



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Received w/Ltr Dated 12/14/89

Reply to:

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M E M O R A N D U M

DATE: December 14, 1989

FOR: John J. Linehan, Director, Repository Licensing and
Quality Assurance Project Directorate (HLPD), Division
of High-Level Waste Management

FROM: Paul T. Prestholt, Sr. OR - YMP *PTP*

SUBJECT: YMP Site Report for the month of November, 1989

I. GEOLOGY-GEOPHYSICS

A. The prototype drilling program is scheduled to resume at the Apache Leap, Arizona site in January, 1990. It is anticipated that all permits and permissions will have been received by the first of the new calendar year. Mobilization of the Lang rig and crew is expected to take place during the first week of January, 1990.

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It is expected that the crew will hammer drill to about 1700' during the first three to seven days of the program. A perched water zone is reported at \pm 350 feet. The crew plans to cement off the water zone to assure a dry hole at the test depth. This first hole is designed to test the entire section and locate problem zones.

The second hole will be cored using the 12 inch core system to 1100 feet and then the 8 inch core system to 1700 feet. The 12 inch system produces a PQ (3.3 inch) core while the 8 inch system produces an HQ (2.4 inch) core. It is hoped to start the core hole by the end of the 2nd week in January.

It is suggested that, should the staff wish to conduct a QA audit of the Sample Management Facility (SMF) that the audit begin at Apache Leap during the drilling of the test core hole. SMF personnel plan to use level one procedures in the handling of all core taken during this exercise. The Project hopes that any flaws or problems with the procedures will show up now so that everything will be ready to go when the drilling program at Yucca Mountain starts.

A copy of the Phase 1e Prototype Drilling Prospectus is enclosed. Please note that boreholes UZF-4 and 5 are combined and that only one 6 1/2 inch hammer drilled hole (UZPSI-2) is planned.

B. The NRC staff, the ACNW, the State of Nevada and the EEI have all commented on the need for site characterization activities to concentrate on potentially adverse conditions (PACs). In an early November guidance document (dated October 31), DOE-Hq. requested YMPD to perform a task to ensure that early testing (surface based) is prioritized to provide data needed to evaluate potentially adverse conditions as found in 10 CFR 6.122 and SCP Issue 1.8.

From the guidance document (enclosed):

"The requested effort (Attachment 1) would expand on existing information in the SCP. As appropriate, a methodology should be developed to prioritize testing in the initial phase of site characterization and, possibly, to make decisions regarding testing priorities or changes during site characterization. This effort could be used to help define priorities for performance assessment sensitivity studies to be completed over the next one to two years as well as to make use of the initial results from such performance assessment studies. The results of the effort described in Attachment 1 will be an important source of information in terms of defining the process to be used to evaluate potentially adverse conditions during site characterization, and should form the primary basis for a draft methodology to evaluate site suitability. Specifically, the feasibility of developing evaluation criteria for the potentially adverse conditions will be considered. Such criteria may be associated with either the results of field work or the results of performance assessment sensitivity work and should be related to the process to be developed and employed on a continuing basis during site characterization for evaluating site suitability. Such a process would focus initially on geotechnical information obtained from surface-based testing related to characterization of potentially adverse conditions and their potential impacts on waste isolation.

"It is envisioned that this task would be completed under appropriate YMP QA controls, and that an implementation management plan would be written to describe the work to be accomplished and documentation to be produced in implementing this guidance. Included in the management plan should be a schedule for completion, with appropriate linkage to the ongoing performance assessment work being undertaken jointly by the Project Office and Headquarters, as well as an assessment of the

geosciences, engineering, and performance assessment resources that would need to be committed to the completion of the proposed task."

A discussion of the documentation and deliverables are (from the guidance document):

DOCUMENTATION AND DELIVERABLES

The documentation and deliverables produced as a result of the implementation of this guidance should include the following:

- I. The first deliverable should be a detailed management plan to describe how the guidance provided here will be implemented. The management plan should describe the sequence of activities to be completed to satisfy the scope of work described in Section 3.0 and present a schedule for the activities that will result in meeting the milestones identified in Section 8.0. The individuals responsible for conducting the work should be identified and the organizational framework described. The plan should identify the deliverables to be developed and the YMPD quality assurance (QA) requirements and procedural controls that will be applied in controlling and documenting the activities.
- II. Briefing materials should be provided as interim deliverables to support interactions associated with milestones 8.4, 8.5 and 8.6.
- III. The final report and supporting documentation should include the following information:

- ♦ A description of the process followed and criteria used in:
1) evaluating the significance of each PAC known or suspected to be present at the site with respect to its potential impacts on waste isolation; 2) identifying and assessing the relative importance of the information needed to characterize each PAC; 3) comparing information needed against the surface-based tests planned to acquire that information; and 4) prioritizing the testing program based on the relative significance of the PACs and the tests associated with their characterization.

- ♦ The results of the evaluation, including: 1) a description of the PACs and their relative ranking in terms of significance to waste isolation, including identification of the site-specific conditions or features that are associated with the possible presence of each PAC; 2) a description and assessment of the relative importance of the information needed to characterize each PAC; 3) priorities for surface-based testing, including justification based on items 1 and 2; and 4) an assessment of the adequacy of the current plans for testing, or recommendations regarding the need for resequencing of planned tests, or modifications to the testing strategy in response to programmatic decisions regarding the scope and timing for site characterization activities.

- ♦ A description of the options considered for conducting site-suitability evaluations on a continuing basis during site characterization, an evaluation of the options, and recommendations for the preferred approach to conducting both the preliminary and more detailed evaluations described in Section 3.4.

- ♦ A description and discussion of the information used in support of the evaluations.
- ♦ A description of the QA controls applied to the activities.
- ♦ A listing of the minimum qualifications for participants in each aspect of the evaluations, identifying the actual participants and their qualifications.
- ♦ A list of references.

Oversight, implementation and QA are described as follows:

- I. The YMPD will have lead responsibility for the actions taken in response to this guidance and for documenting the results. It is expected that this guidance will be implemented through a joint effort involving YMPD, their contractors, and YMP participants, with DOE-HQ management over view of the progress. The prioritization activities should be conducted by a small team (perhaps 6-8 FTEs), with staff representing geoscience, engineering, and performance assessment. Periodic briefings will be scheduled to inform DOE-HQ of the status and preliminary results of these activities. The results will be subject to review and approval by DOE-HQ as noted in Section 7.3.
- II. The evaluations to be conducted warrant the selective application of QA procedural controls sufficient to ensure that the nature of and basis for the evaluations and conclusions are appropriately documented. The activities to be conducted should be assessed in accordance with the YMP QA program requirements to confirm the preliminary determination of QA program applicability and to determine the necessary QA requirements and procedural controls to be

applied. The QA controls to be applied by YMPO should be described in the management plan as discussed in Section 6.1.

- III. The final report, presenting the results of the evaluations conducted in response to this guidance (see Section 6.3), will be submitted to OFSD (RW-20) for review by DOE-HQ under OCRWM QAAP 3.1.
- IV. A management plan (as described in Section 6.1), covering the activities to be conducted, the responsibilities and personnel involved, the QA controls to be applied, and the schedule for the evaluations and preparation of the associated documentation, should be prepared and submitted to OFSD (RW-20) for approval prior to initiating work.

