



Department of Energy

Washington, DC 20585

FEB 2 1989

Mr. B.J. Youngblood
Deputy Director
Division of High-Level
Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References:

- 1) Letter from USGS Hydrologists to Verne Schneider (USGS); dated August 17, 1988; re: USGS Role in Yucca Mountain Site Characterization Effort.
- 2) Letter from Larry Hayes (USGS) to Carl Gertz (DOE-NV); dated October 3, 1988; re: Response to Technical Concerns Raised by USGS Hydrologists in the August 17, 1988, Memorandum to Verne Schneider, USGS, Reston, VA.
- 3) Letter from Dallas Peck (USGS) to Samuel Rousso; dated December 15, 1988; re: Actions taken relative to the concerns expressed in an internal memorandum dated August 17, 1988.

Dear Mr. Youngblood:

As you are aware, a number of United States Geological Survey (USGS) hydrologists involved in the investigation of Yucca Mountain expressed several serious concerns related to technical, quality assurance and management matters in an August 1988 internal USGS memorandum (Reference 1). In summary, they alleged a lack of USGS management responsiveness to technical staff concerns, attributable to USGS-NNWSI efforts to satisfy the Department's objectives. The concerns were recognized to require serious consideration, evaluation and remediation by not only the USGS, but also by the Department of Energy's Yucca Mountain Project Office and Office of Civilian Radioactive Waste Management.

Based on the attached correspondence, both the Department and the USGS consider that the technical staff concerns have been or are actively being addressed. This has resulted in no apparent long-term impact on the effectiveness of the USGS's site characterization efforts.

Specifically, we believe Mr. Hayes' response to Carl Gertz (Reference 2) adequately addresses the four technical concerns of the group, as indicated in Mr. Peck's correspondence with Mr. Rousso (Reference 3). Mr. Hayes' response also reflects a reaffirmation of commitment by the USGS management to improving the day-to-day working relationship with the technical staff. We

8902070360 890202
PDR WASTE PDC
WM-11

1/1
102
WM-11
NH03

believe Mr. Peck's letter adequately addresses the remaining three management/quality assurance issues and details their initiative to establish a group of senior scientists to address the broader issue of an apparent lack of a forum to express general programmatic concerns. In addition, Mr. Peck's statement of the USGS's dedication to implementing a Quality Assurance Program consistent with the NNWSI 88-9 document is exemplary.

The Department believes that in a highly visible, aggressively scheduled, and technically demanding program such as ours, it is important to maintain one's perspective on contentions that arise between and within the various organizations involved. In the Department's view, the concerns expressed by the USGS staff and the manner in which they were addressed by their senior management demonstrates that a positive, responsible and effective approach exists to openly identify and resolve problems within the Program.

Questions regarding this correspondence may be addressed to myself or G. Appel of my staff at 586-1462.

Sincerely,



Ralph Stein
Associate Director for Systems
Integration and Regulations
Office of Civilian Radioactive
Waste Management

cc:

D. Peck, USGS
J. Linehan, NRC
R. Loux, State of Nevada
D. Betchel, Clark County NV
J. Bradhurst, Nye County NV
M. Baughman, Lincoln County NV
C. Gertz, YMPO



United States Department of the Interior

GEOLOGICAL SURVEY
BOX 25046 M.S. 421
DENVER FEDERAL CENTER
DENVER, COLORADO 80225



August 17, 1988

IN REPLY REFER TO:
Memorandum

To: Verne Schneider, Assistant Chief Hydrologist for Program
Coordination and Technical Support, USGS, WRD, Reston, VA

Through: Larry Hayes, Chief, Branch of Nevada Nuclear Waste Storage
Investigations, USGS, WRD, Lakewood, CO

From: The undersigned, Hydrologists and Hydrologic Technicians,
Nuclear Hydrology Program, Nevada Nuclear Waste
Investigations, USGS, WRD, Lakewood, CO and Mercury, NV

