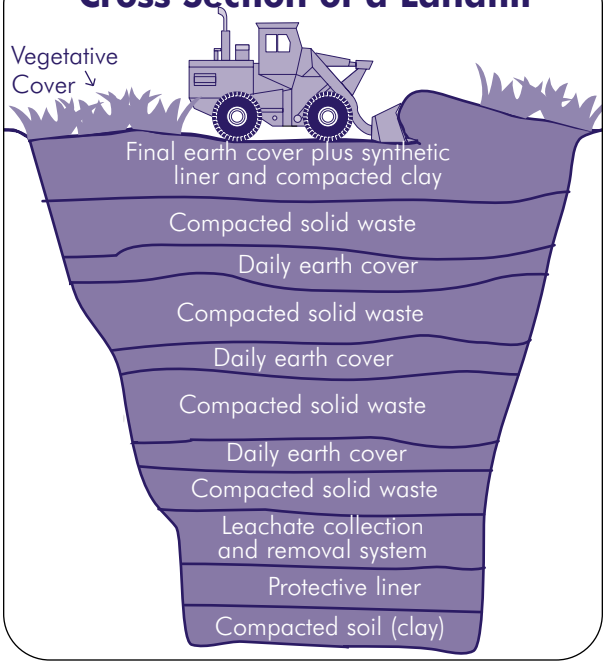
Landfills

What Is a Landfill?

A landfill is a large area of land or an excavated site that is specifically designed and built to receive wastes. Today, about 55 percent of our country's trash is disposed of in landfills (EPA, 1998). Items such as appliances, newspapers, books, magazines, plastic containers, packaging, food scraps, yard trimmings, and other wastes from residential, commercial, and some industrial sources can be disposed of in municipal solid waste landfills. Municipal solid waste landfills can also accept some types of hazardous waste, such as cleaning products, paint, and chemicals, as well as some industrial wastes from certain businesses. Many states and communities, however, promote the safe collection of these hazardous wastes through local programs. (See "Are There Landfills for Hazardous Waste?" on page 156 for more information.)

In the past, garbage was collected in open dumps. These uncovered and unlined sites allowed leachate, a liquid formed by decomposing waste, to soak into the soil and ground water.

Cross Section of a Landfill



Key Points

- Landfills are the most common form of waste disposal and are an important component of an integrated waste management system.
- Federal landfill regulations have eliminated the open dumps of the past. Today's landfills must meet stringent design, operation, and closure requirements.
- Methane gas, a byproduct of decomposing waste, can be collected and used as fuel to generate electricity.
- After a landfill is capped, the land may be used for recreation sites such as parks, golf courses, and ski slopes.
- Landfills that handle hazardous wastes are specially designed with two sets of liners and two leachate detection systems.

Open dumps also attracted rodents and insects, emitted odors, and created fire hazards. Most of these small and unsanitary dumps have been replaced by large, modern facilities that are designed, operated, and monitored according to strict federal and state regulations. Today's landfills eliminate the harmful and undesirable characteristics of dumps to help protect public health and the environment.

In addition to being safer for the environment and neighboring communities, these larger landfills hold more trash than the dumps of the past. In 1998, about 2,300 municipal solid waste landfills were operating in the United States (EPA, 1998). While this number is significantly smaller than the number of landfills 25 years ago, new landfills—often called megafills due to their size—can accommodate significantly more garbage. This greater capacity is necessary to keep up with the steady growth of municipal solid waste.

Are There Landfills for Hazardous Waste?

Each year, about 29 million tons of hazardous wastes are disposed of in landfills or other land disposal sites. Hazardous waste is toxic, ignitable, corrosive, or reactive, or generated from certain industries or manufacturing processes. When it comes to disposing of hazardous waste in landfills, EPA takes additional steps to ensure environmental safety and human health.

While landfills that accept solid waste have a clay and plastic liner and a leachate system to prevent leakage, landfill owners that accept hazardous waste must take extra precautions. For example, a hazardous waste landfill must have two sets of liners, one consisting of a special plastic, and the other composed of both plastic and a thick layer of soil material. In addition, a landfill accepting hazardous waste must have two leachate detection systems instead of just one.

Before hazardous waste even reaches a landfill, however, it must be treated differently than solid waste. If hazardous waste is bound for disposal in a landfill, it is regulated under EPA's Land Disposal Restrictions program. Through this program, hazardous waste must undergo treatment that will destroy or immobilize its hazardous components before it is sent to a landfill. For example, when a business generates hazardous waste, it must either treat that waste itself, or send it to a special facility for treatment, before sending the waste to a landfill.

How Does a Landfill Work?

A typical modern landfill is lined with a layer of clay and protective plastic to prevent the waste and leachate from leaking into the ground or ground water. The lined unit is then divided into disposal cells. Only one cell is open at a time to receive waste. After a day's activity, the garbage is compacted and covered with a layer of soil to minimize odor, pests, and wind disturbances. A network of drains at the bottom of the landfill collects the leachate that flows through the decomposing waste. The leachate is sent to a leachate recovery facility to be treated. Methane gas, carbon dioxide, and other gases produced by the decomposing waste are monitored and collected to reduce their effects on air quality.

Landfills are regulated by federal and state laws. The federal laws dictate where landfills can be located, such as away from unstable land prone to earthquakes or flooding, and require them to be lined and have a leachate collection system. In addition, landfill owners must monitor and collect explosive gases; regularly test nearby ground water; and compact and cover waste with a layer of soil on a daily basis.

