



Landfill 102: How MSW Landfills Work

It's not a dump – so don't call it that.

It's not just some hole in the ground either – it's much too expensive to build and operate to think of it that way. It's a municipal solid waste (MSW) landfill. It's the place your household garbage calls home.

So, just what is a MSW landfill? A MSW landfill is a scientifically engineered facility built into or on the ground that is designed to hold and isolate waste from the environment. Federal and state regulations strictly govern the location, design, operation and closure of MSW landfills in order to protect human health and the environment.

MSW landfills are the most common places for waste disposal and are an important part of an integrated waste management system. Today, about 71 percent of the MSW generated in South Carolina is disposed of in the state's 18 permitted MSW landfills. Nationwide, about 54 percent of the MSW generated is disposed of in MSW landfills according to the U.S. Environmental Protection Agency (EPA).

Life is a highway.

You think garbage, you think garbage truck. Depending on the MSW landfill's size, as many as 200 trucks may come every day. The trucks come from all over, too. Why? Well, MSW landfills are difficult to locate as well as expensive to build and operate. So there are fewer MSW landfills today than in the past, but they are larger and accept MSW from greater distances.

There are, of course, different types of garbage trucks that hold different amounts of waste. The truck that comes through your neighborhood can hold anywhere from 12 to 14 tons of waste. How much is that? Well, on average, this type of garbage truck can pick up waste from about 800-850 homes. When the truck is full, it heads to the landfill. At the landfill, the truck drives on to a scale and is weighed on its way in, on its way out, or both. The truck carefully drives to a specific area of the landfill and dumps or "tips" its load. Then it leaves and drives to another neighborhood to repeat the process.

The Daily Show

The daily operation at a MSW landfill includes dumping of waste into a specific area of the landfill – called a working

face – followed by compaction (crushing) of the waste and then covering of the waste with soil.

Waste is dumped into an open area of the landfill called a cell. MSW landfills almost always just have one cell open at a time to accept waste. At the same time, another cell is being built so it is ready when the current cell becomes full.

Space is money. Garbage is compacted or crushed to save space. You've seen the giant tractor with spiked wheels that goes back and forth over the garbage. Well, that's a compactor. It weighs 100,000 pounds. The compactor makes three to five passes over the garbage to crush as much garbage into the space as possible. On average, about 1,200 to 1,400 pounds of garbage can be compacted into one cubic yard of space.

At the end of the day, the working face of the cell is covered with a layer of soil or other cover material to minimize odor, pests and rodents as well as litter. This is called daily cover.

This three-step process is repeated over and over until the cell is filled.

The Sum of Its Parts

Here are some basic parts of a landfill.

