Guidelines for Waste Management

DRAFT

Mackenzie Valley Land and Water Board
Gwich'in Land and Water Board
Sahtu Land and Water Board
Wek'èezhìi Land and Water Board

November 13th, 2009

TABLE OF CONTENTS

DEFINITIONS AND ACRONYMS

This section of the Guideline provides a list of common Waste terms and their definition. Many of the terminologies and definitions are common to the land use permits and water licenses issued within the Mackenzie Valley. These terms are capitalized wherever they appear in this document.

Term	Definition
Boards	Land and Water Boards of the Mackenzie Valley (GLWB, MVLWB, SLWB, WLWB)
Dam Safety Guidelines	means the Canadian Dam Association's (CDA) Dam Safety Guidelines (DSG), 2007 or subsequent approved editions.
Engineer	means a professional engineer registered to practice in the Northwest Territories in accordance with the Engineering and Geoscience Professions Act, S.N.W.T. 2006, c.16
Freeboard	means the vertical distance between water line and the effective water containment crest on a dam or dyke's upstream slope
GLWB	Gwich'in Land and Water Board
Greywater	means all liquid Wastes from showers, baths, sinks, kitchens and domestic washing facilities but does not include Toilet Wastes.
Landfarm	comprises the area and associated engineered infrastructure designed to contain and treat impacted soils
Minewater	includes runoff from facilities associated with the Project and all water or Waste pumped or flowing out of any open pit or underground mine
MVLWB	Mackenzie Valley Land and Water Board
MVRMA	Mackenzie Valley Resources Management Act
NWT	Northwest Territories
Project	any development that requires a water licence or land use permit
Proponent	applicants for water licences and land use permits
Sewage	means all toilet Wastes and greywater
SLWB	Sahtu Land and Water Board
Stakeholders	term includes industry, federal agencies, the territorial government, Aboriginal governments and organizations, communities, and other interested parties
Tailings	means material rejected from the mill after the recoverable valuable minerals have been extracted
Tailings Containment Area	comprises engineered structures designed to contain Tailings
Waste	means any chemical or toxic material to be used, stored, disposed of, or handled

	on land, and also as defined by Section 2 of the *Northwest Territories Waters Act*[1]
Waste Disposal Facilities	means all facilities designated for the disposal of Waste, and includes the Sewage Disposal Facilities, Solid Waste Disposal Facilities and Landfarm
WLWB	Wek'èezhìi Land and Water Board

[1] "Waste" is defined as:

(a) Any chemical or toxic material to be used, stored, disposed of, or handled on land; and

according to the NWT Waters Act *(C.39, pg. 998, 1992)*:

(b) any substance that, if added to water, would degrade or alter or form part of a process of degradation or alteration of the quality of the water to an extent that is detrimental to its use by people or by any animal, fish or plant, or

(c) water that contains a substance in such a quantity or concentration, or that has been so treated, processed or changed, by heat or other means, that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water to the extent described in paragraph (a), and, without limiting the generality of the foregoing, includes

(d) any substance or water that, for the purposes of the Canada Water Act, is deemed to be Waste,

(e) any substance or class of substances prescribed by regulations made under subparagraph 33(1)(b)(i),

(f) water that contains any substance or class of substances in a quantity or concentration that is equal to or greater than a quantity or concentration prescribed in respect of that substance or class of substances by regulations made under subparagraph 33(1)(b)(ii), and

(g) water that has been subjected to a treatment, process or change prescribed by regulations made under subparagraph 33(1)(b)(iii).

1 INTRODUCTION

1.1 Purpose

The purpose of this Guideline is to outline the expectations of the Land and Water Boards with respect to Waste management in the Mackenzie Valley. This Guideline will be beneficial to all stakeholders because it will help to ensure Waste management plans are submitted in a consistent format, it provides a template for Proponents to write a plan, and a benchmark for reviewers to evaluate a Proponent's plan.

1.2 Authority

Section 65 of the *Mackenzie Valley Resource Management Act*[2] (1998), authorizes the Gwich'in Land and Water Board, Sahtu Land and Water Board, Wek'èezhìi Land and Water Board, and the Mackenzie Valley Land and Water Board to issue land use permits, and water licenses, required under the *Northwest Territories Waters Act* (NWTWA), within their respective areas of jurisdiction. Responsible management of Wastes, generated in the course of a project, is a common requirement under both land use permits and water licences.

