURE PREVENTION

## 4.1 **Sewage Lift Station**

The lift stations are physically checked on a daily basis. The wet are equipped with high fluid level alarms connected to an autodialed which contacts the dispatch number. In he event of pump shutdown, the wet wells approximately 20 minutes worth of storage capacity before they overflow.

Diesel pumps and piping are located in the stations, and may be installed for emergency operations when the electrical pumps are down. Sewage trucks are on call and may be mobilized by Dispatch in case of pump shutdown.

# 4.2 **Sewage Force Main**

The sewage force main is completely buried and is not monitored.

# 4.3 **Sewage Lagoon**

The sewage lagoon is routinely checked seven days per week for levels and leaks. If problems are suspected, the frequency of monitoring would increase.

# 4.4 Chlorine Gas Storage

A fixed chlorine gas detector is installed in the chlorine gas storage room.

# 5.0 RESPONSE TEAM, ACTION AND EQUIPMENT

Key personnel have been identified for emergency spill response. They are identified below with their key role in the event of a spill:

Director of Public Works - Manpower, Loaders and Trucks

Chief Administrative Officer- Media

Fire Chief - Trucks, Fire Retardant Foam and

**Emergency Measures Organizations** 

The Director of Public Works and the Fire Chief work together to coordinate the mobilization of men and equipment as required to contain the spill. The Chief Administrative Officer is in charge of coordinating the information and messages flow to the media. The Fire Chief will provide men and equipment to assist in a spill response action. If the situation is deemed to require it, the Fire Chief will call out the Emergency Measures Organization (EMO).

The following details the response to be taken in case of a spill or leak at the locations outlined in section 3.

## 5.1 Sewage Spills

Should a sewage spill become apparent, the Director of Public Works would be responsible to:

- Ensure the public safety at all times and if required, notify the Fire Department and CAO
- Contact the NWT 24-hour Spill Report Line (867) 920-8130
- Mobilize staff to determine the cause of the problem, and act to stop the release of the sewage
- Mobilize equipment as required to contain the spill through trenching, berming, etc. to prevent sewage from entering Koojesse Inlet
- Clean up contaminated areas with suction trucks, loaders, dump trucks and absorbent materials as required.

# 5.2 Fuel and Gasoline Spills

In the event of a fuel or gasoline spill, the Fire Chief would be contacted by Dispatch and would be responsible to:

Ensure the public safety at all times and notify the Director of Public Works and the CAO.

The Director of Public Works is then responsible to:

- Contact the NWT 24-hour Spill Report Line (867) 920-8130
- Mobilize staff to determine the cause of the problem, and to act to stop the release of the product
- Mobilize equipment as required to contain the spill through trenching, berming, etc.
- Clean up contaminated areas with hand tools, suction trucks, loaders, dump trucks and absorbent materials as required.

#### 5.3 Chlorine Gas Leaks

In the event of a chlorine gas leak, the Fire Chief would be contacted by dispatch and would be responsible to:

• Ensure the public safety at all times and to notify the Director of Public Works and the CAO

The Director of Public Works is then responsible to:

- Contact the 24-hour Spill Report Line (867) 920-8130
- Mobilize staff to determine the cause of the problem and to act to contain the material, if possible to do so in a safe manner, using the available capping tools
- If the cylinder cannot be capped, arrange for their transport to a safe area and allow the gas to escape.
- Dispose of the faulty cylinders in such a manner as to minimize the risk to human health

# 5.4 Hydofluosilicic Acid

Spills of this material less than 5L will be cleaned up by the Water Treatment Plant Operator using acid neutralizing material. The Water Treatment Plant Operator will notify the Utilidor Foreman of the spill. For spills in excess of 5L, the Water Treatment Plant Operator will evacuate the immediate area and notify Dispatch. Dispatch will contact the Fire Department. The Fire Chief will then be responsible to:

• Ensure the public safety at all times and notify the Director of Public Works and the CAO

Upon notification by the Fire Chief or Dispatch, the Director of Public Works will be responsible to:

- Contact the 24-hour Spill Report Line (867) 920-8130
- Mobilize staff to determine the cause of the problem and act to contain the material if possible to do so in a safe manner.
- Dispose of the neutralized material according to GNWT regulations.

# 5.5 Sodium Hypochlorite

Spills of this material less than 5L will be cleaned up by the Water Treatment Plant Operator using appropriate neutralizing material. The Water Treatment Plant Operator will notify the Utilidor Foreman of the spill. For spills in excess of 5L, the Water Treatment Plant Operator will evacuate the immediate area and notify Dispatch. Dispatch will contact the Fire Department. The Fire Chief will then be responsible to:

Ensure the public safety at all times and notify the Director of Public Works and the CAO

Upon notification by the Fire Chief or the Dispatch, the Director of Public Works will be responsible to:

- Contact the 24-hour Spill Report Line (867) 920-8130
- Mobilize staff to determine the cause of the problem and act to contain the material if possible to do so in a safe manner.
- Dispose of the neutralized material according to GNWT regulations.

#### 6.0 GENERAL SPILLS

The following sections provide general information on the handling of large volume spills to a variety of receptors. In Iqaluit, sewage and petroleum products are stored in sufficient quantities that a large volume spill could occur.

## 6.1 Sewage Spills

#### 6.1.1 Containment on Land

Containment of large volume sewage spills on land is generally accomplished using minor earthworks such as earth dams or dykes and trenches.

Dykes and dams may be used to contain and direct spilled materials. The dam or dyke may be lined with a synthetic liner to render it impermeable to the spilled product. The location and size of the barrier should allow for the volume of material to be contained.

When the ground is thawed, trenches may be used to intercept and collect spilled materials. A synthetic liner may be places on the trench floor and walls to contain the contaminant in the trench. The location and size of the trench should take into account the volume of material to be contained. Trenches placed down slope of the spill may be effective in containing both surface and subsurface movement of spilled material.

#### 6.1.2 Containment on Surface Water

As sewage will readily mix with water it may prove impossible to contain the spill once water is reached. Strong action should be taken to prevent the material from entering a water body and to stop the material discharge at the

source. Care should be taken to ensure public health safety (eg. Protect water intakes, etc.) and the long term environmental effects of the spill should be monitored.

If the water is flowing through a drainage or smaller stream a channel should be constructed to divert the water flow around the spill area. A dam should be constructed to contain the water the sewage has already entered.

#### 6.1.3 Containment on Ice

Containment of spills on ice will be affected by the load bearing strength of the ice. If it is determined that the ice is safe to work on, containment bill be achieved using dykes and dams constructed of earth or snow. The dam or dykes should be lined with plastic to make it impermeable to the sewage. Water may be sprayed on snow dams/dykes to form a impermeable ice layer. Absorbent materials may be used in conjunction with barriers to prevent further spread and seepage.

#### **6.1.3** Containment on Snow

Snow will readily absorb liquids which may facilitate the removal of spilled material to a recovery or disposal site. Saturated contaminated snow may be collected relatively easily and hauled away. Compacted snow can be used to create an effective physical barrier to reduce the spread of spilled materials.

Several types of snow containment structures may be constructed to contain spilled materials. Snow dykes and dams can be erected and then lined with an impermeable liner or sprayed with water to form an impermeable ice layer. Initially the snow around the perimeter of the spill can be compacted, eg. With a snowmobile, to slow the movement of contaminants. The saturated snow can be collected with hand tools or heavy equipment and removed to the sewage lagoon for disposal.

Caution should be exercised as spilled materials can migrate under snow cover for considerable distances and not be visible from above.

#### 6.1.4 Material Removal

Removal of the spilled sewage may be accomplished using several techniques depending on the nature of the spill. Generally, methods used include suction mechanical removal and the application of absorbent material.

Suction methods may be used initially if there is a significant quantity of free product on the ground. Equipments used to recover material in this fashion may include vacuum trucks, portable pumps or shop vacuums.

Suction screens may be required to prevent hose plugging and possible pump drainage.

Mechanical recover using hand tools or heavy equipment should be used to collect soils or other loose material contaminated by the sewage. Caution should be exercised when using heavy equipment on a spill site as it is possible to cause a greater environmental impact from the operation of the equipment than form the spill itself.

Recovered liquids and saturated soils will be disposed of in the sewage lagoon.

## **6.2** Fuel and Gasoline Spills

Extreme caution should be exercised when containing and cleaning up spilled petroleum products due to high fire and explosion hazards associated with these materials.

Depending on the size of the spill and surrounding conditions, personal protective equipment such as rubber gloves (nitrile, neoprene, butyl rubber or PVC), rubber boots (neoprene or butyl rubber), chemical safety goggles and NIOSH/MSHA approved half mask respirators with organic vapor cartridges may be required. In poorly ventilated areas where there is the potential for vapors to concentrate, the use of heavy equipment should be carefully evaluated due to the potential explosion hazard.

## 6.2.1 Containment on Land

Containment of large volume fuel spills on land is generally accomplished using minor earthworks such as earth dams or dykes and trenches.

Dykes and dams may be used to contain and direct spilled materials. The dam or dyke may be lined with a synthetic liner to render it impermeable to the spilled product. The location and size of the barrier should allow for the volume of the material to be contained.

When the ground is thawed, trenches may be used to intercept and collect spilled materials. A synthetic liner may be placed on the trench floor and walls to contain the contaminant in the trench. This location and size of the trench should take into account the volume of material to be contained. Trenches placed down slope of the spill may be effective in containing both surface and subsurface movement of spilled material.

#### **6.2.2** Containment on Surface Water

As diesel fuels and gasoline are less dense than water, they will float on the surface. Spills of these materials to surface water bodies may be contained using booms and their floating devices.

In standing water, booms should be deployed to contain the floating material close to the shore, thereby facilitating contaminant recovery. If the water is flowing, the booms should be stretched across the width of the water surface and angled against the current to allow for shore side collection.

If the water is flowing through a drainage ditch or smaller stream, an underpass or water bypass should be constructed. An earthen dam is constructed to completely stop the flow of water. Piping is than installed to allow water to flow through below the level of the floating fuel. Alternately, a channel may be constructed to divert the water flow around the spill area. A dam should be constructed to contain the water the fuel has already entered.

Weirs constructed of sheet metal, plywood, etc, may be constructed to prevent material flow through culverts or ditches. The sheet is inserted into the stream to below the level of the fuel. The water flows under the weir and spilled material will collect at the surface for removal.

If commercial booms are not readily available, improvising booms can be constructed of virtually any material that will float and form a barrier, eg. logs, inflated fire hoses, etc. These materials may be used alone or preferably as supports for absorbent materials.

#### 6.2.3 Containment on or Under Ice

Containment of spills on ice will be affected by the load bearing strength of the ice. If is determined that the ice is safe to work on, containment will be achieved using dykes and dams constructed of earth or snow. The dam or dyke should be lined with plastic to make it impermeable to the fuel. Water may be sprayed on snow dams/dykes to form an impermeable ice layer. Absorbent materials may be used in conjunction with barriers to prevent further spread and seepage.

If the spill penetrated the ice, containment becomes more difficult. If the water beneath the ice is standing, the ice will be broken to install a containment boom.

If the water is flowing slowly, ice slotting may be used. A trench is cut into the ice downstream of the spill and at an angle to the current to deflect and concentrate the spill. Spilled material that collects in the ice slot may be pumped out, absorbed or burned in place.

