

The Science Behind Your Landfill

ecomaine welcomes you



Background

ecomaine, a non-profit organization, is owned and operated by 21 municipalities and serves more than 20 percent of the state's population with environmentally sound disposal services: single-sort recycling, waste-to-energy, and a landfill/ashfill.

On Blueberry Road, just three miles away from **ecomaine**'s landfill/ashfill, the organization's waste-to-energy plant burns waste and uses the resulting steam to make electricity; the electricity is sold to help offset expenses. Right next door is **ecomaine**'s state-of-the-art, single-sort recycling facility, which also helps to offset organizational expenses. These two facilities are located in Portland, while the 260-acre landfill crosses the borders of Scarborough, South Portland and Westbrook.

The **ecomaine** landfill began operation in 1977 as a place to bury baled, municipal solid waste (MSW). When, in 1988 the organization's waste-to-energy plant was built, the resulting ash needed to be buried, rather than unprocessed trash. Consequently, because the **ecomaine** site is both a landfill and an ashfill, effective environmental management systems have been designed and installed for both types of refuse.

ecomaine's strong commitment to environmental protection has earned it the International Standards Organization's ISO 14001 certification for the landfill/ashfill, as well as for the waste-to-energy plant and the recycling facility – a rare achievement.



Your Tour Starts Here.

#1 Closed Balefills

Large concrete cylinders scattered on the grassy hillsides surround gas wells for the extraction of methane gas, which is a by-product of decomposing organic material in buried MSW (municipal solid waste). This is the oldest section of the landfill and these “cells,” called balefills, have been closed (capped) with the approval of the Environmental Protection Agency and the Maine Department of Environmental Protection.

White plastic pipes standing vertically from the ground are monitoring sites for underground gas and water levels. Water that passes through buried waste is contaminated, to varying degrees, and is called *leachate*.

The environmental management program put in place by **ecomaine** includes two extensive underground systems of pipes: one that collects gas and the other collects leachate.



#2. The Glass Pile

Truckloads of glass come to the landfill from **ecomaine**'s own recycling facility just three miles away. There, glass bottles and jars are separated from all the other recyclables as they move through the automated single-sort system and, are crushed. Most often, the glass will be mixed with gravel (or similar material) to serve as an aggregate for roadway maintenance. However, most recently, the crushed glass has been cleaned, mixed with concrete and



These plants are growing in a pile of ground glass (without assistance).



Sunflowers

polished for fashionable countertops.

While in storage at the landfill during warmer months, we usually find plants – such as corn, sunflowers, squash, and tomatoes - sprouting from the glass! This occurs because some of the jars and bottles contained seeds from these plants when they arrived at the recycling facility.



Corn



Squash

#3 The Pumping Station

The pumping station (housed in the small building shown below) moves water collected from the old, capped balefills to the leachate pond, which you will see later. The leachate collection system is all underground and, on average, moves 1,600 gallons per day from the 44 acres of closed balefills.



#4 Wetlands Treatment System

Subsurface water that collects beneath the liner under the closed balefill is not contaminated enough to require leachate treatment, but neither is it clean enough to discharge directly into a brook. This water is diverted to **ecomaine**'s wetlands treatment system, a marsh area that cleans the water by natural means. The cat-tails and reeds planted here extract heavy metals, such as arsenic and lead. The scum on the surface is called blue-green algae, which feeds on phosphorus. The red scum layer is created by a bacteria that feeds on iron. The presence of this algae and iron bacteria is an indicator that the treatment system is working as intended.

The wetlands treatment system uses plants, algae, and bacteria to clean water that is minimally contaminated. At right, a snowy egret lands at ecomaine's site.



5 Neighbors

The **ecomaine** landfill/ashfill is bordered on the North side (on your left) by the 140- acre landfill from SD Warren, which is now part of Kimberly Clarke and, therefore, maintained by them. Along the southeastern border, our neighbors are mostly commercial or industrial, on the southwestern border are Running Hill Road and the Red Brook, and on the northeast side is the industrial park you drove through to get here.

A view of neighboring Kimberly Clarke's landfill (formerly the SD Warren site).



#6 Flare Station

All the underground pipes carrying methane gas from old MSW bales lead to this point (on your right). Fans draw the gas into the flare station where it is burned (flared) at the top of a tall pipe. (Although methane is odorless, the other gasses that come with it can have strong odors.) Burning the methane is far better for the environment than just releasing it into the atmosphere; methane is a greenhouse gas and is 20 times more harmful than carbon dioxide, the by-product of burning fossil fuels.



