Manitoba
Sustainable Development

GUIDELINE TITLE: LEACHATE MANAGEMENT AT A WASTE MANAGEMENT FACILITY

BRANCH/DIVISION: Environmental Approvals / Environmental Stewardship

Date Revised: October 25, 2016

INTENT

To provide guidance to the public and operators of a waste management facility (WMF) regarding leachate management at a permitted or licenced WMF.

DEFINITIONS

Landfill *– means a facility at which solid waste is disposed of by placing it on or in land, but does not include a remote seasonal waste facility.*

Leachate *– means liquid that has percolated through solid waste and contains dissolved and suspended materials from the solid waste.*

Non-contaminated water *- means stormwater (or meltwater) which does not come in direct contact with the landfilled waste, the waste handling and treatment areas, or landfill leachate.*

Transfer station *– means a facility at which solid waste is received and temporarily stored for the purpose of transporting it to another site for processing, recycling, or disposal.*

Waste Management Facility *– means a landfill, a composting facility, a transfer station, a material recovery facility or a remote seasonal waste facility.*

BACKGROUND

When water percolates through solid waste, both biological and chemical materials are leached into the effluent. Leachate from a WMF can be hazardous to human health and the environment because of the potential chemicals and pollutants it can contain. Preventing contamination to groundwater, surface water and soil is the main goal when managing leachate. If leachate is not managed properly, it can also result in odours, unsightly conditions, attract insects, and cause distress in vegetation.

There are many factors that can influence leachate generation. These include precipitation volumes, landfill cover, type of waste deposited, vegetation, climate, and landfill design.

Pursuant to Section 12(1)(f) of the *Waste Management Facilities Regulation 37/2016, the operator of a waste management facility must manage leachate so that it is not recirculated in solid waste or discharged from the facility site.*

GUIDELINE

A. Characteristics of Leachate

Leachate mainly consists of trace metals, major elements, organic compounds and microbiological components carrying both dissolved and suspended materials. The typical composition of leachate from new and mature landfills includes:

• 5-day biochemical oxygen demand (BOD_5)	• pH
• Total organic carbon (TOC)	• Total hardness as $CaCO_3$
• Chemical oxygen demand (COD)	• Calcium
• Total suspended solids (TSS)	• Magnesium
• Organic nitrogen	• Potassium
• Ammonia nitrogen	• Sodium
• Nitrate	• Chloride
• Total phosphorous	• Sulphate
• Ortho phosphorous	• Total iron
• Alkalinity as $CaCO_3$	

(McGraw-Hill, 1993, p 418)

Leachate also carries trace pollutants. These are found in low concentrations but they can be toxic. These include heavy metals (eg: lead or arsenic) and organic pollutants (eg: benzene, trichloroethylene, and PCBs). All these factors make leachate difficult to manage.

B. Leachate Production and Management

The best way to control leachate is to prevent leachate generation. This includes managing surface and storm water flows, use of proper cover materials to prevent infiltration, and keeping high liquid content material out of the WMF.

If prevention and management is not enough, liner systems, removal systems and operational practices can also be implemented.

Operators of the WMF are responsible for storage, treatment, and handling of the leachate in accordance with the Waste Management Facilities Regulation and the Permit or Environment Act Licence.

C. Treatment and Disposal

1.0 Treatment Technologies

The two main treatment technologies for leachate are biological and physical/chemical. Biological treatments are more common in newer landfills as the leachate may contain more biodegradable organics. Leachate treatment methods include evaporation, treatment for disposal, discharge to a municipal wastewater collection system, and leachate recycling. The most common methods for treatment and disposal in Manitoba are leachate evaporation and transporting the leachate to a wastewater treatment plant (WWTP).

1.1 Leachate Evaporation

One of the simplest and most preferred ways to manage leachate is through lined leachate evaporation ponds. The ponds are used to collect leachate in a cell by extracting it from the waste containing landfill cell using a leachate collection system. These leachate cells may be lined with a synthetic material or with a clay liner in order to prevent the leachate from permeating the soils underneath. The liner system may also be similar to the one used in the cell of the landfill.

A common practice in the leachate pond is to use floating aerators. This helps provide some treatment and reduce odours by keeping the ponds from becoming anaerobic, and may increase evaporation for volume reduction. The amount of yearly evaporation will depend on temperature, precipitation and humidity. Sludge from the bottom of the pond may need to be removed periodically and deposited within the landfill cell or other approved location.

1.2 Leachate Treatment

When recycling, evaporating, or direct disposal to a WWTP is not feasible, pre-treatment or complete treatment will be required. Both biological and physical/chemical treatment options can be used depending on the contaminants to be removed. This can include aerobic and anaerobic biological processes. Following complete treatment, surface discharge may be considered under authorization of an Environment Act Licence.

