

Landfilling of Solid & Hazardous Waste: Facing Long-Term Liability

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- Subtitle C & D Landfills Can Carry Long-Term Liabilities for Waste Generators

- Waste Generators Become Responsible Parties in Future "Superfund" Clean-Ups

Characteristics of "Dry Tomb" Landfills

Untreated Wastes Placed in Plastic- and Compacted-Soil-
 Lined Landfill

Try to Isolate Wastes from Water for as Long as Wastes
 Are a Threat - In Perpetuity

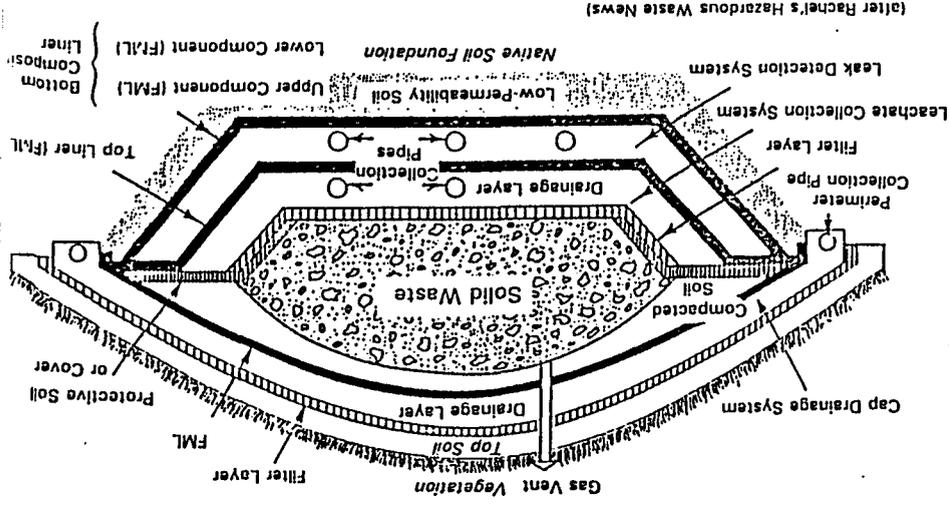
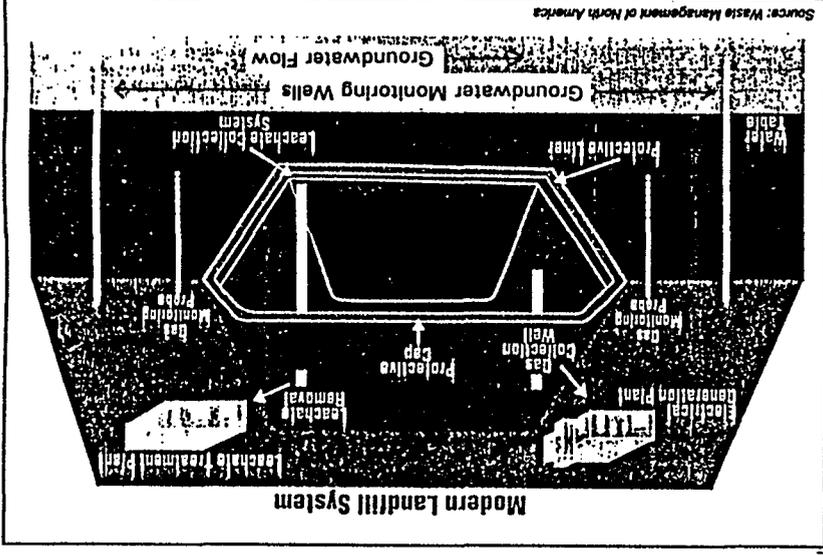


Figure 2. A Double-FML, Single-Composite Liner Landfill Design - An Example of the "Dry Tomb" Approach - Landfilling of Wastes

ENGINEERING TIMES
 July 1991



High-Tech Landfills
 Replace Low-Tech Dumps

Long-Term Durability of Plastic Sheeting Liners

Haxo and Haxo (1988) Stated in a Consensus Report for US EPA Expert Panel,

"The polymers that were discussed and first-grade compounds based on these polymers should maintain their integrity in landfill environments for considerable lengths of time, probably in terms of 100's of years."

"Nevertheless, when these polymers or compounds are used in products such as FMLs, drainage nets, geotextiles, and pipe, they are subject to mechanical and combined mechanical and chemical stresses which may cause deterioration of some of the important properties of these polymeric products in shorter times."

