

Landfill Siting Criteria with Emphasis on Karst Hydrogeology

by Allan Biddlecomb, P.G.,
Diane Yeager, P.G.,* and
Laurie Irwin

Karst landscapes result from the subsurface solution of rock and are usually characterized by sinkholes, caverns, and drainage of surface water to the subsurface. Karst terrane covers an estimated 15 percent of the earth's land surface and is usually associated with carbonate rock.

Once these surfaces become buried, they may comprise very prolific aquifers. Karst may continue to develop (in areas where the groundwater table is near the surface and unconfined) after the rock has been buried and becomes the matrix for the aquifer. An example of this type of aquifer is the Floridan Aquifer located throughout most of central and north-central Florida.

Where the karst aquifer is near surface or relatively unprotected by thin soils, impacts to the aquifer are likely. In areas where the limestone is buried beneath a thick sequence of clay (example: Hawthorn Formation, Florida), the groundwater is confined and the aquifer is generally perceived as protected from surface influences. However, the paleo-karst development within the limestone may breach the clay unit and fill with permeable sediments such as sands and silts. These breaches are also avenues for contamination to enter the aquifers and are not easily mapped from surface features. Other karst features, such as fractures and conduits, do not have predictable patterns, are difficult to trace, and enhance the aquifer's porosity (secondary porosity).

In many areas of the country, landfills have been built over these karst aquifers. Where the landfills have been constructed prior to establishing landfill siting criteria, drinking water supplies (recovered from the karst aquifers) have most likely been impacted. For example, several landfills

in north Florida have impacted the Floridan Aquifer and numerous potable drinking water wells. Contaminants impacting the karst aquifer tend to migrate rapidly in both the lateral and vertical directions. The impacted area of the aquifer makes active remediation impractical. Once these aquifers become impacted, alternative drinking water supplies need to be established for the population and the aquifer monitored for contaminant migration.

For these reasons, establishing practical landfill siting criteria is critical. In karst hydrogeologic environments geologic investigations should provide the necessary detail to determine if paleo-karst has breached clay units and other features that cannot easily be established from surface mapping. Other siting features are inherently related to the hydrogeologic environment and should be considered prior to conceptual development of the landfill design.

BIOGRAPHICAL SKETCHES

Diane Yeager has worked in the environmental arena for approximately 10 years focusing on hydrogeology. Ms. Yeager obtained her B.S. in geology at Ball State University in Muncie, Indiana. She studied civil engineering at the University of Florida and has her professional registration in Florida. She has worked as both a consultant and government contractor to NASA in California and Florida. As a government contractor at the Kennedy Space Center, Ms. Yeager oversaw the hydrogeology compliance issues affiliated with the Space Center's landfill closure and construction. Her work with Allan Biddlecomb, P.G., of Jones Edmunds & Associates, Inc. included landfill siting investigations in north Florida that are the basis of this paper. Ms. Yeager is currently with Dames & Moore in Houston, Texas, working on a variety of environmental projects.

Laurie Irwin is the manager of the Geosciences Unit at Dames & Moore Houston, Texas. Ms. Irwin has worked in the environmental field for 15 years. She has a wide variety of experience with solid waste facilities throughout the U.S. with emphasis on hazardous waste landfills.

Allan Biddlecomb has an M.S. degree in hydrogeology from the University of Florida (Gainesville). He has worked as a consultant for JEA in Gainesville for approximately 10 years. His current work involves a variety of hydrogeologic investigations for landfill sitings, closures, and contamination investigations. Mr. Biddlecomb has his professional registration in the States of Florida and Georgia.

* Denotes speaker other than senior author

Chairman's note: We would like to thank Faizur R. Khan, P.E., Project Manager for Laidlaw Environmental Services Columbia Engineering Department (Houston), for substituting at the last moment for October's speaker. His talk was entitled "Cut-Off Wall System for Subsurface Liquid Containment."

reservation code for this meeting is 5-0-2.