Subject: USGS role in Yucca Mountain Site Characterization Effort

As you may know, scientists in the Nevada Nuclear Waste Storage Investigations (NNWSI) Branch, and particularly hydrologists in the Nuclear Hydrology Program (NHP), have been struggling for the past several years to maintain morale and motivation in the site characterization program at Yucca Mountain, Nevada. During this time the Department of Energy (DOE) has essentially converted the USGS's active role in site investigations to a passive role as a DOE consultant for hydrologic/geologic document preparation. Our program has doubled in size with an influx of many managers and few technical people. We also see that our organization is conforming to a host of policies which, in many respects, diminish our scientific credibility and hamper our efforts to implement a sound technical evaluation. In a recent meeting with NNWSI management, for example, the term "embarrassment" was used to describe the USGS management attitude toward our previous technical work.

We believe that these issues require immediate attention, and, in their neglect, call into question our ability to satisfy our mission within the current program context (that mission being the "...wise management of the Nation's natural resources and the potential health, safety and well-being of the people"). As a result, we recommend that a group outside of NNWSI, such as the Chron Committee, review this program and determine what action should be taken to ensure that the scientific issues do not continue to diminish in importance.

In memoranda and in meetings, the technical staff have outlined very clearly a number of problems that severely impact the scientific credibility of our work as well as the likelihood of success in our mission at Yucca Mountain (e.g. memorandum to Larry Hayes, Chief, Branch of NNWSI, dated August 5, 1987). Despite our efforts, we believe that USGS-NNWSI

management has not been receptive to the concerns of the technical staff. This failure at dialogue and consequent lack of autonomy for the USGS program has severely hindered program-managed technical activity over the last two and one-half years. The few significant achievements have been accomplished in spite of, and in most cases outside of the program protocol.

In light of these circumstances, our ability to conduct objective, credible scientific investigations is in jeopardy. It is certain that the good reputation of the USGS is being eroded by the action of DOE, due to our own inaction. The USGS is capable of providing most of the earth science analysis in the characterization effort. It is clear from both intra-program and public meetings, that we contribute most to the body of information concerning the site. As a result we have a responsibility to ourselves and the public to apply this knowledge. However, we lack the control to exercise our responsibility. In the absence of this control, as a minimum, we desire a specific definition of our mission and goals, other than to abide by DOE's. The combination of responsibility without control is a well recognized formula for anxiety and failure. These anxieties are manifest in the low morale (reflected in a high attrition rate of technical staff), diminished motivation, and stifled productivity prevalent in our program.

As a result of these management policies, specific technical concerns are not receiving adequate attention. The following is a sampling of some of those priority issues that we feel are critically important to responsible site characterization:

1. Topographically affected air flow -- Topographically induced air circulation through Yucca Mountain may negatively affect the suitability of the site as a repository in the following way. The circulation will shorten the residence time of gaseous radionuclides in the unsaturated zone before being discharged to the atmosphere. This issue is particularly critical with regard to the issue of $^{14}\text{CO}_2$ emissions. Regulations state that no more than 200 curies of $^{14}\text{CO}_2$ be released to the atmosphere in the first 1000 years after repository closure. Because ^{14}C is produced by neutron bombardment of the Zircalloy cladding around the spent fuel rods, a real possibility exists that current repository design might fail this objective. Personnel at Sandia National Laboratory and the Desert Research Institute are concerned with this problem, and are modeling such circulation. Data

collection on gas circulation requires open boreholes, but USGS-NNSWI has forbidden such data collection until paperwork is completed, at which time the holes are to be stemmed. Thus USGS-NNWSI management seems unconcerned about losing potentially irretrievable data, in this case data on gas circulation, to the detriment of scientific evaluation of the site.

