Module: Landfill Mining – Blackstock Landfill

Introduction

This module teaches student about closed historic landfills and the need for long-term environmental management. Students will explore how landfill mining can be used as an opportunity to reduce greenhouse gas emissions, improve groundwater quality, recover recyclable material from landfilled waste, convert garbage into a resource for energy recovery and reduce the need for long-term groundwater monitoring.

Learning Objectives

1. Identify where your garbage goes in Durham Region
2. Define the term historic landfill
3. Identify potential issues caused by historic landfills
4. Define the term landfill mining
5. Understand the basic landfill mining process
6. Identify examples of the benefits of using landfill mining as a tool for remediation

What are historic landfills?

Historic landfills are sites that once received waste for disposal and are now closed. These landfills were built at a time before modern regulations were in effect. In the past, recyclable and non-recyclable waste was typically sent to landfill and buried. As a result, many waste materials buried in these sites are lost resources that in today's market, could have been recycled.

It is important to note that while there are numerous closed landfills throughout Durham, Durham Region (Region) is only responsible for the long-term management of seven of the historic landfill sites within the Region's boundaries. For the purposes of this lesson, only landfills managed by the Region have been included in this module.

Where are the Region's historic landfill sites located?

While the Region no longer relies on landfill sites as its primary way to dispose of waste, we are responsible for the long-term management of seven closed landfill sites within the Region's boundaries which include:

1. Blackstock Landfill (landfill area ~2 hectares)
2. Brock Landfill (landfill area ~8 hectares)
3. Darlington Landfill (landfill area ~7.2 hectares)
4. Oshawa Landfill (landfill ~32 hectares)
5. Scott Landfill (landfill area ~2.2 hectares)
6. Scugog Landfill (landfill area ~7.2 hectares)
7. Whitby Landfill (landfill area ~9.7 hectares)

Environmental monitoring, mitigation, and rehabilitation

The Region provides the oversight of environmental monitoring programs at its historic landfill sites. A team within the Region's Waste Management Division works with the Province, Regional Council and other stakeholders to monitor any potential impacts from each site to ensure the infrastructure is in good repair to continue to meet environmental standards and regulations.

To prevent negative environmental impacts, perpetual (or long-term) care programs have been established for each of the Region's seven historic landfills to ensure the environmental integrity of these sites. Annual reports are prepared and submitted to the Ministry of the Environment, Conservation and Parks (MECP) for review. Annual monitoring includes activities such as:

- Surface and groundwater monitoring
- Well maintenance
- Seep repair
- Gas monitoring
- Soil erosion control
- Site grading and landscaping

The Region is committed to ensuring the safety of the community and the environment. In addition to regular monitoring, the Region continues to look for innovative ways to mitigate the effects of their historic landfill sites. An example of an innovative approach includes landfill mining.

What is landfill mining?

Landfill mining is a process where previously landfilled waste is excavated, screened, processed and/or recycled. Landfill mining can be used as a tool to recover buried resources which can then be refined or resold "as-is" to market.

What are the benefits of landfill mining?

Landfill mining is a process where waste in a landfill is excavated, screened, and removed from the site for treatment and recycling. Typically landfill mining is used to make room for more waste by removing recyclable waste and excess soil from the existing landfill site. However, the Region has taken a unique approach to use landfill mining to rehabilitate (or restore) one of its historic landfill sites back to a natural green space - land that is partly or completely covered with grass, trees, shrubs, or other vegetation. The Region sees landfill mining as an opportunity to reduce greenhouse gas emissions, improve groundwater quality, recover recyclable material from landfilled waste, convert waste into a resource for energy recovery and reduces the need for long-term groundwater monitoring.

Blackstock Landfill - Landfill Mining Pilot Project

Durham began landfill mining in October 2018 at the Blackstock landfill site in the Township of Scugog. For a first hand look at the project, check out the Blackstock Landfill Mining video to see how the project was completed!

Blackstock Landfill Quick Facts

- Site size ~ 2 hectares
- Waste fill area ~ 4,500 m2

The Regional Municipality of Durham - Waste Management Services
If this document is required in an accessible format, please contact schoolprograms@durham.ca

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- Landfill operations ended in 1974
- No engineered controls for leachate and landfill gas
- Transfer station in operated from 1976 to 2004
- Annual ground and surface water monitoring and reporting program since 2003
- Groundwater flows easterly towards the wetland
- Landfill leachate (water that has been in contact with buried waste and is contaminated) was influencing groundwater quality

Figure 1 Map showing the location of the Blackstock Landfill

Background Investigation

Before the Region could mine the landfill, we needed to know what was there. To do this ground penetrating radar and electromagnetic surveys were completed that are non-intrusive geophysical methods that image material below the ground without digging to evaluate the extent of the waste in the landfill (how much and where it was located).

