4. Modern Landfill (English)

**Methane to Markets**

*Introduction to Modern Municipal Landfill*

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**Introduction**

- MSW generation rate ~ 1 ton/yr/capita in the USA
- Since 1989, the number of municipal solid waste landfills in the United States has declined from 7,379 to 2,216 in 1999.
- The average amount of waste received by a landfill has increased from 92 tons per day to 300 tons per day.
- It will typically operate between 10 and 20 years.

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**Potential Environmental Problems - Groundwater**

http://earthsci.org/education/teacher/basicsgeol/solid_waste/sanitary-landfill.jpg

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**Potential Environmental Problems - Wetlands and Streams Protection**

http://clu-in.org/products/newstrs/handtl/images/200305_fig2.gif

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Potential Environmental Problems - Emissions
- VOCs/hazardous air pollutants, greenhouse gas, explosion hazard.

Potential Environmental Problems - Vectors

Major Components of a Modern Landfill

Modern Sanitary Landfill Cross Section

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Landfill Phases

- Phase 1: Site Selection and Investigation - Evaluated from a geotechnical standpoint, as well as from a variety of environmental factors, concurrent with a public participation program.
- Phase 2: Design and Regulatory Approval - Detailed plans and specifications are prepared, regulatory approvals and financial commitments are received, and construction is initiated.
- Phase 3: Site Construction - This involves development of the support facilities, and the development of the landfill's first one or two cells.

- Phase 4: Operation - As cells are filled, additional cells are constructed. Landfill operation is a long-term construction project.
- Phase 5: Site Closure - As the cells within the landfill are filled to capacity, that area is closed. The landfill then is monitored for > 30 years.
- Phase 6: Long-Term Care - If environmental problems are detected, the owner is responsible for taking remedial action. During the long-term care period, the owner also is responsible for any facility maintenance.

Overview of Design Criteria

- Performance-based
  Contaminant level shall not be exceeded in the uppermost aquifer at the relevant point of compliance, which shall not be more than 150 m from the unit boundary and still on the property
- Technology-based
  - a composite liner: top FML >30 mil (60 mil for HDPE) and lower compacted soil (K < 1E-7 cm/s) with a leachate collection system.
  - or approved alternative design.

Landfill Construction

- Disposal Cell Preparation
  - Bartholomew County Sanitary Landfill, IN
  - 1st Cell is 5 acres and 80 feet deep.
  - Soil is saved for daily coverage of trash.
  - Must have 2 feet of clay over bedrock.

- Leak Detection Layer
  An 18 inch sand layer will contain perforated PVC pipe to collect leachate in case of main collection level failure.
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**Landfill Construction - Soil Liner**
- 3 feet of soil is then placed on top of the leak detection layer.
- All rocks and objects are removed to assure smooth surface in preparation for plastic liner.

**Landfill Construction - Leachate Collection Layer**
- A 60 mil HDPE plastic liner is placed on top of the soil liner as the first phase of the leachate collection layer.

**Liner is then seamed and tested.**

**All of the disposal cell is lined.**

**Perforated PVC pipe is then installed. This layer is the main leachate collection level and will collect liquids that seep through the trash.**

**The leachate collection pipe and plastic liner are then covered with a protective layer of soil 18 inches thick.**

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Collection pipe is installed to pump percolating fluids from the disposal cell to the leachate holding pond.

Leachate Ponds
- 2 leachate collection ponds hold 100,000 gallons of water each.
- Water is then pumped directly to the local waste water treatment facility and cleaned.

Sediment Ponds
Rainwater that does not come in contact with trash is collected in sediment ponds.

Overview of Landfill Operation
- Procedure to exclude hazardous waste
- Apply daily cover
- Control disease vectors
- Control explosive gases
- Control access to LF
- Control run-on and run-off
- Protect surface water and groundwater
- Restrict liquid
- Maintain operating records

Landfill Operation - Scale House
Every load of trash entering the landfill must be weighed and inspected.
- Users will be charged $27.50 per ton over 500 lbs.

Landfill Operation - Disposal Cell
- Large loads of waste are directed to the disposal cell.
- The working face of the cell is a 10,000 sq. foot area.
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- A compactor will run over the trash all day long.
- 250-275 tons are disposed of each day at the landfill.

http://www.bcswmd.com/

The working face is covered at the end of the day with a geo-textile tarp or 6 inches of soil to keep odors down and rodents away.

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- A 24 inch soil barrier is placed on top of the gas venting layer.
- A 30 mil. minimum plastic liner is placed over the cell and seamed to the original cell liner, entombing the waste.

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- Then comes a 12 inch drainage layer of sand.
- Next, an 18 inch minimum layer of soil and 6 inches of top soil, all sloped 4% for drainage.
- Vegetation such as grasses and legumes are then planted.
- It is required to maintain the landfill for minimum of 30 years after closure.

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Benefits of a Modern Landfill

- Los Angeles County Puente Hills Energy Recovery System

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