2. Water in the neutron holes -- Water from snowmelt and from a recent (April 1988) heavy rain has collected in four neutron holes, including two in Pagany Wash and one each in Coyote and Wren washes. Three of these holes are in welded tuff from top to bottom, and the fourth penetrates 40 feet of alluvium, with the bottom 5 feet in welded tuff. The fact that water collected in these neutron holes tells much about recharge mechanisms, and its chemical composition may indicate whether ground water beneath the site originated by deep percolation through Yucca Mountain or by recharge in Fortymile Wash. However, neither support nor urgency for sampling these wells has been shown by USGS-NNWSI management, and existing samples and analyses have been obtained in spite of NNWSI, again to the likely detriment of scientific evaluation of the site.

3. Strain-related water-table fluctuations -- Water-level fluctuations of up to a meter which are correlated with large sudden changes in atmospheric pressure have occurred in test wells USW-H5, USW-H3, USW-G3, located on the crest of Yucca Mountain and in USW-H6 located west of Yucca Mountain in Solitario Canyon. The time series of water-level changes does not correlate with other physical phenomena, such as other meteorological events, seismicity, or hydrologic effects. One plausible explanation is aseismic fault creep, possibly triggered by changes in atmospheric load. The well hydrographs are not unlike the water-level changes measured along the San Andreas Fault in response to fault-creep events. The active movement of a fault or faults in the immediate vicinity of the proposed repository is an obvious negative factor for the stability and predictability of the repository environment. Although this issue has received some attention from USGS-NNWSI, the interpretation of water-level records from these wells is currently forbidden by the recent stop-work order issued by DOE for the USGS.

4. The steep hydraulic gradient of the water table -- For a distance of several kilometers north and east of the design repository, the horizontal hydraulic gradient of the water

table is about .15, whereas downgradient from Yucca Mountain, the hydraulic gradient is about .0001. Although the cause and nature of the anomalously large hydraulic gradient is not known, several explanations have been offered: (1) along nontransmissive faults, nontransmissive tuffs juxtapose transmissive tuffs; (2) the presence of an intrusive body such as a volcanic dike; or (3) a change in the orientation of fractures and a change in the hydraulic aperture of fractures based on their orientation relative to the regional stresses. Because the design repository will be located between about 100 to 400 meters above the water table, and because it will be located immediately downgradient from the steep hydraulic gradient, the stability of the nontransmissive property of this barrier to ground-water flow is of primary importance. Neotectonics may have a large effect on this stability. While NNWSI has been receptive to motions advocating the examination of the steep gradient, nothing is now being done to assess this critical issue which has the potential of disqualifying the site. Any further interpretation of the steep gradient based on water-level data is currently forbidden by the stop-work order. X

5. Extravaqant Nevada Test Site contractor costs -- Our dollars buy much less science at the Nevada Test Site (NTS) than on the open market. In general we pay an order of magnitude more for contractor services at NTS than conservatively priced services off-site. For example, one of our projects requested 14 rocks from G-tunnel. They asked for 2 rocks (1-foot cubed) to be removed from the tunnel wall at six different locations, along with 2 rocks from a rubble pile, waxed and delivered to the Core Library at NTS. The request was made only after a USGS hydrologist was turned away by union laborers when he attempted to retrieve the rocks himself. The cost estimate (attached) from the NTS contractor was \$74,960! This included a \$19,500 charge to upgrade the ventilation system. By itself, this work order cost estimate may be laughable but taken together with other costs it is all too typical.

6. Research and engineering -- There seems to be some disagreement as to whether research has a place in the evaluation of Yucca Mountain as a nuclear waste repository. One view, common at DOE and ostensibly supported by USGS-NNWSI management, is that research is inappropriate to the evaluation process. This is naive for two reasons: (1) engineering and research are hardly mutually exclusive and;

(2) this is the first project of its kind ever to be attempted - whatever is done will be research, regardless of what it is called. Because of the uniqueness of this undertaking, standard approaches, whether they be scientific investigation techniques or engineering procedures, will be inadequate or inappropriate to characterize the site- to accomplish this will require either the extension of standard techniques, or the development of entirely new techniques. Both of these approaches are rightfully called research and play a central role in developing the information base needed to rationally assess the site, as well as being the necessary basis for developing the standards for a pure engineering approach. Any reasonable strategy for evaluating Yucca Mountain will necessarily involve research as a significant component. If we approach the characterization effort from the perspective of a purely engineered repository without an adequate research base, our engineering assumptions are tenuous at best, and we've moved away from objective site characterization and into site construction.

