



**BATTELLE**

# LANDFILL CONSTRUCTION AND OPERATIONS WORKSHOP



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# Module No. 4 Landfill Operation Part I

Marcos Elizondo, WCA



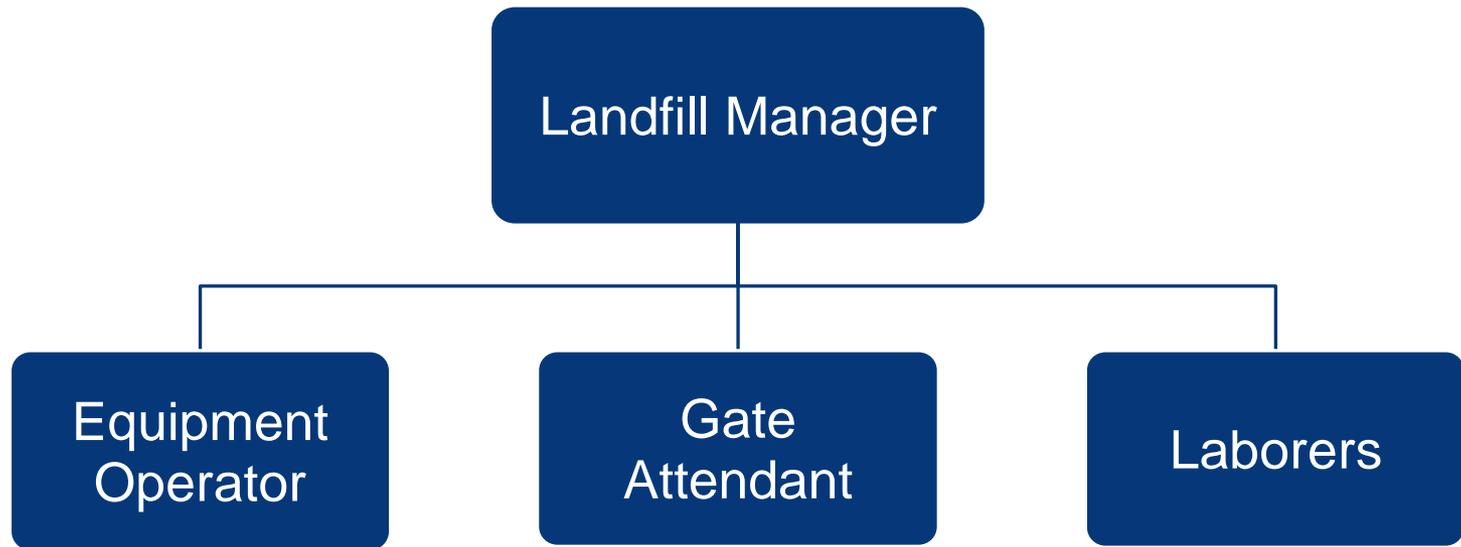
# LANDFILL CONSTRUCTION AND OPERATIONS WORKSHOP

No.	Module	Presenter
1	Importance of Proper Landfill Management	P. Ruesch
2	Landfill Construction Part I	M. Elizondo
3	Landfill Construction Part II	J. Davila
4	Landfill Operations Part I	M. Elizondo
5	Landfill Operations Part II	M. Elizondo
6	LFG Basics and GCCS	J. Davila
7	LFG Utilization Technologies	J. Davila
8	Open Dump Closure	P. Ruesch

# Initial Operation

- Landfill personnel
- Main entrance
- Equipment
- Access roads
- Operation of active disposal area
- Compaction
- Prohibited waste

# Personnel



# Landfill Manager

- Responsible for all landfill activities and designated contact for regulatory compliance
- Responsible for ensuring compliance of day-to-day operations
- Ensures adequate staffing to operate facility
- Supervise equipment operators, gate attendants and laborers
- Responsible for fire prevention training

# MOLO SWANA Certification

- Solid Waste Association of North America (SWANA) provides training and certification for landfill managers (Manager of Landfill Operations – MOLO). This training provides complete course on landfill operations including landfill design, compliance, and aspects to consider during planning, operation and closure. For more information: [https://swana.org/training-certification/find-a-course/course-catalog/certification-course/manager-of-landfill-operations-\(molo\)](https://swana.org/training-certification/find-a-course/course-catalog/certification-course/manager-of-landfill-operations-(molo))