US EPA (1988) Stated in Developing Subtitle D Regulations,

"First, even the best liner and leachate collection system will ultimately fail due to natural deterioration, and recent improvements in MSWLF (municipal solid waste landfill) containment technologies suggest that releases may be delayed by many decades at some landfills."

US EPA (1988) Had Previously Concluded,

"Once the unit is closed, the bottom layer of the landfill will deteriorate over time and, consequently, will not prevent leachate transport out of the unit."

30-Year Post-Closure Care Myth

RCRA Indicates That Only 30 yrs of Post-Closure Care May Be Needed for "Dry Tomb" Landfills

Based on Incorrect Assumptions about Landfill Processes

Landfill Processes Depend on Moisture Content of Waste
Fermentation - Decomposition of Fermentable Organics;
Landfill Gas Formation

Leaching - Solubilization of Waste Components

Freeze & Cherry - Roman Empire Landfills Still Producing Leachate

Belevi & Baccini - Sanitary Landfills Will Produce Leachate That Is Hazardous to Public Health for >2,000 yrs

"Dry Tomb" Landfills Threaten Groundwater Quality Forever

Monitoring "Dry Tomb" Landfills

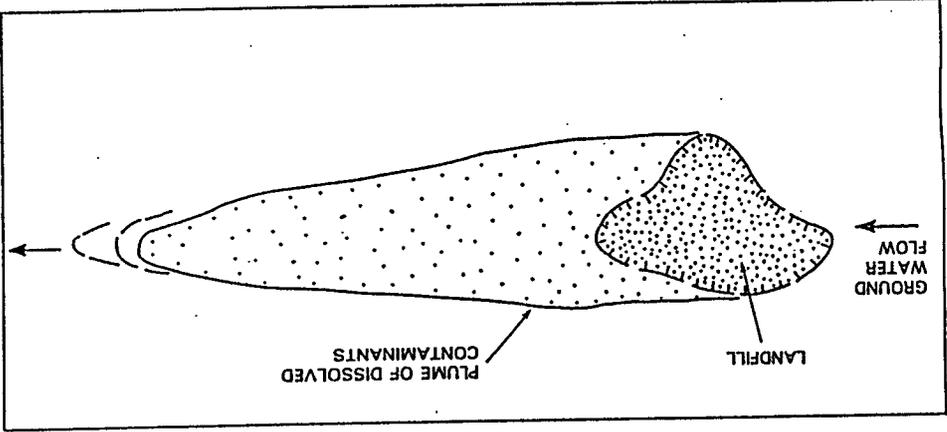
Current Groundwater Monitoring Approach Not Reliable for Lined Landfills

Does Not Consider Characteristics of Leakage and Leachate Migration from Lined Landfills

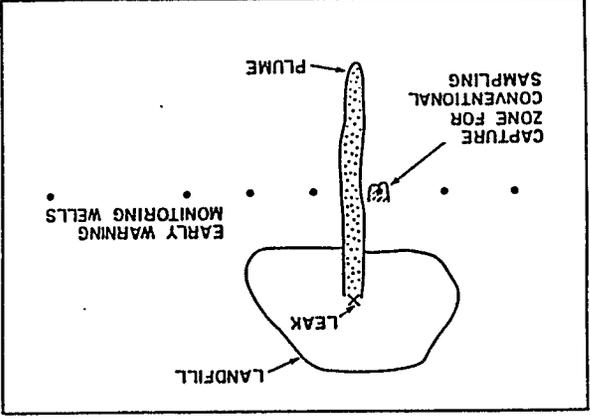
Significantly Different from Unlined Landfills

Widespread Groundwater Pollution Can Occur from Lined Landfill before Detected by Current Groundwater Monitoring Systems

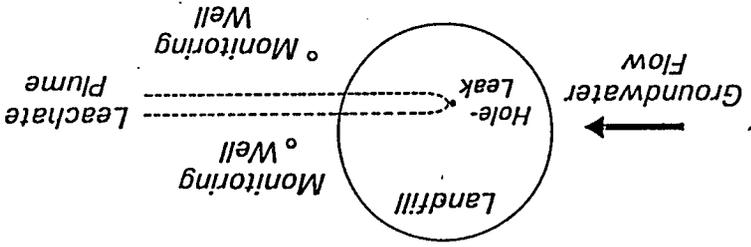
Pattern of Landfill Leakage - Groundwater Contamination from Unlined Landfills (After Cherry, 1990)



Pattern of Landfill Leakage - Groundwater Contamination from Lined Landfills (After Cherry, 1990)



Will Groundwater Monitoring Programs Detect Landfill Leakage ?