Vertical barriers, e.g. plywood sheets, may be inserted into the ice to deflect the movement of spilled material. Trenches should be cut in the ice at an angle to the direction of flow. The vertical barriers are inserted in the slots and allowed to freeze into place. The extent of the under ice spill may be monitored by boring observation holes into the ice with an auger.

# **6.2.4** Containment on Snow

Snow will readily absorb liquids which may facilitate the removal of spilled material to a recovery or disposal site. Saturated contaminated snow may be collected relatively easily and hauled away. Compacted snow can be used to create an effective physical barrier to reduce the spread of spilled materials.

Several types of snow containment structures may be constructed to contain spilled material. Snow dykes can be constructed and then lined with an impermeable liner or sprayed with water to form an impermeable ice layer. Initially the snow around the perimeter of the spill can be compacted, eg. with a snowmobile, to slow the movement

of contaminants. The saturated snow can be collected with hand tools or heavy equipment and removed to the land fill for disposal or recovery.

Caution should be exercised as spilled material can migrate under snow cover for considerable distances and cannot be visible from above.

# 6.2.5 Fire or Explosion

The first step to be taken at a site where there is a fire or explosion risk, or if the material is on fire is to evacuate people from the surrounding area. Dykes or trenches are then constructed down slope of the spilled material to minimize spread of unburned liquids and/or the fire. The fire may then be extinguished using suitable methods and action may be taken to prevent further spillage, contain the material and begin clean-up procedures.

#### **6.2.5** Material Removal

Removal of the spilled fuels may be accomplished using several techniques. Generally, methods used include suction, mechanical removal and the application of absorbent material.

Suction methods may be used initially if there is significant quantity of free product on the ground or on the surface of a water body. Equipments used to recover material in this fashion may include vacuum trucks, portable pumps or shop vacuums.

Suction screens may be required to prevent hose plugging and possible dump damage.

Mechanical recovery using hand tools or heavy equipment should be used to collect soils or other loose material contaminated by the fuel. Caution should be exercised when using heavy equipment on a spill site as it is possible to cause a greater environmental impact form the operation of the equipment than from the material itself.

Absorbents may be used to soak up petroleum product. They are commonly used for final clean-up, recovery of small amounts of fuel or to remove fuel from places which are inaccessible to other spill clean up methods. Snow and soil can be used as absorbent material for a variety of petroleum products. The saturated absorbent can be collected mechanically and moved to a suitable disposal location.

Recovered liquids will be disposed of in accordance with appropriate GNWT regulations. Saturated soils and absorbents will be transported to the landfill for disposal.

## 6.3 Chlorine Gas Leak

Chlorine is a very toxic gas. Appropriate personal safety equipment must be worn by personnel attempting to contain a leak. Two Class A response suites with Scott packs are located at the Fire Department for use in the event of a leak.

# 6.3.1 Containment and Disposal

Capping tools are available for sealing leaking cylinders. If a cylinder is capped successfully, it may be returned to the supplier for disposal. If the cylinder cannot be capped, remove the cylinder to a safe location downwind of any populated area and allow the gas to escape.

# 7.0 SPILL EQUIPMENT INVENTORY

# 7.1 Spill Equipment Inventory

The following is a listing of equipment owned by the City of Iqaluit that may be used in the event of a spill emergency. The usual location of the equipment is also indicated.

MUNICIPAL SPILL EMERGENCY EQUIPMENT			
EQUIPMENT	STORAGE LOCATION		
2 Cat 950 Loaders	1 at the Municipal Garage		
	1 at 1552 Parking Garage		
1 Rubber Tired Backhoe	Municipal Garage (outside)		
2 Dump Trucks	1 at the Apex Parking Garage		
	1 at the Municipal Garage		
1 Cat 814 Wheel Dozer 1 at the Air Base Garage			
2 Road Graders	1 at 1552 Parking Garage		
	1 at the Apex parking Garage		
1 Cat M322 Excavator with hammer	1 at the Municipal Garage (outside)		
4 Sewage Trucks	4 at the Airbase Parking Garage		
5 Water Trucks	1 at the Airbase Parking Garage		
	4 at the Apex Parking Garage		
1 Cat 966 Loader 1 at the Apex Parking Garage			

#### 7.2 Resource Contact

The following is a listing of internal and external resources that may be contacted for aid in the event of a spill.

RESOURCES				
CONTACT	CONTACT #	RESOURCE PROVIDED		
Fire Department: Volunteers	979-4422	Manpower, Trucks, Foam		
Fire Department: Ambulance	979-4422	Medical, Rescue Equipment		
Fire Department: EMO	979-4422	Evacuation, Rescue		
24-Hour Spill Report Line	(867)920-8130	Expert Advice		
External Contractors	See Appendix G for As and When	Manpower, Equipment		
	Contracts			

# 8.0 TRAINING EXERCISES

Training and communication exercises should be carried on an annual basis to determine the actual readiness and ability of the City to handle a spill emergency. The exercised should be served to train key personnel and determine any weaknesses in the plan prior to the occurrence of an emergency situation. A variety of scenarios should be tested, eg. sewage spills from the force main, sewage lagoon dam failures, chlorine gas leaks, fuel spills, etc. to ensure that appropriate action can be take quickly.

The Fire Department and the Emergency Measures Organization (EMO) currently conduct disaster training exercises in the City of Iqaluit. Neither of these groups target hazardous material scenarios specifically, but a spill situation is often included as part of the larger exercise.

The Worker's Compensation Board will provide funding for employees to participate in hazardous material courses if contact with hazardous materials is a component of the employee's job description. Courses available include Materials Safety Data Sheets (MSDS), Workplace Hazardous Materials Systems (WHMIS) and First Aid.



# Appendix K

West 40 Landfill Spill Contingency Plan Water Treatment Program & Leachate Treatment

### **SPILL CONTINGENCY PLAN**

### CITY OF IQALUIT LANDFILL WATER TREATMENT PROGRAM

**IQALUIT, NUNAVUT** 

**REVISION 0** 



24-Hour Non-Emergency Dispatch: 867 979-5650

Operations Superintendent: 867 222-2956



November 30, 2016

O/Ref. No.: QE15-107-5

Confidential and priviledged document





**Spill Contingency Plan** 

City of Iqaluit Landfill Water Treatment Program

Iqaluit, Nunavut
REVISION 0

Privileged and confidential document presented to

**CITY OF IQALUIT** 



Prepared and verified by:

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Approved by:

Benoît Pion, B.Sc., M.Env. Director - Northern Projects



Qikiqtaaluk Environmental City of Iqaluit

#### **PREAMBLE**

This Emergency and Spill Response Plan covers the works that are related to the treatment of contaminated landfill contact water.

The Plan will be updated and revised as necessary if operations are modified or if type and quantity of waste stored changes.

Formal distribution of the Plan has been made to:

Aboriginal Affairs and Northern Development Canada - Nunavut Field Operations 969 QIMUGJUK BUILDING PO BOX 2200 IQALUIT (Nunavut) X0A 0H0 Fax: 867 979-6445

Additional copies and updates of this Plan may be obtained from:

#### City of Igaluit

Att.: Matthew Hamp PO Box 460 Iqaluit, Nunavut XOA 0H0

Phone: (867) 979-5600

Qikiqtaaluk Environmental City of Iqaluit

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APPENDIX A Standard Nunavut Spill Report Form

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#### GENERAL

The Spill Contingency Plan (Plan) was developed to assist with implementing measures to protect the environment and minimize impacts from spill events. It provides precise instructions to guide all personnel in emergency spill response situations. The Plan outlines procedures for responding to spills, while minimizing potential health and safety hazards, environmental damage, and clean-up costs.

This Emergency and Spill Response Plan covers the work related to the treatment of contaminated landfill contact water.

The activities listed in this Plan will be located near the City of Iqaluit Landfill (hereinafter referred to as the "Site"). The following table presents the approximate location of the water treatment activities:

TABLE 1
Approximate Location of Area Impacted by the Airport Project

Coordinate	Latitude	Longitude	Description
1	63"44'0.0"	68°31'40.0"	Northeastern Corner of Site
2	63*44'0.0"	68*32'15.0	Northwestern Corner of Site
3	63°43'42.0	68*32'15.0	Southwestern Corner of Site
4	63*43'42.0	68*31'40.0	Southeastern Corner of Site

The site is bordered by Koojesse Inlet to the east of the site, Frobisher Bay to the south, and the outlet of the Sylvia Grinnell River to the west of the site. The approved discharge location is into Koojesse Inlet, and the drainage from the Site runs toward the south, into Frobisher Bay.

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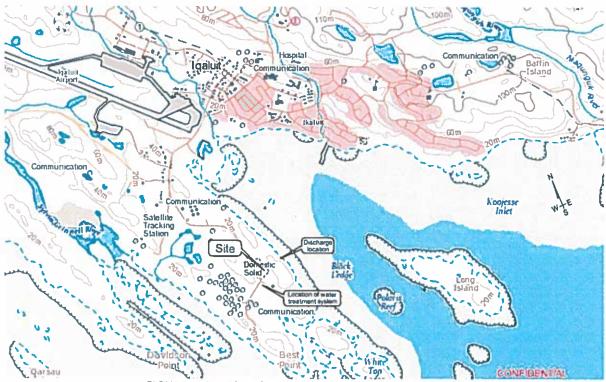


FIGURE 1: Site Plan Showing Locations of Site Works
Source: Google Maps, 2015

The Plan will be implemented to ensure that the storage and treatment of contaminated water respects all applicable federal and territorial laws, regulations and requirements. The City of Iqaluit will obtain, and comply with, all required permits, approvals and authorizations required for the operations. The following applicable Regulations and documents constitute an integral part of the Spill Contingency Plan:

- The <u>Canadian Environmental Protection Act</u> controls hazardous substances from their production and/or import, their consumption, storage and/or disposal;
- The federal <u>Transportation of Dangerous Goods Act</u> and <u>Regulations</u> ensure the protection of public health and safety, and the environment during the handling and transport of dangerous goods. The Regulations apply to all modes of transportation, by road, by sea, and by air;
- The <u>Nunavut Environmental Protection Act</u> governs the protection of the environment from contaminants. The act defines offences and penalties as well as the powers of government inspectors;
- The <u>Nunavut Spill Contingency Planning and Reporting Regulations</u> describe requirements for spill reporting and emergency planning;
- The <u>Land Transportation Emergency Response Guideline for Petroleum Spills</u> developed by the Canadian Petroleum Products Institute outlines scope, emergency response code of practice, response time guidelines, response equipment and personnel capability requirements;

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#### 2. STORAGE OF CONTAMINATED WATER

As part of the spill emergency response plan, the City of Iqaluit is responsible for implementing, through the subcontractor responsible for the treatment of contaminated water at the landfill, the following procedures:

Contaminated water will be stored on-site in holding basins with the following maximum volumes:

- Leachate Containment Pond 4,000,000 L;
- Retention Pond 3,500,000 L;
- Bioreactor 4,500,000 L.

The holding basins will be inspected weekly for signs of leaks. Any leaking water will be collected and pumped into another basin, or if there is no space back into the same basin, and the source of the leak will be determined and repaired.