At the **ecomaine** flare station, a flame burns gas for about ten hours each day and produces enough heat for 100 single-family homes. (Actually making use of the gas is possible only if a customer is in close proximity; otherwise, the cost of laying a pipe makes its use unfeasible.)

#7 Expansion Area

What we call “the expansion area” is **ecomaine**'s newest ashfill area. The expansion was constructed in 2006 and first used in July, 2009. The seven-acre site was built with state-of-the-art environmental protection features at a cost of \$6.8 million. The thick, black plastic covering – called a rain cap - was put in place in 2006 to keep out rainwater. The rain cap will be removed in pieces as more of the cell space is needed to bury ash from the waste-to-energy plant.



The seven-acre expansion cell (outlined in white) was constructed

Waste that has not been designated as recyclable when brought to **ecomaine** is burned at very high temperatures, using sophisticated environmental filtering methods. The heat generated from burning is used to produce steam, which, in turn, is used to produce electricity. In addition to getting value from non-

recyclable waste, burning stabilizes potentially harmful materials and reduces the volume of what must be buried by 90%. Through a combination of recycling and waste-to-energy technology, **ecomaine**'s landfill/ashfill will serve Maine well for a very long time.

A tour of the landfill/ashfill clearly demonstrates **ecomaine** has all but eliminated the problems of odor, blowing trash, and seagulls. In fact, most people are unaware that a landfill is located in this area.



A heavy thick plastic rain cap was placed over the expansion area to keep out the rain. You can see a sample of this material on display at the tent.



Ash from the waste-to-energy is trucked just 3 miles to the ashfill. Bulldozers level the ash after each delivery.

#8 Geological Monitors

Within concrete cylinders seen on this part of the tour are geological monitors that measure movement of the ground. The landfill sits on top of marine clay, which is slippery and slimy, and prevalent in this area of Maine. It is possible for the weight of landfill material to disperse some of the underlying clay and cause a ripple effect movement of the surrounding land. To ensure this does not occur, monitors are checked and the findings reported to the Maine Department of Environmental Protection each month.



A new geological monitor is placed in a pit to measure ground movement. Continued on next page...



In the next step, a large concrete protective cylinder is placed around the measurement device...



...and, then, the remainder of the pit is filled-in.

#9 The Leachate Pond

Leachate (contaminated water) is collected through a network of underground pipes and, with use of the pumping station, is delivered to the large leachate pond. When full, the pond holds 3.5 million gallons of water. The pond provides storage for excess leachate during periods of high rainfall.



Normally the leachate pond is kept nearly empty as leachate is continuously pumped out and sent into the Portland sewer system. Recent improvements to the landfill system have been so effective that water from the pond is allowed to enter the Portland waste treatment facility without pre-treatment by **ecomaine**.

#10 Rain Caps

Parallel to the leachate pond is a 20-acre area covered with a heavy black plastic rain cap. Part of this area was filled with ash and unburned MSW that dates back to 1985. In the last few years, **ecomaine** has uncovered a portion of the MSW to discover whether or not it could

Old tires are recycled as weights to keep the rain caps in place.



be burned after more than 20 years underground, and the results showed that much of it was still combustible. The ability to burn the old MSW provides **ecomaine** with a secondary fuel source for the waste-to-energy operation and, at the same time, allows reclamation of valuable space in the landfill.

#11 MSW Storage

Based on the trial burning of the old MSW, **ecomaine** began a program in 2009 to store new MSW at the landfill for future use as a fuel. Two cells measuring 150 feet by 200 feet and protected with 13-foot high berms have been built solely for this purpose. During the summer months, when MSW is most abundant, some of it (unburned) is diverted here and covered with a paper residue that will keep it dry until it is burned at the waste-to-energy plant. Everything is used – even the paper residue is waste that has been recycled as a cover and will be re-used, later, as fuel for the waste-to-energy plant.

Next to the existing MSW storage berm is a pile of the paper residue, called wetlap, that will be used for cover.



On the left is a pile of wetlap; on the right is the existing MSW storage berm covered with shredded wetlap.

#12 Post-Burn Metal

In addition to producing ash, the waste-to-energy plant also recovers metal from the waste. This post-burn material includes a wide variety of metal that consumers include with their trash: for example, though old mattresses are reduced to ash, the mattress springs remain intact.

The post-burn metal is separated from the ash by a magnet and stored at **ecomaine**'s landfill and sold to industrial recyclers who process the material for new uses.