# Equipment Operator

- Trained in safe operation of vehicles and heavy equipment
- Duties include spreading and compacting waste and cover soil as needed for placement and containment of waste
- Maintain access roads, establish and maintain stormwater drainage
- Excavate cover soils
- Responsible for daily inspection of equipment for operational and safety conditions

# Gate Attendant

- Responsible for monitoring, documenting and measuring incoming waste
- Collects of appropriate fees
- Selects of random loads for inspection

# Laborer

- On and off-site litter control
- Inspection and maintenance of perimeter fences and gate(s)
- Fire protection operations
- Dust control
- Other duties as necessary

# PERSONNEL TRAINING

- Landfill operations
- Safety
- Hazardous waste
- Prohibited waste
- Asbestos
- Random inspections
- Litter control
- Fire prevention
- Fire control
- Fuel and oil spill control and countermeasures
- Emergency procedures
- Emergency equipment

# Record Keeping

- Asbestos records
- Access records
- Inspection and maintenance of access roads
- Notifications of access issues and repairs
- Fire incident records
- Water ponding records
- Landfill inspection records
- Daily record of litter on public roads leading to site

# Equipment

- Compactor



# Equipment

- Bulldozer



# Equipment

- Earthmoving equipment



# Equipment

- Water pump



# Hours of Operation

Recommended:

Monday thru Friday 7:00 am to 5:00 pm

Saturdays 7:00 am a 4:00 pm

Sunday closed

Hours of operation must be visible at entrance

# Signage

- Signs
  - 1 m x 1m (minimum)
  - Letters at least 7 cm high
- Contents:
  - Name
  - Hours & days of operation
  - Emergency 24-hour contact phone number(s)
  - Local Fire Department phone number



# Signage

- Additional signs
  - Prohibit receipt of hazardous waste
  - Prohibit receipt of closed drums
  - Prohibit smoking
  - All loads should be properly covered or otherwise secured



# Access Control

- Artificial or natural barriers



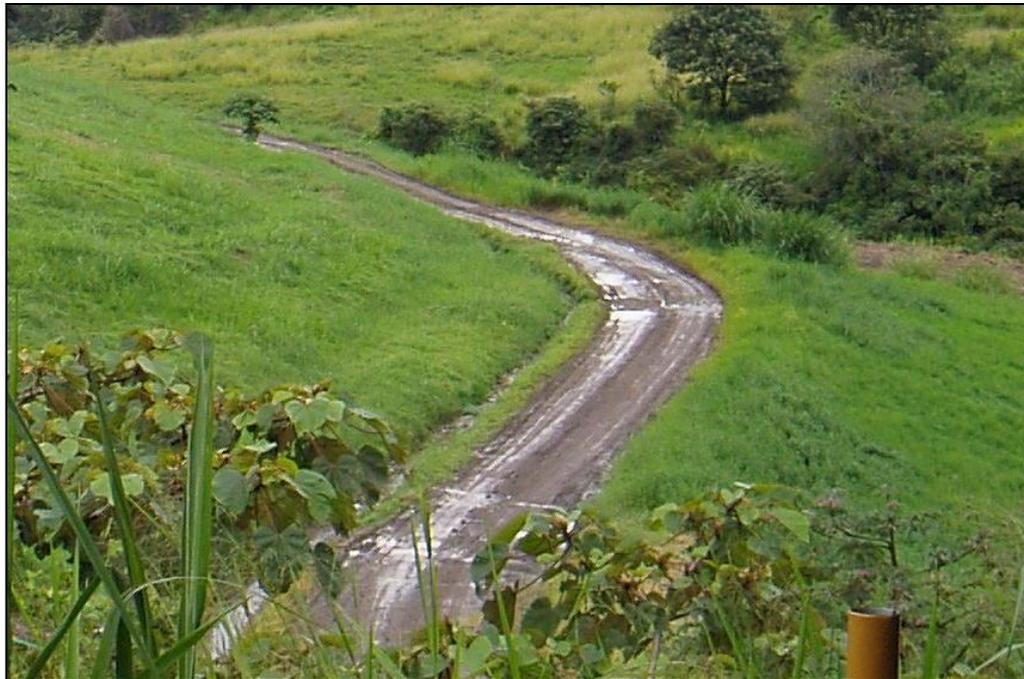
# Access Control

- Combination of fencing and gated entrance



# Access Roads

- Access roads provided from public road to the unloading area should be all-weather design