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#### 3. STORAGE OF PETROLEUM HYDROCARBONS

As part of the spill emergency response plan, the City of Iqaluit is responsible for implementing, through the subcontractor responsible for the treatment of contaminated water at the landfill, the following procedures:

Liquid hydrocarbons will be stored at the water treatment site. Diesel generators will be used to power the treatment unit. These generators have their own storage tanks. In addition, there are 2 diesel-fired water heaters on-site; each will have its own storage tank. The storage site will be inspected daily, for signs of leaks or spills. The list of hydrocarbon products including the size and type of storage container and estimated volume to be stored at each location is listed below:

#### Water Heaters:

Diesel Fuel – 2 reservoirs of 1,000 L each;

#### Generators:

- 25 kW generator diesel fuel 300 L;
- 125 kW generator diesel fuel 1,000 L.

An emergency spill response kit will be installed at each of the liquid storage locations. The spill kits will be inspected and maintained during the inspection of the storage sites, if required. All spill kits will contain the appropriate type, size and quantity of equipment for the volume and type of product present at the storage location, as well as for the environment likely to be affected by a spill (i.e., soils/water). The spill kits will also include a fire extinguisher.

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#### 4. ACID, LIME AND POLYMER STORAGE

As part of the treatment program, the pH¹ of the water must be adjusted. First, the pH is raised above 8.5 using lime to cause the metals to come out of solution. Immediately following this, a polymer is added to the water to remove the suspended solids including the metals. Both the lime and the polymers are in a powder form. They are stored in a locked marine container, according to the manufacturer's instructions. They are not stored with incompatible products.

The lime is in 25 kg bags, and the maximum quantity of lime to be stored on the Site will be 6,000 kg. The polymer also comes in 25 kg bags, and the maximum quantity of polymer to be stored on-site will be 750 kg.

Any powder form of either of the lime or the polymer that is spilled will be collected using a shovel, placed in a water-tight container, and disposed of as per the manufacturer's instructions and local regulations.

In the final stage of the treatment, sulphuric acid is added to the water to lower the pH to between 7 and 7.5. The acid is shipped in a liquid form in 1000 L tote tanks. Only one tote tank is at the treatment site at any given time. The remainder of the acid is stored at Qikiqtaaluk Environmental's (QE) EWPF<sup>2</sup> located at 2027 Iqaluit Lane in Iqaluit.

At the Site, the acid is contained in a spill tray of sufficient capacity to hold the entire volume of the tote tank should the containment be breached. Furthermore, access to the area where the tote tank is stored is restricted by a plywood barrier with labelling indicating the danger, so as to ensure that no unauthorized and untrained personnel come in contact with the acid. Furthermore, the acid is stored in a location that, should a spill of acid occur, it will flow into the bioreactor.

The maximum quantity of acid stored on the Site is 1,000 L. The maximum quantity of acid stored at the EWPF is 3,000 L.

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<sup>1</sup> Measure of acidity or alkalinity

<sup>2</sup> Environmental Waste Processing Facility

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#### 5. CONTAMINATED WATER

The contaminated water is stored in 2 holding basins and in the bioreactor. During normal operations, a spill from the holding basins should not occur. The only time that there is potential of a spill from the holding basins is during the transfer of water from one basin to another. To prevent spills, all hoses and pumps will be visually inspected hourly to ensure that there are no leaks or breaks in the lines. Pumping operations will be supervised by a QE Technician specialized in water treatment and spill response.

Should a spill of contaminated water be found, the water will be immediately contained, and pumps will be used to pump the spilled water into the nearest holding basin compatible with the type of water spilled. Soil testing will be performed to ensure that no residual contamination remains in the soils following the removal of the contaminated water.

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#### 6. DUTIES AND RESPONSIBILITIES

As part of the spill Emergency Response Plan, the City of Iqaluit and QE are responsible for implementing, through their respective management teams, the following procedures:

- Training of Site personnel in spill response procedures and the proper use of response equipment and materials;
- In the event of a spill, mobilize all available site personnel, equipment and tools, as required;
- Implement all required health and safety procedures at the site of the spill;
- Eliminate all fire hazards and potential ignition sources near the spill area;
- Control the source of the spill (i.e., reduce or stop product discharge);
- Contain the spilled product using the most appropriate methods and equipment (i.e., dykes, ditches, sorbent materials, containment booms, and other barriers);
- Evaluate the possibilities of recovering spilled materials;
- Obtain, if required, assistance from government agencies such as Environment Canada and the Government of Nunavut's Department of Environment;
- Comply with all applicable guidelines and regulations;
- Conduct a preliminary assessment of environmental impacts;
- Report the spill to the Government of Nunavut Spill Report Line, within 24 hours of the event, and submit a written spill report using the appropriate form (see below for the list of information required in the report).

Table 2 presents the management team members responsible for overseeing emergency spill response operations and their contact information.

TABLE 2

City of Iqaluit Landfill Water Treatment Program Management Contact Information

Position	Contact	Telephone Number
Incident Commander	Raphael Gagnon	514 809-0496
Back-up Incident Commander	Martin Lemay	867 222-3246
Project Manager	Olivier Simard	867 222-8194
Project Director	Greg Johnson	514 717-7604
City of Iqaluit Fire Department	Shift Supervisor	867 979-4422
City of Iqaluit Project Manager	Richard Sparham	867 979-6363, ext. 259
City of Igaluit Back-up Contact	Matthew Hamp	867 979-5653

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As part of the spill response plan, the <u>Incident Commander</u> is responsible for implementing the following procedures:

- Assume authority over the spill scene and personnel involved;
- Activate the Spill Response Plan;
- Evaluate the initial situation and assess the magnitude of the spill;
- Develop an overall action plan;
- Report to the Project Manager and provide recommendations on resource requirements (additional manpower, equipment, materials, etc.) to complete the clean-up effort. The responsibility of the Project Manager is to mobilize personnel and equipment to implement the clean-up.

The responsibilities of the **Project Manager** also include the following:

- Report the spill to NT-NU 24-hour Spill Report Line at 867 920-8130;
- Provide liaison with Management and the City of Iqaluit to keep them apprised of clean-up activities;
- Obtain additional required resources not available on-site for spill response and clean-up;
- Document the cause of the spill and effectiveness of the clean-up effort, and implement the appropriate measures to prevent a recurrence of the spill;
- Prepare and submit follow-up documentation required by appropriate regulators;
- Ensure that the spill is cleaned up and all follow-up communications and reports are filed with the GN DoE<sup>1</sup> and ECCC<sup>2</sup> offices.

The responsibilities of the Project Director include the following:

- Work with the Project Manager on regulatory follow-up, as necessary;
- Act as the spokesperson with government agencies on any significant spill events.

The responsibilities of the <u>City of Iqlaluit Project Manager</u> include the following:

Act as the spokesperson with government agencies as well as the public and the media as appropriate.

Once a spill event has been reported, the Incident Commander, will establish a specific strategy for containing and controlling the spill, and to initiate the clean-up activities. The Project Manager, along with other external resources such as the Iqaluit Fire Department, may act as technical advisers prior to and during the intervention. The trained Spill Response Team will conduct all emergency spill response operations under the leadership of the Incident Commander. During the clean-up phase of the intervention, other site personnel (e.g., heavy equipment operators, labourers, etc.) may be involved in the intervention. Figure 2 presents an organizational chart of the Spill Response Team.

O/Ref. No.: QE15-107-5 Revision 0

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<sup>1</sup> Government of Nunavut Department of Environment

<sup>2</sup> Environment and Climate Change Canada

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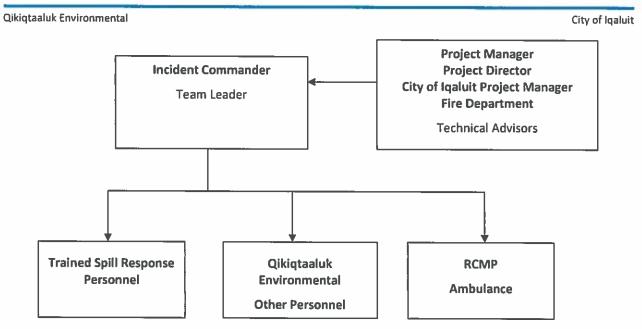


FIGURE 2: Spill Response Team Organization Chart

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#### TRAINING AND DRILLS

All Site personnel will be advised that any spill of contaminated soils, whatever the extent, must be immediately reported to the Incident Commander.

The Incident Commander will select a certain number of workers to form the Spill Response Team. Crewmembers will be trained in emergency spill response procedures and operations. Training will include knowledge in the:

- Properties of the contaminated soils;
- Common causes of spills;
- Environmental effects of spills;
- Worker health and safety during emergency interventions;
- PPE<sup>1</sup> and clothing;
- Spill response procedures and techniques on land; and,
- Spill response equipment and materials.

Training will also include analysis of potential spill events that are more likely to occur during waste management operations. Spills are more likely to be caused by:

- Human error during the handling of hazardous waste containers;
- Rupture of waste containers due to accidental damage, deterioration or equipment failure.

Training will include spill response drills and classroom training.

Personal protective equipment

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#### 8. MATERIALS AND EQUIPMENT

In order to prevent spills and to provide adequate response in case of spill events, the City of Iqaluit and QE will maintain the appropriate types and quantities of response equipment and materials on the Site.

To facilitate immediate first response in the event of a release on land, 2 spill kits will be strategically placed in areas of contaminated soil excavation and placement. The contents of the spill kits are detailed in Table 3.

TABLE 3
Spill Kit Contents

Description	Minimum Contents	Quantity
1 yd <sup>3</sup> capacity	1 yd³ Quatrex Bag	1
For Contaminated Soil Excavation Areas	Shovel	2
	Pairs of gloves	2
45 gallon capacity	45 gallon plastic drum	3
	Sorbent pads of 15" X 19" X 12 oz	300
	Sorbent socks 3" X 48"	15
	Sorbent booms 5" x 10'	6
	Epoxy sticks	3
	Disposal bags 40" x 60" x 6 mil	9
	Pairs of nitrile gloves	6

In addition to the spill response materials listed above, a loader, excavator, bulldozer and a dump truck are available to aid with spill response and recovery efforts.

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#### 9. SPILL RESPONSE PROCEDURES

A spill is defined as the discharge of contaminated soils, or any hazardous liquid, out of its containment and into the environment. Potential hazards to humans, vegetation, and wildlife vary in severity, depending on several factors including the nature of the material, the quantity spilled, the location and the season. Hazardous liquids are the principle types of waste materials that may be spilled, and therefore spill response procedures will focus on these types of materials.

All Site personnel will be briefed on the procedures to be followed to report a spill and initiate spill response. The first person to notice a spill will take the following steps:

- 1 Immediately warn other personnel working near the spill area;
- Evacuate the area if the health and safety of personnel is threatened;
- 3 Notify the Incident Commander, who will initiate the spill response operations;
- 4 In the absence of danger, and before the spill response team arrives at the scene, take any safe and reasonable measures to stop, contain and identify the nature of the spill.

All spill response interventions carried out by the spill response team will follow these general procedures:

**Source Control** - Reduce or stop the flow of product without endangering anyone. This may involve very simple actions such as sealing a puncture hole with almost anything handy (e.g., a rag, a piece of wood, tape, etc.);

**Protection** - Evaluate the potential dangers of the spill in order to protect sensitive ecosystems and natural resources. Block or divert the spilled material away from sensitive receptors. This can also be achieved by using various types of barriers;

Clean up the Spill – Recover and containerize as much soil as possible. Recover and containerize/treat contaminated soils, water, and snow;

Report the Spill - Provide basic information such as date and time of the spill, type and amount of product discharged, location and approximate size of the spill, actions already taken to stop and contain the spill, meteorological conditions and any perceived threat to human health or the environment. Reporting requirements are presented in Section 10.