7. Quality assurance -- We are aware that the USGS QA manager has the difficult job of designing a QA program that is palatable to the USGS as well as satisfactory to DOE. It is also generally recognized that our current quality assurance (QA) program is modeled after the nuclear power industry's reactor facilities QA guidelines. As a result, the present QA program is engineering oriented, inappropriate in most instances, and counterproductive to the needs of good scientific investigations. There is no facility for trial-and-error, for genuine research, for innovation, or for creativity. In addition, those portions of the QA program that have been successfully modified to better suit the needs of our work have been seriously eroded by USGS-NNWSI's enthusiastic intent to fall into DOE's favor by refusing to defend our program or our technical staff.

It is appropriate to refer to the Challenger space shuttle disaster as a profound example of what happens when management is unresponsive to the concerns of the technical staff. The attached article by the late Richard P. Feynman, Nobel laureate, was published in Physics Today and provides a detailed assessment of a general deterioration at NASA, brought about, according to his theory, by an unwillingness of

management to heed various engineering and scientific problems. Dr. Feynman refers to this as a "loss of common interest between the engineers and scientists on the one hand and management on the other".

It is our urgent recommendation that we prevent our own 'NNWSI disaster' by making USGS-NNWSI management aware that in subjugating the technical program to satisfy DOE political objectives, we may succeed in making the program comply with regulations, while being scientifically indefensible. A joint effort is required and some bold action may be necessary as we re-evaluate the nature of our working relationship with DOE. We are anxious and prepared to discuss specific matters of concern -- in addition to the issues presented above. We are eager for a meaningful dialogue and we appreciate your willingness to engage our communication.

Respectfully,

Philip Harwell

Steven E. Galloway

Edwin P. Weeks

Charles P. Peters

Robert C. Trumbull

Han C. Riggs

Joe S. Downey

Edwin P. Galloway

Leland W. McKinley

John B. Gamael

James L. Robinson

Arthur K. Klob

Kat C. Galloway

Alvin J. Galloway

Peter Sinton

attachments (2)

cc (with attachments):

CERON Committee: Jim Devine, DO
Ike Winograd, WRD
George Dinwiddie, WRD
Pete Stevens, WRD
Glen Faulkner, WRD
Ian Zen, GD
Newell Trask, GD
Ray Wallace, GD

Dan Gillies, Acting Chief, Nuclear Hydrology Program, WRD

Bob Raup, Jr., ORG, GD

USGS RC/1231/3/morale, stop-work order, technical concerns

William J. Duffield
for Alan Flint, et al



United States Department of the Interior

GEOLOGICAL SURVEY
BOX 25046 M.S. 421
DENVER FEDERAL CENTER
DENVER, COLORADO 80225



IN REPLY REFER TO:

October 3, 1988

Carl P. Gertz, Project Manager
Yucca Mountain Project Office, MS 523
U.S. Department of Energy
P. O. Box 98518 Las Vegas, NV 89193-8518

Subject: Response to Technical Concerns Raised by USGS Hydrologists in
the August 17, 1988, Memorandum to Verne Schneider, USGS, Reston,
VA

Dear Carl:

The purpose of this letter is to present my and senior NHP/USGS (Nuclear Hydrology Program/United States Geological Survey) management's perspective on the specific technical concerns listed in the August 17 memorandum. Other issues presented in the August 17, 1988, memorandum will be addressed by USGS Headquarters.

