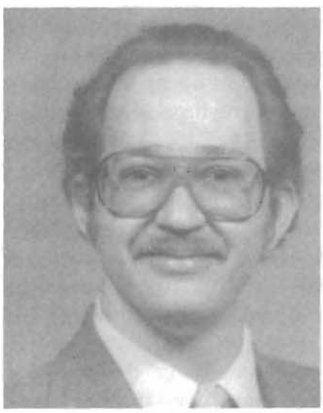
MEETINGS

DINNER MEETING—JANUARY 12, 1987

DAVID C. ANDERSON—Biographical Sketch



Mr. Anderson received a Masters Degree in Soil Physics from Texas A&M University and is a member of the ASTM committees dealing with soils and waste disposal. Over the last 10 years, he has conducted research, taught courses and provided consulting services on land disposal of waste. Research conducted by Mr. Anderson revealed that certain leachates can greatly increase the permeability of liners. These findings resulted in the implementation of mandatory leachate compatibility testing for liners to hazardous waste disposal facilities.

Recently, his attention has been focused on alternatives to conventional land disposal such as above ground landfills and injection wells. Mr. Anderson recently testified before the U. S. Senate on the use of injection wells and landfills for disposal of hazardous waste.

GEOLOGIC HAZARDS OF DEEP WELL INJECTION AND LAND DISPOSAL OF TOXIC WASTE

EPA recently estimated that 264 million metric tons of hazardous waste are generated in the United States each year. This equates to over a ton per person per year. More than 70% of this waste comes from petroleum and petrochemical sources; less than 1% is detoxified or destroyed and more than 99% ends up in the geologic environment. In effect, we are spending billions of dollars annually to store waste on, in, and below the soil surface as follows:

1. 59% is injected into deep wells;
2. 35% is pumped into surface impoundments; and
3. 5% is buried in landfills.

In Texas, between 60 and 80% of all hazardous waste is disposed of by means of injection wells. Most of the remaining hazardous waste is disposed of in either landfills or surface impoundments.

There are over 400 existing or proposed hazardous waste disposal facilities in Texas. The densest cluster of these facilities is in the immediate Houston area. Of the existing and proposed commercial hazardous waste disposal facilities in Texas, 65% are located in Harris and adjacent counties. All but three of these facilities are sited in the Texas Gulf Coast.

In most landfills and surface impoundments, an attempt is made to isolate the waste from the environment by use of low permeability liner systems. With injection operations, wastes are pumped into the subsurface (generally at least 5,000 feet deep) and supposedly confined by low permeability shale layers.

Most waste regulations have long required the use of compacted soil liners to restrict the rate of leachate migration to less than 2 inches/year (equivalent to a permeability of less than 10^{-7} cm/sec at a hydraulic gradient of one). Testing of soil permeability is performed with distilled water. Recent studies have shown, however, that strong acids, strong salts and organic liquids may alter the secondary structure of clay minerals, thereby increasing the permeability of clayey soil liners. This discovery has led to EPA regulations which require the use of synthetic liners and limit the landfilling of organic liquid wastes. Nonetheless, synthetic liners leak and organic-rich liquids are released from the organic sludges which can still be landfilled.

In disposal wells, no attempt is made to determine potential effects of the waste on the permeability of the confining layer. Confining layers can be breached and waste can migrate into drinking water aquifers via pressure fractures, shrinkage cracks, dissolution channels, faults, and along the well bore.

As a result of our waste disposal practices, very little waste is actually destroyed. Instead, wastes are accumulating in deep aquifers and in near surface desposits throughout the U.S. Hundreds of these deposits have been found to be leaking and billions of dollars are being spent on emergency responses at the few sites where action is being taken. A clear understanding of why so many sites have failed to contain waste is necessary for the development of a sensible plan to correct past mistakes and to implement sound waste management practices in the future. Geologists must be involved in these efforts.

Legislative efforts, such as the recent Hazardous and Solid Waste Amendments of 1984, encourage improvements in hazardous waste management. The geoscientific community should involve itself in the implementation of the legislation, in public education, and in the search for innovative new solutions to the problems. Alternatives to deep well injection and below ground landfills (such as recycling, reduction, detoxification, incineration, and above-ground landfilling of waste) should be encouraged.