# Easements

- No waste unloading, storage, disposal or processing operations should occur within any easement crossing the site



# Markers and Benchmarks



- Benchmark monument
  - Metal marker
  - Set in concrete
  - Elevation and survey date stamped

# Waste Unloading

- Municipal solid waste should be unloaded at active working face
- Brush and other wood material should be unloaded at brush/wood storage area
- Asbestos waste disposal areas for receipt of regulated asbestos containing material
- Construction & demolition waste may be unloaded at a working face
- Tire area
- Recycling area



# Waste Unloading

- Waste unloading should be confined to as small an area as practical
  - 100m x 50m maximum
- Size of the working face should correspond to amount of wastes being received on any given day
- There may be 1-2 active working faces open at any given time

# Waste Unloading

- Unloading in unauthorized areas should be prohibited
- Trained personnel must be on duty during regular operating hours at working face to direct and observe unloading of waste
- Unauthorized material should be removed by transporter, and/or assess appropriate surcharges, with unauthorized material removed by landfill personnel

# Compaction

- Waste should be thoroughly compacted by heavy equipment in layers approximately 60 cm in thickness
- Compaction equipment should pass over the waste a sufficient number of times (i.e., minimum of 4 passes) to achieve thorough compaction
- When waste is used as ballast, the first 1.5m or the total thickness of ballast, whichever is less, placed on the liner system should be free of brush and large bulky items, which might damage the liner system



# Upwards



# Downwards



# Flat



# Benefits of Good Compaction

- Optimize landfill area
- Waste takes less volume
- Increases airspace
- Requires less soil material to cover waste
- Reduces waste settlement
- Prevents gaps for vector control
- Prevents leachate seepage on slopes