The suggested schedule of milestones are:

<u>Milestone</u>	<u>Date</u>
1. Issue DOE-HQ guidance for activity	10/30/89
2. YMP management (implementation plan submitted to OFSD (RW-20) for DOE-HQ approval	12/15/89
3. DOE-HQ approval of management (implementation) plan	01/05/90
4. Brief DOE-HQ on status (progress, problems, etc.)	04/13/90
5. Brief DOE-HQ on status and preliminary results of prioritization activities (relative ranking of PACs and prioritization of surface-based testing)	06/08/90

6. Briefing DOE-HQ on status and preliminary results 08/03/90
identification of bases for evaluating site
suitability.
7. Submit final documentation and recommendations to 09/28/90
DFSD (RW-20)
8. Briefing to Executive Committee on results 10/19/90
9. Recommendations to RW-1 for approval 11/09/90

Insert "A" is the "Preliminary Scoping for Surface-Based
Testing Prioritization Initiative"

C. The Right-of-Way Reservation was granted by the Bureau of
Land Management (BLM) on October 10, 1989. All mining claims
have been relinquished so there are no longer any issues
regarding mining claims. DOE has now completed all land access
requirements for the site characterization activities in the
Yucca Mountain area. Public hearings on land withdrawal will be
held in Reno, Nevada on December 18 and in Henderson, Nevada on
December 19.

Enclosed is a copy of the Nevada Nuclear Waste News,
published by the Nevada Nuclear Waste Project Office, which
presents some views in opposition to this land withdrawal.

II. HYDROLOGY

During the December 8 Technical Project Officer
(TPO)-Project Manager meeting, Dr. John Stuckless, USGS gave an
update on the hydrogenic deposits (calcite and opaline silica)
found in Trench 14, other trenches and on Busted Butte.

11-17-89

Enclosure 2

PRELIMINARY SCOPING FOR SURFACE-BASED TESTING PRIORITIZATION INITIATIVE

TASK PLAN FOR SBT PRIORITIZATION

- o Assume 5-7 FTE support for 11 mos.
- o Task is to have high priority
- o Limited or no new evaluations/analyses will be performed
- o Small expert team will utilize available information (previous SCP-Integration Group assessments of site activity importance, records of interactions with U.S. Nuclear Regulatory Commission, etc.) to reevaluate priorities
- o Options and recommendations will be developed through formal use of expert opinion/decision analysis
- o Integration Team will be called upon to provide input to core team and to serve as members on expert panels

CORE TEAM

DOE Task Force Leads: Hughes/Boak (.4 FTE)
T&MSS Team Lead: S. Mattson (.5 FTE)
Site Team Lead: T. Barbour, USGS/SAIC-Golden (.5 FTE)
Perf. Assessment Team Lead: S. Sinnock, SNL (.5 FTE)
Decision Analyst Consultant: TBD (.3 FTE)
Regulatory-Technical Consultants: TBD (.5 FTE)

YMP Integration Team (IT)
USGS Contact & staff (1 FTE)
(R. Raup - Geology; W.
Wilson - Hydrology)
SNL Contact & staff (1 FTE)
(F. Bingham; T. Bonano)
LLNL Contact & staff (.3)
(Ballou)
LANL Contact & staff (.3)
(Canepa)
T&MSS technical/administrative
support (.5)

HQ Direct Oversight*

HQ-OFSD rep.: Van Camp (.3 FTE)
Weston rep. (.3 FTE)
HQ-OSIR rep. (.3 FTE)

YMP Management Review **
YMP RSED & EDD Division Managers
T&MSS Technical Director
T&MSS Senior Technical Staff

- * Oversight of IT activities (telecons, workshops)
- ** Review and approve recommendations at completion

INSERT "A"

These studies are important in site characterization in order to determine (from the handout):

- ♦ Whether or not any hydrogenic deposits or hydrothermal data have significant implications for repository performance?
 - Stability of waste package?
 - Travel time to biosphere?
- ♦ Do any hydrogenic deposits have potential economic implications?

Hydrogenic deposits are defined as (from the handout) "Minerals and Mineraloids precipitated from water". Three types of hydrogenic deposits have been identified in the Yucca Mountain region. They are (from the handout):

- Calcite and opaline silica
- Bedrock breccias
- Drusy quartz and other vug fillings

There are four modes of origin for hydrogenic deposits. They are (from the handout):

1. Pedogenic: deposited by meteoric waters as part of the soil forming process.
2. Cold springs: groundwater of deep or shallow origin that has moved along fractures.
3. Hydrothermal springs: water heated by any of several mechanisms and moved up fractures.
4. Seismic springs: hot or cold waters moved along faults as a direct result of faulting.

This problem came to the forefront in 1984 during a field trip and inspection of trench 14. Since then, trench 14 has been deepened and mapped in detail. Other hydrogenic deposits have

been identified and studied. These paleohydrologic studies are not complete, however, Dr. Stuckless and his colleagues are over 90% convinced that these deposits are not hydrothermal (hot water) in origin and are probably the result of meteoric (rain) water deposits in fault zones. The enclosed handout describes some of the research that led to this conclusion.

III. GEOCHEMISTRY

During the November 3 TPO-PM meeting, Dr. Edward Norris, LANL gave a presentation on his work using ^{36}Cl (Chlorine-36) as a tracer to characterize water movement at a potential repository. Such water movement includes:

- ♦ Infiltration
- ♦ Percolation
- ♦ Fault and fracture flow
- ♦ Hydrologic flow

The characteristics of chlorine that make it useful as a tracer are (from the handout):

- ♦ Geochemical form is chloride
- ♦ Soluble in water
- ♦ Nonsorbing
- ♦ Nonvolatile
- ♦ ^{36}Cl half-life is 3×10^5 year
- ♦ Quantitative assay by accelerator mass spectrometry
- ♦ Epigene (process originating near earth surface) sources of ^{36}Cl -
 - Cosmogenic fallout
 - Bombpulse fallout (important at test site)

Dr. Norris explained that he is interacting with other disciplines and organizations while pursuing his research. Examples are:

- | | |
|----------------------|------------------------|
| ♦ J. Czarnecki, USGS | Regional Hydrology |
| ♦ P. Kaplan, SNL | Performance Assessment |
| ♦ B. Travis, LANL | TRACR3D |
| ♦ M. Ray, LANL | Air Coring Test |

Other interested parties:

- | | |
|-----------------------|------------------------------------|
| ♦ B. Scanlon, U-Texas | Texas Low-Level Nuclear Waste Site |
| ♦ T. Beasley, DOE/EML | ³⁶ Cl at INEL |

The following is a summary of Dr. Norris' work to date (from the handout):

Infiltration

Measured rate of approximately 1.8 mm/yr from bomb pulse

Percolation

³⁶Cl/Cl varies with particle size

Fault and fracture flow

Bomb pulse detected at 500 ft beneath Yucca Mountain and
1300 ft beneath Rainier Mesa

Studies of solute transport may be possible in G-Tunnel

Hydrologic flow

³⁶Cl/Cl profiles along flow path may show that water in
saturated zone beneath Yucca Mountain is old

IV. REPOSITORY ENGINEERING

A. Exploratory Shaft Facility Alternatives Study

From the Implementation Plan - Rev. 0, "The Yucca Mountain Project will perform an evaluation, conducted under a quality assurance program that meets the requirements of YMP/88-9 to identify various Exploratory Shaft Facility configuration and

construction method options, to evaluate those options, and to select a preferred option to be used as the basis for subsequent design efforts.

"The Project Office has assigned the lead technical and coordination responsibility for the evaluation to Sandia National Laboratories (SNL). Other Project participants will be assigned by the Project Office, at the request of SNL, to perform individual tasks within this evaluation."

The tasks outlined by SNL to complete this study are (from the handout):

ESF Alternatives Study

Tasks

1. Plan management & implementation
 - Develop and approve task plans
 - Schedule and approve task plans
 - Records management
 - Training
2. Develop methodology/rules for evaluations of options
 - Repository options
 - ESF options
3. Identify requirements basis for evaluations
 - Requirements for repository
 - Requirements for ESF
 - Testing requirements
4. Identify options to be evaluated
 - Repository UG configurations and accesses
 - ESF options
5. Selection of preferred option
 - Application of methodology/rules

6. Prepare study report
 - Prepare text for each task
 - Graphics/editorial support
 - Independent technical review
 - Management approval/acceptance
7. Revise SDRD for resumption of design
 - Establish quantitative PA requirements, as required
 - Update repository and testing interface requirements, as necessary
 - Verify requirements
 - Prepare/submit CR to CCB
8. Identify revisions to RDR

The proposed schedule is insert "B".