1.3 How These Guidelines Were Developed

This document was developed by the Plan Review Process and Guidelines Working Group, one of the Standard Procedures and Consistency Working Groups established by the Land and Water Boards in 2008. This DRAFT document is based on input from Board staff, consultants and numerous publically available documents.

1.4 Application

This document will be applied by all of the Land and Water Boards operating under the MVRMA including the:

- Mackenzie Valley Land and Water Board;
- Gwich'in Land and Water Board;
- Sahtu Land and Water Board; and
- Wek'èezhìi Land and Water Board.

All Proponents must submit a Waste management plan to the appropriate Land and Water Board as part of their application for both land use permits and water licences. All Proponents should follow this guidance when preparing or updating a Waste management plan or implementing Waste management on site.

[2] Mackenzie Valley Resource Management Act, S.C., 1998, c.25.

1.5 Monitoring and Performance Measurement for these Guidelines

This guideline will be reviewed periodically by the Land and Water Boards, and whenever there is a relevant change in technology or legislation.

1.6 Structure of this Document

The content of this document is as follows:

(a) Section 1 provides an introduction;
(b) Section 2 outlines Waste management activities and planning;
(c) Section 3 details methods of Waste treatment and disposal and typical regulatory requirements; and,
(d) Section 4 provides a template that should be used by Proponents in the development of a Waste management plan.

Wherever possible, this document was developed to minimize inconsistencies with other regulators' requirements. However, it remains the Proponent's responsibility to comply with other agencies' requirements.

2 Waste Management Planning

Effective Waste management requires appropriate planning, as well as management and operation personnel to execute the plan. Waste management typically begins with developing a Waste management plan. A Waste management plan is a document that outlines the activities and methods of Waste management from Waste generation to final disposal (i.e., cradle to grave). This includes, but is not limited to:

(a) Waste generation, including reduction;
(b) Waste handling and separation, storage;
(c) Waste collection;
(d) Recycling;
(e) Processing at the source and transformation of Wastes;
(f) Waste transfer and transport; and,
(g) Waste disposal.

Waste management is an activity that is practiced by most Proponents seeking, or currently holding a land use permit and/or water licence, regardless of the Project (e.g., mining, oil and gas production, municipal, exploration, etc.). The types and amount of Waste generated are specific to the Project and each Waste type generated may have a unique way of being managed. For example, hazardous Waste may involve shipping to a licensed facility (off-site) for disposal,

whereas, domestic Waste may be disposed of in a landfill. How each Waste type is managed depends on various factors such as: Waste characteristics (i.e., solid, liquid, toxicity, etc.), volume/mass generated, site conditions and location, and costs. Management of specific types of Waste, along with typical regulatory requirements, are described in Section 3.

Examples of different Waste types include, but are not limited to:

Ash	Paints	Drill Cuttings
Oily wastes and oil filters	Inert Waste	Scrap Metal
Chemical waste	Sludges	Electrical equipment
Incinerator residue	Tires	Bulky metals (cars, equipment)
Used oil, fuels, lubricants, and solvents	Hazardous Waste	Domestic refuse
Lead acid batteries and alkaline batteries	Salvageable or recyclable materials	Equipment containing ozone depleting substances (e.g., refrigerators)
Construction waste	Sewage	Plastics
Greases	Putrescible Waste	Asbestos
Tailings		

2.1 Hierarchy of Waste Management Methods

In accordance with the Guiding Principles of the Land and Water Boards *DRAFT Water & Effluent Quality Management Policy* and the Canadian Council of the Ministers of the Environment's non-degradation policy, Proponents are expected to minimize and, where technically and economically possible, to prevent pollution from entering water in the NWT. To this end, the Land and Water Boards expect Proponents to demonstrate how their planning processes have considered the following Waste prevention/minimization hierarchy[3]. That is, source reduction as the most preferred method, followed by reuse, recycle/recovery, treatment, and the least preferred method being disposal; each is described below.

