Federal Register Notice

NUCLEAR REGULATORY COMMISSION

Draft Report for Comment: "Documentation and Applications of the Reactive Geochemical Transport Model RATEQ," NUREG/CR-6871

AGENCY: Nuclear Regulatory Commission

ACTION: Notice of availability and request for comments

BACKGROUND: The U.S. Nuclear Regulatory Commission (NRC) uses environmental models to evaluate the potential release of radionuclides from NRC-licensed sites. In doing so, the NRC recognizes that, at many sites, groundwater-related pathways could contribute significantly to the potential dose received by members of the public. Consequently, consistent with its mission to protect the health and safety of the public and the environment, the NRC uses contaminant transport models to predict the locations and concentrations of radionuclides in soil as a function of time. Through this notice, the NRC is seeking comment on documentation of a subsurface transport model developed for the NRC by the U.S. Geological Survey (USGS) for realistic transport modeling at sites with complex chemical environments.

Because many radionuclides temporarily attach, or adsorb, to the surfaces of soil particles, their mobility is reduced compared to that of compounds that move with the groundwater without interacting with solid surfaces. As a result, most subsurface-transport models used by the NRC and its licensees estimate the effects of the anticipated interactions between

radionuclides and solids in the ground. Toward that end, these subsurface-transport models use a “distribution coefficient,” which is assumed to be constant and reflects the proportion of radionuclide in the groundwater compared to the radionuclide associated with the solids in the ground. These distribution coefficients are widely used, and consequently, the relevant literature documents ranges of their values for various soil types and radionuclides. However, the documented ranges can be very large because the chemical reactions that cause radionuclides to attach to solids are very sensitive to water chemistry and soil mineralogy. As a result, uncertainties in the parameters used to characterize the adsorption of radionuclides in soils have been identified as a major source of uncertainty in decommissioning, uranium recovery, and radioactive waste disposal cases evaluated by the NRC.

Surface-complexation and ion-exchange models offer a more realistic approach to considering soil-radionuclide interactions in performance-assessment models. These models can also account for variable chemical environments that might affect such interactions. The subject report, prepared for the NRC by the USGS, describes the theory, implementation, and examples of use of the RATEQ computer code, which simulates radionuclide transport in soil and allows the use of surface-complexation and ion-exchange models to calculate distribution coefficients based on actual site chemistry.

The RATEQ code will help the NRC staff define realistic site-specific ranges of the distribution coefficient values used to evaluate NRC-licensed sites. In site-remediation cases, such as restoration of the groundwater aquifer in and around uranium in-situ leach mining facilities, the RATEQ code can aid in the estimation of restoration costs by estimating the volume of treatment water needed to restore sites to acceptable environmental conditions.

SOLICITATION OF COMMENTS: The NRC seeks comments on the report and is especially interested in comments on the value of the report to users who run the RATEQ code and are familiar with the types of complex chemical environments that complicate many remediation projects.

COMMENT PERIOD: The NRC will consider all written comments received before August 12, 2005. Comments received after August 12, 2005, will be considered if time permits. Comments should be addressed to the contact listed below.

AVAILABILITY: An electronic version of the report is available in Adobe Portable Document Format at http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6871/cr6871.pdf and can be read with Adobe Acrobat Reader software, available at no cost from http://www.adobe.com. The report and the computer files for the test cases discussed therein are available at http://wwwrcamnl.wr.usgs.gov/rtm. Hard and electronic copies of the report are available from the contact listed below.

CONTACT: Dr. John D. Randall, Mail Stop T9C34, US Nuclear Regulatory Commission, 11545 Rockville Pike, Rockville, MD 20852, telephone (301) 415-6192, e-mail jdr@nrc.gov.

Dated at Rockville, Maryland, this _____day of _____ 2005.

For the Nuclear Regulatory Commission

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Cheryl A. Trottier, Chief

Radiation Protection, Environmental Risk & Waste Management Branch

Division of Systems Analysis and Regulatory Effectiveness

Office of Nuclear Regulatory Research