The alternatives study will be accomplished using the SNL QAPP and procedures:

ESF Alternatives Study

QA

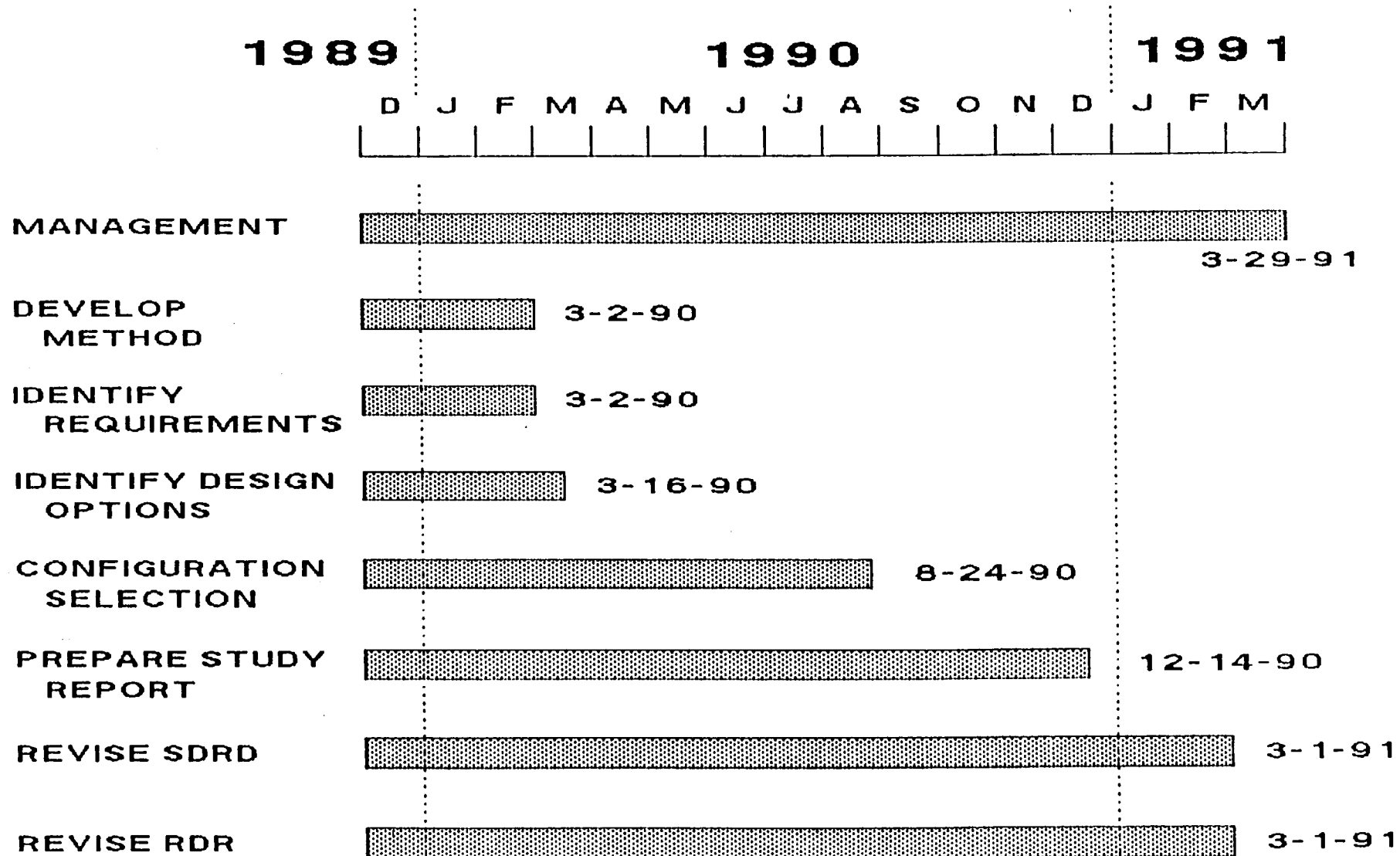
Basis for QA program is SNL QAPP and Procedures

- ◆ Those "participants" with an "approved" QA Program will operate under their own program and interface with SNL through AP-5.19Q, Interface Control.
- ◆ Those "participants" without an "approved" QA Program will operate under SNL QA procedures.

First time application of subpart G under YMP 88-9

- ◆ Work/task plans with QALAS and grading
- ◆ Software QA
- ◆ Use of data
- ◆ Formal plans
 - Personnel certification and training
 - Implementing instructions
 - Records
 - Peer review
 - Document preparation and review
 - Audits & surveillances

ESF ALTERNATIVE STUDIES SCHEDULE



The various construction and layout options that will be addressed in this study include:

ESF Alternatives Study

Options

Repository/ESF layout

Access (Shaft-Ramp)

Location of Access

Construction Method

Drill & Blast

Mechanical

TBM

V-Mole

Raise-Borer

Etc

The SNL technical lead and the participant lead scientists for the tasks outlined above are:

<u>Task</u>	<u>Lead</u>	<u>Participant Lead</u>
1. Plan Mgmt	Al Dennis (SNL)	
1.1 QA		- Richards (SNL) - Heaney (SAIC)
1.2 Dev/Approve		- Dennis (SNL) - Dokuzoguz (SAIC)
1.3 Records		- Sharpton (SNL)
1.4 Training		- Tang (SNL)
2. Methodology	Costin (SNL)	- Voegele (SAIC) - Kalia (LANL) - Stanly (FSN) - Harig (PB) - Deklever (H&N) - Grams (REECo)

3. Requirements	Davenport (SAIC)	<ul style="list-style-type: none"> - Parsons (SAIC) - Morales (SNL) - Hill (SNL) - Foster (SAIC) - Oliver (LANL) - Mirza (FSN) - Schreiner (H&N) - Schepens (REECo)
4. Options	Wavrik (SNL)	<ul style="list-style-type: none"> - Chytrowski (FSN) - Graves (PB) - Musick (H&N) - Elkins (LANL) - Luke (SNL) - Koss (REECo) - Gardiner (SAIC)
5. Selection	Bauer (SNL)	<ul style="list-style-type: none"> - Hinkebein (SNL) - Peterson (SNL) - Hardin (SAIC) - Grenia (FSN) - Mrugala (FSN) - Kalia/Elkins (LANL) - McNeely (H&N) - Gardella (REECo)
6. Report	Dennis (SNL)	All Task Leaders Reviewers (All Part.)
7. SDRD	Morales (SNL)	<ul style="list-style-type: none"> - Smith (SAIC) - Milligan (LANL) - Kennedy (FSN) - Brake (H&N) - PA Staff (SNL)
8. RDR	Hill (SNL)	<ul style="list-style-type: none"> - Standish (SAIC) - (TED) (PB)

The possible impacts of the ESF Alternatives Study on the program are:

ESF Alternatives Study

IMPACTS

Possible major revisions to test program

Title II Design restart moved to March '91

Construction dates estimated to be

Site prep 6-92

Collar 11-92

Repository configuration may change

Surface based testing program may change

Enclosed is the "Yucca Mountain Project Exploratory Shaft Facility Alternatives Study Implementation Plan - Rev. 0 and the handout of Dr. Tom Hunter's presentation at the December 8 TPO-PM meeting.

V. LICENSING AND DOE-NRC INTERACTIONS

A. A list of study plans that are presently in review cycle was given to each Participant with the request that YMPD be told whether or not these listed study plans can be completed in FY 90.

The Project expects to send about 60 study plans to the NRC for review by the end of FY 90. It was hoped that 3 to 4 study plans would be submitted to the staff by Christmas. There are 25 study plans that deal with ongoing activities. These plans have a high priority.