2.1.1 Source Reduction

Source reduction is the elimination or decrease, to the extent practical, of the volume/mass or relative toxicity of Waste generated by using alternative materials or processes. This is the most effective, proactive and cost reducing method of Waste management as it reduces the amount of Waste that has to be managed. This can be accomplished by, but not limited to:

[3] The waste prevention/minimization hierarchy as written above has been adapted from the following reference: F. Henry Habicht II. Memorandum: EPA Definition of Pollution PREVENTION. U.S. Environmental Protrection Agency, May 28, 1992.

(a) Material elimination;
(b) Inventory control and management;
(c) Material substitution;
(d) Process modification; and,
(e) Improved housekeeping, maintenance, or training.

"Minimizing or avoiding the creation of pollutants and waste can be more effective in protecting the environment than treating them, or cleaning them up after they have been created." - Canadian Council of the Ministers of the Environment

2.1.2 Reuse

Reuse is the use of a product more than once for the same or different purpose, either on-site or off-site. An example is the reuse of an empty plastic pail to store or separate items in a garage. In this case, the pail is still used as a storage container. Alternatively, the pail could be used to hold up a sign by filling the pail with sand/gravel. In this case, the pail's function has changes from its initial purpose. The examples provided above are for a case where a Waste product is reused on-site. If the Waste product has an alternative application, it could be shipped off-site for reuse in another industry. Prior to the reuse of all types of Waste, it should be verified that the reuse of the Waste is appropriate and will not cause a negative effect to the environment.

2.1.3 Recycle/Recovery

Recycle/recovery is the process by which materials otherwise destined for treatment or disposal are collected, processed, and/or remanufactured into the same or different product either on-site or off-site. An example of recycle/recovery is scrap metal that is separated from a Waste source, consolidated, and shipped from site for reprocessing to make a new product.

2.1.4 Treatment

Treatment of Waste is a method to reduce the volume, mass and/or toxicity prior to disposal. Common methods of treatment are thermal, physical, chemical, and biological processes.

Thermal

Thermal treatment is the application of heat onto Waste. Combustion can transform the Waste to ash and therefore reduce the bulkiness of the Waste (i.e., occupy less volume) and reduce the mass. One method of combustion includes the use of an incinerator that is optimized to have a controlled burn and temperature so as to reduce production of toxins, and potentially allow for control on gaseous emissions. Another form of combustion is open burning. Open burning is not a controlled burn and therefore should be limited to materials that will not result in the

production of toxic by-products and used only when absolutely necessary. Proponents should contact the Government of the Northwest Territories Environment and Natural Resources department prior to burning.

Chemical

Chemical treatment is the process of transforming Waste to another form or reducing the toxicity through a chemical process. An example of chemical treatment is the addition of lime to acidic mine waters to neutralize the water and precipitate metals.

Biological

Biological treatment is the process of transforming Waste to another form or reducing the toxicity through a biological process. Landfarming is an example of biological treatment that involves reduction of contaminant concentrations from impacted soil by microorganisms.

Physical

Physical treatment is the process of transforming Waste to another form or reducing the toxicity through a physical process, such as filtration, flotation, gravity separation, adsorption and other techniques. Whereas biological, thermal, and chemical treatments often destroy toxic chemical constituents of Waste, physical treatment does not. Instead physical treatment typically results in a Waste stream that is easier to manage environmentally. For example, the removal of solid particulate from an airstream using a baghouse or other filtration device results in the release of cleaner air, leaving behind a solid Waste stream that must be further managed (e.g., disposed).

2.1.5 Disposal

In general, disposal is the final activity for Waste management and is the last resort after source reduction, reuse, recycle/recover, and treatment. Once Waste is disposed, it no longer undergoes further processing, handling, transporting, etc. Disposal is commonly associated with the final storage location for Waste. In the case of domestic refuse, a landfill may be the final storage location. In the oil and gas industry, a sump may be the final storage location for drill cuttings. At a mine site, Tailings may be stored in containment area as the final storage location. Discharge of liquid Waste to the environment shall be limited by site-specific Effluent Quality Criteria (EQC).

3 Regulatory Requirements for Disposal Options

The disposal of Waste is the least preferred method in the Waste management hierarchy and has the most regulatory requirements. The following section provides examples of these requirements for several disposal options.

