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Hydrogeology • Mineral Resources Waste Management • Geological Engineering • Mine Hydrology

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Communication No. 49

Mr. Jeff Pohle
Division of Waste Management
Mail Stop 623-SS
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: Trip Report

Dear Jeff:

The NRC convened a meeting with its consultants April 14, 1986, in Silver Spring, Maryland. Williams and Associates were represented by Dr. Williams, Dr. Ralston, Dr. Osiensky, Dr. Sharp, Dr. Parizek, and Mr. Winter. Mr. Paul Davis represented Sandia National Laboratory. Nuclear Waste Consultants (NWC) was represented by Mr. Brown, Mr. Logsdon, Mr. Lyle Davis, Dr. Daniel Stephens and Mr. Mike Galloway. NRC participants in the meeting included Mr. Jeff Pohle, Mr. Fred Ross, Mr. Mike Weber, Mr. Neil Coleman, Mr. Mike Fliegel, Mr. Paul Hildenbrand, Mr. King Stablein, Dr. Dick Codell, and other observers who were present during portions of the meetings.

Mr. Pohle opened the meeting at 8:30. The plans to review the Final Environmental Assessments (FEA) were presented to the participants. The review will concentrate on major comments with lesser emphasis being placed on minor comments generated during the Draft Environmental Assessment reviews. Minor comments may be upgraded to major comment status. Nuclear Waste Consultants will be involved only to a limited extent on the Nevada Test Site or on the Salt Sites. The use of Nuclear Waste Consultants on the FEA for the BWIP site is up to the discretion of Mr. Mike Weber. Mr. Pohle stated that the review process should be much simpler than the review required for the Draft Environmental Assessments. A three week turn around is allowed for Mr. Pohle's group to generate and submit their comments on the FEAs.

Mr. Pohle approached the subject of references which are cited in the FEAs which are not available for review. Mr. Pohle suggested that if the references cited are not received by the time the EAs

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are received, then these references should be ignored due to the short time available for review of the FEAs. Inadequate time would be available for proper review of the references cited in the FEAs.

Mr. Pohle stated that the document lists on the Palo Duro Basin are in good shape. He noted that Mr. Bill Ford has sent out additional documents on the salt domes to the consultants. Mr. Pohle stated that several reports have been deemed critical on the BWIP site. These reports are in limbo at this time because of the apparent reluctance by the DOE to release the references which will be cited in the FEA.

Mr. Fred Ross stated that the DOE has categorized the NRC comments. They have revised the text to produce blanket comment responses to the NRC comments. Mr. Ross stated that DOE has produced a document which states what sections have been changed to reflect the NRC comments.

Mr. Pohle and Dr. Williams discussed the stochastic models which are being used to estimate travel times for the various high level sites. Mr. Pohle stated that we will not have time to review all the stochastic approaches being used for the various sites. Mr. Fliegel stated that the NRC will be obligated to state whether there are problems with the documents. Mr. Brown commented that the short time period that will be available for review is not conducive to adequately dealing with the uncertainty analysis that will be inherent with the modeling approaches being used in the FEA and supporting documents. Mr. Winter asked what the turn around time was for contractor comments to Mr. Pohle. Mr. Pohle replied that such comments had to be received in the third week of the NRC review period. Mr. Pohle has to supply his comments on all sites to the Repository Branch Section at the end of the third week.

Mr. Brown requested that pressure be applied to obtain the cited documents. Mr. Weber responded that BWIP can't seem to get the documents out. A few documents have come out in microfiche form. Key documents have not been released.

The NRC efforts for Site Characterization Plan (SCP) reviews were discussed. Table 1 from your memorandum to Mr. Fliegel (dated March 24, 1986) was presented and discussed which outlines the product efforts for the hydrology section for the SCP reviews. The efforts include technical evaluation memoranda, data needs assessment, site characterization objectives, and testing strategy. Some editorial suggestions were made regarding this memorandum.

The emphasis of the meeting shifted at this time to current efforts. Mr. Pohle stated that we will continue with our document reviews. Mr. Pohle requested that Mr. Logsdon develop an outline of the scenario analyses that NWC believes are appropriate for evaluation for the sites.

Mr. Pohle reconvened the meeting after a short break. Mr. Pohle provided an introduction for Dr. Osiensky's presentation on the Nevada Test Site conceptual groundwater flow models. He also pointed out the influence on data needs with respect to the conceptual model. He cited as an example that of Waddell's model that was developed for the Nevada Test Site. Dr. Williams pointed out that the regional model has very little value at the Nevada Test Site.