# Compaction Factors

- Equipment
- Waste composition
- Operations – how to apply compaction

# Bulldozer - 800 - 1,000 lbs/yd<sup>3</sup>



Bulldozer are designed to spread waste

# Compactors - 900 - 1,800 lbs/yd<sup>3</sup>

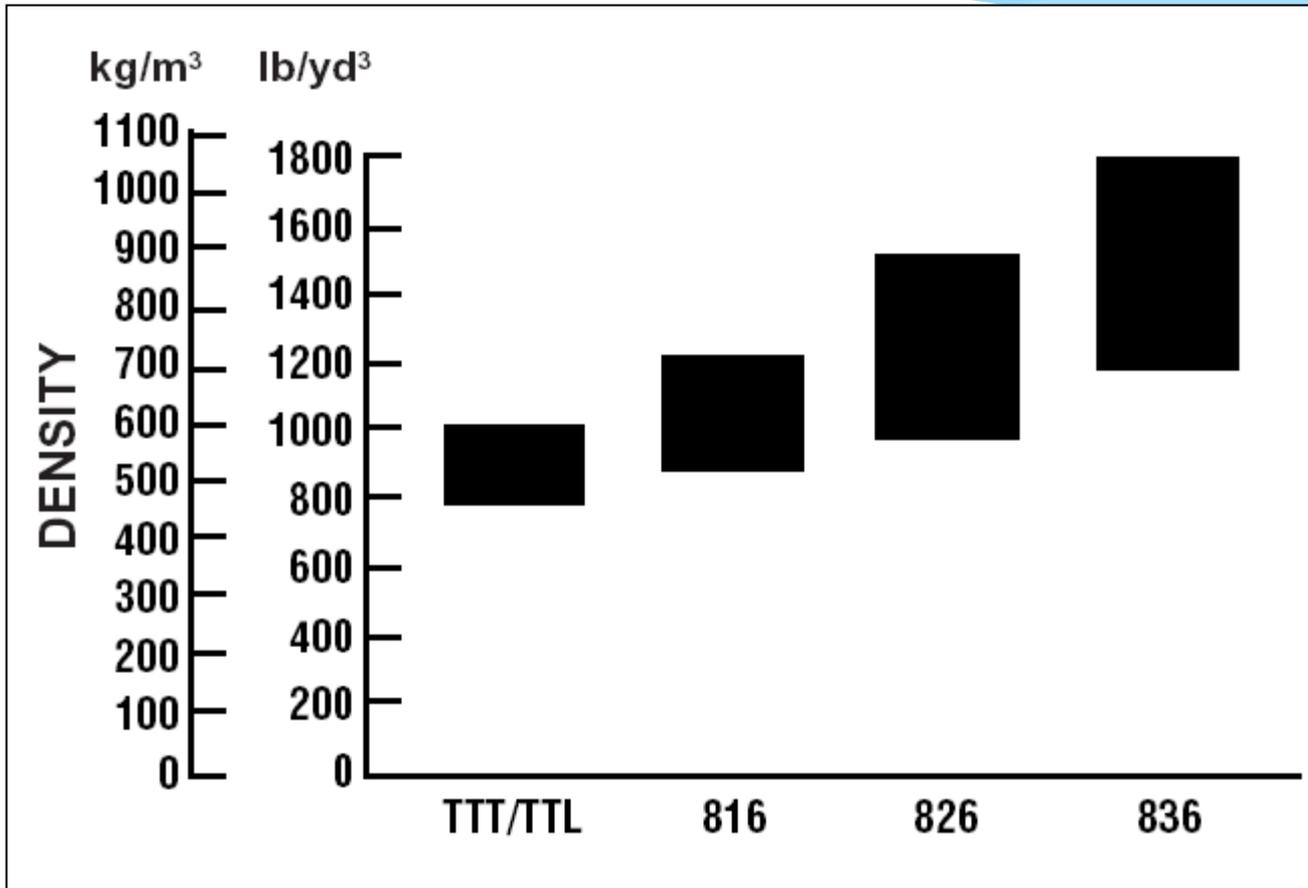


Compactor are designed to compact waste

Using them together is key



# Compaction



# Compactor - Efficiency

Modelo	Ton/Hr*	Ton/Día*
836	125-150	1200-1800
826	100-125	950-1500
816	63-80	900-1200