As noted in Section 2, the methods of Waste management that a Proponent conducts are unique to the Project (e.g. municipality, mine, exploration camp, etc.). For each Project, there is often more than one type of Waste that is generated, and each must be managed independently using the most appropriate technology. This section of the Guideline provides examples of regulatory requirements for several Waste management options that a Proponent may have to complete in order to obtain or maintain a land use permit and/or water licence.

Prior to building infrastructure that is required to manage Waste (e.g., a landfill with perimeter berm, liner, and top cover), Proponents should expect to submit the following, as they apply to most Waste management options (e.g., landfarm, sump, etc.):

(a) An Engineered design report with any supporting engineered drawings that accounts for all life stages of the infrastructure, from construction, operation, to closure and decommissioning. Where applicable, the infrastructure design report is to include details of construction specifications and QA/QC requirements, as well as monitoring requirements for each life stage of the infrastructure;
(b) Proposed location for the Landfarm, sump etc., on a map to scale with GPS coordinates;
(c) Description of site physical, surface and subsurface characteristics, site water management, and geotechnical characteristics;
(d) Geotechnical analysis that contributes to the containment of Waste and waters, which may include, but not limited to: settlement, slope stability, groundwater seepage and contaminant transport, and any liner performance;
(e) Any studies to support the design and operation of the infrastructure;
(f) A Spill Contingency Plan;
(g) An Operations and Maintenance Plan;
(h) Detailed Closure Plan.

The Engineered design report must include any pertinent information from studies that support the design and operation with reference to any supporting documents. References should include the report title, author(s), year of production, and section number to where information is located. Various studies are often completed to support the design and operation of the infrastructure. For example, in the case of a landfill, a geotechnical investigation may be completed.

Proponents should follow *Indian and Northern Affairs Guidelines for Spill Contingency Planning*[4] (2007), in developing spill contingency plans that either form part of the Operations and Maintenance Plan or act as a stand-alone plan. Note that the Land and Water Boards within the Mackenzie Valley have officially endorsed the contents and use of this reference document.

Examples of regulatory requirements for several Waste management options are included in Section 3.1-3.5, to give Proponent's an idea of the kind of information regulatory agencies may request as part of the application process or during operations for a land use permit or water licence.

3.1 Landfarm

Landfarming is a soil bioremediation technique that is common for petroleum hydrocarbon contaminated soil but has also been used to treat other contaminant such as salts. In general, landfarming involves manipulation of the soil conditions to promote volatilization and biodegradation of contaminants in the soil. Manipulation may involve, but is not limited to:

(a) Aeration through tilling;
(b) Adjusting moisture content and adding water when required;
(c) pH adjustment using chemicals; and,
(d) Soil conditioning, such as adding bulking agents to assist in aeration and moisture retention, or chemicals to promote biological activity.

The success of contaminant degradation is dependent on numerous factors including environmental setting, soil and contaminant characteristics, and operations. Proponents may elect to seek guidance in the location, design, operation and monitoring of a landfarm for remediation of petroleum hydrocarbon contaminated soil by referencing the *Federal Guideline for Landfarming Petroleum Hydrocarbon Contaminated Soil*[5] (2005). Note that the Land and Water Boards within the Mackenzie Valley do not endorse or reject the contents and use of this reference document.

Typical Regulatory Requirements

In addition to the general requirements for most Waste management options and the specific terms and conditions of the land use permit(s) and/or water licence, Proponents should expect to provide the following for a Landfarm:

(a) Details of a volume balance and Landfarm sizing that considers expected amounts of contaminated soil and snow to be contained and Landfarm configuration;

[4] Water Resources Division Indian and Northern Affairs Canada, 2007. Guidelines for Spill Contingency Planning.
[5] Science Applications International Corporation, 2005. Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. Report submitted to Environment Canada.

(b) Details of leachate management that includes, but not limited to: estimation of leachate generated; leachate collection and disposal, and leachate sampling and monitoring;
(c) Spatial and temporal monitoring of soil chemistry within the Landfarm; and
(d) Within the respective Operation and Maintenance Plan, describe at minimum: acceptable soil types that can be treated in the Landfarm, remediation standards, methods and frequency of any soil manipulation to promote remediation, routine facility inspection, monitoring of annual volume/mass of soil entering and leaving the facility, and facility maintenance.