Mr. Brown stated that DOE should look at the EPA standards with respect to the overall characterization of the sites. He stated that the NRC appears to have chosen to spend a minimum amount of time on developing a critical pathway for evaluation of the site data. He further stated that there will not be a second field test plan after issuing the major documents. NRC cannot go out and do the testing so the NRC has to influence DOE's testing to be sure that the NRC obtains the information it requires for licensing. Dr. Williams stated that he really does not disagree with what Mr. Brown has stated. Mr. Fliegel interjected that the NRC cannot be in a position of defending their test design at a hearing. A general discussion ensued of the five-year program plan being developed at the NRC. Mr. Fliegel stated that he is concerned that the NRC is just reacting to DOE and that the NRC is not resolving anything.

Mr. Brown made a presentation on one of the data needs assessment efforts that was performed under the earlier Golder salt contract. Mr. Brown described the resaturation process for salt in a repository in the Palo Duro Basin. Mr. Brown stated that the results of the assessment appear to indicate that the repository will be resaturated probably from fluid obtained from aquitard storage. Mr. Brown went into a lengthy discussion concerning the relative storage capabilities of the various backfill materials that could be used in a salt repository. Mr. Paul Davis stated that these subanalyses described by Mr. Brown should be decided upon by the group because of the dependence upon conceptual model and mechanics used in the analyses. Dr. Sharp noted that multiple conceptual models have to be considered in these analyses. Mr. Paul Davis stated that the approach which deals with small portions of the problem may not accurately represent this complex problem. Mr. Brown agreed.

The group reconvened after lunch. Mr. Fliegel introduced Mr. Seth Coplan of the Repository Projects Branch. Mr. Coplan stated

that this is a five-year plan that is divided into two parts. The first part will develop generic open items that will result in generic technical position papers. The second part will be to plan site specific activities. The work should be completed on the plan by the end of the EA review. An example of this effort is the generic technical position paper being produced on travel time. Mr. Coplan reviewed a list of topics that they are considering in this plan. This list includes preclosure protection, retrievability, containment in waste packages, release rate from engineered barrier, pre-waste groundwater travel time, post-closure groundwater protection, post-closure individual protection, post-closure EPA standards, quality assurance, format and comment guide for license application, review plan for license application, and systems integration.

Mr. Brown expressed concern about the conceptual models they will use for their data needs assessment. He requested guidelines from the group. Mr. Pohle requested that NWC produce a list of thought processes regarding their ideas.

Dr. Williams spoke briefly on the scale of conceptual models as opposed to the scale of the test and of the modeling efforts that are being conducted at the various sites. He pointed out that dispersion and hydraulic conductivity are scale dependent.

Dr. Osiensky presented a summary of conceptual models of groundwater flow in the saturated and unsaturated zones in the vicinity of Yucca Mountain, Nevada. The contents of the presentation were consistent with the report by Williams and Associates, Inc., entitled "Conceptual Models of Groundwater Flow in the Saturated and Unsaturated Zones in the Vicinity of Yucca Mountain, Nevada" (Communication No. 41). In addition to presenting the general contents of the report, a film entitled "Water Movement in Soils" was shown to illustrate the mechanics of unsaturated flow in layered materials, and the formation of capillary barriers under transient flow conditions.

Discussion subsequent to the presentation dealt primarily with the potential existence of capillary barriers under the conditions of sloping stratigraphy. Discussion focused also on the potential effects of anisotropy within the stratum forming the capillary barrier and the importance of scale of anisotropy.

The meeting reconvened April 15. Mr. Weber showed a movie that had been produced by Pacific Northwest Laboratories on diffusion.

Mr. Pohle introduced Mr. Brown and Mr. Logsdon. Mr. Logsdon introduced Mr. Lyle Davis. Mr. Davis listed several questions that they are considering for the Nevada Test Site. These

questions for this site and the salt and BWIP site will be forwarded to the NRC in a letter. Briefly these items are:

- 1) Investigate infiltration rates to determine what rate will meet the EPA standard assuming that the water table is the accessible environment.
- 2) Investigate the effect of sloping capillary barriers using a simple model.
- 3) Investigate matrix flow which may be preferential over fracture flow at the Nevada site.
- 4) Investigate the influence of vapor flow transport. Mr. Davis noted that this work had been done previously. NWC stated that they will not redo work that has been done by other investigators.
- 5) Investigate transport in the saturated zone near the site.

Dr. Williams interjected that the NRC should follow up on Mr. Logsdon's comments about checking on bomb tritium in the wells at the Nevada Test Site. A general discussion ensued regarding the topics listed by Mr. Davis. Mr. Brown presented a brief flow chart outlining the topics presented by Mr. Davis. Dr. Sharp requested an outline of the conceptual models at the Nevada Test Site. Mr. Pohle responded that two dimensional figures have not been developed for conceptual flow at the Nevada Test Site.