Response procedures specific to spills on land and snow are presented in the following sections. Because of the nature of the contaminated soils, and because the soils will not be crossing any waterbodies, response to spills on water are not discussed in this Plan.

Procedures will vary depending on the season. Spill response operations, techniques, equipment and materials are further detailed in the spill response training course manual.

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#### 9.1 Spills on Land

Response to spills on land will include the general procedures previously detailed. The main spill control techniques involve the removal of any soils contaminated by contact with contaminated water. Barriers should be used to limit the spreading of water to reduce the impacts on the surrounding soils and flora.

#### 9.2 Spills on Water

Response to spills on water will include the general procedures previously detailed. The main spill control techniques involve the immediate stopping of the drainage of liquid into the waterbody. Barriers should be used to prevent any liquid from flowing into a waterbody.

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#### POTENTIAL SPILL ANALYSIS

In order to prepare for emergency spill response, potential spill analysis was conducted on the worst case scenario. The exercise serves to identify potential risk areas, as well as to determine the fate of spilled products and their environmental effects. The potential spill scenario identified for this activity is:

Spill of tote tank full of acid.

This spill scenario is analysed in detail in the following page.

#### Scenario #1: Spill of a Full Tote Tank of Acid

Description of incident: Spill of 1,000 L of hydrochloric acid from a tote tank;

<u>Potential causes</u>: resulting from operation over uneven ground or while putting the tote tank in place, human error, accident;

Hazardous products spilled: Hydrochloric acid;

Maximum volume spilled: 1,000 L;

Estimated time to spill entire volume: 30 seconds;

Immediate receiving medium: Soils;

Most probable direction of contamination migration: Since the area where the operations will occur is relatively flat, the soils will remain next to the tote tank;

<u>Distance and direction to nearest receiving body of water</u>: Bioreactor holding basin immediately adjacent and a drainage ditch approximately 10 m north-northeast of the containment area;

<u>Resources to protect</u>: Drainage ditch, which is away from the Site. The drainage ditch drains into Frobisher Bay, located 270 m from the Site. It should be noted that the operations will not pass over or near the drainage ditch, and since the contamination is on the top of the soils, there is no risk of it spreading quickly;

Estimated emergency spill response time: 5 minutes after spill is noticed;

Spill response procedures: Evacuate the area and call the fire department.

<u>Safety hazards associated with the spill event:</u> The acid spill could result in someone being splashed with the acid, which could cause chemical burns.

Measures and procedures to prevent such events from occurring: Include regular inspections of vehicles and heavy equipment on-site; establish speed limits on the worksite and further limit speed over rough or uneven areas; proper training of heavy equipment operators; safety orientation of workers, and use of a spotter when reversing; wearing of proper acid-resistant PPE when in proximity of the acid or during movement of totes containing acid.

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#### Scenario #2: Heating Oil Storage Tanks

The heating oil will be stored in a 1,000 L tank that will be located next to the marine container that holds the heating units.

<u>Description of incident</u>: 2 potential situations could occur that would cause a spill:

- The accidental spill of fuel due to a fuel line break, or
- The rupture of the storage tank, possibly due to a violent impact caused by a collision with a vehicle or heavy equipment;

Potential causes: Collision with the storage tank by heavy equipment or a vehicle, vandalism;

Hazardous products spilled: Petroleum, oil, lubricants, glycol;

Maximum volume spilled: In the first case, the spilled volume would be, at worst, 1,000 L, which represents the entire volume of the reservoir. In the other case, it can be assumed that the impact would occur at mid-height on the tank and, at worst, the spilled volume would not exceed ½ of the total volume (i.e., 500 L);

<u>Estimated time to spill entire volume</u>: In either case, the spill flow rate would be moderate to high, and it can be assumed that the entire volume would be spilled within 15 to 20 minutes;

Immediate receiving medium: Soils;

<u>Most probable direction of contamination migration</u>: The general direction of migration would be along the natural drainage pathway. This would cause the fuel to flow towards the bioreactor containment basin. A depression along the road between the road and the containment basin would most likely collect the fuel;

<u>Distance and direction to nearest receiving body of water</u>: Drainage ditch, approximately 10 m north-northeast of the containment area;

<u>Resources to protect</u>: Frobisher Bay, which is approximately 270 m away from the Site. It should be noted that the operations will not pass over or near the creek, and since the contamination is on the soil surface of the, there is no risk of it spreading quickly;

Estimated emergency spill response time: The spill would be communicated by the witness to the scene to the Incident Commander, or in his absence, the Back-up Incident Commander. The latter would then proceed down the chain of command and advise the appropriate persons of the immediate actions to be taken. Between 7:00 and 17:00, there should always be someone on the Site to supervise the operation of the water treatment unit;

<u>Spill response procedures</u>: The personnel responsibilities are outlined in previous sections of this document. The witness to the spill would be advised to try to stop the source of the spill, while waiting for assistance to arrive; his actions would be immediate. The Incident Commander would coordinate the spill response activities carried out by the containment unit. Members of this unit would be mobilized to the spill site.

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Mobilization of containment equipment to the spill site can be carried out rapidly. A bucket loader can reach the Site of the spill within 15 minutes. Stockpiles of sand and gravel are also located in the vicinity, if required for berm construction. Spill response kits containing sorbent materials will be kept next to the fuel tank. Containment would be carried out by the construction of soil berms and the installation of sorbent booms. After containment, clean-up equipment can be mobilized to the Site. Excavators, loaders and dump trucks are all available as part of the project works. Should none be available, local contractors with the necessary equipment will be hired. There is a vacuum trailer unit in Iqaluit available for the collection of free product resulting from a spill;

<u>Safety hazards associated with the spill event:</u> These include the risk of fire. This can be minimized by preventing personnel from smoking near the spill scene. Risks to personnel (from inhalation and dermal contact) can be prevented by the proper use of PPE;

Measures and procedures to prevent such events from occurring: Include regular inspection of the fuel storage tank and containment system, and safety rules concerning the use of vehicles and heavy equipment on-site, especially in close proximity to this area (e.g., speed limits, training of heavy equipment operators, restricted area posting, worker safety orientation, etc.).

#### Scenario #3: Fuel Delivery

<u>Description of incident</u>: The fuel delivery operations (fuel truck) to supply fuel to the heating oil storage tank present some risk of spills. Any accident involving the fuel delivery truck could result in the loss of its entire volume of fuel. Such an accident could occur almost anywhere on-site, anywhere the fuel truck has access;

Potential causes: Damage to the truck, accident with another vehicle, roll-over of the truck;

Hazardous products spilled: Diesel fuel;

<u>Maximum volume spilled</u>: This would be the volume of the storage tank on the back of the fuel truck. The largest truck holds 18,488 L;

<u>Estimated time to spill entire volume</u>: Depends on nature of incident, anywhere from 10 to 15 minutes to up to an hour;

<u>Immediate receiving medium</u>: Soils, possibly a waterbody, depending on where the incident occurs;

<u>Most probable direction of contamination migration</u>: The spill will proceed downgradient from the spill location. The direction will depend on the topography of the area where the spill occurs;

<u>Distance and direction to nearest receiving body of water</u>: The nearest body of water is the bioreactor, approximately 20 m away. Drainage then leads to Frobisher Bay, approximately 260 m away;

Resources to protect: Any nearby waterbodies or drainage ditches, structures and minimize the area of impacted soils;

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Estimated emergency spill response time: The personnel responsibilities are outlined in previous sections of this document. The witness to the spill would be advised to attempt to stop the source of the spill, while waiting for assistance to arrive; his actions would be immediate. The Contractor's Site Technical Advisor would coordinate the spill response activities carried out by the containment unit. Members of this unit would be mobilized to the spill area. It is anticipated that an initial mobilization to a spill site would take no more than 10 minutes;

<u>Spill response procedures</u>: Any spills would be communicated by the witness to the Incident Commander, or in his absence, the Back-up Incident Commander. The latter would then proceed down the chain of command and advise the appropriate persons of the immediate actions to be taken. Radio communication will be used at all times on the Site; as such, key team members will carry a radio with them at all times.

Mobilization of containment equipment to the spill site can be carried out rapidly. Sorbent booms may be required to contain the oil slick and prevent further spreading or migration to any discharge stream. If the construction of an oil-water separator in the discharge stream is necessary, the following equipment and materials would be required: heavy equipment (loader or excavator), sand and gravel, piping, and tarp/geomembrane. This equipment and materials could all be mobilized within 20 to 30 minutes. If the fuel reaches a discharge stream, spill response measures may need to be implemented further downstream. After containment, clean-up equipment will be mobilized to the area. Excavators, loaders and dump trucks are all available as part of the project works. Should none be available, local contractors with the necessary equipment will be hired, including a vacuum unit, if required. However, due to the size of the temporary fuel tanks used for delivery/supply, potential impacts from spills are likely to be rapidly contained;

<u>Safety hazards associated with the spill event:</u> These include the risk of fire. This can be minimized by preventing personnel from smoking near the spill scene. Risks to personnel (from inhalation and dermal contact) can be prevented by the proper use of PPE;

Measures and procedures to prevent such events from occurring: These include regular safety regulations regarding the use of vehicles on the Site, especially in close proximity to sensitive areas (e.g., speed limits, training of truck drivers, etc.).

#### Spill Contingency Plan City of Iqaluit Landfill Water Treatment Program Iqaluit, Nunavut

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City of Igaluit

#### 11. REPORTING REQUIREMENTS

Quantities of hazardous substances spilled which require reporting are listed in Schedule B of the Nunavut Spill Contingency and Reporting Regulation<sup>1</sup>. For example, all flammable liquid (Class 3) spills of volume equal to or greater than 100 L (half a drum) require reporting.

After the initial field emergency response to the spill event, the spill will be reported to the 24-hour Spill Report Line:

24-Hour Spill Report Line Tel. 867 920-8130 or Fax 867 873-6924

Additionally, the spill must be reported to AANDC<sup>2</sup> to the following person:

Erik Allain

Manager Field Operations

Tel. 867 975-4295

Fax: 867 975-6445

Should the spill be of a nature, or in a location, that affects airport activities, the airport authorities will also be notified of the spill immediately following the notification of the Spill Report Line and AANDC.

Failure to report a spill can lead to fines. It is the responsibility of the Project Manager to prepare the proper reports and transmit them to regulatory authorities. Table 4 presents an additional contact list for spill reporting.

TABLE 4
Contact List for Spill Reporting

Department	Person	E-mail	Telephone
GN DOE	Kristi Low	klowe@gov.nu.ca	867 975-7748
Fire Department (general) Fire Department (emergency)		-	867 979-5655 867 979-4422
Royal Canadian Mounted Police - Iqaluit	78		867 979-0123
Ambulance	+		867 979-4422

Afterwards, the spill event will be reported in writing using the standard Spill Report Form presented in Appendix A.

