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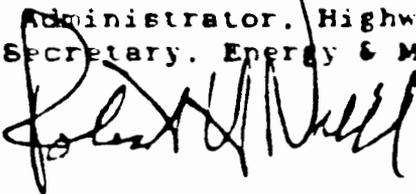
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FROM: Robert H. Neill 

DATE: July 7, 1987

SUBJECT: DOE's Desire to Delete a Consultation and Cooperation
Agreement Mandated Test at WIPP

The Issue

The November 1984 Modification to the Consultation and Cooperation Agreement between the State of New Mexico and the U. S. Department of Energy (Appendix 1 to the Working Agreement), lists "at least one field test using sorbing tracers at a site to be selected after consultation with EEG" as one of the geotechnical studies which DOE committed to perform. All the other studies listed in this Appendix are to be completed by January, 1988 according to the Agreement. The Sorbing Tracer Test, however, may require continuous pumping for several years and, therefore, the commitment for this test was simply to "make every effort to start the long-term Sorbing Tracer Test as soon as possible and no later than January 1986." (Art. IV, Section K, Para 12, Modified C and C Working Agreement). DOE has not yet started this test and would now like to delete it from the Agreement. At a June 16-17 meeting of the National Academy of Sciences WIPP Panel in Washington D. C., Sandia presented DOE's desire to delete the Sorbing Tracer Test and replace it by some additional field tests to refine the understanding of groundwater flow in strata overlying the WIPP repository. The reasons given were that 1) the tests proposed in lieu of the Sorbing Tracer Test would provide more relevant and useful information to perform performance assessment for showing compliance with the EPA Standards, and 2) the results of the test, if it were to be initiated now, would not be available until after the waste starts arriving at WIPP in October 1988. Jack Tillman, the DOE WIPP Project Manager, told me separately that the DOE Attorney, Jim Stout, would be contacting the State A. G. Office to include deletion of this test as an item in the forthcoming State/DOE negotiations on another modification to the C and C Agreement. The intention of this memorandum is to provide you with the background of this issue and make recommendations for your consideration as a response to the DOE request for deletion of this test.



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The Background

One of the pathways of potential release of radionuclides after a breach from the WIPP repository is through the Rustler Formation aquifers. When radionuclides suspended or dissolved in water pass through an aquifer, the movement of a fraction of them is "retarded" by the rock through several processes which include adsorption, ion exchange and precipitation. This "retardation" is measured by a quantity called the "distribution coefficient" (expressed by the symbol K_d) with units of ml/g. K_d values are dependent on the rock types: permeability; fracture and matrix porosity; and the radionuclides present. It may be necessary to take credit for sorption of the radionuclides by the rock in modeling breach scenarios in order to show compliance with the EPA Standard. It is likely that without assuming certain finite values for K_d , the EPA Standard may not be met.

The initial radionuclide transport calculations performed by DOE in 1978-79 used K_d values that had been determined from laboratory tests on powdered samples of the aquifer rock. EEG criticized the use of these values and suggested that field tests should be performed to obtain reliable K_d values to be used in breach scenario modeling (EEG 2, 1979, p. 25). The suggestion for one or more field Sorbing Tracer Tests was repeated by EEG in communications with DOE and in EEG reports (e.g. EEG-16, 1982, p. 62; EEG-23, 1983, p. 143). DOE made a formal commitment to conduct at least one field test for sorption in the 1984 modification to the C and C Agreement. At a quarterly meeting of the National Academy of Sciences (NAS) WIPP Panel in November 1985 in Albuquerque, the Panel expressed some doubts about the need for the test and whether useful information would be gained from it. After several deliberations and exchange of letters between EEG, DOE and NAS, the NAS Panel recommended at a meeting on September 29-30, 1986 in Santa Fe that three field tests for sorption be performed. This recommendation was provided by NAS to DOE through a letter dated April 16, 1987.

In June, 1986 DOE informed EEG that the Sorbing Tracer Test was being re-scheduled (delayed) for FY 1988. To this, EEG replied on July 11, 1986 that the results of the test are needed for performance assessment and should, therefore, be available before waste is brought to WIPP. Then on June 4, 1987 we received a copy of a June 1, 1987 Sandia National Lab memorandum from Al Lappin to the NAS recommending that the Sorbing Tracer Tests be deleted and some hydrological studies be carried out instead. Even though the list of studies proposed is long, much of the proposed work is already in progress or planned. At the June 16-17, 1987 meeting of the NAS Panel in Washington, D. C., the discussions between the NAS, DOE and EEG remained inconclusive and the NAS Panel did not provide a clear response to the DOE recommendation to delete the test.