B. Since the DOE budget was reduced by 10%-15%, there will be some personnel actions among Participants. Supposedly, most personnel reassignments will take place at REECO, H&N and FSN. However, SAIC and the laboratories are expected to lose some people.

LLNL is expected to lose some people because major waste package studies, along with repository design activities, are being deferred.

Testing in "G" tunnel has been suspended and the Climax facility has been closed. Exploratory Shaft Facility (ESF) design work has been stopped and the alternative ESF concept studies have started.

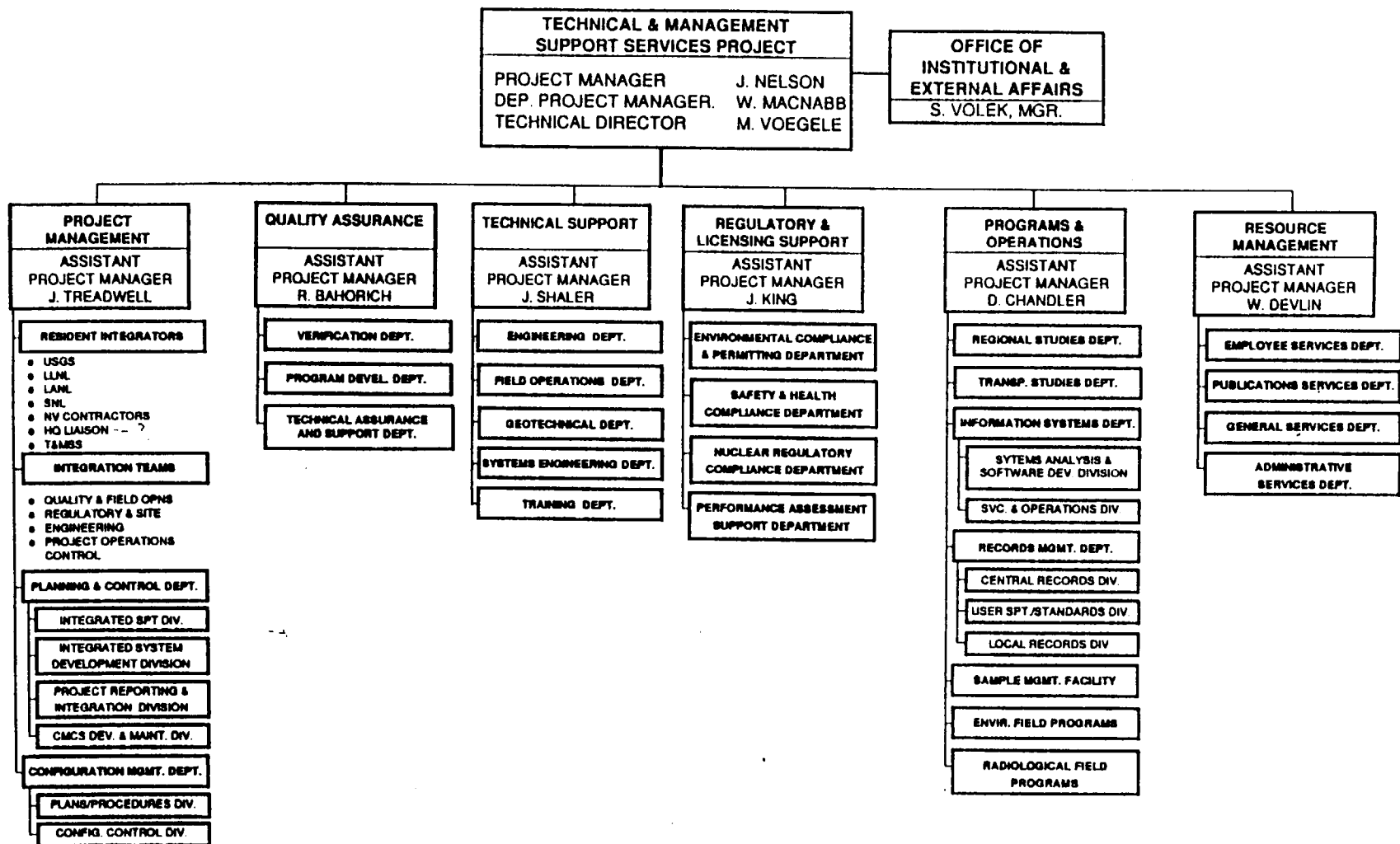
C. The SAIC T&MSS organization is undergoing a reorganization. SAIC has not issued a detailed staffing chart yet but an organization chart with the major managers is included as insert "C".

VI. STATE OF NEVADA

A. Brian McKay, the State of Nevada Attorney General, has issued an opinion concerning the legality of the States' veto of the HLW repository. The full text of this opinion is enclosed. Mr. McKay finds the Governor's veto to be legal. In the last paragraph of his opinion, Mr. McKay states:

"With respect to the pending applications for permits, it appears, based upon the foregoing conclusions, that they are moot. We advise you therefore to direct the agencies considering such permits to consider action upon the applications as unnecessary."

B. The State of Nevada attended the tectonics meeting that was held with the USGS in Denver. Mr. Carl Johnson, leader of the States' group, expressed disappointment with the technical content of the meeting. Mr. Johnson pointed out that he had made sure that the State was properly represented by technical staff to interact with the USGS principle investigators working on the tectonics problem. Mr. Johnson felt that the subject matter of the meeting was programmatic rather than technical.



INSERT "C"

VII. GENERAL

Meetings attended:

- 11-6 Meeting with Carl Gertz concerning new DOE budget exercise and how the Project would be effected
- 11-13 Meeting with Dr. Uel Clanton, DOE concerning the prototype drilling program at Apache Leap, Arizona
- 11-20 Field trip for the Center's Overview Committee, Mr. John Latz, et al
- 11-22 Meeting with Dr. Larry Hayes, USGS, TPO, concerning the upcoming tectonics meeting and QA in the USGS
- 11-28 Tectonics meeting in Denver, Colorado

There are no new issues that this office has identified that have not been brought to management's attention.

cc: With enclosures: K. Stablein, M/S 4 H3; R. Adler, J. E. Latz
Without enclosures: C. P. Gertz, R. E. Loux, M. Giora, G. Cook,
D. M. Kunihiro, K. Turner, R. E. Browning, M/S 4 H3;
R. Bernero, M/S 6 A4; H. Thompson, M/S 17 G21;
H. Denton, M/S 17 F2; S. Gagner, M/S 2 G5;
L. Kovach, M/S NLS260

Enclosures: Request for Staff Support for Surface-Based Test
Prioritization Task Force (from Gertz, 12/1/89); Phase 1e
Prototype Drilling Prosepctus (from Gertz, 12/13/89); NV
Nuclear Waste News, 12/89; Activity to Evaluate
Prioritization of Surface-Based Testing, 12/8/89; ESF
Alternatives Study, T. O. Hunter, 12/7/89; 8.3.1.5.2.1
Characterization of Quaternary Regional Hydrology
(Paleohydrology), 12/8/89; YMP Exploratory Shaft Facility
Alternatives Study Implementation Plan - Rev. 0, 11/30/89;
TPO Presentation, Carl Gertz, 12/8/89; ³⁶Cl Studies of Water
Movements for the Yucca Mountain Project, E. Norris, LANL,
11/3/89; Ongoing Study Plans; TPO Presentation, Carl Gertz,
11/3/89; NWTRB Presentation, 12/11-12/89; LLNL Monthly Status
Report, 10/89; McKay re: Yucca Mountain Site (News Release,
11/1/89)



Department of Energy

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DEC 01 1989

WBS 1.2.5.1

QA: N/A

Thomas O. Hunter, SNL, 6310, Albuquerque, NM
Leslie J. Jardine, LLNL, Livermore, CA
John H. Nelson, SAIC, Las Vegas, NV, 517/T-04
Richard J. Herbst, LANL, Los Alamos, NM
Larry R. Hayes, USGS, Denver, CO

REQUEST FOR STAFF SUPPORT FOR SURFACE-BASED TEST PRIORITIZATION TASK FORCE
(NN1-1990-0588)

The enclosed letter (enclosure 1) transmits guidance to the Yucca Mountain Project Office (Project Office) from the Office of Civilian Radioactive Waste Management (OCRWM) to initiate an activity to ensure that site characterization testing is prioritized to study potentially adverse conditions early during site characterization. In the guidance, the Yucca Mountain Project (YMP) is requested to develop an implementation plan describing details of the task and the associated milestones by December 15, 1989.