Key to Detection of Leak is the Zone of Capture of Monitoring Wells Relative to Width of Leachate Plume from Point Source Leak.

Zone of Capture for Typical Monitoring Well is a Few Inches About the Well

Currently Used Monitoring Programs Inadequate - Designed for Un-Lined Landfills

Monitoring Landfills to Protect Groundwater Quality

Use Double-Composite Liner System

Lower Composite "Liner" Serves Not for Containment but as Lysimeter Leak Detection System for Upper Composite Liner
 When Leak Detected That Cannot Be Stopped, Exhume Waste & Properly Treat to Produce Non-Polluting Residue
 Need Dedicated Trust Fund Derived from Disposal Fees to Meet Needs When Upper Composite Found to Leak

Problems with "Dry Tomb" Subtitle D Approach

- Containment Systems Used Are Not Able to Keep Water Out of Landfill Forever
- Water in Landfill Will Generate Leachate That Is Highly Hazardous to Public Health and Deleterious to Groundwater Quality for Domestic Water Supply Use
- Bottom Liner System Will Ultimately Fail to Prevent Significant Leachate from Polluting Groundwaters in the Vicinity of Landfill
- Cannot Detect Pollution before Widespread Pollution Occurs
- Insufficient Funding Being Provided for Post-Closure Care Maintenance, Monitoring and Remediation

Hazardous Wastes

US EPA Allows Hazardous Wastes to Be Placed in "Dry Tomb" Landfills without Treatment or with Only Partial Treatment

TCLP Used to Determine Adequacy of Treatment

Not a Technically Valid Procedure for Classification of Waste as "Hazardous" - A Political Testing Procedure Designed to Limit the Size of the Hazardous Waste Stream to Be Managed by the US EPA

Allows Leachable Components to Be 100-Times Drinking Water MCL

Considers Only a Few of the Components in Hazardous Wastes That Are Hazardous to Public Health and the Environment

Dry Tomb Landfill Band-Aid

Liner Systems Used for Subtitle D "Dry Tomb" Landfills Will Ultimately Be as Effective for Preventing Groundwater Pollution by Landfill Leachate as a Band-Aid over the Navel for Curing Stomach Cancer

While Both May Seem Effective to the Uninformed, Both Are Technologically Flawed

Solid Waste Management Decisions

Reduce, Reuse, & Recycle Waste to Maximum Extent Possible

Organic Residues

- Land Burial
- Incineration
 - Hazardous Waste Incineration • Cement Kilns
 - Ash Management in Landfills • Cement

Alternative to "Dry Tomb" Landfilling

◀ Treat Wastes to Remove Potentially Polluting Residues ▶

Fermentation/Leaching Wet-Cell Approach

- Double-Composite-Lined Landfill (Landfill Lysimeter)
- Shred Wastes
- Add Water to Ferment Wastes and Then Leach Wastes While Liner System Still Functional
- Initially More Expensive (10-15¢/per/day More) Much Cheaper in Long-Term

Not Just Leachate Recycle

Basically Leachate Disposal

In "Dry Tomb" Landfill, Increases Potential for Groundwater Pollution by Landfill Leachate

Selecting a Landfill for Solid and Hazardous Waste Residues

Landfills Do Not All Present the Same Long-Term Liabilities for Responsible Parties

Key Factor is the Siting of the Landfill

Landfills Sited in Area with Limited Groundwater Resources That Can Be Polluted Pose Less Liability Threat Than Those Sited Where the Bottom of the Landfill Is Hydraulically Connected to Large Volumes of High-Quality Groundwater That Is or Could Be Used for Domestic Water Supply Purposes

Select the Landfill Carefully for Your Solid and Hazardous Waste Residues

Waste Diversion

◀ Waste Reduction • Reuse • Recycle ▶

All Waste Management Approaches Have Potential Adverse Impacts on Public Health & Welfare, and Environmental Quality

Cannot Assume That All Waste Diversion Measures Have Fewer or Less Significant Potential Adverse Impacts

Each Alternative Waste Management Approach Should Be Fully Evaluated for Potential Adverse Impacts