Many states require landfill operators to obtain a license and present a plan for how the site will be safely closed, even though the closing date might be 50 years in the future. Furthermore, federal law requires landfill owners to set aside the money to close the landfill properly and support ongoing monitoring activities. Once a landfill is capped (closed), the operator must monitor the site for gas and leachate for a minimum of 30 years after the closing date. In addition to federal regulations, each state has its own landfill requirements, which are often more stringent than the federal laws.

What Are the Benefits of Landfills?

In addition to providing a cost-effective, safe method to dispose of ever-increasing amounts of trash, landfills often provide other services to the community. For example, some landfills collect methane, a gas created by decomposing

Landfill Facts

- The first garbage dump was created in 500 BC by the ancient Greeks in Athens. Residents were required to take their trash 1 mile away from the city walls to dump.
- Paper takes up as much as 50 percent of all landfill space. Recycling 1 ton of newspapers would save 3 cubic feed of that space.
- In a study of waste buried for more than 15 years, Professor William Rathje of the University of Arizona found legible newspapers and chicken bones with meat still on them, proving that waste does not decompose completely in a landfill.

(Sources: The League of Women Voters' Garbage Primer, 1993; Rubbish! The Archaeology of Garbage by William Rathje, 1990; Anchorage Recycling Center, 2000)

garbage that can contribute to global climate change, and convert it into an energy source. In addition, after a landfill is capped and a certain amount of time has passed, the land might be reused for parks, ski slopes, golf courses, and other recreation areas.

What Are the Challenges of Landfills?

Though regulations have made landfills safer to the public and the environment, public opposition, high land prices, and environmental concerns can make it difficult to find suitable places for new landfills.

Landfills can pose other problems if not properly designed or managed. If a liner leaks, for example, the underlying soil and ground water can become contaminated. Additionally, since landfills are often located in remote areas, waste must be hauled long distances, which might result in environmental impacts from increased truck traffic (e.g., air pollution) and noise from truck traffic and the use of equipment onsite. Additionally, within a given municipality, landfills often compete for local garbage. Competition can lead to reduced support for recycling and other waste reduction programs.

Issues also might arise if a landfill is located close to a community. Many people do not want landfills near their homes. The NIMBY (Not in My Backyard) attitude can make finding a landfill site very challenging.

Putting Landfill Gas to Use

1 million tons of waste within a landfill creates 300 cubic feet per minute of landfill gas, or one megawatt of electricity. That is enough to power 700 homes for a year. Removing that much methane gas from the atmosphere is equal to taking 6,100 cars off the road for a year.

(Source: EPA, 2000)

What Are Some Emerging Trends?

Increased waste generation requires landfill operators and managers to constantly evaluate and improve current disposal methods. One strategy to speed the rate of decomposition of landfill waste is to recirculate the collected leachate by pouring it over the cells and allowing it to filter through the rotting garbage.

Another trend that is becoming common for landfill operators is collecting methane gas from the landfill and using it as the energy source to power the landfill or selling it to a local utility provider, company, or even greenhouses. This process allows landfills to reduce their dependence on precious fossil fuels and save money.

A new trend that is gaining attention is landfill reclamation, in which old cells are excavated to recover recyclable items. This process, in which recovered recyclables, soil, and waste can be sold, reused, or burned as fuel, is a new approach used to expand landfill capacity and avoid the cost of aquiring additional land.

Additional Information Resources:

Visit the following Web sites for more information on municipal solid waste landfills:

- U.S. Environmental Protection Agency (EPA): <www.epa.gov>
- U.S. EPA, Office of Solid Waste site on landfills: <www.epa.gov/epaoswer/non-hw/muncpl/disposal.htm>
- U.S. EPA Landfill Methane Outreach Program: <www.epa.gov/lmop>

For more information on the disposal of hazardous waste in landfills, visit:

- U.S. EPA, Office of Solid Waste site on Land Disposal Restrictions: <www.epa.gov/epaoswer/hazwaste/ldr>
- U.S. EPA, Office of Solid Waste site on RCRA Hotline Training Modules (hazardous waste land disposal units): <www.epa.gov/epaoswer/hotline/modules.htm>

To order the following additional documents on municipal solid waste, call EPA toll-free at 800 424-9346 (TDD 800 553-7672) or look on the EPA Web site <www.epa.gov/epaoswer/osw/publicat.htm>.

- *Sites for Our Solid Waste: A Guidebook for Public Involvement* (EPA530-SW-90-019).
- *Safer Disposal of Solid Waste: The Federal Regulations for Landfills* (EPA530-SW-91-092)
- *Decision-Makers' Guide to Solid Waste Management, Volume II* (EPA530-R-95-023)
- *A Collection of Solid Waste Resources*—CD-ROM

The following trade associations can provide information about landfills as well:

National Solid Waste Management Association
4301 Connecticut Avenue, NW., Suite 300
Washington, DC 20008
Phone: 202 244-4700
Fax: 202 966-4841
Web site: <www.envasns.org/nswma>

Solid Waste Association of North America
P.O. Box 7219
Silver Spring, MD 20907-7219
Phone: 301 585-2898
Fax: 301 589-7068
Web site: <www.swana.org>