3.2 Solid Waste Disposal Facility

A Solid Waste Disposal Facility is a solid Waste management option that involves placement of Waste within a controlled area on land, called a landfill. A Solid Waste Disposal Facility is a long term storage option, often permanent, for non-hazardous Waste. Where applicable, a Solid Waste Disposal Facility must satisfy the requirements of the Northwest Territories *Public Health Act, General Sanitation Regulations*[6] (1990).

For the purposes of this Guideline, a Solid Waste Disposal Facility is not to be a storage location for materials that are hazardous. Proponents may elect to seek guidance on hazardous Waste management by referencing the *Guideline for the General Management of Hazardous Waste in the NWT* (1998)[7], *Guideline for Industrial Waste Discharges in the NWT* (1998)[8]. Additional hazardous Waste guidelines for specific types of Waste are provided on the Government of Northwest Territories, Environment and Natural Resources website (www.enr.gov.nt.ca). Note that the Land Water Boards within the Mackenzie Valley do not endorse or reject the contents and use of these reference documents.

Proponents may elect to seek guidance in the siting, design, operation and monitoring of a Solid Waste Landfill Facility by referencing the *Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories* (2003)[9], *Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal*

[6] General Sanitation Regulations, R.R.N.W.T. 1990, c.P-16
[7] Government Northwest Territories, Environment and Natural Resources, 1998. Guideline for the General Management of Hazardous Waste in the NWT.
[8] Government Northwest Territories, Environment and Natural Resources, 1998. Guideline for Industrial Waste Discharges in the NWT.
[9] Kent, R., Marshall, P., and Hawke, L. 2003. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories. Prepared for Government of Northwest Territories, Department of Municipal and Community Affairs.

Facilities in the Northwest Territories (1996)[10], *Municipal Solid Waste Suitable for Open Burning* (1993)[11], and *Operating and Emission Guideline for Municipal Solid Waste Incinerators* (1989)[12]. Note that the Land and Water Boards within the Mackenzie Valley do not endorse or reject the contents and use of these reference documents.

Typical Regulatory Requirements

In addition to the general requirements for most Waste management options and the specific terms and conditions of the land use permit(s) and/or water licence, Proponents should expect to provide the following for a Solid Waste Disposal Facility:

(a) Details of a volume balance and Solid Waste Disposal Facility sizing that considers, but not limited to: refuse volume and density, cover material volume and density, and material balance describing storage capacity and material inputs;
(b) Details of leachate management that includes, but not limited to: estimation of leachate generated, leachate collection and disposal, and leachate sampling and monitoring;
(c) Within the respective Operation and Maintenance Plan, at minimum, the details of: acceptable Waste types entering the facility, routine facility inspection, monitoring of annual volume/mass of Waste entering facility, and facility maintenance;
(d) Engineered design of a final cover that includes, at minimum, the details of: wildlife control, a water balance, material characteristics and configuration and final slopes and contouring to be geotechnically stable, minimize water pooling and erosion;

3.3 Sump

A sump is a large pit that is excavated into the ground that is used to contain Waste. Sumps have been used to contain drilling Waste during exploratory or production drilling. A sump excavated into the ground can contain Waste and water if the right soil conditions are present. For example, low permeability soils like clay can limit the passage of water and therefore effectively contain the Waste and water. Soil conditions that do allow the passage of water may require a liner to effectively contain the drilling Waste.

Chemical components within the drilling materials, such as select additives, if biodegradable or susceptible to chemical degradation, will have potential to be destroyed over time. However, brine based drilling fluids are common and the sodium and chloride generally do not undergo

[10] Duong, D. and Kent, R. 1996. Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories. Prepared for Government of Northwest Territories, Municipal and Community Affairs Community Development.
[11] Government Northwest Territories, Environmental Protection Division, 1993. Municipal Solid Waste Suitable for Open Burning.
[12] Canadian Council of Ministers of the Environment, 1989. Operating and Emission Guidelines for Municipal Solid Waste Incinerators.

destruction biologically or chemically. As such, both the drill cuttings and fluid are necessary to be contained within the sump for long-term storage. It is common for sumps to be capped with the excavated materials after use and left to re-vegetate.

