

# 2004 Deep South Regional Conference

## ENVIRONMENTAL COMPETITION

### **Background**

The use of landfills for the disposal of hazardous waste is the primary option available for the foreseeable future. The possibility of hazardous waste leaching to underlying ground water aquifers is a concern with land disposal. Precipitation falling onto the surface of landfills leaches into the disposal site. Waste material dissolves into the water. Contaminated water can then potentially percolate to underlying ground water. Potential consequences of this contamination include significant health risks to aquatic ecosystems when the contaminated ground water discharges to streams and health risks to humans when wells used as sources of drinking water are contaminated.

This year's ASCE Deep South Region Environmental Contest involves the design and construction of a secure landfill for hazardous waste disposal with limited time and materials. The goal is to design the system such that a minimum concentration of "artificial hazardous waste" (AHW) escapes from the landfill. The contest will follow the theme of the popular Discovery Channel program "Junk Yard Wars": teams will need to construct their landfills on-site the day of the contest with given materials.

### **Guidelines**

Each team will construct a model landfill in a plastic container using a variety of provided materials, including numerous soil types (gravel, sand and/or clay), PVC pipe and a number of other "junkyard" materials. The contest prohibits prior constructed landfills and no outside materials are allowed. Some materials will have use regulations. Each team must bring their own tools for construction of the landfill. Suggested tools include a hammer, screwdriver, tape measure, pliers, handsaw, and a battery-powered drill. All tools must be battery or man powered. The following are specific rules for the contest:

1. Plastic containers with a volume of approximately 3000 in<sup>3</sup> will have pre-drilled holes in the bottom and a layer of gravel approximately 1 inch deep. No modifications can be made to the bottom of the container or to the gravel layer.
2. Teams will have a specified time (approximately 1 hour) for initial construction of the landfill and siting of the location for disposal before the simulated hazardous waste arrives at the site.
3. Teams can drill ONE hole on the side of the container and construct leachate collection systems. AHW flowing from the leachate collection system will not penalize a team as much as AHW flowing into the groundwater.
4. Outlets of leachate collection systems must be located at least 1 inch from the bottom of the container.
5. Teams will then have approximately one hour to place approximately 100 in<sup>3</sup> of AHW in the landfill, cover the hazardous waste to minimize environmental exposure and complete the landfill. Allowing environmental exposure will result in disqualification.

6. Equivalent precipitation events will be simulated on each landfill. Teams should prepare to handle anywhere from 5 to 10 gallons of precipitation. One gallon of water will be added every 5 minutes. Teams will be disqualified if water ponds on the surface of the landfill to the degree that the water overflows the container.
7. Teams will be disqualified if significant leakage occurs from the sides of the container. Significant will be determined by the contest judge.
8. The concentration of artificial hazardous waste in the water passing through the landfill and in a team's leachate collection system (if chosen to be included in the design) will be measured.

### **Scoring**

A team's score will be based on the concentration of hazardous waste leaching to the ground water ( $C_{GW}$ ) and exiting the system through the leachate collection system ( $C_{LCS}$ ). The team with the lowest score, calculated based on the formula below, wins the competition:

$$\text{Score} = 100\% C_{GW} \quad \text{without Leachate Collection System}$$

$$\text{Score} = 75\% C_{GW} + 25\% C_{LCS} \quad \text{with Leachate Collection System}$$

Teams will also give informal presentations of their landfill designs to the judge during the simulated precipitation events. In the case of a tie, the team with the most innovative design and best presentation will be awarded with the higher place.

### **Questions**

Direct questions to Dr. Garey Fox, 2004 Environmental Contest Committee Chair, University of Mississippi, University, Mississippi 38677-1848, [gafox@olemiss.edu](mailto:gafox@olemiss.edu).