==========Electronic Edition==========

RACHEL'S HAZARDOUS WASTE NEWS #119
---March 7, 1989---
News and resources for environmental justice.

Environmental Research Foundation
P.O. Box 5036, Annapolis, MD 21403
Fax (410) 263-8944; Internet: erf@igc.apc.org
==========

The **Back issues** and **Index** are available here.
The official RACHEL archive is here. It's updated constantly.
To subscribe, send E-mail to rachel- weekly- request@world.std.com
with the single word SUBSCRIBE in the message. It's free.
===Previous Issue==========Next Issue===

LEACHATE COLLECTION SYSTEMS: THE ACHILLES' HEEL OF LANDFILLS.

A landfill is a bathtub in the ground, and a bathtub can leak two ways: it can leak through a hole in the bottom (failure of its bottom liner), or it can fill up with fluid and spill over its sides. Either way, it's bad news. The basic problem is the fluid. If a landfill begins to fill up with fluid, the weight of the fluid puts pressure on the bottom of the landfill, increasing the likelihood of bottom liner failure, so any fluid inside a landfill is a potential source of trouble.

To prevent fluid from causing problems, every modern landfill has a system for draining liquids out of the landfill. This is called a leachate collection system. What is leachate? Think of a landfill as being like a drip coffee maker. The dry coffee is the garbage, the water you pour in the top is rainwater, and the dark, brewed coffee dripping out the bottom is leachate. You might want to drink coffee, but you definitely do not want to drink leachate: it has many toxic and dangerous characteristics. It is badly polluted with chemicals and with micro-organisms (bacteria and viruses) that would make you sick.

The picture below represents a closed landfill; the heavy dark line represents the plastic baggie (bottom liner and top cover) that is supposed to keep leachate from entering the environment. The round circles between the two bottom liners represent collection pipes which have many holes drilled along their length (making these pipes resemble a swiss cheese); they are supposed to collect any leachate that flows to the bottom of the landfill. In theory, these pipes carry off the leachate to a wastewater treatment plant, where the leachate is processed to remove the toxic chemicals. (At the wastewater treatment plant, some of the chemicals are released into the air, and the remaining ones are collected [they're now in a mud-like sludge] and they are sent to another landfill somewhere.)

One of the least-studied aspects of landfill design is how to make a leachate collection system that will work for many decades (much less many hundreds of years). The fact is, leachate collection systems can clog up in less than a decade and, when that happens, fluids begin to build up inside the landfill--a dangerous situation, as we have noted above.

Leachate collection systems fail in several known ways. First, they can clog up from silt or mud. Second, they can clog up because of the growth of microorganisms in the pipes. Third, they can clog because of a chemical reaction leading to the precipitation of minerals in the pipes; anyone who has boiled a pot of "hard" water and seen the whitish crusty residue in the bottom of the pot knows what "precipitated chemicals" look like. Fourth, the pipes themselves can be weakened by chemical attack (acids, solvents, oxidizing agents, or corrosion) and may then be crushed by the tons of garbage piled above them.

The book, AVOIDING FAILURE OF LEACHATE COLLECTION AND CAP DRAINAGE SYSTEMS, by Jeffrey Bass, discusses these four failure mechanisms. The first problem (silt) can sometimes be avoided, or at least reduced, by installing a "filter layer" above the leachate collection system. The filter layer may be made up of gravel or of a rug-like plastic material called "geotextile." Since the oldest leachate collection systems date from the early 1970s, humans have very little experience with the long-term performance of leachate collection systems. The hope is that a "filter layer" will solve the siltclogging problem, but after many decades the entire filter layer itself may clog. Only time will tell.

The growth of microorganisms seems to be an uncontrollable problem. The conditions for growth of slime-forming microorganisms are not well understood. Even if they were understood, we could not control chemical and physical conditions (temperature, pH, etc.) at the bottom of a landfill because of the thousands of tons of wastes heaped up in the landfill.

The problem of chemical precipitation also appears to be uncontrollable. The chemical conditions that lead to precipitation may be knowable, but again the conditions in the leachate collection system cannot be controlled because the system is not accessible once wastes have begun to be dumped into the landfill.

The last problem--chemical attack on the leachate collection pipes, leading to destruction of the pipes themselves--also appears to be an unsolvable problem. Mr. Bass suggests, in best ivory tower fashion, that the way to control chemical attack on the pipes is to select pipes that are resistant to the chemicals that you know will make their way into the landfill. In principal, this is a good idea. But in the real world, how do you know what's going to be put into your landfill next week? Next year? With 1000 brand new chemicals being put into commercial use each year, over the next 10 years, today's leachate collection pipes may come into contact with 10,000 new chemicals that don't even exist today. Any of those chemicals may attack the pipes. In addition, chemicals mixing together inside a landfill will create new chemical combinations that may produce heat or may otherwise attack the pipes.

Mr. Bass's book is misnamed because it seems to suggest that the failure of leachate collection systems can be avoided. However, as the text of Mr. Bass's book makes abundantly clear, if such failures were to be avoided, it would be by dumb luck, not by engineering design. Only a fool trusts dumb luck.

Mr. Bass's book is overpriced at $36.00 from: Noyes Data Corporation, Mill Road, Park Ridge, NJ 07656. No telephone orders accepted.
--Peter Montague, Ph.D.

Descriptor terms: landfilling; landfill failure mechanisms; leachate collection systems; msw;