1.3 Discharge to Wastewater Treatment Plant

Leachate may be sent to an existing WWTP for treatment and disposal, depending upon the treatment type of the facility and the capacity of the WWTP. In order to do this, authorization is required from the receiving WWTP and the Director of Manitoba Sustainable Development (SD). This may be done through gravity and/or force main sewer systems, or using tanker trucks. Pre-treatment may be required to reduce the organic loading before being discharged into the sewer system. If the minimum standards are not met, the WWTP may refuse to accept the leachate or charge a surcharge for high strength waste, and an alternative disposal method may be required.

1.4 Leachate Collection and Recirculation (Recycling)

An effective method for leachate treatment is to recirculate the leachate back through the landfill. This is done to provide leachate treatment within the waste, increase waste settlement leading to more efficient use of land airspace, and to accelerate waste degradation. As well, this avoids leachate being transported to a WWTP for treatment and disposal, and increases landfill gas generation rates for potential energy recovery.

Recirculation does have potential issues with odours and other problems. Therefore, if an operator wants to re-circulate leachate into the landfill, they must submit a plan that details the design, operation, monitoring and reporting that will be performed. This would also include contingency plans for events such as elevated leachate head, seeps, odours, equipment failure, slope instability, and emergencies. Approval must be given prior to construction and commissioning. This option would only be considered in Manitoba for sites with a double liner system compatible with high strength leachate under an Environment Act Licence.

All proposed forms of leachate treatment or disposal must be approved in advance by a Director of SD. Other options or advanced technologies for use and disposal may be accepted at the discretion of the Director.

D. Management Issues

There are many issues with the management of leachate. Maintaining enough storage capacity and an acceptable level of extra storage as freeboard to handle additional precipitation and wave action can be an issue. If this is not maintained, leachate can escape the collection area and pose a risk to human health and the environment on and off site. For example, leachate with high salt content could impact a groundwater source and make it no longer drinkable.

As well, side seeps (or breakouts) are a common occurrence at some landfills. This occurs when leachate is directed to the side slope of the landfill and not into the leachate collection system. Since leachate migrates along the path of least resistance thorough the landfill waste, this can allow for leachate to migrate on and offsite when capacity has been reached.

Ongoing maintenance of equipment and monitoring for pump operation is required. It is good practice to keep a spare pump onsite for servicing without interruption of the leachate collection system.

Maintaining a surface water control system is important to prevent flow of non-contaminated water into the active area during peak flows. Once the water has been in contact with the waste, it is considered leachate and must be handled as leachate. Therefore, operators of all WMF must design, construct and maintain a surface water control system to handle increased precipitation from a 25 year storm event. All discharges to the environment whether intentional or not are to be reported to SD.

E. Reporting

Sampling results and interpretation shall be submitted to SD as required in the Permit or Environment Act License. Any requests to deviate from the method of leachate disposal as identified in the EAL or Permit must be submitted to the Director for approval prior to the discharge.

Typical leachate sampling parameters may include, but not be limited to:

Physical	Organic Constituents	Inorganic Constituents	Biological
Appearance	Organic chemicals	Suspended solids (SS), Total Dissolved Solids (TDS)	Biochemical oxygen demand (BOD)
pH	Phenols	Volatile suspended solids (VSS), volatile dissolved solids (VDS)	Coliform bacteria (total, fecal; fecal streptococci)
Conductivity	Chemical oxygen demand (COD)	Chloride	Standard plate count
Oxidiation-Reduction Potential	Total organic carbon (TOC)	Sulphate	
		Phosphate	
Color	Volatile acids	Alkalinity and acidity	
		Nitrate-N	
Turbidity	Tannins, lignins	Nitrite-N	
Temperature	Organic-N	Ammonia-N	
Odour	Ether soluable (oil and grease)	Sodium	
	Methylene blue active substances (MBAS)	Potassium	
		Calcium	
	Organic functional groups as required	Magnesium	
		Hardness	
	Chlorinated hydrocarbons	Heavy metals (Pb, Cu, Ni, Cr, Zn, Cd, Fe, Mn, Hg, Ba, Ag)	
		Arsenic	
		Cyanide	
		Fluoride	
		Selenium	

(McGraw-Hill, 1993, p 419)

It is important to note that a closed WMF will still generate leachate and will need to be monitored regularly. A closed landfill can also be converted to a transfer station and will require the same long term monitoring. Requirements for maintenance will be identified by the operator in the approved closure plan for the WMF.

Any environmental emergency or a release of a pollutant or contaminant to the environment must be reported immediately to the Manitoba Emergency Response line at 1 (204) 944-4888 or toll free in Manitoba at 1 (855) 944-4888.

FOR MORE INFORMATION

Manitoba Sustainable Development
Environmental Compliance and Enforcement Branch
Regional Office Contact Information
www.gov.mb.ca/conservation/ece/contact.html

Manitoba Sustainable Development
Environmental Approvals Branch
2nd Floor, 123 Main Street (Box 80) Winnipeg, MB R3C 1A5
General Inquiry: (204) 945-8321
http://www.gov.mb.ca/conservation/eal/index.html

Manitoba Sustainable Development
Solid Waste Management Program
1007 Century Street Winnipeg, MB R3H 0W4
http://www.gov.mb.ca/conservation/envprograms/swm/index.html

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