CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: American Geophysical Union 2003 Fall Meeting (06002.01.141)

DATE/PLACE: December 8–12, 2003; San Francisco, California

AUTHORS: S. Painter, L. Browning, D. Ferrill, R. Green, D. Hooper, C. Manepally, L. McKague, and D. Wyrick

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PERSONS PRESENT:

The following staff from the Center for Nuclear Waste Regulatory Analyses (CNWRA) attended the American Geophysical 2003 Fall Meeting: L. Browning, D. Ferrill, R. Green, D. Hooper, C. Manepally, L. McKague, S. Painter, and D. Wyrick

BACKGROUND AND PURPOSE OF TRIP:

The American Geophysical Union 2003 Fall Meeting is an important annual meeting for hydrologists, geochemists, geologists, and geophysicists, and usually includes several presentations on Yucca-Mountain-related work. CNWRA staff presented several posters on NRC-funded technical work. The total attendance at the meeting was over 10,000, making it one of the largest meetings in recent years.

MEETING SUMMARY:

Twenty-one presentations summarized work that relates, directly or tangentially, to the potential repository at Yucca Mountain, Nevada. Of these 21 presentations, approximately one-half directly addressed technical issues associated with the potential repository.

Many of the Yucca Mountain presentations were in the Poster Session, "Recent Advances in Groundwater Hydrology." Three CNWRA presentations were in that session. S. Painter, et al., presented "Colloid facilitated transport at the field scale: Model and parameter sensitivities." That work examined the sensitivity of saturated-zone colloid facilitated transport to various modeling assumptions, and will be used to focus future reviews of colloid facilitated transport. L. Browning, et. al., presented "MULTIFLO simulations of silica mobility in the ambient unsaturated zone at Yucca Mountain" that emphasized the potential discrepancies between U.S. Department of Energy (DOE) hydrological and geochemical models. C. Manepally presented "Effects of drift degradation on environmental conditions in drifts," which described the abstracted model for in-drift heat transport which is used in TPA Version 5.0 code.

DOE poster presentations in the same session included a summary of the saturated zone representation in the total system performance analysis, an analysis of vapor-phase transport in the near drift environment, a status report on the development of computational fluid dynamics codes to model in-drift conditions, summary of the multiscale thermal hydrology modeling, a

new analysis of saturated zone anisotropy as inferred from the C-wells tests, an analysis of film flow along tunnel walls, and an analysis of infiltration tests to address preferential flow in faults.

Three presentations addressed the thermohydrological modeling of the drift-scale test, which has been undertaken to enhance confidence in numerical modeling of repository thermohydrological processes. In the poster "Thermohydrological Conceptual Model Evaluation Using Laboratory- and Field-Scale Heater Tests," R. Green, et al., described CNWRA modeling of the drift-scale test using the MULTIFLO code. The simulations were able to reproduce observed temperature profiles within the rock by using the heat lost through the bulkhead as a calibration parameter. The authors conclude that the in-rock processes are adequately represented, but the in-drift heat transfer processes cannot be compared directly to the simulations because of unmonitored heat and moisture loss through the heater bulkhead. In a related poster, Y. Sun (Lawrence Livermore National Laboratory), et al., also described modeling of the drift-scale test that was able to adequately reproduce conditions observed in the rock near the heater drift. In addition, C.F. Tsang (Lawrence Berkeley Laboratory) presented an invited talk "DECOVALEX—An International Cooperative Research Project on Coupled Thermo-hydro-mechanical Processes in Fractured Rocks," which included analysis of the drift-scale test as one of the test cases.