Dr. Stephens presented the list of topics for the Deaf Smith site after a brief break. Dr. Stephens stated that they have not developed conceptual models for the Palo Duro Basin; they will complete their conceptual models in the near future. Dr. Stephens listed the following topics:

- 1) Investigate the vertical hydraulic conductivity that can be averaged over the units which would exceed the flux limits for the Palo Duro/Deaf Smith site.
- 2) Investigate effects of breccia pipes and faults on flux rates.
- 3) Investigate effects of diffusion in salt without groundwater flow.
- 4) Investigate potential osmotic effects of interbeds on flow in the salt sequence.
- 5) Investigate thermal effects on upward flow (buoyancy).

- 6) Employ mixing models which consider inflow from the salt beds into the Wolfcamp (water chemistry).
- 7) Investigate age dating the water in the Wolfcamp which appears to be too young for connate water.
- 8) Investigate input data that were used in the PTRACK document for calculating travel times.
- 9) Two additional topics were added to the list during the general discussion of the list presented by Dr. Stephens. These topics are salt dissolution and brine intrusion migration.

Dr. Sharp had to leave the meeting at this time; Dr. Sharp noted that the conceptual models that will be considered at the Deaf Smith site may have to include a new conceptual model which has upward flow from the strata below the Permian evaporite aquitard sequence to the shallower units. This potential conceptual model is still being evaluated by Williams and Associates, Inc.

A discussion ensued based on Mr. Paul Davis' question regarding the size of the area of interest. Mr. Davis stated that a regional approach is required to establish boundary conditions for modeling which is required for performance assessment. Mr. Brown disagreed.

Mr. Weber convened a BWIP strategy meeting after lunch. Mr. Weber handed out the list of characterization issues on hydrogeology. Mr. Weber also handed out a copy of a handout produced by Dr. Dalem (DOE) that was presented to the State of Oregon.

Mr. Paul Davis requested an up-date on testing at the BWIP site. Mr. Weber responded that borehole DC-23W is completed; borehole DC-23G is nearing completion. Mr. Weber stated that a considerable amount of drilling mud was lost in drilling RRL-17 in the Rocky Coulee flow top. This mud loss caused a one-foot change in head at the RRL-2 boreholes. A drilling pad has been constructed for borehole DC-24.

Mr. Coleman stated that Mr. Cook (NRC on-site representative) spotted a QA problem on the temperature logging of DC-23. The problem apparently is being resolved at this time.

Mr. Weber has talked to Mr. Thompson (DOE) regarding the upcoming test strategy meeting for the BWIP site. Mr. Thompson informed Mr. Weber that they have a two-month review period before they can meet with the NRC. They have gone back to the drill and test sequence at this time because the type of data obtained from the

drill and test sequence is compatible with the stochastic performance assessment approach being employed by BWIP. The BWIP site has initiated hydrochemical sampling. Mr. Hildenbrand stated that the letter sent to DOE states that the DOE must have a QA program prior to initiating large-scale testing. Mr. Weber stated that DOE has identified the data needs and they are producing the test strategy. Mr. Winter asked whether the NRC and its consultants would see this strategy prior to the meeting. Mr. Weber responded that the NRC will receive a copy of the test strategy prior to the meeting.

Mr. Galloway (NWC) stated several questions on the BWIP site.

- 1) To what extent are pre-waste emplacement heads important to post-emplacement performance?
- 2) To what extent is it important that we know the characteristics of the hydrogeologic properties below the repository horizon?
- 3) Given a knowledge of bulk vertical hydraulic conductivities is it important that we know how these vertical hydraulic conductivities are distributed?
- 4) How many long-term tests should be run to provide adequate information for performance assessment?
- 5) How far out can the boundaries be before they have no impact on the EPA standards?
- 6) With respect to other imperatives, how do we stand with respect to dispersivity?

A lengthy discussion ensued between Mr. Paul Davis and Mr. Brown regarding the need for additional head data to define conceptual groundwater flow models. Mr. Galloway returned to the discussion of his list. A criteria should be investigated for stopping the large-scale test which is included under Item No. 4. Boundaries below the repository horizons should be investigated, which falls under Topic No. 5.

Dr. Ralston noted that effective porosity should be evaluated in the same light as dispersivity and hydraulic conductivity. Alternative conceptual models must be regarded in the data needs assessment approach proposed by NWC. Mr. Davis asked whether fracture flow will be investigated. The general response was that it would not be investigated per se.

Mr. Paul Davis presented a brief review of Sandia's modeling efforts at the BWIP site. Sandia National Laboratories has

produced at least two scales of models for evaluating various aspects of the BWIP site.

Mr. Weber stated that Williams and Associates needs to look at the role of effective porosity at the BWIP site. Williams and Associates also need to consider the potential effects of the double-porosity model on test evaluation and characterization of the site. Mr. Weber also requested that Williams and Associates consider how linear features could be tested at depth at the BWIP site.

Please call if you have any questions regarding our trip report. We would like to receive a copy of the attendance list for this meeting.

Sincerely,

Gerry Winter
Gerry N. Winter

GVW:sl