1. Topographically affected air flow

Data collection with the awareness of management continued despite QA paperwork deficiencies to avoid irrecoverable loss of critical data. During data collection, we worked with the investigators involved to "retrofit" the QA paper work to the activity, and between about January 1987 and October 1987, worked with the investigators to produce, review, revise, and gain approval for the Scientific Investigation Plan that outlined the air-flow study and assigned quality-assurance levels. During March through May 1988, management assigned a data and QA specialist essentially full time to work with the investigators to develop and gain approval for the necessary technical procedures covering the data collection effort. On April 15, 1988, I reported to DOE that the data collection at the UZ-6 boreholes had occurred during and following the April 1986 SWO, and defended the data collection as necessary in order to avoid irrecoverable loss of data. Apparently, DOE accepted this position because no adverse action was taken as a result of the USGS reporting this violation of the SWO. The only consequence to date has been a nonconformance issued by the USGS QA Office which is being resolved by approval of the technical procedures (May 1988) and review of the data collected. It should be noted that the current drilling schedule indicates that the UZ-6 boreholes will be the last to be

reamed and stemmed (late FY90 or early FY91). This should allow ample time and opportunity to conduct airflow experiments in open boreholes. The main impediments to expanding the topographically affected airflow study beyond the current airflow and gas-composition monitoring are SCP approval, completion and approval of the Study Plan, and preparation and approval of needed technical procedures. NHP/USGS management will continue to work with the investigators to complete these planning documents.

The SCP acknowledges the probable need for parameter input to systems-level models for gas-phase transport, in order to assess the potential for release of gas-phase carbon-14 to the accessible environment (see Section 8.3.5.13.3). However, the need for such analysis depends in part upon the containment strategy that is finally adopted. For example, if all the fast fraction of the C14 were to be released before waste emplacement, such an analysis may not be needed. However, the SCP also acknowledges another critical reason for conducting this study, and that is the potential effect of air circulation on net water-vapor flux. This aspect of gaseous-phase transport is addressed in SCP Study 8.3.1.2.2.7, "Characterization of gaseous-phase movement in the unsaturated zone". No significant changes have been made to plans for this study during the recent SCP revision process. Study consists of the following major elements:

- Determination of air circulation in open UZ-6 boreholes as a function of atmospheric pressure and temperature.
- Description of prewaste emplacement gas-flow field in Yucca Mountain.
- Measurement of total airflow, heat, and vapor transport in and out of the open UZ-6 boreholes.
- Gaseous tracer tests between Solitario Canyon scarp and UZ-6 borehole to determine effective air-filled fracture and/or bulk porosity and dispersivity.
- Measurement of gaseous flow and transport from geohydrologic units by obtaining profiles of air velocity, temperature, and composition in UZ-6.
- Determination of gas composition, including carbon isotopes of CO_2 .
- Natural-stress, airflow-interference tests in all topographically affected boreholes on crest of Yucca Mountain to determine fracture interconnection.

- Cross-hole, gaseous-injection tests at UZ-6 and UZ-9 complexes to determine fracture permeability and storativity.
- Gaseous-phase modeling of Yucca Mountain to interpret gas movement under natural conditions.
- Studies of gaseous radionuclide transport also are included in the Geochemistry Program (SCP Section 8.3.1.3.8.1).