Enclosure 2 provides a preliminary scoping of the general approach that is planned by the Project Office for implementing this guidance. By this letter, you are requested to identify staff to support the task described in Enclosures 1 and 2. The names of your staff who will serve as contacts and support this effort should be provided to the Project Office and the task force manager by December 8, 1989. You will note that, in some cases, suggested task force members and participant contacts are named in Enclosure 2. A kick-off meeting of the task force and key support staff will be scheduled to review the implementation plan prior to sending it to the U.S. Department of Energy (DOE) Headquarters.

According to the OCRWM guidance (Section 7.2, enclosure 1), this activity should be conducted under appropriate YMP quality assurance (QA) procedural controls. Attachment 1 explains that procedural controls should be selectively applied to ensure that the evaluations and conclusions are appropriately documented. The Project Office regards this task to be primarily a review of existing information, accompanied by identification of options and recommendations for consideration by DOE management on the basis of that information. For this reason, we believe this activity is not subject to the requirements of the YMP QA Plan. However, due to the importance of future management actions that could result from this activity, the management/implementation plan should ensure that adequate controls are placed on documentation and records maintenance. In addition, if calculations or analyses are performed as a part of this task, it is assumed they will be done under the participant's approved QA program.

Multiple Addressees

-2-

DEC 01 1989

If you have any questions, please direct them to Maxwell B. Blanchard of my staff at (702) 794-7939 or FTS 544-7939.



Carl P. Gertz, Project Manager
Yucca Mountain Project Office

YMP:MBB-1000

Enclosures:

1. Ltr 10/31/89 Barrett to Gertz
2. Preliminary Scoping

cc w/encls:

D. H. Alexander, HQ (RW-332) FORS
L. H. Barrett, HQ (RW-20) FORS
S. J. Brocoum, HQ (RW-22) FORS
J. K. Kimball, HQ (RW-221) FORS
Ralph Stein, HQ (RW-30) FORS
Robert Jackson, Weston, Washington, DC
William Wowak, Weston, Washington, DC
J. A. Jardine, SAIC, Las Vegas, NV, 517/T-22
J. L. King, SAIC, Las Vegas, NV, 517/T-03
J. H. Peck, SAIC, Las Vegas, NV, 517/T-16
M. W. Pendleton, SAIC, Las Vegas, NV, 517/T-13
M. D. Voegelé, SAIC, Las Vegas, NV, 517/T-03
J. L. Younker, SAIC, Las Vegas, NV, 517/T-03

DEC 04 1989

United States Government

memorandum

OCT 31 1989

REPLY TO
ATTN OF: RW-221

SUBJECT: Guidance on Confirming Test Prioritization Associated with Potentially Adverse Conditions

TO: Carl Gertz, Director
Yucca Mountain Project Office

During the past few months, several organizations, including the Nuclear Regulatory Commission (NRC), the Advisory Committee on Nuclear Waste, the State of Nevada, and the Edison Electric Institute, have commented that the Department should ensure that site characterization testing is prioritized to study potentially adverse conditions early on during site characterization. While the Site Characterization Plan (SCP) includes schedules for each study and activity, and includes testing associated with the NRC's potentially adverse conditions (10 CFR Part 60.122, SCP Issue 1.8), additional effort may be needed to address these outside concerns and ensure that planned tests are appropriately sequenced. By this memorandum the Project Office is requested to initiate an effort related to test prioritization for site characterization. Detailed guidance for this effort is included as Attachment 1 and is briefly discussed below.

The requested effort (Attachment 1) would expand on existing information in the SCP. As appropriate, a methodology should be developed to prioritize testing in the initial phase of site characterization and, possibly, to make decisions regarding testing priorities or changes during site characterization. This effort could be used to help define priorities for performance assessment sensitivity studies to be completed over the next one to two years as well as to make use of the initial results from such performance assessment studies. The results of the effort described in Attachment 1 will be an important source of information in terms of defining the process to be used to evaluate potentially adverse conditions during site characterization, and should form the primary basis for a draft methodology to evaluate site suitability. Specifically, the feasibility of developing evaluation criteria for the potentially adverse conditions will be considered. Such criteria may be associated with either the results of field work or the results of performance assessment sensitivity work and should be related to the process to be developed and employed on a continuing basis during site characterization for evaluating site suitability. Such a process would focus initially on geotechnical information obtained from surface-based testing related to characterization of potentially adverse conditions and their potential impacts on waste isolation.

Ultimately, the process would place reliance on the results of performance assessments employing analytical methods to determine whether site conditions, such as those represented by the potentially adverse conditions, would be likely to permit demonstration of compliance with regulatory requirements.

It is envisioned that this task would be completed under appropriate YMP QA controls, and that an implementation management plan would be written to describe the work to be accomplished and documentation to be produced in implementing this guidance. Included in the management plan should be a schedule for completion, with appropriate linkage to the ongoing performance assessment work being undertaken jointly by the Project Office and Headquarters, as well as an assessment of the geosciences, engineering, and performance assessment resources that would need to be committed to the completion of the proposed task. Specific deliverables requested as part of this effort have also been identified in the guidance provided. We request that the implementation plan be provided by 12/15/89 with the final report and recommendation being completed by 9/28/90.

A second effort, separate from but closely related to the one directed by this memo, will be conducted in parallel. This second effort, to evaluate alternative strategies for the activities leading to assessment of site suitability and development of the license application, will be covered by guidance transmitted under separate cover, with Donald Alexander, Office of Systems Integration and Regulation, as the Office of Civilian Radioactive Waste Management manager with primary oversight responsibility. The work conducted under these two efforts should be coordinated, as necessary, to support the comparative evaluations of alternative strategies.

If you have any questions regarding the above request, or the more detailed information provided in the attachments, please contact Stephan Brocoum on FTS 896-4262.



Lake H. Barrett
Acting Associate Director for Facilities
Siting and Development
Office of Civilian Radioactive
Waste Management

Attachment

cc: R. Stein, RW-30
D. Alexander, RW-331
G. Appel, RW-332
S. Brocoum, RW-22
J. Kimball, RW-221
M. Blanchard, YMPO
D. Dobson, YMPO
W. Wowack, Weston
R. Jackson, Weston

GUIDANCE ON PRIORITIZATION OF SURFACE-BASED TESTING
AND DEVELOPMENT OF A PROPOSED METHOD FOR SITE-SUITABILITY EVALUATIONS
TO IMPLEMENT THE PROPOSED BASE-CASE SCHEDULE FOR THE REPOSITORY PROGRAM

1.0 OBJECTIVES

A process should be developed and used to review the prioritization of testing for the surface-based site characterization tests described in the SCP. The objective of the review will be to ensure an early focus on potentially adverse conditions (PACs) that may be significant in terms of system performance and the ability to meet the NRC's performance objectives, and hence significant to site suitability. In addition, a proposal should be developed regarding the method to be used to evaluate site suitability on a continuing basis during site characterization. The results from the activities conducted under this guidance should be reviewed to evaluate the need for additional performance assessment sensitivity or uncertainty studies or a refocusing of priorities for planned performance assessment studies. The results of the prioritization effort should be compared with the planned testing sequence to identify those tests, if any, to be recommended for rescheduling.

