



Lesson Plan: Landfill Mining – Blackstock Landfill, Grade 10 Science (SNC20 and SNC2P)

Introduction

Historically the Region of Durham relied on local landfill sites for the disposal of garbage which, even after closure, need to be managed to ensure the environmental integrity of these sites. When managing the waste, we must consider how the waste interacts with the natural environment and the long-term plan for the land and community.

In this lesson, students will explore what chemical and biological processes may occur once waste is buried in a landfill, what potential environmental and human health concerns may arise from these interactions and how landfill mining can be used to remediate historic landfill sites.

Learning Objectives

1. Demonstrate and understanding of historic landfills and landfill mining
2. Analyze the potential environmental issues associated with historic landfills
3. Explain the environmental benefits of using landfill mining as a remediation tool
4. Investigate the connection between historic landfills and climate change

Resources Provided

- [Blackstock Landfill Mining Video](#)

Questions

1. What is a historic landfill and what are the potential environmental effects of these sites?
2. What is landfill mining?
3. What is climate change?
4. How may historic landfills in the Region contribute to climate change?
5. What is landfill gas and how is it generated?
6. What chemical or biological processes may occur once waste is buried in a landfill?
7. How does the Region manage waste today?

Activity

1. Watch the [Blackstock Landfill Mining Video](#) with the class.
2. Provide the following scenario to class to work on individually:

The Region is responsible for the long-term management of seven closed landfill sites within the Region of Durham. The Region would like to mitigate any potential negative environmental effects that may arise due to their historic landfill sites.

3. Individually, students will prepare a report identifying what environmental impacts may be present at a historic landfill site and how landfill mining might be used to remediate and

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rehabilitate the site. Students are required to include the following the information within their reports:

- a. Explanation of landfill gas and landfill leachate in their own words, including how landfill gas and landfill leachate is generated at the site
- b. Explain how landfill gas and landfill leached may move through the site
- c. Identify potential environmental and human health impacts associated with historic landfills
- d. Identify and explain how historic landfills relate to climate change and greenhouse gas and why it is important to mitigate these issues
- e. Students will submit their final reports for review by the teacher.

Summary

It is important that waste is managed responsibly to protect the environment and human health. When managing the waste, we must consider how the waste interacts with the natural environment and the long-term plan for the land and community. Over time, how we manage waste has evolved. This innovative project is one tool that the Region is using to tackle our climate change impacts from our historic landfills.

Expanded Curriculum Connections

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

Science, Grade 10, Academic (SNC2D)

A. Scientific Investigation Skills and Career Exploration

- A1. Scientific Investigation Skills: demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating)

C. Chemistry: Chemical Reactions

- C1. Relating Science to Technology, Society, and the Environment: analyse a variety of safety and environmental issues associated with chemical reactions, including the ways in which chemical reactions can be applied to address environmental challenges
- C2. Developing Skills of Investigation and Communication: investigate, through inquiry, the characteristics of chemical reactions
- C3. Understanding Basic Concepts: demonstrate an understanding of the general principles of chemical reactions, and various ways to represent them

D. Earth and Space Science: Climate Change

- D1. Relating Science to Technology, Society, and the Environment: analyse some of the effects of climate change around the world, and assess the effectiveness of initiatives that attempt to address the issue of climate change
- D2. Developing Skills of Investigation and Communication: investigate various natural and human factors that influence Earth's climate and climate change

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- D3. Understanding Basic Concepts: demonstrate an understanding of natural and human factors, including the greenhouse effect, that influence Earth's climate and contribute to climate change

Science, Grade 10, Applied (SNC2P)

A. Scientific Investigation Skills and Career Exploration

- A1. Scientific Investigation Skills: demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating)

C. Chemistry: Chemical Reactions and Their Practical Applications

- C1. Relating Science to Technology, Society, and the Environment: analyse how chemical reactions are employed in common products and processes, and assess the safety and environmental hazards associated with them
- C2. Developing Skills of Investigation and Communication: investigate, through inquiry, the characteristics of simple chemical reactions
- C3. Understanding Basic Concepts: demonstrate an understanding of simple chemical reactions and the language and ways to represent them

D. Earth and Space Science: Earth's Dynamic Climate

- D1. Relating Science to Technology, Society, and the Environment: analyse effects of human activity on climate change, and effects of climate change on living things and natural systems
- D2. Developing Skills of Investigation and Communication: investigate various natural and human factors that have an impact on climate change and global warming
- D3. Understanding Basic Concepts: demonstrate an understanding of various natural and human factors that contribute to climate change and global warming