2. Water in the neutron holes

I and senior NHP management agree that this is a puzzling and potentially very significant technical problem. Obviously, the mechanism by which water accumulated in the neutron holes needs to be determined. Accordingly, NHP/USGS management did not try to prevent sampling of water in the neutron holes, but in fact, encouraged this sampling. NHP/USGS senior management was notified within hours following the discovery of water in a few of the neutron holes and upon request from the individuals reporting the findings, gave immediate verbal approval for measuring water levels, collecting water samples if possible, and analyzing samples. Water levels were measured, samples collected, and submitted for various types of chemical analyses. By reacting in this manner, NHP/USGS management demonstrated concern for the scientific interests of their technical staff and for potential loss of irrecoverable data. In addition, it should be noted that, although the scientists concerned with this activity have not completed a proposal to address this problem, I expect that an investigative strategy will be included in the "Infiltration" Study Plan. Additionally, I believe that despite the current SWO, if a well thought-out and well written proposal were presented to you, approval would be given to allow necessary field work to investigate this problem. Nevertheless, this issue demonstrates the critical need for a DOE-sanctioned procedure, complete with quality-assurance and NTS contractor support, that allows immediate investigation of unanticipated phenomena. This procedure should allow limited field-data collection and interpretation prior to approval of the SCP and Study Plans in order to prevent irrecoverable loss of potentially critical data. Water accumulation in the neutron holes is not addressed specifically in the SCP because its occurrence was unexpected. It is not known whether the water entered the neutron holes as leakage around the surface casings, or as flow in fractures in consolidated tuff that intersect the neutron holes at depth. Both possibilities need to be investigated. But, SCP Activity 8.3.1.2.2.1.3, "Evaluation of artificial infiltration," does address the fracture-flow mechanism that may be responsible for water accumulation in the neutron holes. Specifically, this activity contains the following pertinent elements:

- Ponding tests at selected neutron access holes will be used to track wetting-front advancement via neutron moisture-logging, geotomography, and other geophysical methods.
- Results of ponding tests will be used to estimate flow velocities and to evaluate relative importance of fracture and matrix flow.
- Organic dye tracer will be added to ponded water and several sites will be excavated after ponding tests to map flow pathways.
- Rainfall-simulation studies will be conducted to investigate the degree to which pressure head of perched water in the shallow subsurface causes flow in open fractures in the consolidated tuff underlying the unconsolidated surficial material.

3. Strain-related water-table fluctuations

I and NHP/USGS management have encouraged and supported technical efforts to investigate such water-table fluctuations by (1) assuring that plans for such investigations are incorporated in the SCP and appropriate Study Plans, and (2) providing funding in FY 88 to begin technical planning for measurement of tectonic strain at Yucca Mountain. The main impediments to beginning measurement of volumetric strain at Yucca Mountain are SCP approval, completion and approval of the Study Plan, availability of suitable boreholes, and availability of funds for the purchase and calibration of strain meters (\$30,000 each). Also, in recent months, NHP/USGS management has given investigators concerned about these phenomena wide latitude to pursue the problem. While it is true that the current SWO temporarily prevents further interpretation of the water-level data, the SWO does not prevent the actual collection of the data. Understanding that interpretation of the data must be ongoing to assure data quality, USGS-NNWSI management is formulating rationale to have some of the SWO restrictions lifted.

This phenomena and its potential for being a negative factor for the stability and predictability of the repository environment is addressed in SCP Activity 8.3.1.2.3.1.2, "Site potentiometric-level evaluation." Extensive changes have been made to plans for this activity during the recent SCP revision process to describe collection and interpretation of data on strain-related water-table fluctuations. The SCP revisions have been authored by the technical staff that expressed concern about strain-related water-table fluctuations. The new elements of this activity are as follows:

- Analysis of water-level fluctuations in response to volume/strain changes in the saturated zone.
- Detection and analysis of water-level response to earth tides, atmospheric loading, seismically detectable earthquakes, and underground nuclear explosions to determine (1) relation between formation fluid pressure and strain, and (2) formation elastic properties.
- Detection and analysis of water-level response to coseismic or aseismic earthquakes (slow earthquakes or fault creep).
- Concurrent measurement of volumetric strain in boreholes at Yucca Mountain using strain meters similar to those used in studies of the San Andreas fault.
- Installation of volumetric strain meters on the crest, flank, and flat adjacent to Yucca Mountain.
- Determination of temperature field in the vicinity of each strain meter prior to its emplacement.
- Continuous monitoring of strain meters using intelligent data loggers.
- Transmittal of strain data by satellite telemetry to the field office on a real-time basis so that additional water-level measurements can be made immediately.