2.0 BACKGROUND

- 2.1 Comments received from the ACNW and EEI/UWASTE on the SCP, and the letter from the Director of NMSS transmitting the NRC's site characterization analysis, have suggested that the SCP does not provide an adequate focus on the early identification of conditions that could make the site unsuitable for a geologic repository. In particular, the comments suggest that DOE should conduct site characterization in a manner that will give early priority to addressing those concerns that may have the greatest impact on suitability. The comments also suggest that performance assessment activities should be integrated with site characterization planning in order to help establish priorities for the testing program and to provide for early evaluations of the significance of PACs with respect to meeting the NRC's performance objectives.
- 2.2 The DOE's preliminary strategies for evaluation of the NRC's PACs are covered in the SCP under Issue 1.8, Section 8.3.5.17. The initiating events for various scenario classes and the performance parameters that relate to each of the PACs, as defined under the strategy for evaluating total system performance (Issue 1.1, SCP Section 8.3.5.13), are identified, as are the site-characterization studies or activities planned to acquire the information needed to determine the presence and significance of each condition. The descriptions of the activities that relate to the PACs (including any planned surface-based tests) and the sequencing of these activities are presented in the various subsections of Section 8.3.1.

- 2.3 A decision to initiate underground exploration and testing will be made at some time in the future. That decision will reference and have as part of its basis the results of the surface-based testing and evaluations that have been conducted up to that point. Consequently, the surface-based testing program will serve to support a decision to proceed with underground work, but will not constitute any establishment of prerequisites for such underground work.

3.0 SCOPE

- 3.1 For the purposes of the prioritization activities covered by this guidance, the focus should be on the potentially adverse conditions (PACs), identified by the NRC in 10 CFR 60.122, that should be taken into account in evaluating performance against the NRC's performance objectives relating to waste isolation. In particular, early evaluations of site suitability are expected to be closely related to the identification and characterization of any PACs that may be present and to preliminary assessments of how these PACs might affect performance.
- 3.2 The strategy for addressing the NRC's siting criteria (10 CFR 60.122), described under Issue 1.8 in Section 8.3.5.17 of the SCP, should be reviewed to identify the information and testing needed to characterize the site with respect to each of the PACs. The PACs should be evaluated and judgements made regarding the relative significance of each with respect to the NRC's performance objectives for waste isolation and, hence, to site suitability. The linkage between the PACs and the NRC's performance objectives should be clearly described. If possible, limited performance assessments (e.g., sensitivity studies) should be undertaken for the purposes of supporting such evaluations. These initial evaluations of the PACs should be coordinated with the performance assessment studies that are planned to be conducted over the next year.
- 3.3 The surface-based tests described in the SCP should be evaluated with respect to the PACs and judgements made regarding the relative importance of each test in providing the information needed to characterize the PAC. These evaluations should consider, where possible, performance assessments made specifically for this prioritization effort or those being conducted in parallel as part of the broader performance assessment calculational exercises. Priorities will be established for the testing program through identification of those tests that provide data that are deemed important to the characterization of the most significant PACs. The results of this prioritization effort will be compared with the currently planned sequence for surface-based testing in order to assess the adequacy of the current plans and to develop recommendations for resequencing the testing program, where appropriate, to ensure an early focus on PACs that may represent site-suitability concerns. Comments received from the NRC, the ACNW, the State, and the EEI will be reviewed to determine whether specific site conditions or features have been identified that are not covered by the NRC's PACs that should be factored into the prioritization process.

- 3.4 A process or method that could be used to evaluate site suitability on a continuing basis during site characterization should be defined as part of this effort to ensure that the priorities identified for the testing program are consistent with a reasonable range of options for assessing site suitability. At least two distinctly different types of evaluations should be considered: 1) preliminary evaluations, based on the results from surface-based testing, and 2) detailed evaluations, including a final evaluation conducted near the end of site characterization as part of the process leading to a decision on site recommendation. The strategies presented in the SCP for making findings related to site suitability (Sections 8.3.5.6, 8.3.5.7, and 8.3.5.18) should be reviewed to identify whether programmatic or technical changes would be necessary to implement the evaluation considered under item 2.
- 3.5 The process or method for evaluating site suitability should consider the use of specific evaluation criteria. The evaluation criteria may be related to specific field tests or to performance assessment sensitivity results during the early phase of site characterization.
- 3.6 The results from the activities described in Section 3.2, 3.3, 3.4, and 3.5 should be reviewed to identify whether recommendations should be made on revising priorities for planned performance assessment studies or on adding new sensitivity or uncertainty studies to support prioritization of testing and definition of the bases for site suitability evaluations.
- 3.7 The assumptions made in planning the activities to be conducted under this guidance are as follows:
- The surface-based testing program currently planned provides an adequate basis for initiating site characterization and can proceed in parallel with the evaluations to be conducted under this guidance, once the appropriate prerequisites for initiation of such testing have been satisfied.
 - The implementation of this guidance will require resource commitments from both site characterization and performance assessment program efforts. Planned performance assessment sensitivity studies should be explicitly linked to the evaluation and documentation of testing priorities.
 - Any changes in the testing program recommended as a result of this evaluation will be subject to review and must be approved under the appropriate change-control procedures before any change is implemented. Changes in the testing program and any necessary study plan revisions can be accommodated without causing significant schedule delays.
 - The initial results of this evaluation will be available in time to support implementation of the base-case schedule for site characterization. This will ensure that surface-based tests are

appropriately sequenced to provide an early focus on PACs that are likely to be significant site-suitability concerns. The information is also needed as input to support a separate evaluation of alternative strategies leading to submittal of the license application.

- The decision to proceed with underground exploration and testing once prerequisites have been satisfied is not dependent on the completion of this evaluation or on the completion of the proposed surface-based testing program.

4.0 DEFINITIONS

4.1 Site suitability: For the purposes of the activities described in this guidance, site suitability is defined on the basis of evaluations of site and system performance against the performance objectives specified by the NRC in 10 CFR Part 60, taking into account the influence of PACs such as those identified in 10 CFR 60.122. A site is suitable if site conditions permit the natural and engineered barriers to meet the NRC's performance objectives, or other performance objectives approved by the NRC under 10 CFR 60.113(b).

4.2 Other definitions: As needed.

5.0 REFERENCES

- 5.1 Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada. DOE/RW-0199, December 1988.
- 5.2 NRC Staff Site Characterization Analysis of the Department of Energy's Site Characterization Plan, Yucca Mountain Site, Nevada. July 1989.
- 5.3 ACNW Review of NRC Comments on DOE Site Characterization Plan. Letter from D. W. Moeller, Chairman, ACNW, to K. M. Carr, Chairman, NRC, July 3, 1989.
- 5.4 Comments on Department of Energy Site Characterization Plan for Yucca Mountain Site. Letter from J. J. Kearney, EEI, to C. P. Gertz, YMPO, transmitting EEI/WASTE comments on SCP, June 1, 1989.
- 5.5 State of Nevada Preliminary Comments on the Site Characterization Plan for the Yucca Mountain Candidate High-Level Nuclear Waste Repository Site. Letter from R. R. Loux, Executive Director, Agency for Nuclear Projects, Nuclear Waste Project Office, to C. Gertz, Project Manager, YMPO, May 30, 1989.
- 5.6 State of Nevada comments on the Site Characterization Plan. Letter from R. R. Loux to S. Rousso, Acting Director, OCRWM, September 1, 1989.

