

Department of Energy  
Washington, DC 20585

DEC 17 1992

Mr. Joseph J. Holonich, Director  
Repository Licensing & Quality Assurance  
Project Directorate  
Division of High-Level Waste Management  
Office of Nuclear Material Safety  
and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Mr. Holonich:

Enclosed with this letter is a controlled copy of Study Plan 8.3.1.9.2.1 prepared by the U.S. Department of Energy (DOE) for the Yucca Mountain site. The study plan numbers correspond to the same numbers used in the Site Characterization Plan (SCP) for the Yucca Mountain site.

<u>Number</u>	<u>Title</u>
8.3.1.9.2.1	"Natural Resources Assessment of Yucca Mountain, Nye County, Nevada"

DOE has reviewed the study plan for consistency with the content requirements for study plans, as given in Attachment B to the Summary of the DOE/U.S. Nuclear Regulatory Commission (NRC) meeting on the Level-of-Detail for the SCP (May 7-8, 1986). DOE is submitting this plan to NRC as agreed to in the meeting.

As discussed during the DOE/NRC meeting (December 15, 1988) on study plans, DOE has decided to control preparation and review of study plans as a quality activity. This study plan was reviewed under current Yucca Mountain Site Characterization Project Office (YMPO) and U.S. Department of Energy/Headquarters quality assurance (QA) procedures.

Study plans prepared under current procedures do not require detailed information on QA requirements. To satisfy the May 7-8, 1986, agreement to provide specific QA requirements, current study plans indicate that applicable QA criteria will be specified in Yucca Mountain Site Characterization Project QA Grading Reports, which are issued as separate controlled documents.

It should also be noted that there may be some inconsistencies in the milestone report titles and schedules given in this study plan and those in the SCP. Study plans, in general, represent a further evolution of the study in the areas related to schedules

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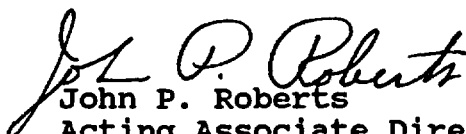
and milestones relative to the SCP, and as such, represent DOE's current plans.

DOE wishes to call to NRC's attention Site Characterization Analysis (SCA) Open Comments 34 and 53 and Questions 14 and 15, which were directed to Study 8.3.1.9.2.1. Enclosure 2 provides a discussion of how these open items are addressed in the study plan.

The Document Transmittal/Acknowledgement Record for your controlled copy of the study plan should be signed and dated and returned to the Document Control Center in Las Vegas, Nevada.

If you have any questions, please contact Mr. Chris Einberg of my office at 202-586-8869.

Sincerely,



John P. Roberts  
Acting Associate Director for  
Systems and Compliance  
Office of Civilian Radioactive  
Waste Management

Enclosures:

- on the shelf*
1. Study Plan 8.3.1.9.2.1
  2. Relation of Study Plan 8.3.1.9.2.1  
to NRC Open Items

cc: w\enclosures  
Alice Cortinas, CNWRA, San Antonio, TX

cc: w\enclosure 2  
C. Gertz, YMPO  
R. Loux, State of Nevada  
T. Hickey, Nevada Legislative Commission  
M. Baughman, Lincoln County, NV  
J. Bingham, Clark County, NV  
B. Raper, Nye County, NV  
P. Niedzielski-Eichner, Nye County, NV  
G. Derby, Lander County, NV  
P. Goicoechea, Eureka, NV  
C. Schank, Churchill County, NV  
F. Mariani, White Pine County, NV  
V. Poe, Mineral County, NV  
E. Wright, Lincoln County, NV  
J. Pitts, Lincoln County, NV  
R. Williams, Lander County, NV  
J. Hayes, Esmeralda County, NV  
B. Mettam, Inyo County, CA  
C. Abrams, NRC

RELATION OF STUDY PLAN 8.3.1.9.2.1 TO NRC OPEN ITEMS

Comment 34

1. How Study 8.3.1.9.2.1 integrates its drilling needs with other studies such as the rock characterization program.
  - o Numerous statements are made in Study Plan 8.3.1.9.2.1 (e.g., Sections 2.1.2.1, 2.2.2, 3.1.1.1) to the effect that full advantage will be taken of cores and cuttings from a sufficient number of existing and proposed new boreholes to adequately cover the study area and lead to a thorough and comprehensive assessment of the natural resource potential. In particular, requests have been made of the integrated drilling program (Activity 8.3.1.4.1.1) to drill boreholes G-5, -6, and -7 to sufficient depths to penetrate a substantial thickness of Paleozoic rocks beneath the volcanic tuff sequence for mineral and petroleum appraisal purposes. Statements are also made (e.g., Sections 3.1.2, 4, and 5) in reference to the coordination of activities with other studies such as Study 8.3.1.4.2.1, Vertical and lateral distribution of stratigraphic units within the site area.
  
2. Sampling in the ESF
  - o Although no specific mention is made in Study Plan 8.3.1.9.2.1 for the collection of samples from the ESF, neither are these excavations excluded from the extensive subsurface sampling program being planned for this study. Detailed sampling of soil and rocks in test pits, trenches, and borings (in connection with the ESF) will be conducted in Investigation 8.3.1.14.2 (Studies to provide soil and rock properties of potential locations of surface and subsurface access facilities), and these samples should be available for geochemical analysis as well as physical properties testing. In addition, rocks will be mapped and also sampled in the ESF as part of Study 8.3.1.4.2.2 (Characterization of the structural features within the site area). In this regard, Study Plan 8.3.1.4.2.2 (p. 2.4-7 states that samples from the ESF will be collected for use in Study 8.3.1.3.2.2 (History of mineralogic and geochemical alteration of Yucca Mountain), and Study Plan 8.3.1.9.2.1 (Section 2.1.1.1) states that full use will be made of data from Study 8.3.1.3.2.2 because of the close relationship between the two studies.
  