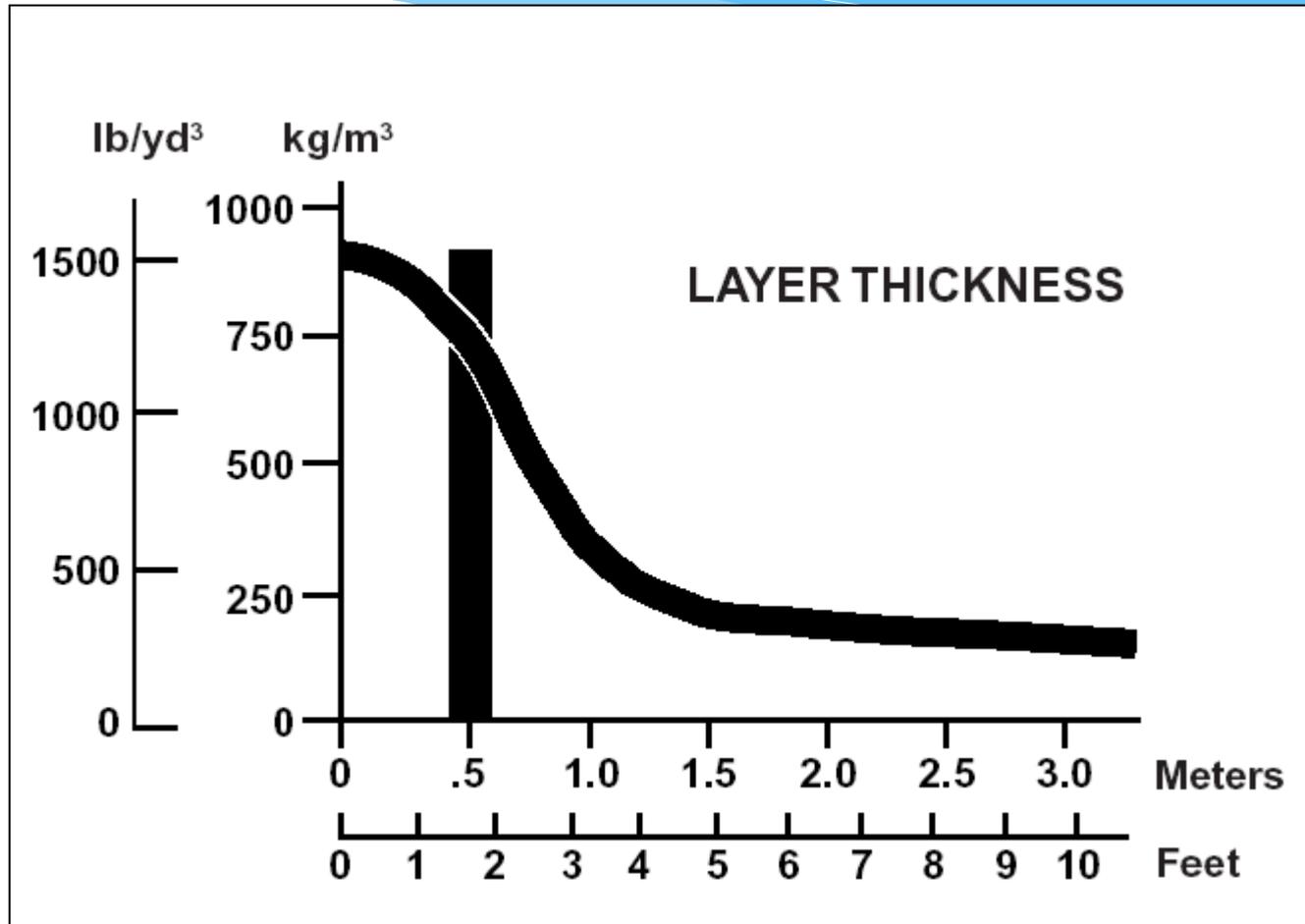
\* Push, spread and compaction of a 60 m layer with 4 passes