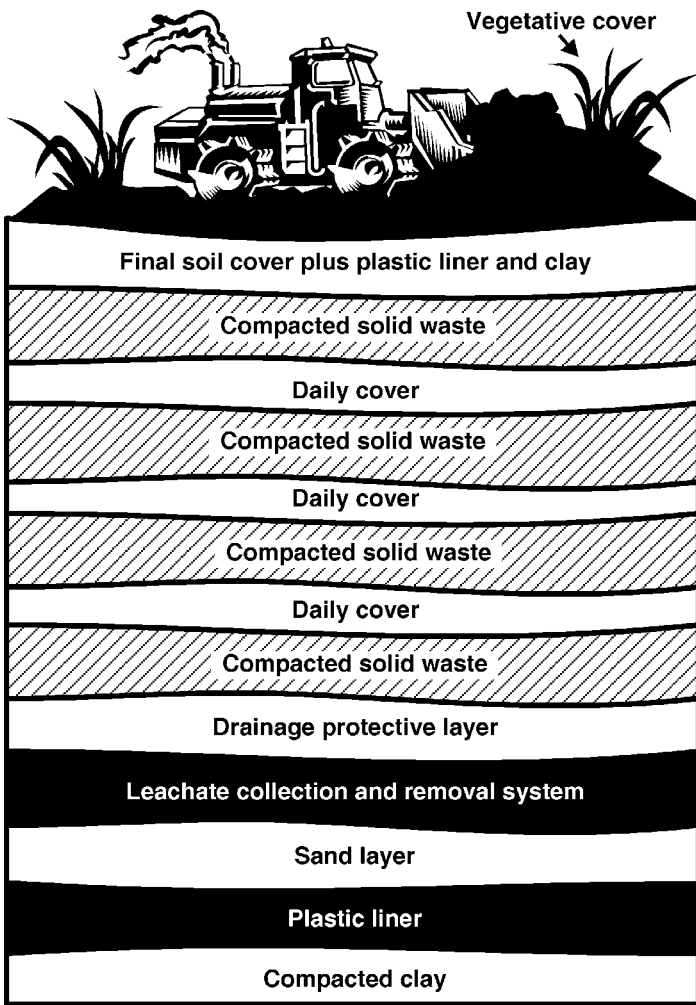
1. The **bottom liner system** is designed to keep waste from coming in contact with the environment – particularly groundwater. From the bottom up, the system is: 1) 2 feet of clay 2) a plastic liner and 3) a protective layer 2 feet thick, usually comprised of sand.
2. **Cells** are specific areas where the waste is dumped and compacted (crushed).
3. The **storm water drainage system** collects rainwater that falls on the landfill. The system may include plastic drainage pipes that collect water and move it to a retention pond at the MSW landfill. This water has not come into contact with the garbage.
4. The **leachate collection system** collects liquids – called leachate – that are part of the MSW and any water (e.g., rainwater) that comes into contact with the garbage. This water works its way through the MSW landfill like water percolating through coffee grounds. As the water moves through the garbage, it picks up

contaminants. This water is called leachate and must be collected and treated.

5. The **methane collection system** collects methane gas that is created during the decomposition of the garbage. Bacteria break down the garbage. The byproduct is landfill gas that is about 50 percent methane and 50 percent carbon dioxide with very small amounts of nitrogen and oxygen. Methane gas presents a hazard because it can explode and/or burn. Methane is actively collected in a series of pipes, then passively vented or burned through a flare. Currently four MSW landfills in South Carolina

(Anderson Regional Landfill, Lee County Landfill, Horry County Solid Waste Authority Landfill and the Richland Landfill) burn methane to produce energy (methane produces about half the energy of natural gas). Another MSW landfill, Palmetto Landfill, provides methane gas to the BMW plant in Spartanburg County.

6. The **final covering or cap** is placed on the MSW landfill when it is closed. The final cover has: 1) 18 inches of clay at the bottom; 2) a plastic liner in the middle; and 3) 2 feet of soil on top. The covering seals the waste from air and reduces the amount of water getting into the landfill. It also prevents pests (birds, rats, mice, flying insects and so on) from getting into the waste.



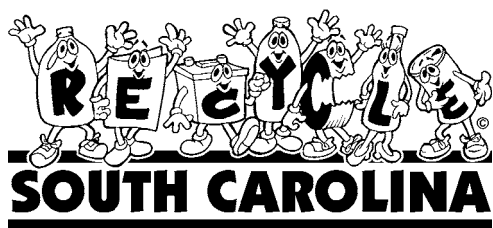
The Life Expectancy of a Landfill

The life of a landfill depends on the size of the facility, the disposal rate and the compaction rate. All MSW landfills are permitted by the S.C. Department of Health and Environmental Control to accept a specific amount (tons) of waste each year – this amount cannot be exceeded. As mentioned earlier, MSW landfill operators strive for the maximum compaction rate possible in order to save space. Given these considerations, the average life expectancy could be anywhere from 30 to 50 years. MSW landfills must be monitored for 30 years after closure.

What happens when a MSW landfill is closed?

When a MSW landfill is full, it is closed with a final cover that includes a clay layer, a plastic liner and a soil layer. Even though the facility is closed, the responsibility of the landfill operator does not end.

MSW landfill owners must set aside money (called financial assurance) to close the landfill and to provide post-closure care in the event of potential environmental issues. Operators must continue to pump the leachate, test the groundwater, inspect the cap, repair any erosion, fill low areas due to settlement, maintain vegetation and prevent trees from growing. Why no trees? Trees have roots and roots can tear the liner. Again, MSW landfills must be monitored for 30 years after closure.



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