The hydrology sessions covering geomorphology and fluvial processes were relevant to ongoing sediment transport (tephra remobilization) studies in the Fortymile Wash drainage system at Yucca Mountain. C. Harrington and T. Ebert (Los Alamos National Laboratory) had a poster presentation entitled "Predicting the Surface Redistribution of Possibly Contaminated Tephra Deposits at the Yucca Mountain Repository Using Cesium-137." They report that the results of Cs-137 concentrations in the samples from the upper portion of the Fortymile Wash alluvial fan indicate erosion over the past 50 years in the upper fan interstream-divide areas. During this time period, they estimate 1–2 cm of erosion in the upper soil horizon, mainly as the result of eolian processes. As part of the Extreme Event Geomorphology session, J. Major (U.S. Geological Survey) discussed the geomorphic response following the 1980 Mount St. Helens eruption. Extreme geomorphic events (such as a volcanic eruption) affect sediment transport, landform development, and landscape evolution. Less understood are the magnitude and persistence of geomorphologic responses to these events and the impact on the various geomorphologic regimes. Typically, a state of disequilibrium follows after the event. The long-term impact depends upon spatial scale and the geomorphologic regime (e.g., sediment transport, water discharge) examined. The cataclysmic 1980 Mount St. Helens eruption altered runoff and abruptly increased sediment supply in several watersheds. Post-eruption infiltration capacity quickly recovered and runoff conditions approached a pre-eruption state. Post-eruption suspended-sediment yields increased significantly. Annual yields were as much as 500 times greater than pre-eruption values and yields 10–100 times greater still persist. He concludes that extreme events do not fundamentally alter geomorphic processes and perturbations in runoff and water discharge typically dissipate within several years. Recovery from and resilience to these events are defined best by examining locations and magnitudes of long-term sediment transport. Although Mount St. Helens is not an example of basaltic volcanism, some process-level comparisons can be made with the Yucca Mountain region and the potential remobilization of contaminated tephra. J. Brainard and V. Tidwell (Sandia National Laboratories) presented their preliminary results of an ongoing investigation into the applicability of Time Domain Reflectometry for remote, real-time monitoring of streambed dynamics, stream discharge, and water quality. A Time Domain Reflectometry-based stream monitoring system involves the propagation of a high frequency, low voltage electromagnetic pulse through

waveguides or probes installed in the riverbed. Reflected signals (traces) from each sensor are analyzed to locate dielectric discontinuities resulting from air-water and water-sediment interfaces, as well as to evaluate the extent of signal attenuation due to the electrical conductivity of the media/water. As applied to measurements of sediment concentration, the method appears to be better suited for perennial streams as opposed to ephemeral streams. However, Time Domain Reflectometry may also help determine stream stage, channel depth, and salinity. Studies of tephra remobilization in Fortymile Wash would have benefitted from instrumentation that aids determination of sediment yield.

Over the five days there were a number of posters and presentations on various applications of Ground Penetrating Radar. They seem to fall into three groups. One group was obviously positioning themselves for proposing experiments for future Mars missions. The second group was using Ground Penetrating Radar for shallow geophysical investigations, especially for the determination of moisture content in the vadose zone. The third group was using Ground Penetrating Radar for glacial studies.

The American Geophysical Union Fall Meeting also provides an opportunity to recruit new technical staff. Potential applicants for a hydrology position were interviewed. Resumes of an additional 30 other potential candidates were selected to be sent from the American Geophysical Union Career Center to the CNWRA for further review and evaluation. There appears to be a larger number of candidates in the job search then in the previous few years, although many of them will not be available until the May/June time frame.

CONCLUSIONS:

The American Geophysical Union Fall Meeting is an important outlet for new research in several geoscience and geoengineering disciplines. As in previous years, several presentations addressed technical issues directly related to the potential repository at Yucca Mountain, and many presentations addressed scientific developments that are indirectly related. This meeting continues to be one that allows CNWRA scientists to interact with a wide variety of top national and international earth scientists. It is also the meeting where state of the art activities and very recent technical developments are often introduced and discussed, allowing CNWRA staff to remain aware of recent developments and trends in the scientific community.

PROBLEMS ENCOUNTERED:

None.

PENDING ACTIONS:

None.

RECOMMENDATIONS:

Continued participation in the American Geophysical Union Fall Meeting is recommended.

REFERENCES:

None.

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