Waste Excavation

Waste was excavated (or dug up) using heavy equipment (two excavators) and placed into a rotating trommel screen that is a mechanical screening machine used to separate the waste from the soil.

Pre-segregated Materials

Concrete, scrap metal, and tires were separated from the excavated waste and from the demolition of the old transfer station building at the site. The concrete weighed 160 tonnes and the scrap metal

weighed approximately 98 tonnes. These materials were recycled along with about 450 tires picked from the excavated waste.

How the trommel screen process works

1. An excavator places landfilled waste and cover soil into the trommel screen hopper
2. Soil falls through the trommel screen perforations (or holes) onto a conveyor forming a soil stockpile
3. Waste exits the open end of the trommel screen forming a waste stockpile called screened waste

Screened Waste

Waste that was capable of incineration or combustible was transported to the Durham York Energy Centre (DYEC) for energy recovery.

A total of 4,796 tonnes of waste was removed from the site: 2,849 tonnes of combustible waste was processed at the DYEC and 1,947 tonnes of waste that was not capable of burning (such as brick, ceramics, and glass) was sent to the Twin Creeks Landfill in Ontario for disposal.

Project Completion

Once all the waste was mined, sorted, and taken away, the hole was re-filled with the remaining soil. The final step for this project included returning the site to natural conditions through grading, seeding, and planting native trees and shrubs, as well as creating food sources and habitats for wildlife, including a snake hibernaculum, and turtle nesting area. Mining at the Blackstock landfill was completed in January 2019, with final contouring and seeding completed in July.

Good News Story

Normally landfills make and release methane as the waste buried breaks down. Methane is a gas that when it is released into the atmosphere contributes to climate change. With the removal of waste, the landfill greenhouse gas emissions from 2020 onward are now estimated to be zero from the Blackstock Landfill site.

How does landfill mining recover resources?

When waste is placed in a landfill, this is usually the final resting place for these materials. However, landfill mining at the Blackstock site provided an opportunity for the Region to recover recyclable material from landfilled waste for proper management and the ability to remove combustible waste to convert it to a resource for energy recovery at the Durham York Energy Centre in the Municipality of Clarington.

Where Does Your Garbage Go Today?

Durham Region no longer relies on landfills as our primary way to dispose of garbage. Instead, garbage remaining after maximizing waste diversion programs (rethink, reduce, reuse, recycle, and compost) is sent to the Durham York Energy Centre (DYEC) in the Municipality of Clarington. At the DYEC garbage is safely burned to generate electricity and to recover additional metals for recycling. Check out the video What happens to your garbage once it leaves the curb? to learn more about the DYEC.

Conclusion

This innovative project is one tool that the Region is using to tackle our climate change impacts from our landfills. This module teaches students the use of landfill mining as an opportunity to reduce greenhouse gas emissions, improve groundwater quality, recover recyclable material from landfilled waste, convert waste into a resource for energy recovery and reduce the need for long-term groundwater monitoring. With the removal of waste, the landfill greenhouse gas emissions from 2020 onward are estimated to be zero from the Blackstock Landfill site.

Curriculum Connections

The Ontario Curriculum, Grade 9 and 10: Canadian and World Studies, 2018 (revised)

- Issues in Canadian Geography, Grade 9, Academic (CGC1D)
- Issues in Canadian Geography, Grade 9, Applied (CGC1P)
- Civics and Citizenship, Grade 10, Open (CHV2O)

The Ontario Curriculum, Grades 11 and 12: Canadian and World Studies, 2015 (revised)

- Regional Geography, Grade 11, University/College Preparation (CGD3M)
- World Geography: Urban Patterns and Population Issues, Grade 12, University/College Preparation (CGU4M)
- Environmental Resource Management, Grade 12, University/College Preparation (CGR4M)
- World Issues: A Geographic Analysis, Grade 12, College Preparation (CGW4C)
- Living in a Sustainable World, Grade 12, Workplace Preparation (CGR4E)

The Ontario Curriculum, Grade 9 and 10: Science, 2008 (revised)

- Science, Grade 9, Academic (SNC1D)
- Science, Grade 9, Applied (SNC1P)
- Science, Grade 10, Applied (SNC2P)
- Science, Grade 10, Academic (SNC2D)

The Ontario Curriculum, Grade 11 and 12: Science, 2008 (revised)

- Biology, Grade 11, University Preparation (SBI3U)
- Chemistry, Grade 11, University Preparation (SCH3U)
- Physics, Grade 11, University Preparation (SPH3U)
- Environmental Science, Grade 11, Workplace Preparation (SVN3E)
- Chemistry, Grade 12, University Preparation (SCH4U)
- Earth and Space Science, Grade 12, University Preparation (SES4U)
- Physics, Grade 12, University Preparation (SPH4U)