6.0 DOCUMENTATION AND DELIVERABLES

The documentation and deliverables produced as a result of the implementation of this guidance should include the following:

- 6.1 The first deliverable should be a detailed management plan to describe how the guidance provided here will be implemented. The management plan should describe the sequence of activities to be completed to satisfy the scope of work described in Section 3.0 and present a schedule for the activities that will result in meeting the milestones identified in Section 8.0. The individuals responsible for conducting the work should be identified and the organizational framework described. The plan should identify the deliverables to be developed and the YMPO quality assurance (QA) requirements and procedural controls that will be applied in controlling and documenting the activities.
- 6.2 Briefing materials should be provided as interim deliverables to support interactions associated with milestones 8.4, 8.5 and 8.6.
- 6.3 The final report and supporting documentation should include the following information:
 - A description of the process followed and criteria used in: 1) evaluating the significance of each PAC known or suspected to be present at the site with respect to its potential impacts on waste isolation; 2) identifying and assessing the relative importance of the information needed to characterize each PAC; 3) comparing information needed against the surface-based tests planned to acquire that information; and 4) prioritizing the testing program based on the relative significance of the PACs and the tests associated with their characterization.
 - The results of the evaluation, including: 1) a description of the PACs and their relative ranking in terms of significance to waste isolation, including identification of the site-specific conditions or features that are associated with the possible presence of each PAC; 2) a description and assessment of the relative importance of the information needed to characterize each PAC; 3) priorities for surface-based testing, including justification based on items 1 and 2; and 4) an assessment of the adequacy of the current plans for testing, or recommendations regarding the need for resequencing of planned tests, or modifications to the testing strategy in response to programmatic decisions regarding the scope and timing for site characterization activities.
 - A description of the options considered for conducting site-suitability evaluations on a continuing basis during site characterization, an evaluation of the options, and recommendations for the preferred approach to conducting both the preliminary and more detailed evaluations described in Section 3.4

- A description and discussion of the information used in support of the evaluations.
- A description of the QA controls applied to the activities.
- A listing of the minimum qualifications for participants in each aspect of the evaluations, identifying the actual participants and their qualifications.
- A list of references.

7.1 OVERSIGHT, IMPLEMENTATION AND QUALITY ASSURANCE

- 7.1 The YMPO will have lead responsibility for the actions taken in response to this guidance and for documenting the results. It is expected that this guidance will be implemented through a joint effort involving YMPO, their contractors, and YMP participants, with DOE-HQ management overview of the progress. The prioritization activities should be conducted by a small team (perhaps 6-8 FTEs), with staff representing geoscience, engineering, and performance assessment. Periodic briefings will be scheduled to inform DOE-HQ of the status and preliminary results of these activities. The results will be subject to review and approval by DOE-HQ as noted in Section 7.3.
- 7.2 The evaluations to be conducted warrant the selective application of QA procedural controls sufficient to ensure that the nature of and basis for the evaluations and conclusions are appropriately documented. The activities to be conducted should be assessed in accordance with the YMP QA program requirements to confirm the preliminary determination of QA program applicability and to determine the necessary QA requirements and procedural controls to be applied. The QA controls to be applied by YMPO should be described in the management plan as discussed in Section 6.1.
- 7.3 The final report, presenting the results of the evaluations conducted in response to this guidance (see Section 6.3), will be submitted to OFSD (RW-20) for review by DOE-HQ under OCRWM QAAP 3.1.
- 7.4 A management plan (as described in Section 6.1), covering the activities to be conducted, the responsibilities and personnel involved, the QA controls to be applied, and the schedule for the evaluations and preparation of the associated documentation, should be prepared and submitted to OFSD (RW-20) for approval prior to initiating work.

8.0 SCHEDULE AND MILESTONES

	<u>Milestone</u>	<u>Date</u>
8.1	Issue DOE-HQ guidance for activity	10/30/89
8.2	YMPO management (implementation) plan submitted to OFSD (RW-20) for DOE-HQ approval	12/15/89
8.3	DOE-HQ approval of management (implementation) plan	01/05/90
8.4	Brief DOE-HQ on status (progress, problems, etc.)	04/13/90
8.5	Brief DOE-HQ on status and preliminary results of prioritization activities (relative ranking of PACs and prioritization of surface-based testing)	06/08/90
8.6	Brief DOE-HQ on status and preliminary results from identification of bases for evaluating site suitability	08/03/90
8.7	Submit final documentation and recommendations to OFSD (RW-20)	09/28/90
8.8	Briefing to Executive Committee on results	10/19/90
8.9	Recommendations to RW-1 for approval	11/09/90

Enclosure 2

PRELIMINARY SCOPING FOR SURFACE-BASED TESTING PRIORITIZATION INITIATIVE

TASK PLAN FOR SBT PRIORITIZATION

- o Assume 5-7 FTE support for 11 mos.
- o Task is to have high priority
- o Limited or no new evaluations/analyses will be performed
- o Small expert team will utilize available information (previous SCP-Integration Group assessments of site activity importance, records of interactions with U.S. Nuclear Regulatory Commission, etc.) to reevaluate priorities
- o Options and recommendations will be developed through formal use of expert opinion/decision analysis
- o Integration Team will be called upon to provide input to core team and to serve as members on expert panels

CORE TEAM

DOE Task Force Leads: Hughes/Boak (.4 FTE)
 T&MSS Team Lead: S. Mattson (.5 FTE)
 Site Team Lead: T. Barbour, USGS/SAIC-Golden (.5 FTE)
 Perf. Assessment Team Lead: S. Sinnock, SNL (.5 FTE)
 Decision Analyst Consultant: TBD (.3 FTE)
 Regulatory-Technical Consultants: TBD (.5 FTE)

YMP Integration Team (IT)
 USGS Contact & staff (1 FTE)
 (R. Raup - Geology; W. Wilson - Hydrology)
 SNL Contact & staff (1 FTE)
 (F. Bingham; T. Bonano)
 LLNL Contact & staff (.3)
 (Ballou)
 LANL Contact & staff (.3)
 (Canepa)
 T&MSS technical/administrative support (.5)

HQ Direct Oversight*

HQ-OFSD rep.: Van Camp (.3 FTE)
 Weston rep. (.3 FTE)
 HQ-OSIR rep. (.3 FTE)

YMP Management Review **
 YMP RSED & EDD Division Managers
 T&MSS Technical Director
 T&MSS Senior Technical Staff

- * Oversight of IT activities (telecons, workshops)
- ** Review and approve recommendations at completion



Department of Energy

Nevada Operations Office

P. O. Box 98518

Las Vegas, NV 89193-8518

DEC 13 1989

WBS 1.2.3

QA: N/A

Leslie J. Jardine, LLNL, Livermore, CA
Larry R. Hayes, USGS, Las Vegas, NV
Richard J. Herbst, LANL, Los Alamos, NM
Thomas O. Hunter, SNL, 6310, Albuquerque, NM
John H. Nelson, SAIC, Las Vegas, NV
Joseph C. Calovini, H&N, Las Vegas, NV
Robert F. Pritchett, REECO, Las Vegas, NV
Richard L. Bullock, FSN, Las Vegas, NV
Richard E. Lowder, MACTEC, Las Vegas, NV

PHASE 1e PROTOTYPE DRILLING PROSPECTUS

Enclosed please find a copy of the Borehole Prospectus which details the Phase 1e Prototype Drilling activities at Apache Leap. Please distribute a copy of the Prospectus to the Principal Investigators in your organization to establish any need for interface with the Phase 1e Program or utilization of the boreholes after drilling is completed.

The last paragraph of the Prospectus summary mentions that access to the prototype boreholes for testing following drilling will be handled through the Sample Overview Committee (SOC) by means of review and approval of a short, 2 to 3 page, proposal. It is important for the proposals to be in to this office no later than January 3, 1990, to be considered at the next SOC meeting, prior to initiation of drilling. Your earliest response to this request will be appreciated. After approved testing is completed, the boreholes will be plugged or "ownership" transferred through the Forest Service to either the University of Arizona or other interested parties.

Should you have any questions, please contact either Uel S. Clanton or Roy C. Long of my staff at (702) 794-7943 or FTS 544-7943 or (702) 794-7503 or FTS 544-7305 respectively.

A handwritten signature in dark ink, appearing to read "Carl P. Gertz", is written over a horizontal line.