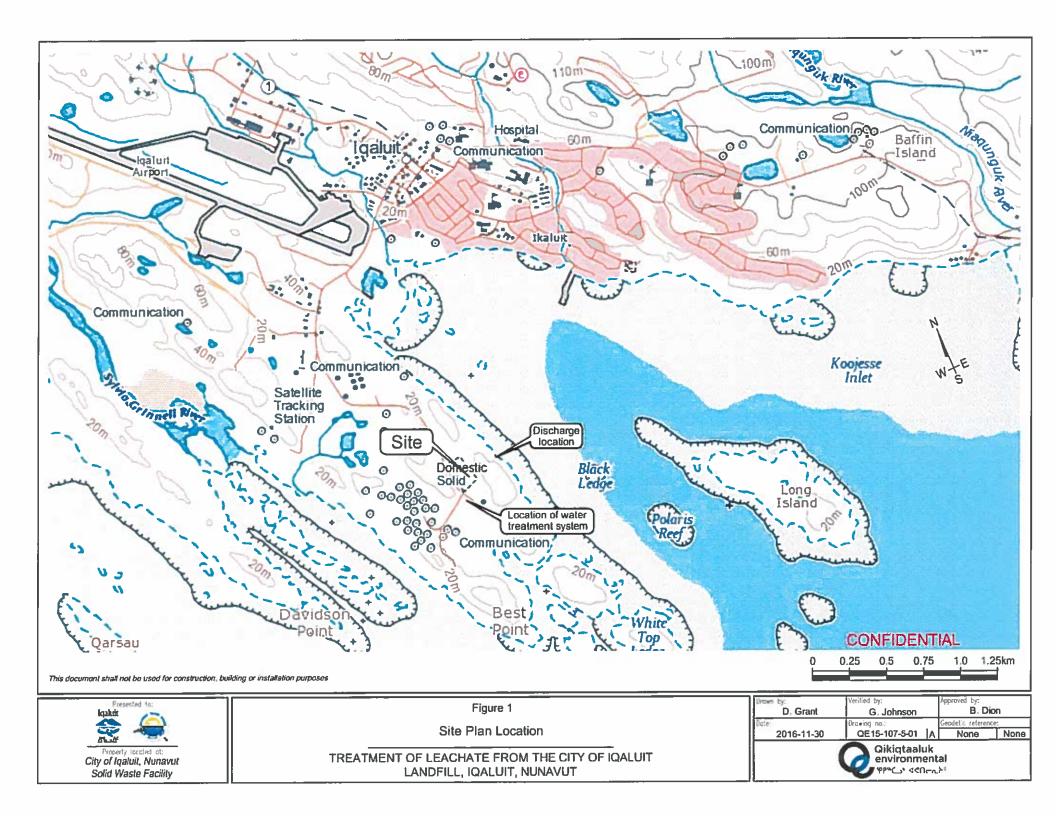
https://www.lustice.gov.nt.ca/en/files/legislation/environmental-protection/environmental-protection.r2.odf

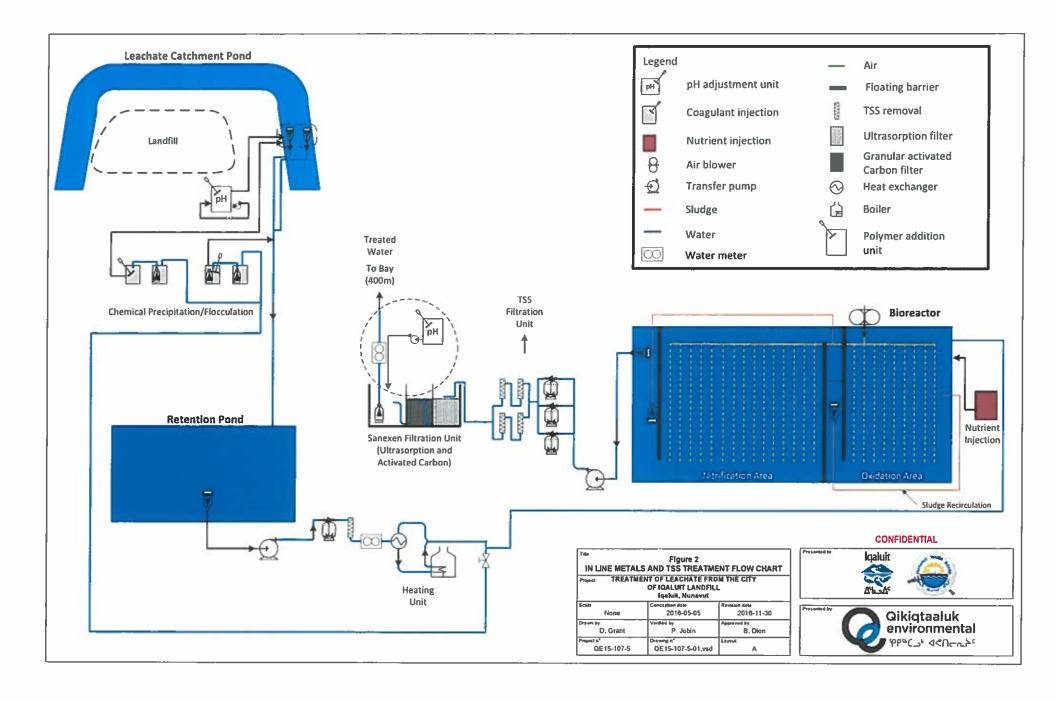
<sup>2</sup> Aboriginal Affairs and Northern Development Canada

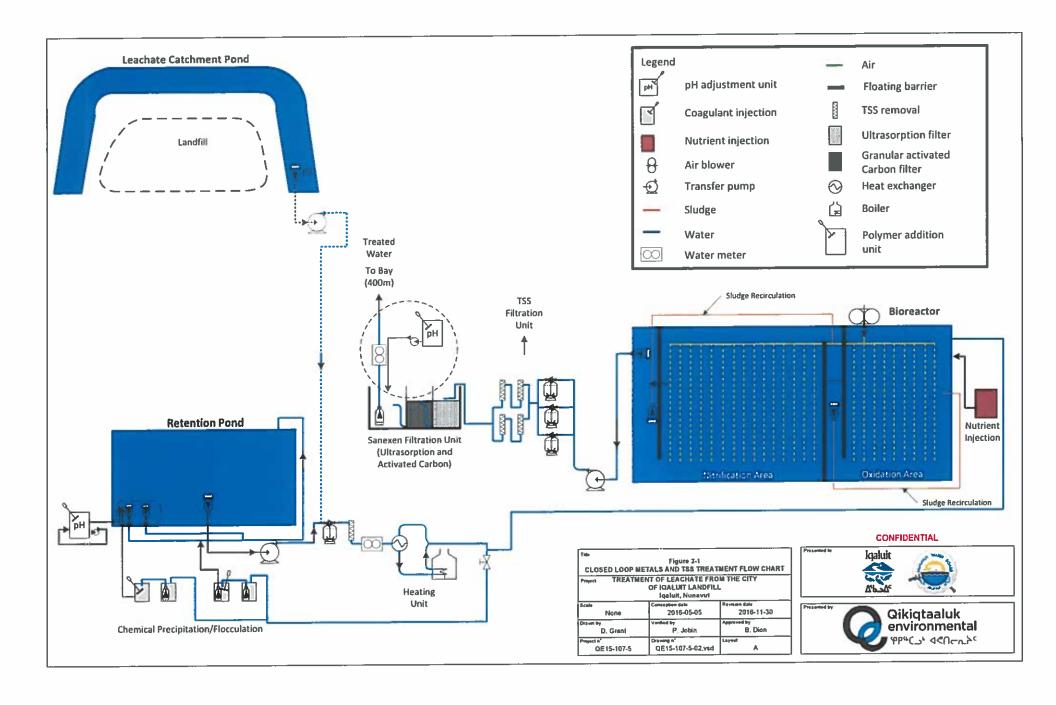
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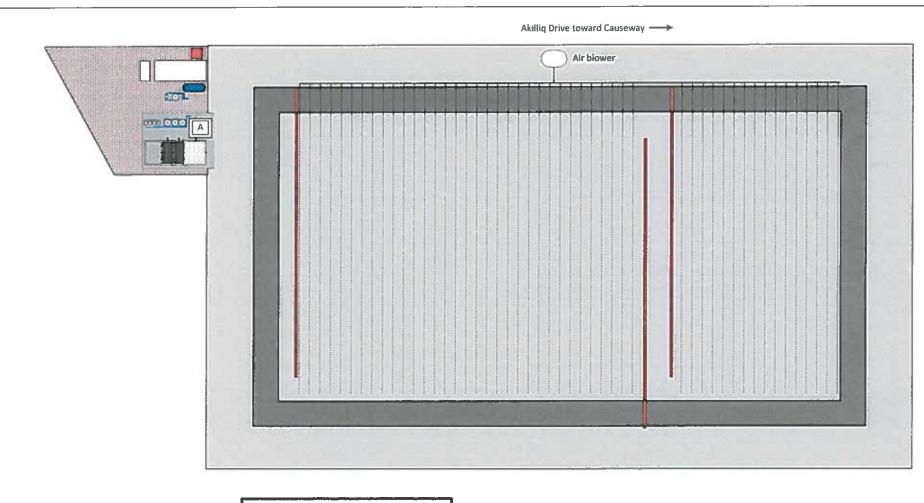
The written report will include the following information:

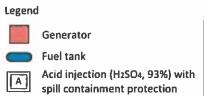
- Date and time of the incident;
- Location or map coordinates and direction of spill movement, if not at steady-state;
- Party responsible for the spill;
- Type and estimated volume of spilled contaminant(s);
- Specific cause of the incident;
- > Status of the spill indicating if spilled materials are still moving or now at steady-state;
- Approximate surface of contaminated area;
- Factors affecting spill or recovery such as temperature, wind, etc.;
- Status on containment actions indicating whether a) naturally, b) booms, dykes or other, c) no containment has been implemented;
- Corrective action taken, or proposed, to clean, contain or dispose of spilled material;
- Whether assistance is required and in what form;
- Whether the spill poses a hazard to persons or property (i.e., fire, drinking water);
- Comments and recommendations;
- Name, position and employer of the person reporting the spill; and,
- Name, position department of the person to whom the spill is reported.

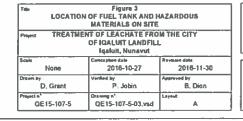


















Appendix

**Montintoring Locations Plan** 

Iqaluit West 40 Landfill

City of Iqaluit, Nunavut Project No.: 60571501 Date: 2018-12-06 Iqaluit West 40 Landfill Monitoring Locations Plan

### **AECOM**

Appendix **V** 

**AirBurners Operating Manual** 



## Operating Manual S-220

Equipped With Kubota V2403-TE Diesel Engine (2018 Model)

### **Self-Contained Refractory Walled Air Curtain Burner**

"Better Environmentally - Better Economically"



Factory and Main Office Air Burners, Inc. 4390 SW Cargo Way Palm City, FL 34990

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FAX: 772-220-7302

E-mail: support@airburners.com

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S-220

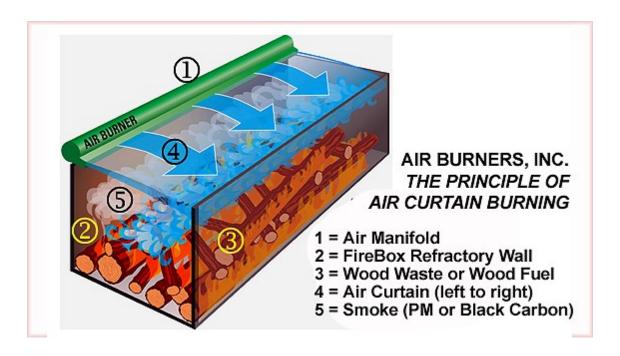


S-220

#### PRINCIPLE OF AIR CURTAIN INCINERATION

#### OPERATION

Air curtain incinerators are designed primarily as a pollution control device. Using a Diesel engine driven fan, these machines generate a curtain of air with a very particular mass flow and velocity. This curtain of air acts as a trap over the top of an earthen trench or thermo ceramic lined firebox. The wood debris is dumped into the trench or firebox and then ignited (usually with a propane torch or with a small amount of Diesel) just as you would light any other pile of wood you intended to burn. Once the fire has gained strength the air curtain is turned on. The air curtain traps most of the smoke particles and causes them to re-burn under the air curtain where the temperatures exceed 1,800° F. These machines do not inject any fuels into the fire, the fire is sustained only by adding more wood waste. The air from the air curtain is not heated. The only fuel used in the continuous operation is that of the Diesel engine driven fan.