4. The steep hydraulic gradient of the water table

While it is true that no studies are currently underway to investigate the steep gradient, technical plans along several lines of investigation have been developed for inclusion in the SCP and Study Plans. In recent months, several workshops have been held specifically to formulate a unified technical strategy for studying problematic features and phenomena such as the steep gradient. USGS hydrologists, geologists, and geophysicists have been integrally involved in these workshops. I and NHP/USGS management have encouraged, supported, and facilitated these technical workshops. While it is true that interpretation of the water-level data is prevented by the current SWO, there is a view that the current water-level data are insufficient to perform a conclusive analysis of the steep gradient based on these data alone. Additional wells and expanded stratigraphic, structural, and geophysical investigations, and reevaluation of the existing data base are planned. The main impediments to beginning the new investigative work are approval of the SCP, completion and approval of Study Plans, preparation of technical procedures, and drilling of new holes.

The steep hydraulic gradient and its potential as a disqualifying factor for siting the repository at Yucca Mountain is addressed, primarily, in two SCP Activities: 8.3.1.2.1.3.2, "Regional potentiometric-level distribution and hydrologic framework studies," and 8.3.1.2.3.1.1, "Solitario Canyon fault study in the saturated zone." Extensive changes have been made to plans for the regional potentiometric-level and hydrologic framework study during the recent SCP revision process. These changes have focussed intensively on investigation of the steep hydraulic gradient. The SCP revisions have been authored, primarily, by technical staff that have expressed concern about the steep gradient and are responsible for its investigation. The new elements of this activity are as follows:

- Results of regionally oriented geophysical surveys conducted under SCP Activity 8.3.1.4.2.1.2 (Surface-based geophysical surveys) will be interpreted to obtain stratigraphic, structural, and water-table data.
- Results of geophysical surveys (such as telluric traverses, audio-magnetelluric soundings, and close-spaced gravity surveys) will be used to site new drillholes, including WT-23, WT-24, and G-5.
- Multiple, working hypotheses have been developed for investigation of the cause of the steep gradient: (1) existing faults acting as nontransmissive barriers to flow, (2) presence of a rhyolitic, argillaceous, or intrusive body that is less subject to fracturing than the tuffs, and (3) change in direction of regional stress field affecting fracture permeability.
- Consideration of neotectonics or alteration of stress fields as possibly affecting the stability of the low-transmissive zone and causing dramatic changes in the water table.
- Analysis of existing and planned borehole fracture data (SCP Activity 8.3.1.4.2.2.3) and surface fracture-network studies (SCP Activity 8.3.1.4.2.2.2) to determine fracture characteristics.
- Determination of in situ stress on either side of gradient (SCP Activity 8.3.1.17.4.8).

In addition, the Solitario Canyon fault study will address the steep hydraulic gradient as follows:

--Hydraulic testing and water-chemistry analysis in drillholes WT-8, H-7, and H-6 to determine the nature of hydraulic connection and flow across the Solitario Canyon fault (SCP Activity 8.3.1.2.3.1.1).

5. Extravagant Nevada Test Site contractor costs

(Not addressed in this letter)

6. Research and Engineering

(Not addressed in this letter)

7. Quality Assurance

(Not addressed in this letter)

As you well know, the Yucca Mountain Project is an extremely complex program with many difficult constraints and unpredictably ever changing conditions, which in total make successful communications a difficult challenge. In response to this challenge, we have begun a systematic dialogue between management and technical staff from among USGS, and the Bureau of Reclamation. Through this process, we intend to identify problems that are inhibiting both technical and administrative progress, and propose constructive solutions to the problems. In this way, we will accomplish a closer and more effective working relationship between management and technical staff in order to assure that the overall goals of the Yucca Mountain Project are met.

I look forward to sharing with you the results of this effort and to working with you to implement constructive changes that will improve the effectiveness and products of the site-characterization effort.

