

# WHAT HAPPENS IN A LANDFILL?

## Waste Decomposition

Waste decomposes in a landfill. Decomposition means that those chemical bonds that hold material together disintegrate and the material breaks down into simpler substances.

Biological decomposition can be hastened or delayed depending on the amount of oxygen, temperature, and moisture available. In older landfills and open dumps, decomposition was faster. That's because oxygen, heat and moisture were plentiful. Older landfills were often uncovered and exposed to more oxygen and rain. You may have heard about open burning dumps. Older dumps were so hot from decomposing waste they often spontaneously combusted.

In past years, the practice of entombing garbage in a dry environment was thought to be the best environmental control. However, recent innovative technologies have challenged that notion and suggest rapid decomposition in a controlled wet environment may have far greater benefits. Such technologies include bioreactor landfills and leachate recirculation. These technologies involve increasing the moisture level of the refuse to its optimum which has the effect of stabilizing the landfill mass sooner, reducing leachate production, by placing impermeable cover systems over the garbage, increasing the potential for landfill gas utilization and reducing long-term care costs. These ideas are constantly being explored for Hartland landfill.

### Decomposition is Slow

But it does happen. During the degradation process, four actions occur:

- organic matter is stabilized, that is, it stops changing;
- leachate is produced;
- landfill gas is generated; and
- settlement occurs.

## What is Leachate?

Solid waste typically contains some moisture when delivered to a landfill. Rain and snow add more liquid and hasten biological decomposition. Liquids which are not absorbed or evaporated flow outward and downward, transporting contaminants from within the landfill. The action is much like water flowing through coffee grounds. In the case of a landfill, the water flowing through the waste is called leachate.

Because leachate may contain contaminants from buried solid waste, it must be prevented from going outside the landfill boundaries or into the groundwater. Through a complex combination of landfill liners, monitoring wells, piping, pumps and capping of the landfill, leachate flow is restricted and captured.

Leachate collected at Hartland landfill is regularly tested to ensure it falls within established parameters before it is discharged to the sanitary sewer system.

A Leachate System Spill Response Plan is in place to ensure that potential risks to the environment and public health and safety are minimized in the event of a spill.

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## Landfill Gas Collection and Utilization

The decomposition process consumes oxygen and produces landfill gas. This gas is mainly a combination of carbon dioxide and methane. Methane, also known as natural gas, is an energy source but it is also a greenhouse gas. It is flammable and explosive in certain concentrations so it must be controlled. Modern sanitary landfills are designed and operated either to vent and/or use landfill gas. Since 1991, Hartland has been collecting this gas using a series of wells and a piping network, then burning it in a flare.

In 2003, a facility was built next to the flare station to use the methane in the landfill gas to produce electricity. The plant's reciprocating engine works very much like the spark-ignition engine in a car, except instead of gasoline, methane is the fuel. Mechanical energy is turned into electrical energy and fed into a BC Hydro distribution system on-site. The plant produces close to 1.6 MW of green power - enough electricity to supply about 1,600 homes.

## Landfill Closure

After a landfill is closed, monitoring must be conducted for many years. The landfill must be capped and a top layer of soil added to support vegetation. Methane and leachate collection and monitoring systems must continue to operate.

The section of Hartland landfill that was closed in 1997 is currently being reforested with a variety of native trees and shrubs so it blends in with its natural surroundings and creates a self-sustaining eco-system.

Hartland is scheduled to be full by 2045. Funds are being set aside today for closure costs and post closure monitoring costs until 2070.

## Waste Settlement

As solid waste in a landfill decomposes, it settles and takes up less space. Because landfills can settle significantly, building structures on top of them after they are closed is not recommended. There is also the risk that landfill gas may accumulate in the basement of a structure, therefore creating a risk for explosion. Typically, the end use for a landfill is a green space, for example a golf course, nature trails or a park.



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