#### **GENERAL DESCRIPTION S-SERIES**

The self-contained refractory walled air curtain system is manufactured as an over-theroad transportable combustion system designed to reduce clean wood waste and vegetative growth to ash in a safe, controlled burning process without excessive particulate emissions.

The standard S-Series machines are offered in several sizes. The smallest is the S-111 (11 ft. firebox) and the largest is the S-327 (27 ft. firebox). The table below shows the approximate dimensions.

S-Series Dimensions					
Model	Overall Size L x W x H	Fire Box L x W x H	Weight lbs.	Fuel Consumption* gal/hr	Average Thru-put** tons/hr
S-327	37' 4" x 11' 10" x 9' 7"	27' 2" x 8' 5" x 8' 1"	54,600	3.5	6-10+
S-220	30' 2" x 8' 6" x 8' 6"	19' 8" x 6' 2" x 7' 1"	35,000	2.5	5-8
S-119	26' x 7' 5" x 7' 8"	19 x 5' x 6'	27,300	2.5	3-5
S-116	23' x 7' 5" x 7' 8"	16' x 5' x 6'	25,600	2.5	2-4
S-111	19' x 7' 5" x 7' 8"	11' x 5' x 6'	22,500	2.5	1-2

\* Diesel Engine Version: S-327: Kubota V3600-TE (Tier4 Compliant) or equivalent engine.

S-220 and S-100 Series: Kubota V2403-TE (Tier4 Compliant) or equivalent engine.

**Drive System:** PTO & mechanical direct coupling drive.

\*\* Notes on Through-Put: Through-put depends on many factors, such as nature and type of wood

waste, its moisture content, prescribed opacity limits, operator skills, elevation of location, etc. The figures stated here are guidelines only. If more specific information is required, please contact the Factory.

Electric Motor Version: Motor: 3-Phase, heavy-duty, with enclosed variable frequency speed controller; Power in: Three

Phase 480V, 50Hz or 60Hz; Drive System: Direct drive (fan and motor on same shaft).

Options: Off-road mobility package; Ember screen; Heat recovery; Electric power generation (PG FireBox

Series), Custom designs available.

**NOTES**: All weights and dimension are approximate.

Dimensional drawings can be provided on request.

Subject to change without notice.



### GENERAL DESCRIPTION S-SERIES

When delivered to a job site, the S-Series machine is ready for use as soon as it is off-loaded. The entire system is built on a skid type base frame which is designed for easy movement over the ground. The forward equipment deck supports a four cylinder Diesel engine, a 60 gallon fuel tank, the direct drive system and the fan. When viewed from the front of the unit, the patented air disbursement manifold is mounted on the left top side of the combustion chamber. The back of the firebox is fitted with refractory lined doors that allow ash removal and access to the (only when it is empty) firebox.

The Diesel engine is coupled through a clutch drive PTO (Power Take-Off) that turns the fan. The high velocity air is sent down the manifold through the vanes and directed to the outlet nozzles. A balanced and distributed air flow is directed across the top of the box and then reflected down into the combustion zone.

The curtain of air acts as a top over the fire box, trapping a large percentage of the escaping particulate matter (smoke) and causing it to burn down even further under the curtain before finally escaping through the curtain as a hot gas. The air from the nozzles travels across the firebox creating the air curtain effect, then it reflects off the far side thermo ceramic wall, adding oxygen to the combustion zone helping to generate a hotter more complete fire. This additional agitation helps prevent the fire from starving for oxygen as the ash builds up during burning operations.

All of this is carefully engineered to provide the correct amount of air at the correct velocity. It is sometimes thought that more air flow will actually increase the burn rate. This is INCORRECT. Modifying the air flow will actually have the opposite effect and reduce the machine's through-put. Additionally it will reduce the machine's ability to meet air quality minimum standards. There is a maximum rate at which wood can burn. Trying to exceed that rate by adding more air to an air curtain burner causes two major problems;

- It will cool the fire reducing combustion efficiency creating more smoke (carbon dioxide and nitrogen enriched). This will begin a circular effect of further reducing the oxygen and further reducing combustion efficiency. The result is your through-put drops and smoke increases.
- 2) Increasing the air flow beyond design standards will over pressurize the firebox causing larger sized particles to be ejected from the firebox. Besides violating the EPA limits for PM (particulate matter) the larger hotter embers ejected will pose a much greater fire hazard.



S-327 in Operation



S-327 Rear Doors (Open)

### **IMPORTANT:**

Notice, how dirt is placed all around the inside bottom to close any openings under the skids that may be caused by uneven terrain. This will prevent smoke from escaping.



### SAFETY CONSIDERATIONS

### READ ALL SECTIONS OF THIS MANUAL BEFORE YOU BEGIN BURNING OPERATIONS

The S-Series machine operator is dealing with fire on a daily basis; it is very important that each and every individual involved with the machine be alert and practice very rigid safety precautions.

When you are running the S-Series unit, you are responsible for assuring that it is operated in the safest possible manner at all times. If you notice something wrong, correct it immediately, and if you cannot correct it, find someone who can and/or shut down the machine.

### **Basic Safety Points:**

- The unit should be placed on cleared, level ground. The unit should be placed on level ground to facilitate loading, dumping and moving of the unit. The rear doors weigh approximately 2,000 lbs. each and should not be opened if the unit is inclined on any axis more than 5 degrees.
- 2) The unit should be placed such that no combustible material is within a minimum 100 foot clearance in any direction.

  The S. Series units do not have a bettem and should not be leasted over some

The S-Series units do not have a bottom and should not be located over combustibles such as dry grass or peat moss. In addition *hot embers* will escape from the unit and, depending on the wind, will land on the ground around the unit. The unit should not be located within 100 feet of any stored combustible materials. The waste material to be burned during the day's operation can be staged within the 100 foot perimeter to facilitate loading. The operator must monitor the loading pile to insure embers do not ignite the loading pile. The combustible materials to be stored for burning at a later date must be stored outside the 100 foot perimeter or in accordance with the chart on page 6 of this manual which suggests adjustments for wind speed.

The unit should not be operated when the wind speeds reach 20 MPH as the potential to carry hot embers is significantly increased.

As an operator you should always be aware of wind speed and direction. increased wind speed will affect the integrity of the "air curtain" and will cause hot embers to travel farther. See the wind speed chart regarding suggested set back on page 6.

**DANGER:** 

Watch for the danger notices throughout this manual.

### 4) NEVER use highly combustible materials to light the unit.

Highly combustible materials such as gasoline, refined spirits, etc. ignite at an explosive rate which may cause serious injury or death. The safest method to start the fire in the box is to use materials such as paper and kindling wood. In the absence of these materials or when starting materials with a high moisture content use Diesel fuel oil as an acceptable option.

### 5) NEVER climb on the unit to view or light the fire.

Use the ladder built into the unit and never go beyond the top step, or use a step ladder or similar platform located at a safe distance from the unit. Do not stand along the rails or on top of the S-Series unit under any circumstance.

# **DANGER:** Falling into the fire box will cause serious injury or death.

### 6) Shut the unit down in an emergency.

Stop loading the unit, stop the air flow by either disengaging the PTO or by shutting down the engine. Dump dirt or sand on to the fire. Water should only be used as a last resort, as it will likely damage the refractory panels.

WIND SPEED VS. SAFE DISTANCE					
	Approximate Safe Distance for:				
Wind Speed (MPH)	Structures (Houses, etc.)	Woods/Trees	Stored Brush Piles		
10	300'	150'	100'		
12	300'	150'	100'		
14	300'	200'	150'		
16	400'	250'	150'		
18	400'	250'	200'		
20	500'	250'	200'		

**DANGER:** The above distances serve as a GUIDELINE ONLY! You MUST ALWAYS observe the down range area regardless of the wind speed. You must always observe local fire ordinances and directives from the local fire department or other authorities.



### 7) Personal Safety

Operators need to be aware of the following potential hazards:

- A) Flying hot embers being released from the fire. Operators or anyone within the 100 foot radius of the fire should wear appropriate fire resistant clothing. The ideal outwear for an operator would include a Nomex jacket, leather gloves, eye protection, hard hat, cotton work jeans and steel toe boots. Operators should never wear synthetic material (i.e. polyester) around the fire as this type of material can melt and cause injury. Additionally, some synthetic materials will support combustion and could be very dangerous around fire. One hundred percent cotton materials would be the minimum, cotton treated with a fire retardant would be better and fire proof materials like Nomex would be best.
- **B)** Noise, ear protection is recommended around the machines. It is a good practice to wear approved ear protection when working in close proximity to the fan and engine.
- **C)** Hot Panels. The backs of the thermo-ceramic panels and parts of the steel structure can reach temperatures as high as 500°F. Caution should be taken to insure operator and visitors do not come in contact with these hot areas.
- **D) Ash and dust** can be released during the operation and during cleaning. Operators should wear appropriate breathing masks to protect themselves from inhaling the dust and ash.



**DANGER:** You must insure debris does not build up on the equipment front deck. It must be keep clean at all times during operation to prevent a fire that would damage or destroy the engine and accessories.



### **HOW TO SET UP THE MACHINE**

# A) POSITIONING THE UNIT

The S-Series units are totally self-contained and ready to use upon delivery to the job site. The S-Series units are built on a skid base that is designed to facilitate dragging the unit into position and to move the unit around the site. The weights of the various units are given in the General Description section. Ensure that lifting or tow cables are certified for these weights.

With respect to the prevailing wind direction, the unit should be positioned such that the wind comes over the back of the manifold. This is the preferred position. It is also acceptable to have the wind blow into the manifold. It is discouraged, however, to have the wind come from either end of the machine, as this will tend to disrupt the air curtain.

DANGER: When you tow (drag) the S-Series units, especially in soft soil, watch that the dirt does not build up under the panels and lift the panels off the rails. Never walk inside the box when it is being towed. Typically, the softer soils will require a longer cable. If the rear of the unit sinks in soft soil while it is being towed, use another vehicle to follow and carry some of the load. If you are still having trouble dragging the unit, try a different length of tow cable. Always stay clear of the tow cable while the dragging operation is underway.

# **B) PRE-OPERATION CHECKS:**

- Air filter for cleanliness (VERY IMPORTANT)
- 2. Engine oil level
- 3. Engine coolant level and antifreeze rating
- 4. Diesel fuel level

# **HOW TO SET UP THE MACHINE**

### C) STARTING

#### PRE-CHECKS

Check all belts and fluids.

Make sure the top cowling is down and locked and secured.

Make sure the clutch (PTO) is disengaged (the lever in the down position).