Typical Regulatory Requirements

In addition to the general requirements for most Waste management options and the specific terms and conditions of the land use permit(s) and/or water licence, Proponents should expect to provide the following for a sump:

(a) Description of Waste generation volumes and Waste types/properties;
(b) Details of a Waste volume balance and sump sizing; and
(c) Details of the operations from construction, disposal, and closure.

3.4 Tailings Containment Area

Tailings and waters from the processing facility at a mine are commonly managed by storing this Waste in a Tailings Containment Area. Typically, Tailings are transported to the Tailings Containment Area as slurry. In some cases, the Tailings Containment Area also is the receiving point for other fluid Waste streams at a mine. A Tailings Containment Area may be within a natural depression to contain Waste and water, and/or it may incorporate the use of Engineered control structures, such as dam(s), to contain Tailings and water. The Canadian Dam Association (CDA) *Dam Safety Guidelines*[13] (2007) are to be followed in engineering a Tailings Dam. Classification of any dam should be determined by the dam owner and the appropriate regulating Land and Water Board. Proponents may elect to seek guidance in the methods of Tailings disposal, design, operation and monitoring of a Tailings Containment Area by referencing the *Guidelines for Tailings Impoundment in the Northwest Territories*[14] (1987). Note that the Land and Water Boards within the Mackenzie Valley do not endorse or reject the contents and use of this reference document.

Typical Regulatory Requirements

In addition to the general requirements for most Waste management options and the specific terms and conditions of the land use permit(s) and/or water licence, Proponents should expect to fulfill the following requirements for a Tailings dam:

(a) Complete an Operation, Maintenance and Surveillance Plan as per CDA Guidelines;
(b) Complete an Emergency Preparedness Plan as per CDA Guidelines;
(c) Ensure regular independent dam safety reviews are carried out as per CDA Guidelines; and,
(d) Ensure annual engineering inspections are conducted.

[13] Canadian Dam Association, 2007. Dam Safety Guidelines.
[14] Northwest Territories Water Board, 1987. Guidelines for Tailings Impoundment in the Northwest Territories.

3.5 Discharge

Discharge is a disposal option for fluid Waste streams, or effluent. Discharge is the least preferred of the Waste management options, however, if it's deemed necessary, Proponents must follow the Land and Water Board's DRAFT *Water & Effluent Quality Management Policy* for further information and direction.

The following template serves as a starting point for Proponent's developing a Waste management plan to submit as part of their application for a land use permit and/or water licence. Additional requirements may be necessary depending on the type and scope of development and the specific terms and conditions issued by the respective Land and Water Board.

4 Template for a Waste Management Plan

INTRODUCTION

This section should include:

(a) Company Name, site name and site location;
(b) Effective date of the plan;
(c) Environmental policy of the Proponent and how it relates to Waste management;
(d) Purpose and scope of the plan including detailed Waste management goals and objectives; Goals and Objectives should consider the following:
    i. Environmental factors such as: land, water, air, wildlife, fish, and vegetation;
    ii. Social factors such as: aesthetics, land use, economic impacts, and public interests; and,
    iii. Regulatory factors such as compliance with all applicable Acts, Regulations, authorizations, land use permits, and water licences.
(e) Description of the Project and for which the Proponent is seeking or currently holds a land use permit and/or water licence; and
(f) A description of the site facilities.

WASTE TYPES

This section should discuss the types of Waste that the Proponent will generate and the method of Waste management. For each type of Waste, provide the following:

(a) Description of its characteristics;
(b) Description of the source of generation;
(c) Estimation of the volume/mass produced;
(d) Description of and rationale for the method(s) that will be employed for each Waste type (e.g., source reduction, reuse, recycle/recover, treatment, and disposal);
(e) Description of how the Waste management hierarchy was considered for each Waste type;
(f) Description of the activities involved in the management (e.g., handling, storage, processing, collection, separation, transportation, disposal, etc.) from generation to disposal;

MONITORING AND REVIEW

This section should describe the monitoring that will be conducted to measure the effectiveness of Waste management practices, as well as, provide a description of the steps taken to review and improve the Waste management plan or correct any management/operational problems.