



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, DC 20555 - 0001

ACNWR-0219

April 27, 2005

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: BRIEFING ON RES-USDA RESEARCH: ESTIMATING GROUND
WATER RECHARGE AND EVALUATING MODEL ABSTRACTION
TECHNIQUES

Dear Chairman Diaz:

During its 158th meeting on March 15-17, 2005, the Advisory Committee on Nuclear Waste heard presentations from the Office of Nuclear Regulatory Research and the Agriculture Research Service of the U.S. Department of Agriculture (USDA) about their research on estimating groundwater recharge and evaluating model abstraction techniques. The main thrust of the research is to develop insights leading to (a) better understanding of near surface water movement, saturated zone recharge, and solute transport at sites with complex processes and features, and (b) guidelines on selecting models that are as simple as possible but are realistic enough to provide a basis for risk-informed decisionmaking. The Committee believes that this research should continue.

The Committee learned about work that is being done to evaluate model abstractions of subsurface water flux and pathways at a highly instrumented, densely sampled watershed-scale site operated by the USDA in Beltsville, MD. This work builds on earlier experiments conducted in well-controlled environments. Ground-penetrating radar coupled with soil moisture measurements has been used successfully at the Beltsville site to identify the location of preferred subsurface pathways that are important to the assessment of uncertainty in infiltration and groundwater recharge estimation.

This research shows:

- Infiltration and groundwater recharge can be better understood using the methodology developed in this research. Models used to predict the fate and transport of contaminants in subsurface environments are sensitive to these parameters.
- These field tests can be used to evaluate alternative conceptual models and improve the selection of the best model abstraction.

- The Beltsville facility provides the opportunity for large-scale field testing in a highly instrumented environment. The research setting permits realistic estimates for sites similar in hydrology and subsurface geology to Beltsville through the incorporation of dynamic hydrologic processes.

The Committee offers the following conclusions and recommendations:

- Continued collaboration between the NRC and the USDA is a cost-effective way to participate in high quality research that is relevant to NRC needs. The Committee noted that the cost to NRC to date has been approximately 2% of the total cost.
- The Committee believes that this collaborative research program is important because it is aimed at reducing model complexity and assessing uncertainty while maintaining realism and the ability to support risk-informed decisionmaking.
- Both the field studies and the model abstraction research appear to have important applications in the areas of site characterization, flow and contaminant transport modeling, performance assessment, contaminant isolation technology evaluation, the design of monitoring programs, and uncertainty assessment.
- The Committee encourages the research staff to develop strategies to enable the transfer of results from studies at Beltsville to other hydrologic environments.
- The Committee believes the Beltsville research program should be coordinated with similar programs. For example, field-scale hydrologic research is being conducted at DOE facilities in Washington (Hanford) and New Mexico (Sandia) and at the University of Arizona's Maricopa site. Experience from these other sites should allow extension of the methodology developed in this research.

Sincerely,

/RA/

Michael T. Ryan
Chairman