Make sure the engine speed control is at minimum by turning the black speed knob clockwise.



Control Panel

### STARTING

If preheat is needed, turn key switch counterclockwise for maximum six seconds.

### To START

- (a) Turn key clockwise and hold for three seconds after engine starts (this will override the oil pressure cut-off sensor, until oil pressure builds up).
- (c) WARM-UP the engine at Idle speed of 1,000 RPM for 5 to 10 minutes before engaging the fan at 1,400 RPM +/- 200 RPM.
- (d) Operate machine at 2,400 RPM max.



PTO/Clutch Handle



Control Area - Open Left Front Door

## HOW TO SET UP THE MACHINE

#### RUNNING

Engine and fan speed may now be increased as required by turning the speed control knob counter-clockwise.

### SHUT-DOWN

To shut the machine down, <u>first reduce the engine RPM to approx. 1,400 RPM</u> by turning the black throttle knob clockwise.

Disengage the clutch by pushing down on the lever until it unlocks into the disengaged position.

Turn key to STOP.

Control Panel (Kubota)



PTO Handle



Fuel Tank - Open Side Door

### SITE PREPARATION

#### THE GOALS TO GOOD SITE PREPARATION ARE:

To place the firebox for easy access.
To sort the waste wood pile.
To organize the inflow of new wood waste.

When locating the firebox;

Consider access for your truck and trailer to load and unload the firebox. Ensure there is enough room to maneuver your truck and trailer.

Consider where the waste piles will be located. We generally recommend two waste piles (explained in next section).

Consider the predominate wind direction. Hot embers <u>will be</u> escaping from the firebox during all burning operations.

Consider where and how you will empty the firebox. If you are going to 'drag' the firebox to empty it, ensure there is room and the soil conditions are not too soft. If you are going to excavate the ash out, then consider where you will dump it. In most cases cold ash can be reapplied to the land. Check your local ordinances.

Once the box is in position, it is important to place dirt around the inside bottom of the firebox to close any openings under the skids that may be caused by uneven terrain as shown on page 4. This will prevent smoke and heat from escaping. Pay particular attention to the seal for the forward (engine side) wall. Any openings under the panels or forward skid will allow heat from the fire to reach the area below the engine deck. This could cause the engine deck to become hot enough to burn the paint and be a hazard to someone standing on the deck.

Never dig a pit in the center of the firebox. This will make it hard to seal the inside of the box and the walls of the pit can deteriorate during operation allowing smoke and heat to escape from the firebox or reach the area below the engine deck creating a hazard for anyone standing on the deck and will void the Air Burners Warranty.

DANGER: This machine DOES NOT prevent hot embers from escaping. This machine is designed primarily as a pollution control device to reduce the smoke generated from burning clean wood waste.



### SITE PREPARATION

## Faster operation through staging the wood piles

Air Burners Fireboxes were designed primarily as a pollution control device, but operated correctly they will burn clean wood two or three times faster than open burning. To achieve the best throughput, the fire must remain at the highest temperature possible. You achieve this by remembering three rules;

- 1) Don't smoother the fire with a huge load or a load of very dense material.
- 2) Load "less more often" smaller bucket loads more often.
- 3) Sort out a pile of your best burnable wood, use it to create a hot fire.

The basic principle of operation is not too different from a campfire. You use your best wood to get it started, and if the fire dies down you add some more "good wood" to bring it back up. The big difference is that on your campfire you are probably not adding root balls and leaves and pine needles. These are the high moisture content and

dense materials that bring the fire temperature down.

The temperature drops (smoke increases) and your burn rate slows down, if you overload the machine with materials that have high moisture content, such as tree branches with leaves and nee-



dles, or green branches such as palm fronds. While these are certainly ok to burn in the firebox, you want to add them to a hot fire so they dry out and ignite quickly. To keep the temperature up and to maintain the highest throughput of waste you should mix the very burnable wood with the less burnable materials throughout the course of the burning operation. The most common way to accomplish this is to stage a pile of the most burnable materials or what we call the "two pile system."

"If it's burning clean it's burning hot, if there is smoke you're losing money."



### SITE PREPARATION

# The "Two Pile System"

For an efficient operation you would have two piles:

The **first pile** or "main debris" pile, is the material being generated from the land clearing or forest clearing operation and is located away from the ember path but with good access to your loading machinery.

The **second pile** or "good wood" pile is your best and most burnable wood. When you first setup, the site the operator should spend some time sorting through the main debris pile pulling out what appears to be your best and most burnable materials. This is the material with which you will start the fire, this is the material that will give you a good hot burning base fire. You will also draw from the "good wood" pile throughout the day if you should need to stoke up the fire (more on this in the following sections).

As the firebox operator is drawing from the main debris pile throughout the day, he should continue to replenish the "good wood" pile as necessary. The "good wood" pile only needs to be enough material to stoke-up the fire if needed and enough material to get you started the next day.

# **IMPORTANT WARNING ABOUT BURNING OF PALLETS**

Wooden Pallets, especially spent pallets burn extremely hot. DO NOT load the FireBox above approximately 3/4 of the height of the burn chamber. Heat damage to the manifold and other structure may occur which would not be covered under your Limited Factory Warranty.

**DANGER:** You must insure debris does not build up on the equipment front deck. It must be keep clean at all times during operation to prevent a fire that would damage or destroy the engine and accessories.

### LOADING AND STARTING THE FIREBOX

### THE GOALS IN STARTING AN S-SERIES UNIT ARE:

To achieve an even fire across the length of the box. To start the fire from the bottom of the initial pile. To build a hot base fire.

There are two methods for lighting the unit; a cold start and a hot start. A cold start means the firebox is clean and has no hot coals left from a previous burn. A hot start uses heat from the coals of the previous days burn.

#### **COLD START**

Unit should be on level ground, the AIR should be off but the engine can be running to bring it up to operating temperature.

To prevent smoke from escaping under the box, shovel dirt along the inside bottom edges of the panels. It will only need a couple inches to prevent the smoke from escaping underneath the unit. This is generally only a concern on hard ground and it usually only lasts for the first hour of burning. As burning continues the ash will build up and seal off the bottom of the unit as well.

Load your most burnable material (materials from the "good wood" pile as discussed in the previous section) which is the smaller, dryer and cleaner wood, into the firebox to a level of about half way up. Insure that the entire bottom area of the fire box is covered. If you are using Diesel fuel to assist in the lighting. Spray it (approximately 10 gallons) across the top of this first load of wood. Be sure to get some Diesel on the wood near the lighting holes in the firebox side and on the wood towards the back. This will help make it easier to light.

**DANGER:** If you are using an accelerant, first insure there are NO HOT COALS remaining in the firebox.

**DANGER:** DO NOT use highly volatile accelerants such as gasoline or kerosene, to light the fire. These fluids ignite almost explosively and may cause injury or death.



### LOADING AND STARTING THE FIREBOX

Once you have this smaller material loaded and your accelerant added (if used) load some larger heavier material on top, such as logs or big branches. Load these heavier materials, also from your "good wood" pile, to a height just below the manifold nozzles. This heavier material will help compress the smaller material which will give you a better light-off. If there are large air spaces between the materials in the firebox the heat will not build up as quickly and the fire may be more difficult to light.

This material once burning will become your hot base fire to support continued burning. Use your best and driest materials ("good wood") for startup as this will form a strong base for continued burning plus it will start quicker and burn hotter. If you will be burning stumps then it is best to load them after the first hour of burning when the fire is up to full temperature.

The level of material in the fire box for light-off should be kept just below the manifold nozzles.

If you are using Diesel fuel as a igniter, it is sometimes helpful to add a second coat to the top load again, ENSURE THERE ARE NO HOT COALS REMAINING IN THE UNIT before adding the accelerant.

Your goal is to develop a good hot base fire and to maintain a good hot fire throughout your burning operation. This will give you the cleanest burn and the most throughput.

There is always smoke on start-up as <u>all</u> of the material in the box contains moisture, compared to later in the burn operation when only the new material you are loading contains moisture. Plus, the air curtain cannot be fully engaged ,until the fire has strengthened, or you run the risk of blowing out the fire.

DANGER: NEVER stand on the machine as you may fall in causing serious injury or death.

### LOADING AND STARTING THE FIREBOX

To minimize *start-up* smoke you can:

Use your driest materials.
Ensure your materials do not retain dirt or sand.
Use Diesel fuel to accelerate the light up.

#### **COLD START LIGHTING**

- 1. The air should be off. The engine should be Running, but the PTO should be disengaged.
- 2. For best results and quickest light up, start the fire from the bottom, because fire will spread up much better than it will spread down.
- 3. Use a propane torch (like a weed burner) or oil soaked rags on poles to light the fire.
- 4. The fire can be started from under the rear doors and from the access door in the forward panel on the manifold side of the unit.



Access door for lighting

If you are using Diesel fuel as a starter, let the fire burn until you begin to see wisps of white smoke replacing the wisps of black smoke from the Diesel fuel or, if you are using propane torches, wait until the fire has strengthened and flames are reaching the top of the firebox. Then engage the air at 1,400 RPM. As the fire burns stronger, increase the air (approximately 200 RPM every 15 minutes) up to maximum.

Don't increase the air too quickly, as you can "blow" the fire out. If you add air and the smoke gets heavy, then reduce the RPM and let the fire "catch-up." Once it clears up you can slowly increase the air again.

Sometimes it is helpful to "fan" the fire during the start-up phase. You accomplish this by increasing the RPM for 3 to 8 minutes, then decreasing it (i.e. 1,400 RPM up to 2,000 RPM and back down to 1,400 RPM). This sometimes helps to spread the fire throughout the material. How much air to add and when to add it during startup will vary with the type of materials being burned.

### LOADING AND STARTING THE FIREBOX

#### **HOT START**

A hot start uses the coals from the previous day's burning operation. Depending on how much ash is in the unit a hot start can be done once or twice before the unit will need to be emptied. The more ash in the firebox that you start with, the LESS room you have for burning new materials.

First, insure there are enough coals remaining to generate enough heat to get the new waste materials burning. You CANNOT add an accelerant, if the waste materials do not light, as that would be too dangerous. You can use propane torches in the lighting holes, if you have trouble with a hot start. If the material does not light, the firebox must be emptied before trying a cold start with the use of an accelerant.

**DANGER:** Do not use an accelerant for a Hot Start, as it may ignite unexpectedly and cause injury or death.

#### **HOT START LIGHTING**

Similarly to a cold start you begin with your best and most burnable materials.

- 1) Load the firebox to about one third or half way with the "good wood". The wood should begin burning as soon as you start loading.
- 2) Engage the fan at 1,400 RPM. This should help fan the flames and spread the fire. If you experience heavy smoke then reduce the RPM or disengage the fan. Be cautious not to "blow out" the fire.
- 3) As the fire begins to heat up, increase the RPM.



### **HOW TO FEED A FIRE**

It will generally take 30 minutes for the fire to build to a point where the temperatures are sufficient for the unit to be operating with minimal smoke.