# Compaction – Key Variables

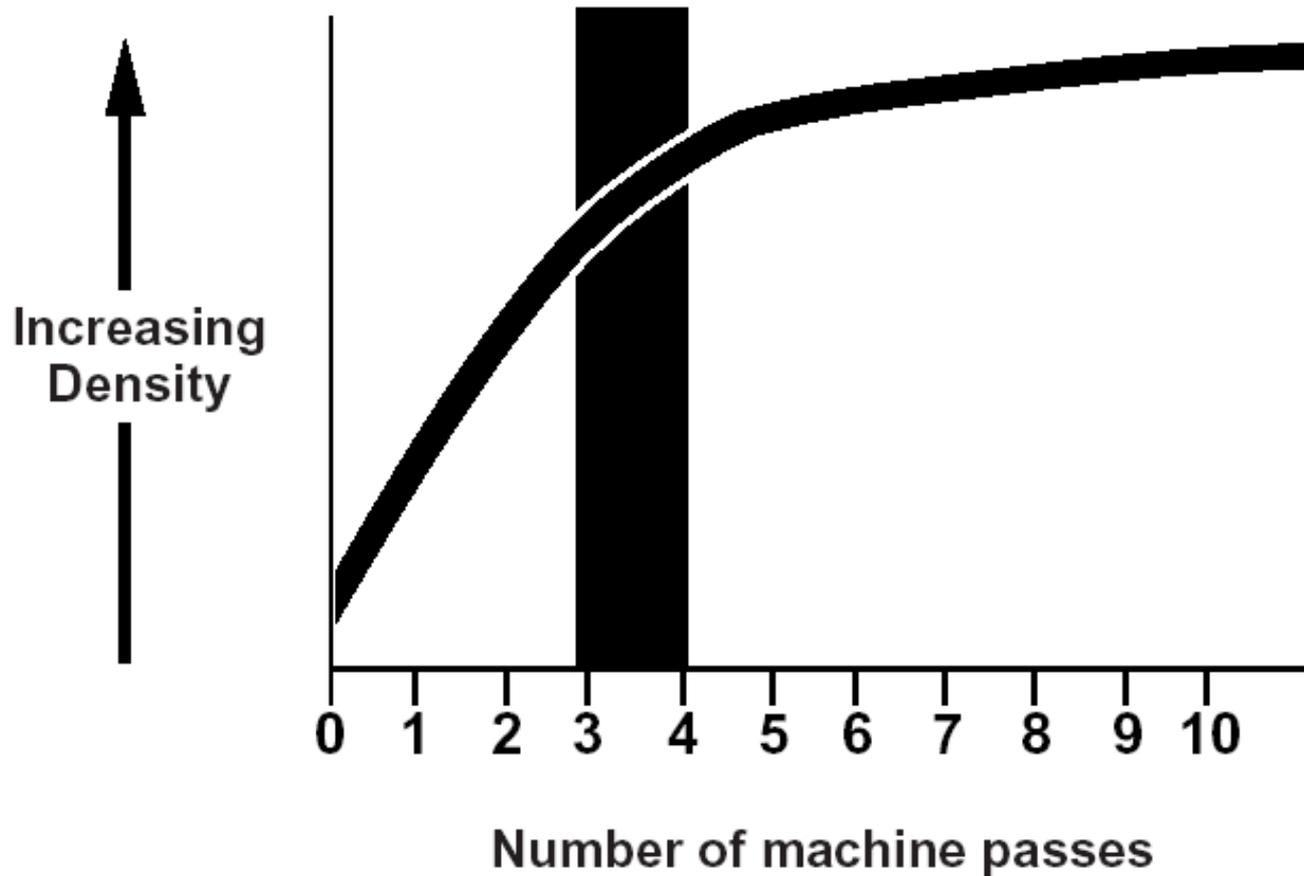
## Operation Variables

- Waste layer thickness
- Compaction equipment
- Active daily disposal area width
- Slope/inclination of active daily disposal area

# Importance of Waste Layer Thickness



# Importance of Number of Passes



# Prohibited Waste



- Motor oil and oil filters

- Batteries

- Tires



# Prohibited Waste

- Liquid waste
- Special waste, unless approved by regulatory agency



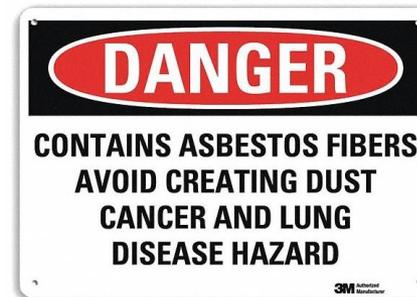
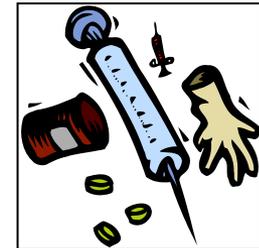
# Prohibited Waste

## \* Waste inspection program

- Prescreening customers bringing special waste and industrial waste
- Provide clients and drivers with a list of prohibited waste
- The facility should implement a minimum of 5 random load inspections per week
- Provide training to personnel and equipment operators annually
- Inspection of residential clients at entrance
- A sign should be placed that lists prohibited wastes

# Special Waste

- Waste that required special handling and disposal to protect the health and environment
- Health facilities waste
- Dead animals
- Asbestos containing waste
- Containers use for pesticides
  - \* Herbicides
  - \* fungicides
  - \* Rodenticides



# Industrial Waste

- Waste coming from any industrial process
  - Manufacturing
  - Mining
  - Agriculture
- Acceptable as long as it is not hazardous or interferes with operations



# Large/Bulky Waste

- Large, heavy or bulky items include:
  - A/C units
  - Tree trunks
  - White goods
  - Metal tanks
  - Metal pieces
- Should be recycled or grinded to avoid settlement in the future



# Repair and Recycling

- Recover and recycling main objective is to control selection of waste for future:
  - Use
  - Reuse
  - Sell

# Scavenging

- Waste scavenging is the unauthorized selection of recycling materials
- Scavenging is prohibited at the landfill

# Thank You

## Module No. 4 Landfill Operations Part I

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