Sincerely,

Larry R. Hayes

Larry R. Hayes
Technical Project Officer,
Yucca Mountain Project

LRH:ml,dw



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

Ralph
FYI

OFFICE OF THE DIRECTOR

DEC 15 1988

In Reply Refer To:
NGS-Mail Stop 106

Mr. Samuel Rousso
Acting Director, Office of Civilian
Radioactive Waste Management
Department of Energy
Washington, D.C. 20585

Dear Mr. Rousso:

This letter addresses actions we have taken relative to the concerns expressed in an internal memorandum dated August 17, 1988, to Verne Schneider, Assistant Chief Hydrologist for Program Coordination and Technical Support, U.S. Geological Survey (USGS), from 16 of our hydrologists and hydrologic technicians within the USGS Nevada Nuclear Waste Storage Investigations (NNWSI) program.

We have conducted a comprehensive review of the specific issues raised in the memorandum and of any additional contributing concerns. This review consisted of detailed discussions with the scientists involved, intermediate managers, senior scientists familiar with, but not directly involved in, the NNWSI programs, and all involved senior managers.

Seven specific issues were raised in the August 17, 1988, memorandum. The first four issues dealt with technical matters. We have reviewed those concerns carefully and believe that they stem largely from incomplete information which was in turn caused by insufficient communications within the various parts of the USGS investigations team, and with the Department of Energy (DOE). We believe that these four items are viewed in a much better light by our technical team now that detailed discussions concerning these items have occurred. A technical response to the four items has been provided in the enclosed October 3, 1988, letter from Larry Hayes, Technical Project Officer, Yucca Mountain Project, to Carl Gertz, Project Manager, DOE. We believe that this response shows that these four technical issues have been or are being adequately addressed, and that no rare or unusual opportunities to collect data have been missed.

The comments in issue five, DOE contractor costs, go beyond earth science. Operations conducted by DOE at the Nevada Test Site (NTS) have always been unique in many ways and costs of specific activities should not be compared directly with similar activities offsite, where factors such as security and safety are not comparable.

Issue six relates to concern on the part of our technical staff that the documents being developed by DOE to describe the physical characteristics of the site lock in the process so tightly that the flexibility to deal with the uncertainties inherent in the geohydrologic investigation is not adequate.

8802251

Mr. Samuel Rouso

2

We would agree with our staff that the flexibility to make necessary changes in the program in a timely manner has not been self evident. However, as a result of discussions with DOE, we understand that the DOE process does allow for unexpected results that lead to program modification. We also recognize, though, that such changes will require vigorous justification, but we are confident that by working together, we all will be able to address these concerns satisfactorily as the program develops.

We understand that NNWSI investigations need to be well documented and, so far as possible, should be carried out by standard or widely accepted techniques. Although our scientists raise the legitimate concern that off-the-shelf techniques and instrumentation to assess performance objectives of the repository are not available in many necessary areas of study, we believe such techniques and instruments can be developed and standardized within a reasonable timeframe. We know that DOE shares our concern that the appropriate techniques be available when needed for site characterization and we are diligently striving toward that goal.

Regarding issue seven, we are dedicated to a sound and properly implemented program of quality assurance in support of the eventual licensing process for Yucca Mountain and, in fact, believe we are well along in its development. Furthermore, we are committed to remain responsive to quality-assurance requirements in an accurate and timely manner, and to implement necessary changes in the present USGS quality-assurance program to comply with NNWSI/88-9 and other revisions as they are developed.

However, we share the opinion of our technical staff who believe that the quality-assurance program must contain procedures that are compatible with established earth-science practices. Consequently, we urge you, along with the Nuclear Regulatory Commission (NRC), to remain cognizant of the difficulties inherent in the application of such a vigorous quality-assurance effort to frontier earth-science investigations. We would be pleased to work with DOE and NRC in this area, and are optimistic that quality assurance and good science can be made compatible.

We plan to establish a group of USGS/NNWSI program senior scientists to meet monthly with USGS/NNWSI management to encourage information exchange and to provide a forum within which to express programmatic concerns. We also plan to establish a system of information exchange throughout the USGS/NNWSI program to explain not only what is required by regulation and quality assurance but also why these requirements are needed and justified.

Sincerely yours,



Dallas L. Peck
Director

Enclosures