Analysis of the Recommendation

There are two important factors that would determine the transport of radionuclides to the accessible environment through the Rustler Formation. These are 1) the flow rate of water, and 2) the transport of radionuclides within the water mass with due consideration of the various mechanisms of retardation. In order to determine the WIPP's compliance with the EPA Standards, it is obviously essential to characterize the Rustler Formation hydrology as accurately as possible. On the question of sorption, we have the following thoughts.

- 1) If the Rustler hydrology is well understood and the travel rates are extremely slow, no credit may have to be taken for sorption. But if the uncertainties remain and/or the flow rates are relatively high, it may be necessary to take some credit for retardation in order to show compliance with the EPA Standards.
- 2) Laboratory studies to determine K_d values can be useful but are more uncertain than field studies because they are performed on extracted material of a much smaller volume and without regard to the in situ geometry and fracture configurations.
- 3) Successful field studies to determine K_d values are more representative of the behavior of contaminants for the form in which the tracer is introduced. However, certain chemical species of the waste may affect the mobility of the radionuclides and the aquifer geochemistry may be modified by additional water such as brine bringing up the waste that would be injected into the aquifer.

Based on the above observations, we offer the following discussion on items that are pertinent to a sorbing tracer study and the related June 1, 1987 memorandum from Al Lappin to the NAS WIPP Panel.

We believe it is more important to determine the low end of the K_d distribution function than to determine an average or median value. This is because preliminary calculations by EEG indicate that the EPA standard could be exceeded if as little as 3% of the injected TRU radionuclides are mobile ($K_d=0$) and travel through fractures to the site boundary. If matrix diffusion were to delay arrival until 3000 years after closing, the allowable mobile fraction could be 10% or more. Furthermore, it is not certain that future hydro-geological evaluations will confirm that the above approximations are conservative. If the tracers are not inserted in a more mobile form, we don't see how the proposed sorbing tracer test, even if conducted successfully, will provide data on the low end of the K_d distribution function. In the absence of direct data on the K_d distribution function, EEG would have to recommend that some fraction of the radionuclides be assumed to be transported as if the K_d were zero even if a sorbing tracer test yielded a finite K_d value.

In spite of the assertion in Dr. Lappin's June 1 memo that there have been numerous K_d measurements, we are not satisfied with the existing data base. Our position coincides with that stated by DOE in the 1986 WIPP Safety Analysis Report (SAR) Section 2.5.8:

. . . site-specific data are inconclusive and limited in scope, and there is little justification for applying them to WIPP-site performance assessment and radionuclide migration analyses. The simplest and most conservative means to deal with sorption in radionuclide transport is to assume that sorption does not occur ($K_d=0$) for all dissolved radionuclides and that there is no retardation of radio-nuclide transport by geochemical processes.

SAR, Page 2.5-51

Based on the discussion in the SAR, as well as the data limitations stated in the two sources of WIPP K_d values (PNL-2448, 1977; SAND 78-0297, 1978), we stated in our 1-13-87 comments on the SAR Chapter 8 that $K_d=0$ is the only value we find defensible for use in radionuclide migration analysis at WIPP until additional test data from the lab and field are available. Therefore, we support the laboratory investigations suggested in Mr. Lappin's memo. It must, however, be recognized that reliable application of lab values to release scenarios will be more difficult without the field test.

In order to obtain a better understanding of Rustler hydrology, we support performing the additional studies suggested, though many of them appear to be work that is already underway or planned. The new hydrologic test hole between H11 and P17 is particularly needed and could provide valuable data for hydrologic characterization in the critical southern area. We believe it is important to try to determine how high a transmissivity actually exists in the "high transmissivity channel" and to evaluate whether the matrix diffusion transport modeled in SAND 87-7105 would still be applicable for low or high pressure releases.

EEG Recommendations on the Sorbing Tracer Test Deletion Issue

In summary, we recommend acceptance of the DOE proposal to delete the Sorbing Tracer Test only if DOE agrees to use $K_d=0$ for all its analyses of breach scenarios. We may, after careful evaluation of the findings of a properly designed laboratory study, accept a K_d value greater than zero for a portion of the wastes even though we believe

that the laboratory determined values for K_d would be less accurate and reliable without a field Sorbing Tracer Test. The modification to the C and C Agreement should also list specific studies in lieu of the Sorbing Tracer Tests, as provided in the Lappin memo.

Attachments

- . Copy of Lappin memo dated June 1, 1987
- . Copy of letter to Mr. W. R. Cooper dated July 11, 1986
- . Copy of letter to DOE dated January 13, 1987
- . Copy of NAS letter to DOE dated April 16, 1987