  - o Collection of samples from the ESF will not significantly reduce the dependency of Study 8.3.1.9.2.1 on samples of cores and cuttings from boreholes.

Comment 53

- 1) Plans to test structures or potential ore hosts and the testing of tectites on the margin of the hypothesized Crater Flat caldera complex
  - o As described in Section 3.2.1 of Study Plan 8.3.1.9.2.1, the major emphasis of the mineral resource study will be placed on identifying rock types, depositional environments, mineral associations, and tectonic and volcanic settings that are favorable for, or indicative of, the formation of mineral deposits. All existing geologic, geophysical, and geochemical data, as well as new data from other site characterization studies (e.g., Study 8.3.1.4.2.1), will be utilized in the evaluation. Particular attention will be given to geophysical boundaries associated with faults and lithologic variations in bedrock. The possible presence of faults, including detachment and thrust faults, and (or) a metamorphic core complex beneath Yucca Mountain and their significance to ore-forming processes will also be evaluated. Maps, cross sections, and other graphic materials will be prepared to portray geologic structure and stratigraphy and the type and extent of identified or inferred zones of alteration and mineralization.
  - o To our knowledge, there are no current plans in the integrated drilling program (Activity 8.3.1.4.1.1) for a borehole to test the presence of contact metamorphism around the hypothesized Crater Flat caldera complex. If evidence of contact metamorphism is forthcoming from current mapping in that area (Studies 8.3.1.4.2.1, 8.3.1.4.2.2, and 8.3.1.17.4.5), then such evidence will be pursued to the extent possible under present drilling plans.
2. Integration of Study 8.3.1.9.2.1 with other geological, geophysical, and geochemical investigations.
  - o Coordination of this study with other, closely related studies in the site characterization program is referenced in many sections of Study Plan 8.3.1.9.2.1 (e.g., Sections 2.2, 3.2, 4, and 5).
3. Assessment of mineral/hydrocarbon potential of pre-Cenozoic rocks
  - o Proposed boreholes G-5, -6, and -7 have been requested to be drilled to depths that will penetrate the Cenozoic/Paleozoic contact zone (detachment fault?) as well as substantial thicknesses of the Paleozoic strata; pertinent discussions are found in Sections 2.1.2.1, 2.4.2.2, and 3.1.1.1 of Study Plan 8.3.1.9.2.1.
  - o As indicated in Section 3.1.1.1, sampling for geochemical analyses will not be restricted to the volcanic tuffs within the potential repository area, but will include rock types from the surrounding areas, and particularly from those areas with potential or suspected mineralization and from prospects and currently or previously active mines.

- o With regard to the study of potential petroleum source rocks, outcrop samples of Paleozoic rocks will be obtained from adjacent areas such as Bare Mountain, Calico Hills, Bullfrog Hills, and the Mine Mountain-Syncline Ridge area, and possibly from still more distant areas (see Section 2.4.2.2, Study Plan 8.3.1.9.2.1).

#### 4. Conceptual models

- o In Section 3.5.1 of Study Plan 8.3.1.9.2.1, it is stated that analog environments of known mineral deposits will be compared with the geological, geochemical, and geophysical characteristics of the potential site area. To the extent possible, analogs will be selected that consist of comparable structures, rock types, and other features which originated under similar geologic conditions in the surrounding regions.

Question 14

1. Use of historical data

- o By direct statements or strong inferences in Sections 3.1.1.1 and 3.2 of Study Plan 8.3.1.9.2.1, data bearing on all currently or previously active mines and prospects in and surrounding the potential site area will be evaluated during the course of the mineral resource studies; all available information bearing on past mineral exploration and development activities will be utilized.

2. Coordination with other studies using previous drill data

- o As indicated in Sections 2.1.1.1, 2.3, 3.2.1, Figure 5-1, and Table 5-1 of Study Plan 8.3.1.9.2.1, and as stated in previous parts of this statement, there will be close coordination and sharing of information between the mineral resource study and numerous other studies in the site characterization program. This includes the use of all pertinent geological, geophysical, and geochemical data resulting from studies of previous drilling in the study area.

Question 15

1. Program for assessing natural resources in Study 8.3.1.9.2.1
  - o The general theme of Study Plan 8.3.1.9.2.1 is to conduct a broadly based, comprehensive, and objective program for assessing the natural resource potential of the Yucca Mountain area. All pertinent geologic factors will be taken into account (including Yucca Mountain's proximity to other mineralized areas and the presence of faults and other potentially mineralized zones--see, for example, Section 3.2.1), and no assumptions are being made in advance of the planned studies as to the nature of the evidence that will be found with regard to the presence or absence of mineral deposits.
2. Probabilistic and quantitative estimates of discovered or undiscovered mineral resources
  - o Section 3.5.1 of Study Plan 8.3.1.9.2.1 addresses this subject in detail.
3. Utilization of supporting activities
  - o Responses to previous comments regarding the relationships and need for coordination with other studies/activities should suffice to answer this question.