Carl P. Gertz, Project Manager
Yucca Mountain Project Office

YMP:RCL-1104

Enclosure w/4 encls:
Borehole Prospectus

DEC 13 1989

Multiple Addressees

-2-

cc w/encl:

S. J. Brocoun, HQ (RW-221) FORS

A. D. Youngberg, HQ (RS-221) FORS

Ray Wallace, HQ (RW-22) FORS

B. B. Garms, FSN, Las Vegas, NV

C. J. Mason, REEC Co, Las Vegas, NV

BOREHOLE PROSPECTUS
PHASE 1e PROTOTYPE DRILLING: APACHE LEAP, ARIZONA

The overall objective of the Phase I Prototype Drilling Program is to determine if the prototype air drilling and coring equipment that has been specially designed and fabricated for the Yucca Mountain Project can obtain core from the depths required (almost 3000 feet) and leave the borehole in such a clean, dry condition that the logging and testing programs described in the Site Characterization Plan (SCP) can be successfully carried out. (Please note that no one has previously had the requirement for drilling and coring equipment to perform under the scientific constraints to be applied in site characterization.) There is no off-the-shelf equipment available for this task; almost all of the equipment is one-of-a-kind, a prototype.

The Lang Exploratory Drilling LM-120 drilling rig that we presently have under contract for the prototype drilling has a "001" serial number. Its present configuration did not exist prior to our discussions with Lang Exploratory Drilling. This unit is the largest known dual-wall drilling rig presently used in an operational capacity by a drilling contractor in the mining industry. It has a pull-back capacity that permits us to test the tools to approximately one half the full depth required during site characterization. The LM-250 rig (a new design under construction by Lang Exploratory Drilling) is being built to our specific requirements and will be the only rig in existence that will have the capability to meet the sampling/testing requirements called out in the SCP.

The bits being tested (both diamond and roller cone) are new designs made to order; they are not off-the-shelf items. The drill strings (both 7 and 9-5/8 inch) that we are using with the LM-120 and LM-250 are nonstandard items. The new bits and modified drill strings must be tested at the earliest possible date and to the maximum depth to determine if the total system can drill the boreholes to depth with minimum borehole contamination and acquire the core required for site characterization.

The Apache Leap drilling program is the third test of the prototype equipment. Changes have been made to the tools based on each of the previous tests. If the present designs do not work to the depth required, some additional time/money/design/testing will be required to obtain a viable system. Ideally, we should have a proven drilling and coring system before we start site characterization.

The Project plans to drill three different diameter boreholes (6-1/4", 8", and 12-1/4") at Apache Leap, Arizona. The two smaller holes will be drilled to a planned depth of 1700'. The larger hole will be drilled to a depth of 1100'.

The 6-1/4" hole will be hammer drilled. Cuttings will be available but no core will be taken. The 8" hole will be drilled in close proximity (within 50') to the 6-1/4" hole. Both cuttings and HQ size core (2.4" diameter) will be taken and logged by Sample Management Facility (SMF) personnel. The 12-1/4" hole will be drilled in close proximity to the 8" hole. Cuttings and PQ size core (3.3" diameter) will be taken and logged by SMF personnel.

The continuing objective of the Phase I Prototype Program is to drill and core the prototype boreholes as deep as possible. In conjunction with this continuing objective, the focused, primary objective of the Phase 1e Drilling

ENCLOSURE

Program at Apache Leap is determination of drilling, coring, and trip times along with bit life (both roller cone and diamond bits) so that a drilling schedule can be developed to determine the time required to complete the drilling requirements outlined in the Site Characterization Plan (SCP). An important adjunct to this primary objective is the determination of the number of drill rigs required to complete the SCP drilling program once drilling/coring durations are known and a completion date is set.

The second objective is to compare the geophysical log quality from three different sizes of boreholes and establish, as soon as possible, a basis for determining the need for both the 8 and 12-1/4" boreholes. Enclosure A is a matrix of the activities to be completed versus diameter. The lower portion of the matrix describes the geophysical logs planned to be run as the basic U.S. Geological Survey (USGS) logging program. As noted on the matrix, additional logs may be run to fulfill geochemical requirements as soon as need and capabilities are verified. Enclosure B and C are the Apache Leap site evaluation report and the anticipated Geologic Section respectively. Enclosure B contains a map showing the primary and contingency drill sites.

A third, and continuing, objective is the establishment of efficient methods and procedures for acquisition of samples while minimizing contamination and maximizing quality of the borehole. Enclosure D is the Fenix and Scisson of Nevada (FSN) drilling program. In accordance with this program, perched water, known to exist at Apache Leap, will be grouted off. Development of successful grouting procedures for water shutoff in an empty borehole (and minimizing borehole contamination) will also be an objective of the prototype drilling. These procedures will be distributed to the Principal Investigators (PIs) following the Apache Leap drilling. The PIs will review the procedures for potential conflicts with each PIs testing/sampling program. Although perched water is not presently anticipated at Yucca Mountain, establishment of acceptable procedures will avoid significant delays in the event perched water (however limited) is found after Quality Level I Activities are initiated.

PI interactions while the borehole is being drilled will be limited. If the interaction does not impact the prototype objectives, the SOC will recommend a course of action as per AP-6.4Q. Both the Director, Regulatory and Site Evaluation Division, and the Project Manager, Yucca Mountain Project Office, will concur on PI involvement at Apache Leap.

The present plan calls for installing locking caps on all three boreholes to leave them available for additional packer and geophysical testing by the USGS and others as required. Access to the boreholes for testing, logging, gas sampling, etc. will be through the Sample Overview Committee (SOC) by way of a short proposal. The proposal should outline the activity to be performed, the time/duration of the activity, schedule/sequence of the test, support required and from which organization(s), Study Plan/Activity under which the activity will be performed and any other information that the PI wishes the SOC to consider in the evaluation of the proposal. Timing and schedules are required in order to allow coordination with the Forest Service (the landowner at Apache Leap) for potential conflicts.

Page 3 of 3

The holes will be plugged and the locations reclaimed as soon as possible after completion of testing in order to maintain a good working relationship with the Forest Service. The possibility exists of leaving the boreholes open for an extended period, as required for additional testing, by means of a transfer of ownership agreement. However, the Yucca Mountain Project Office should be notified of needs as soon as possible and the transfer will have to be coordinated with and approved by the Forest Service.

**PHASE 1 PROTOTYPE DRILLING, APACHE LEAP:
DETAILED OBJECTIVES**

	BOREHOLE SIZES		
	6-1/4"	8"	12-1/4"
CORING TIME		X	X
DRILLING TIME	X		
REAMING TIME		X	X
TRIP TIME:			
FOR CORING		X	X
FOR REAMING		X	X
FOR HAMMER	X		
BIT LIFE:			
CORE BIT		X	X
DRAG BIT		X	
ROTARY BIT		X	X
HAMMER BIT	X		
REAMING BIT - TESTING FOR DURABILITY		X	
GEOPHYSICAL LOGS:			
DENSITY TOOL #2213	X	X	X
DENSITY TOOL #2227		X	X
NEUTRON- ENP	X	X	X
NEUTRON- AWS TOOL #2415	X	X	X
6-ARM CALIPER	X	X	X
GYRO SURVEY	O	X	X
TV LOG	O	X	X
* DUAL INDUCTION	O	X	X
* DIELECTRIC		X	X

* These logs will require that laboratory measurement of water saturation be made in order to confirm calibration.

The above logs, marked with an "X", have the concurrence of USGS as a basic logging program to attempt at Apache Leap if "empty hole" calibrations can be made by Atlas Wireline Services in time for the Prototype operations estimated to begin in January. Lab work will also likely be required on recovered samples to confirm grain density and porosity. The three logs marked with an "O" are additional logs recommended to be run by the Project Office. Additional Geochemical and Water Saturation Logging tools available from Schlumberger are in the process of being investigated. Should these tools prove applicable to site investigation requirements, the following additional Schlumberger tools might be run: 1) GNT-G Dual Detector Neutron Log (improved compensated neutron log for air-filled boreholes); 2) Schlumberger's Geochemical Tool; and 3) TDT (Thermal Decay Time - new dual-pulse/dual-gate system for improved statistics)