alternative corrective and preventive actions. Decision-makers, therefore, need some assurance that elements of uncertainty are minimized and that hydrogeological investigations provide reliable results.

The purpose of the book (really a report of the U.S. Environment Protection Agency—(U.S. EPA) is to discuss the measures that can be taken to ensure that uncertainties do not undermine our ability to make reliable predictions about the response to contamination of various corrective or preventive measures. To this end, the author has written the following chapters:

- Framework for Protecting Groundwater Resources
  - Groundwater contamination
  - Groundwater quality investigation
  - Groundwater restoration
- Scientific and Technical Background for Assessing and Protecting the Quality of Groundwater Resources
  - Basic hydrogeology
  - Monitoring well design and construction
  - Groundwater sampling
  - Groundwater tracers
  - The use of models in managing groundwater protection programs
  - Basic geology

A further goal of the report is to bring together available technical information for groundwater personnel working for the U.S. EPA and for personnel working for state and local governments on whom the U.S. EPA ultimately depends for proper groundwater management.

It appears that the authors have met their goal of information gathering and transmission. And from an examination of the peer-review panel U.S. EPA put together to scrutinize this report, one can be assured it's of the highest quality.

GARY F. BENNETT

Detection of Subsurface Hazardous Waste Containers by Nondestrucive Techniques, by A.E. Lord Jr. and R.M. Koerner, Noyes Data Corp., Park Ridge, NJ, 1990, ISBN 0-8155-1244-4, 83 pp., $ 39.00.

The authors of the book are well-recognized experts in the area of subsurface detection having conducted research on the topic under US Environmental Protection Agency (U.S. EPA) sponsorship for a number of years. Papers on this topic have been published in the *Journal of Hazardous Materials* and the second author (Koerner) serves on its advisory board.

This book really is a project report to the U.S. EPA on the author's research carried out with U.S. EPA funds. The project's goal was to identify and

assess the best possible nondestructive techniques (NDT) for detecting and delineating hazardous wastes. The work concentrated on the detection of steel and plastic containers beneath the surface of soil and water bodies. Seventeen techniques were considered and four were ultimately tested: electromagnetic induction (EMI), metal detection (MD), magnetometer (MAG) and ground-penetrating radar (GPR). The containers, both steel and plastic, varying in size from 5 to 55 gallons were buried in known locations in a wide variety of soils; some containers were submerged in water; five diverse field sites were used. Among the conclusions the authors made were the following:

- MD, EMI and MAG perform extremely well in detecting buried steel containers in dry granular soil of low electrical conductivity to any reasonable depth (easily to 6 ft)
- MAG works well under all subsurface conditions for steel containers
- MD, EMI and GPR suffer severe loss of detection ability when the soil's electrical conductivity is greater than 40 mmhos/m
- GPR is the only reliable method to detect plastic containers in sandy soil, but suffers in high conductivity and/or heterogenous soils
- For a preliminary survey of a metal container dump site, the MD (instrument cost $ 500) is a good first method followed closely by the MAG method (instrument cost $ 4000). More detailed surveys can use more expensive instruments; EMI ($ 8000) and GPR ($ 30,000)
- The contents of steel containers essentially have no effect on detectability but liquids of high conductivity enhance detection in plastic containers (except for the MAG method).

GARY F. BENNETT