- 1. Add material from your "Good Wood" pile slowly for the first hour. It takes about an hour for the fire to reach minimum temperature. Your goal is to achieve an even and hot fire across the unit.
- 2. For continuous operation the engine RPM is run at full throttle (preset at the factory). If the fire is burning very hot with no smoke the RPM can be reduced by 1000 RPM to save fuel but that is very dependent on the waste material.
- 3. If you get excessive smoke and ash when you load the wood waste while dropping the load through the air curtain, then you may need to turn the RPM's down temporarily as you load. This is most likely earlier in the burn operation.
- 4. Take caution when loading the unit that the material to be burned is not "dumped" in the box too quickly causing hot embers to be thrown from the unit.
- 5. If you have an area in the box that is smoking, this indicates the temperature is low in that area. Add material from the "Good Wood" pile to get the fire temperature up. Once that area is burning add some of the heavier material.
- 6. The rate at which you load the unit varies depending on moisture content of the materials and the temperature of the fire. If you overload the box you will notice an increase in white smoke. White smoke is an indication that the temperature is dropping. If the smoke increases stop loading until the fire has caught-up. You can also bring the temperature up by adding materials from the "Good Wood" pile.
- 7. For the highest throughput load "LESS MORE OFTEN." Smaller bucket loads more often will give the materials a better chance to ignite and will result in your highest throughput of material. Oversized bucket loads may smother the fire for a short period before it ignites this will slow the burning down and reduce your daily throughput.
- 8. The load in the box should not go higher than the bottom of the manifold. If the material is piled higher, it will begin to break the air curtain and more smoke will escape.

The fire should be loaded continuously throughout the day, in order to maintain operating temperatures. If the fire is not loaded continuously, the temperature will drop, the through-put will go down and more smoke will escape.

"If it's burning clean it's burning hot, if there is smoke you're losing money."



### **SHUTDOWN**

### HOW TO BURN THE FIRE DOWN FOR SHUTDOWN

All loading should stop one or two hours before you intend to put the fire out.

As the fire burns down, maintain the air speed until the firebox begins to smoke. As the smoke increases, reduce the air speed in increments of about 300 RPM. This will help to reduce the smoke.

The air in the manifold needs air flow, both to accelerate the burn down and to protect the manifold from warping due to excessive heat. **DO NOT shut off the air flow, while there are still flames within 24 inches of the manifold.** Doing so may cause elevated temperatures to warp the manifold, nozzle assembly, etc. Your warranty does NOT cover damage due to excessive heat.

Once the fire has burned down to about one or two feet and flames are not visible near the manifold, it will be safe to shut the engine and air down. Make sure the fire is extinguished before you leave the job site. The best way is to load dirt or sand into the box, but do not spray the refractory walls with water as this will damage them.

When the burning materials in the fire box have burnt down to ash, reduce engine RPM to 1,400 RPM and disengage the PTO. Move the toggle switch to the OFF position to shut down the engine.

Some local authorities allow the firebox to be secured and the embers to smolder all night. There is generally no smoke from this smoldering. Insure the work site is secured or has a constant security guard to prevent any people or animals from getting near the firebox. The inside temperatures of the firebox will remain very high most of the night.

If you are not allowed to smolder through the night, then verify the fire inside is completely out. If it is still burning or smoldering you can either drag the firebox forward and water down the embers or your can use sand or dirt to cover the remaining hot spots. Ensure the fire is out and the job site secure before you leave.

**DANGER:** Falling into the fire box will cause serious injury or death.



# ASH REMOVAL HOW TO EMPTY THE S-SERIES UNITS

We recommend removing the ash every morning before burning operations begin. This will give you maximum capacity in the firebox and the ash will be easier to handle.

The box will operate with up to 3 feet of ash inside, but as the ash gets deeper the efficiency of the unit goes down. Three feet of ash would represent approximately 20 hours of burning. The box should not be run with over 3 feet of ash inside.

There are generally three ways to empty the ash: (1) by use of Air Burners' Ash Rake, (2) by excavating it out and (3) by dragging the unit forward.

#### **ASH RAKE**

Air Burners offers an ash removal implement (ash rake) designed for each model Fire-Box as pictured below. The ash rake is fitted with a universal quick connect faceplate or blank faceplate for installation on your machine.



You can remove some or all of the ash by reaching in through the rear doors with the ash rake and dragging the ash out. Remember to use the appropriate breathing apparatus, and be cautious of the remaining hot embers. It is not required to remove all the ash if you are planning on a restart, generally just a

"scoop" or two with the Ash Rake is all that is required. This will leave a very hot ember base from which you begin the new day with a "hot start" as explained previously.

DANGER: When removing ashes from the firebox, make sure that no hot ashes, embers, burning or hot materials are carried by the wind to places where they could start a fire! Wear appropriate PROTECTIVE GEAR.



# ASH REMOVAL HOW TO EMPTY THE S-SERIES UNITS

#### **EXCAVATING**

Excavating the ash out is a common method for daily operations as it allow you to maintain the ember base for restarting a new days burning operations.

You can remove some or all of the ash by reaching in through the rear doors with an excavator and scooping the ash out. **Remember to use the appropriate breathing apparatus, and be cautious of the remaining hot embers**. It is not required to remove all the ash if you are planning on a restart, generally just a "scoop" or two from an excavator is all that is required. This will leave a very hot ember base from which you begin the new day with a "hot start" as explained previously.

an excavator is all that is required. This will leave a very hot ember base from which you begin the new day with a "hot start" as explained previously.

DANGER: When removing ash from the firebox, be aware of the wind direction and insure all operators wear appropriate face masks to prevent inhaling the ash.

#### DRAGGING

Dragging the unit will allow you to remove all the ash for repositioning or when a job is complete, but it will not allow you to maintain the embers for a "hot start."

Open the back doors and cover the ash with a thin layer of dirt to minimize fly ash. Connect appropriate strength cables or chains to the pad eyes or the pull block on the front of the machine and pull the firebox forward. The ash will pile up and fall out the back of the unit. Be cautious for the remaining hot embers. Wet the ash pile down, remove unburned chunks of wood and then mix the ash into the native soil or otherwise dispose of it as required by local ordinance.

DANGER: When removing ashes from the firebox, make sure that no hot ashes, embers, burning or hot materials are carried by the wind to places where they could start a fire!

### **TROUBLESHOOTING**

#### 1. Fire will not start.

Material in fire box has too much air space. To correct, load heavy material such as stumps to make the lower material pack down. Use torches and light from the bottom so the fire burns up.

### 2. Fire burning at one end.

Load heavy materials directly on top of the burning area. This causes the flames to fan out in an effort to reach the top of the pile. As the fire begins to spread, keep material piled on top of the flames until the entire firebox is burning.

### 3. Fire smoking too much.

The most common reason for a smoking fire is too much dirt or dense materials going into the fire box and reducing the heat. You must make sure the wood waste material is free from large amounts of dirt. Load from your "Good Wood" pile to bring the temperature back up

You may have overloaded the box or loaded the box too fast. Example; if you only have 1 ton of material burning you can not load in 3 tons of material. The new material will smother the fire. Stop loading and let the fire catch up. The material you are loading may have a very high moisture content. You can either load at a slower rate or mix the wetter material with dryer material.

If you are letting the fire burn down or the load in the box is less than 3 feet deep you may need to turn the air down by reducing the engine RPM.

#### 4. Smoke from one area of the box

The area is probably not burning well. Add smaller material from your "good wood" pile to this area to help build the fire. As the smoke clears add heavier material.

#### 5. Smoke from under the base rails or bottom of panels.

Loose dirt was not properly shoveled around inside of box to seal between panel bottoms and the ground. To fix, shovel dirt around the outside where the smoke is escaping. Once the ash inside builds up this will stop.



### MAINTENANCE AND CARE

### 1. Daily check list:

- A. Oil level (top off as needed)
- B. Engine coolant level (top off as needed)
- C. Diesel fuel level in fuel tank
- D. Tap dirt out of air intake housing and check for excessive dirt
- E. Clean debris off radiator

Consult the supplied Kubota Engine Service Manual and the PTO Service Manual of the PTO Manufacturer, such as WPT Power.

#### 2. Periodic Maintenance

- A. Change oil and oil filter
- B. Clean/replace fuel filters (2) as needed
- C. Clean and inspect air filter and replace as needed
- D. Grease both (inside and outside) fan bearings every 2-4 months
- E. Adjust and grease PTO per supplied PTO Service Manual
- F. Inspect adjustment of coupler hubs and realign by re-adjusting the engine isolators (motor mounts)
- G. Check alternator V-belt and adjust as needed

Contact Air Burners, Inc., should you require assistance with any of these necessary maintenance tasks. Send Email to support@airburners.com, call 772-220-7303 or 888-566-3900



# THERMO CERAMIC PATCHING COMPOUND

For minor repair of S-Series refractory panels and doors.

# Part # 6900-1003 Thermo Ceramic Wet Pre-Mix

NOTE: This is an air cured product, reseal unused portion immediately.

Once opened the shelf life is one (1) year.

#### **Directions:**

- Cracking of the panels is normal as they flex in the heat. Filling the cracks every 6 months or as needed will extend the life of your Thermo Ceramic Panels.
- 2) Air Burners patching compound is pre-mixed and ready to use (may require some stirring).
- 3) Storage: Compound should be stored indoors in a frost free location.
- 4) Preparation: The area in and around the damaged area to be patched must be cleaned and brushed to provide the best surface for the compound to adhere. Remove all loose refractory and debris from the area to be patched.
- 5) Wet the cleaned surface with a light spray or damp cloth.
- 6) Installation: Using a trowel or similar tool, pack the refractory compound material into cracks and into areas where the refractory is missing. To achieve proper thickness trim off the excess material using a sharp flat blade or the side of the trowel.
- 7) Allow the material to harden overnight before placing the FireBox back into service. After the compound has hardened operate the FireBox under normal conditions.

#### **AIR BURNERS INC.**

4390 SW Cargo Way, Palm City, FL 34990 772-220-7303 E-mail: support@airburners.com

# SERVICING SPECIFICATIONS Parts List for Routine Service of Kubota Industrial Diesel Engine - V2403-TE

Also Refer to Engine Manufacturer's Service Manual for Engine Service Details (Engine should be serviced first after 50 then every 200 hours of operation)

Description	Air Burners P/N	Manufacturer's P/N
Air Filter (primary)	5000-1334	Donaldson P827653
Air Filter (safety)	5000-1229	Donaldson P829332
Oil Filter	5000-1327	Kubota 70000-32091
Fuel Filter	5000-1299	Kubota 16631-43560
Fuel/Water Separator Filter	5000-1297	Racor R20P
V-Belt (Engine)	5000-1341	Kubota 1G953-97010
Electrical System Fuse 40A Amp ID: Green, Style: MAXI	5000-0302	NAPA BK7821079
Optima Battery Red Top (12V, CCA 800, AH 50)	5000-0199	OPTIMA SC34U
CAT Battery (Standard) (12V, CCA 580, AH 50)	5000-2050	CAT 8C-3612

Engine Oil	15W40 Diesel Grade	
Engine Coolant	Low Silicon Anti-Freeze (Green) Units are shipped from factory with 50-50 mixture green antifreeze/water	
Bearing Lubricant	NLGI Grade 2	
Fuel Tank Capacity	Minimum 60 Gallons (227 Liters)	١.

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### LIFTING POINTS





S-327 Series Lifting Points

There are four designated lifting pad eyes for lifting the S-220 units by crane, two on each side. **Only lift by attaching cables to these four pad eyes.** Their locations are marked with yellow lifting point labels with *up-arrows* (One side shown here)

The <u>Stair Guard</u> is shipped in place secured with a bolt and nut (red circle in photo to right). The bolt must be replaced with a suitable padlock, before the firebox is placed into service.

